

Ba⁺teries International

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Don't play it again, Sam When supply chains fracture the industry, we must all remember this

**Europe's big storage gap:
from ambition to inaction**

**Why Yichang is the battery
capital you've never heard of**

**Beware the Thucydides trap:
China, power and paranoia**

**The big BESS balancing act:
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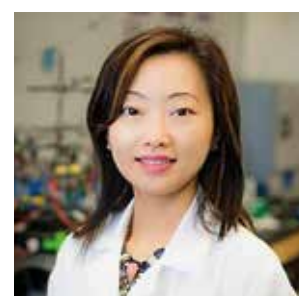


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China, technology, and the new Thucydides Trap

Two ideas — one from ancient Greece and one from modern academic thinking — help explain much of the tension between China, the West, and their race for technological leadership.

The first idea comes from the Greek historian Thucydides. Writing about 2,400 years ago, he argued that the rise of Athens and the fear it created in Sparta made conflict between the two Greek city-states unavoidable.

Today this is known as the “Thucydides Trap”: when a rising power threatens an established one.

In simple terms, it means fear of losing power or influence pushes nations toward confrontation.

The second idea is the so-called Collingridge Dilemma, developed by technology scholar David Collingridge around 1980.

His argument is straightforward. Early in the development of a new technology, governments can still control how it is used and how it grows — but nobody yet understands its long-term consequences. Later, once the risks become clear, the technology is already deeply built into society and almost impossible to remove.

Put these two ideas together and a worrying picture appears.

Today’s geopolitical struggle with China is no longer only about economics or military strength. Increasingly, it is about technology — and the fear among current powers of losing control over the know-how that will shape the future.

Technology has become the new battlefield of global politics.

Artificial intelligence, quantum computing, semiconductors, surveillance systems, green energy infrastructure, telecommunications networks — and now batteries and energy storage — are no longer just tools for economic growth.

They are strategic assets. Energy storage is becoming the new oil. Batteries are the barrels of modern Brent crude. Control energy storage and you become the new OPEC.

Whoever controls these technologies may shape not only markets, but also military strength, intelligence capabilities, and political influence for decades.

That is why China’s technological rise has unsettled the US, Europe, and their allies so deeply.

Take Huawei and the battle over 5G networks. For years, many countries welcomed Huawei because it provided advanced telecommunications systems cheaply and efficiently.

Only later did governments begin asking difficult questions. What happens when critical national infrastructure depends on a Chinese company closely linked to the Chinese state? Could hidden weaknesses exist? Could data flows be monitored or manipulated?

By then, many countries had already integrated Huawei technology into their systems.

This is the Collingridge Dilemma in action. The technology was easy to adopt before its geopolitical consequences were understood.

Once those consequences became clear, removing it became expensive, politically divisive, and strategically difficult.

When Tesla introduced automatic software updates for its vehicles in 2012, the world praised the arrival of over-the-air technology. When Chinese car and battery giant BYD introduced similar systems in 2021, media discussion quickly shifted toward fears in some quarters that, during a conflict, China could potentially stop traffic remotely with a single electronic OTA message.

Artificial intelligence creates the same problem on an even larger scale. China is investing heavily in AI, from facial recognition systems to military applications and generative models.

The US fears not only commercial competition, but also the possibility that China could dominate the next foundational technology of the global economy. Europe, although less powerful in this contest, also worries about the pressure this competition places on its own industries.

That fear has led to export controls on advanced chips, restrictions on technology transfers, and efforts to shift semiconductor supply chains away from China. These policies are not normal trade measures. They are acts of strategic containment shaped by the logic of Thucydides: established powers fear the speed and scale of the challenger’s rise.

The danger is that the Collingridge Dilemma and the Thucydides Trap strengthen each other.

Because emerging technologies are not fully

understood, countries assume worst-case scenarios. Nobody completely knows how transformative AI or quantum computing may become, so governments rush to avoid falling behind. Waiting may seem dangerous. But acting aggressively can also increase tensions. Uncertainty creates fear, and fear encourages confrontation.

Unlike earlier industrial rivalries, this competition affects every part of society. Modern technologies are “dual-use”: civilian on the surface, military underneath.

Semiconductor factories make smartphones possible, but also advanced weapons systems. AI powers consumer apps, but also cyberwarfare and autonomous weapons. Satellite systems support navigation, but also intelligence gathering.

As a result, every technological breakthrough gains geopolitical importance.

Even green technology has become tied to strategic rivalry. China dominates much of the global supply chain for solar panels, batteries, and electric vehicles. Western governments want fast green transitions, but they also fear becoming dependent on Chinese manufacturing.

Again, the same dilemma appears: societies adopt transformative technologies before fully understanding the long-term strategic costs.

Yet the real danger may not be Chinese innovation itself, but the psychology surrounding it.

Thucydides’ central insight was ultimately about fear.

Rising powers become dangerous partly because established powers panic. History shows that insecurity can become self-fulfilling. Trade wars harden into political hostility. Technology restrictions deepen distrust. Scientific cooperation collapses into suspicion. Every innovation begins to look like a threat.

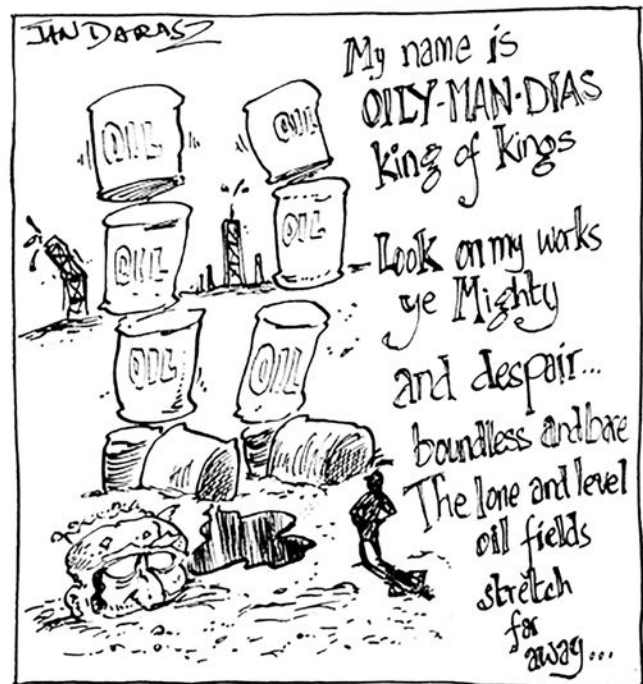
The risk is that technology becomes militarized not because conflict is unavoidable, but because nations convince themselves that it is.

That said, the comparison with ancient Greece has limits. The modern world is deeply interconnected. The US and China remain economically tied together even during periods of rivalry.

As our cover story in this issue argues, global supply chains, multinational corporations, and international research networks make complete technological separation almost impossible. Despite many determined but unrealistic efforts to achieve it.

The concern is that this interdependence may be the ONLY real restraint preventing escalation.

Still, the broader pattern is clear. The rise of Chinese technology has collided with a classic geopolitical reality: established powers fear losing dominance.



Energy storage is becoming the new oil. Batteries are the barrels of modern Brent crude. Control energy storage and you become the new OPEC.

At the same time, societies are dealing with technologies whose consequences they barely understand until it becomes too late to control them.

The result is a volatile mix of uncertainty, dependence, and strategic anxiety.

This century may therefore be shaped by a new version of an old struggle — not simply between nations, but between the speed of technological change and humanity’s ability to govern it wisely. China’s rise has exposed that tension more clearly than ever before.

Unless governments learn to manage both technological disruption and geopolitical rivalry at the same time, the world risks stumbling into exactly the kind of outcome both Collingridge and Thucydides warned about.

A crisis nobody fully intended, but nobody could prevent.

If history offers lessons worth remembering, then it is worth recalling the outcome of the original Thucydides Trap. The rising power, Athens, challenged the established power, Sparta.

And Athens lost.

Its empire was dismantled, Athens’s defences destroyed, and its naval fleet surrendered. A reign of terror followed, and much of its political and commercial elite was executed. ■

Mike Halls, publisher

The Battery Capital You've Never Heard Of



In a city few outside China know, battery giants are building a complete battery ecosystem at a pace that challenges Western assumptions about sovereignty, competitiveness and the future of the industry.

Hans Eric Melin, MD of Circular Energy Storage, visited Yichang and reveals how the astonishing speed of its rise offers an uncomfortable lesson in scale, coordination and the limits of Western industrial policy.

Recently I was in Yichang, a city of 3.9 million people in Hubei province. Outside China it is not especially well known. You may know the Three Gorges Dam, the world's largest hydropower plant, which sits

just upstream and produces more electricity than Austria consumes in a year.

You likely don't know that Yichang is also one of the largest phosphate basins in China, sitting on the

Yangtze with direct shipping access to Shanghai, and that it is in the process of turning that geology into one of the most concentrated battery and battery materials clusters in the world.

I was invited by the municipality of Yichang to speak at the International Energy Storage Battery Conference as an expert on battery circularity. What I saw is worth describing in full, because it shows how detached the European and American discussion has become from the realities of scaling the battery industry and the meaning of sovereignty and independence.

The scale

Yichang already has more than 100GWh of battery cell production capacity in operation or under construction. CORNEX is building toward 145GWh on a single site. Envision AESC is investing RMB24.2 billion (\$3.6 billion) in



Huang Jianxiong, Secretary of the CPC Yichang Municipal Committee opens the International Energy Storage Battery Conference in Yichang

100GWh of large-format storage cells. Sunwoda's joint venture with Dongfeng is producing EV cells at 30GWh.

On the materials side, Brunp — the CATL subsidiary — went from signing a contract in January 2025 to operating a 450,000 tonnes per year LFP cathode plant in December of the same year. Eleven months.

Yihua Group has filed environmental assessments for 1.6 million tonnes per year of LFP cathode capacity on top of that. Tinci is building iron phosphate at 300,000 tonnes per year. Recycling capacity at the CATL Brunp park is being expanded by another 300,000 tonnes per year of LFP battery throughput.

This is one city. It is not Shenzhen, not Ningde, not Changzhou.

It is a place most people outside of China have never heard of, building an integrated value chain from phosphate rock through cell to recycled material on the bank of a river that connects directly to the global market.

The clarity

What was just as striking as the scale was the alignment. Province, municipality, banks, and companies are reading from the same page. Every actor knows what Yichang is becoming and what their role in it is.

That clarity is what gives companies the confidence to commit billions to projects that move from signing to commissioning in under a year.

Before the conference, I was invited for tea with Huang Jianxiong, Secretary of the CPC Yichang Municipal Committee. Polite, ceremonial, as these meetings tend to be.

The next morning he opened the conference with a speech that laid out a clear vision: a region built on the world's largest hydropower plant and one of China's largest phosphate basins, positioning itself as a centre of the global energy storage industry, with decarbonisation as the organising principle — both decarbonising the battery industry itself and capturing the opportunity created by the world's need to decarbonise. He then stayed for the whole morning session.

So did the mayor's office. They listened to technical experts on cathode chemistry, ESS fire mitigation, and cell innovation until lunch.

What I believe in



The far larger prize, and the one the EU in particular is not paying enough attention to, sits in what batteries enable rather than in who produces them.

Electrification, independence from imported fossil fuels, clean air, lower system costs, energy security, the productivity gains of cheap clean power. This is what we call the real battery economy, and it is where most of the economic and societal value of the energy transition is realised. It does not require us to win the cell race to capture it.

What we do at CES is serve the business that comes out of a battery society — regardless of who produced the batteries.

We see real opportunity across the whole value chain in Europe, the US, Canada, Australia, and other emerging markets where electrification is growing: in developing and selling applications that use batteries, financing them, operating them, and the equivalents for the batteries themselves — repairing, reusing, repurposing, remanufacturing, and eventually recycling.

I even think a genuine material recovery industry is possible in Europe — but not by copying a Chinese model that cannot be copied, and not by hoping that subsidies and targets will conjure demand that is not there. It has to be built on demand and capabilities that actually exist. Starting from where profit is actually possible.

I believe in particular that we need to focus on value creation and retention. That is what a high-cost society can do well.

Retained value increases bankabil-

ity, which makes products available to larger audiences even when not everyone can pay up front. It nurtures repair and reuse, and it lets us extract more value from every atom delivered, regardless of where the atom was produced. All of that value stays inside the borders where the battery sits.

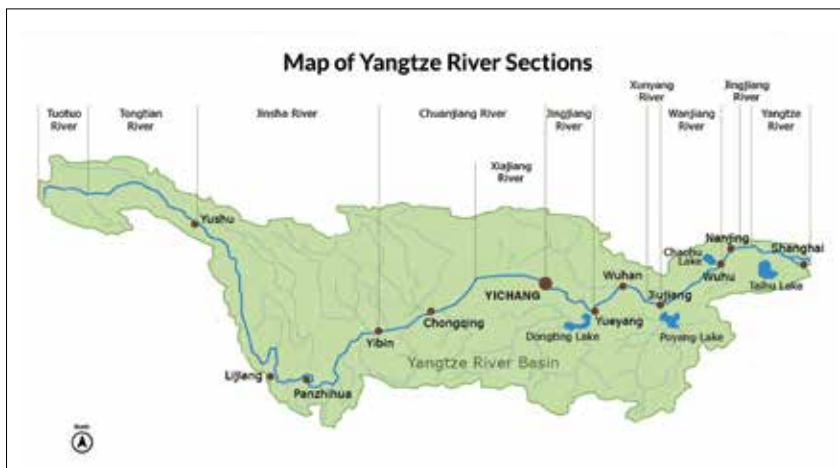
China is operating at an order of magnitude that Europe and the US are not. And the gap is widening every month.

A lot of our attention right now is on the future value of batteries and how to safeguard it, because that is the lever for several important industries in our region.

Rather than helping companies build what already exists elsewhere, built better by more experienced and more competitive players, we try to help companies optimise the battery volumes that are evidently already here.

That is also my biggest motivation for trying to cut through the noise in this market, where projects and companies get funded on the basis of unrealistic dreams. That is not good for anyone — not for society, not for investors, and not for the entrepreneurs who fly until they discover they were never airborne to begin with.

It is not wrong to be a visionary. It is wrong to plan against a vision that has no relation to reality. Yichang is real. It will not wait for us to catch up. ■



Above and right: The Three Gorges Dam's location on the Yangtze River

Below: Yichang, China: High angle panoramic view of the Three Gorges Dam multi-stage ship locks and the Yangtze River surrounded by mountains and close to of the Dam



I am not interested in being the bore who declares the race over. The race is not over. But the gap is not the kind of gap that gets closed by a subsidy programme or a directive.

I have sat through many conferences in Europe and the US where a politician arrives to deliver opening remarks while a stressed press secretary waits by the stage to pull them out to the next event with a new script in hand.

In Yichang the politicians were the audience for the engineers.

At dinner the night before, I was seated with the founder of Brup, the leadership of Dongfeng Motors, Envision AESC, Sunwoda, Tinci Materials, the China Three Gorges Corporation, Yunnan Energy New Materials, and the heads of several other large battery companies, alongside the political delegation. Behind us, a screen ran footage of the dam, of automated cell lines, of robots disassembling battery packs.

Dishes arrived at a pace that left no room to drift; conversation moved from technology to commercial terms to project timelines and back again, in the same polite, well-organised register that runs through everything in China. There is no country where I feel a stronger commercial appetite than in China right now.

The interest in making deals, finding partners, opening markets, building businesses is everywhere. This is not a system winding down on past success. It is a system pushing outward.

Dan Wang's recent book *Breakneck* argues that China is run by engineers and America by lawyers — and Europe, one might add, by bureaucrats. After this week, I would not argue with him.

The execution

Yichang is not only vision. It is the power of execution — vision rapidly translated into capacity, with the whole ecosystem scaling together and talking to each other while it scales.

It shares that dedication to execution with the rest of China.

A few days before Yichang I was in Guangdong. I visited three LFP recycling sites and several pCAM and cathode plants. Every one of them was discussing expansion, partnerships, offtake, joint ventures, export markets.

One was a joint venture between GEM and the carmaker GAC for direct recycling of cathode material — 25,000 tonnes per year of electrode repair capacity. At CES we covered the announcement two years ago. The plant is now operational, and it is among the most modern facilities of its kind I have seen anywhere.

The cell plants I visited had automation levels and scrap rates that European producers would struggle to match.

That alignment shows up in lived experience too. In Shenzhen last week, 80% of the cars I saw on the streets now were electric. Deliveries arrive by drone. The air is clean, the streets are quiet, and the quality of life that comes from electrification and clean energy is something you can see and hear with your own eyes and ears.

This is what alignment between policy, capital, and industry actually produces.

What this means for the West

I am not interested in being the bore who declares the race over. The race is not over. But the gap is not the kind of gap that gets closed by a subsidy programme or a directive.

China is not slightly cheaper or slightly faster. On the dimensions that matter — manufacturing capability, integration of the value chain, speed from decision to operation, political alignment behind industrial outcomes — China is operating at an order of magnitude that Europe and the US are not. And the gap is widening every month.

This is the context in which I want to push back on a broader idea that runs through European policy debate: that the way for Europe to capture value from the energy transition is to build, at scale, what China already builds — cells, materials, and recycling — and that doing so will deliver strategic independence.

We are chasing the wrong kind of independence, and in doing so we stumble and lose resources at the same time.

European and American industry will not out-produce its Chinese

Back then I believed Western companies could keep up. I don't believe it today, simply because the industry here has stood almost still.

equivalents on cells, cathode material, or recycled material this decade or next. Europe cannot provide the conditions for this to happen, and it is a waste of time and resources to work for it.

Even Korean companies, which alongside Panasonic used to be the leaders, are now scrambling to shift into LFP and into stationary storage — two segments they once led with nickel chemistries and then lost to Chinese manufacturers.

For energy storage the message from the companies on stage in Yichang was clear: ternary chemistries will die out. And bear in mind that it is Chinese producers leading that segment too.

One of the ideas most detached from reality is that Europe and America would gain independence through recycling — that by keeping the materials here we would eventually be able to control our own supply, whoever “we” is.

It is just not realistic.

The volumes of secondary material we can recover in Europe over the coming decade are a marginal fraction of what we need to electrify transport, build out the grid, and power industry.

We do not have a full value chain to absorb that material, and one is not about to be built. The companies that would produce, sell, and use that material at scale are not here. Recycling is a useful and necessary industry, but it cannot deliver sovereignty.

Anyone claiming otherwise — politician, civil servant, industry organisation — is telling you something that sounds good in a conference room and means nothing in the market.

This matters because it leads companies to plan against a fantasy. Targets are set, contracts are signed, obligations are sized against a version of the world that does not exist.

Eight years ago I was already pointing out what the conditions in China and South Korea actually were, and arguing that Europe could build something on a smaller scale if we were honest about the economics.

Very little has happened since in the West, while a great deal has happened in China and South Korea.

To believe the same strategies from then could be used today is comfort thinking. Back then I believed Western companies could keep up. I don't believe it today, simply because the industry here has stood almost still.

That does not mean Europe has nothing to offer. We are slower because we care about safety, environmental protection, and labour conditions, and that is not a fault to be apologised for. The fault is that we have not turned those principles into competitive processes.

Permitting is too slow. Construction costs are too high. Energy costs are too high — high enough that even Chinese companies trying to establish operations in Europe run into the same wall European companies do. These are problems that can be solved without abandoning what makes Europe Europe.

In fact solving some of these problems would be a much bigger opportunity than building business that ignore them. And they will surely not be solved by setting higher targets without dedicating resources to meet them. ■

We see real opportunity across the whole value chain in Europe, the US, Canada, Australia, and other emerging markets where electrification is growing: in developing and selling applications that use batteries, financing them, operating them, and the equivalents for the batteries themselves — repairing, reusing, repurposing, remanufacturing, and eventually recycling.

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Van Laack appointed as CTO for Clarios

Alexander van Laack has been appointed chief technology officer of Clarios, the battery giant announced on May 13.

Van Laack joined Clarios in 2024 as VP of sales for original equipment in the Americas and has served as interim CTO since February 2025.

He has nearly two decades of experience in engineering, technology and commercial leadership in the automotive sector, including senior



posts at Forvia and Faurecia Clarion Electronics.

Clarios said van Laack will now lead the firm's global

engineering, advanced development, validation, and innovation activities and will focus on low-voltage system architecture.

Federico Morales-Zimmermann, VP and general manager of global OEM customers, products and engineering, said. "His deep industry expertise and ability to connect technology with customer needs will be critical as we continue to advance our innovation strategy. ■

Mehra joins top leadership team of Exide Industries



Amol Mehra has been appointed to the top leadership team of India's Exide Industries.

Mehra told Batteries International on May 12 that he had joined the lead and lithium battery firm's senior management personnel as of May 4.

He said he would continue to serve as Exide's president and chief procurement officer.

Mehra has nearly 30 years of experience in commodities, including non-ferrous metals and coal as well as sales and trading and has worked for companies including Trafigura.

Prior to joining Exide in 2024, he was most recently chief business officer and joint president of Indian business incubator Adani Enterprise in the firm's integrated resource management business.

Last August, Exide outlined plans to invest more than Rs1,000 crore (\$116 million) across its lead acid and lithium battery manufacturing businesses. ■

Charno succeeds Yoshioka as Yuasa sales VP in US

Yuasa Battery in the US has appointed Thomas Charno as VP of sales and marketing, succeeding Kazuhi Yoshioka.

Yoshioka, who has led the sales and marketing organization for Yuasa Battery since October 2021, is returning to the group's headquarters in Japan, where he will support the US and other business units in a new role, the battery giant announced on March 19.

Charno joins the company with more than two decades of experience leading sales, marketing, and commercial strategy in the highly engineered B2B manufacturing sector.

He will lead growth initiatives, strengthen OEM and distributor relationships, and ensure product



development aligns with market needs using Yuasa's manufacturing investments in the US.

"I look forward to working closely with our distributors, OEM partners, and internal teams to build on that foundation and continue delivering value to the market," Charno said.

Ryo Okubo, presi-

dent and CEO of Yuasa Battery Inc, said Yoshioka had played a key role in building distributor relationships, navigating challenging market conditions and helping position Yuasa for growth.

"We are excited to build on that momentum as Tom steps into this role."

GS Yuasa president Takashi Abe said last September that lead acid batteries would continue to be the mainstay of the corporation's global business beyond the next decade.

Abe, who was appointed president in 2024, said the group expected demand for lead acid to remain strong, "at least through 2040" — continuing to provide a solid foundation for business performance. ■

Gravita executive director Pareekh resigns

Vijay Pareekh, an executive director and non-board member of Gravita India, is resigning effective March 31, the lead recycling group has announced.

Pareekh confirmed in

a letter to the National Stock Exchange of India on March 19 that he would be leaving his post owing to personal commitments.

He thanked Gravita's board and management for their support during

his term of office and wished the company well for the future.

Fellow executive director and non-board member, Yogesh Mohan, took over Pareekh's duties and responsibilities. ■

Earlier this year, Gravita launched its first lithium recycling plant at Mundra — converting EV batteries into black mass — with a total processing capacity of some 6,000 tonnes annually. ■

Amara Raja appoints new senior managers

Amara Raja Energy & Mobility has announced two senior management appointments to boost development of battery tech for EVs, energy storage and extend the firm's international presence.

The lead battery giant and lithium developer said on April 1 Dwarakanadha Reddy B had been appointed head of business at the group's Amara Raja Advanced Cell Technologies (ARACT) subsidiary, succeeding Indeevar Govardhanagiri.

Divakar Sukumaran was named international chief marketing officer

of the group, succeeding Vijayanand Samudrala. He is now chief business officer of ASBU International.

Amara Raja said Govardhanagiri and Samudrala's terms of office ended on March 31. The company also confirmed that C Narasimhulu Naidu, whose planned retirement was announced earlier this year, stepped down on the same day.

Reddy has nearly 30 years' business experience across manufacturing, supply chain management and infrastructure. At ARACT, he will lead activities across advanced cell, battery pack and BESS manufacturing



Dwarakanadha Reddy B



Divakar Sukumaran

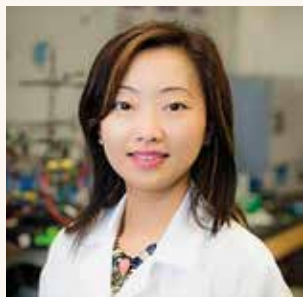
— which Amara Raja said will accelerate the group's operations in EVs and battery storage in support of India's energy transition.

Sukumaran has spent more than 25 years in sales and marketing across diverse industries and has held senior posts at Amara

Raja including Asia-Pacific head of business for the group.

The appointments are the latest in a series of executive changes, including that of Narayan Sudhakar Choudhary as chief operating officer of the company last January. ■

Shirley Meng heads for top university post in Singapore



Energy storage scientist Shirley Meng is saying farewell to the US to become the next VP for industry and distinguished university professor at her alma mater, Nanyang Technological University (NTU) Singapore.

NTU confirmed on April 22 that Meng, most recently chief scientist at the Argonne Collaborative Center for Energy Storage Science and a professor at the University of Chicago's Pritzker School of Molecular Engineering, would take up the post on July 1.

She will succeed Lam Khin Yong.

Meng said: "Twenty-five years ago, I left Singapore for the US, embarking on a journey that would define my life as a scientist and an educator."

She said her quarter

century in the US — at MIT, UF, UC San Diego, UChicago and Argonne — had been an incredible masterclass.

"I am profoundly grateful for the mentors, colleagues, and students who challenged me to think bigger, take risks and push the boundaries of what is possible in energy storage science. Science has no borders, and neither should innovation. I have always believed that technical breakthroughs are most

impactful when they serve as 'scientific diplomacy'."

Meng said NTU was where her passion for materials science was first sparked by a "simple" magnetic levitation experiment.

"I look forward to maintaining my connections with the Pritzker School of Molecular Engineering at the University of Chicago, UChicago Institute for Climate and Sustainable Growth UC San Diego Jacobs School of Engineer-

ing during the transition and continuing the critical work of the Energy Transition Network."

Meng is an elected Fellow of the Electrochemical Society, the Materials Research Society, and the American Association for the Advancement of Science.

NTU president Ho Teck Hua said: "Energy storage is one of the defining technological challenges of our time, and Shirley is one of the world's foremost author-

Energy leadership award for Narada's Xiang

Narada Power VP and chief engineer Jiayuan Xiang has been honoured during the inaugural 2026 Women Leaders in Energy Awards at The Battery Show Asia.

The award, which recognizes outstanding women across the energy value chain who have made significant contributions to energy technology, renewable development and industry progress, was presented in Hong Kong on March 10.

Narada said Xiang, who was selected from candidates from more than 20 countries and regions, has

been involved in R&D for new energy materials and power supply technologies for 15 years.

Xiang's achievements have included leading technical teams to develop Narada's full-stack data center products incorporating lead acid and lithium ion battery tech. She has also led work on new 800 high voltage DC power distribution architecture for artificial intelligence data center (AIDC) technology.

Under her leadership, Narada Power has combined technological innovation in the lithium battery industry



with energy digital transformation to provide safer and more intelligent products, the company said. She has also presided over and participated in the compilation of more than 110 national, industry and group standards. ■

Donna Snyder receives BCI Distinguished Service Award



Donna Snyder, the former VP for marketing and advertising at East Penn Manufacturing, has been named as the 2026 recipient of Battery Council International's Distinguished Service Award. She was formally honoured as part of BCI's 2026 Convention + Power Mart Expo on May 5 in Nashville.

The prestige honour, announced on April 23, follows her retirement last October after 42 years with the company.

The award recognizes exemplary service to the energy storage industry and is the association's highest individual honour. The award recognizes those who have made a sustained, long-

term, and meaningful contribution to the advancement of both the association and the battery industry.

BCI president and executive director Roger Miksad said: "It is not an exaggeration to say that BCI would not be the organization it is today without Donna Snyder's leadership and commitment.

"She didn't just fill a spot on BCI's committees, she led them – and in some cases, built them from scratch. Donna's volunteer service over many years is exactly the kind of selfless work that the Distinguished Service Award was created to recognize."

In 2009, she was one of the founding members of the BCI Marketing Committee and served as its chairman to promote the value of lead, standardize industry practices and provide valuable member marketing resources.

In 2016, she also helped found BCI's Communication Committee, championing efforts to strengthen the industry's message with regulators and the general public. Additionally, Donna served as chair for BCI's Data Book Committee and participated in BCI's Product Information Committee.

The Distinguished Service Award is presented by BCI's board to individuals who have made a sustained, long-term, and meaningful contribution to the advancement of the association and the industry.

In 2025, BCI honoured former BCI board chairs Chris Pruitt of East Penn Manufacturing and Dave Shaffer of EnerSys with its Distinguished Service Award.

The award was founded in 1945, previously called the BCI Honorary Lifetime Membership, and past recip-

ients include battery industry icons such as Hal Hawk, Roger Winslow, and DeLight Breidegam Jr. ■

Courts joins Clarios as chief legal officer



Clarios has appointed Chris Courts as chief legal officer to succeed Claudio Morfe, who is to retire in July.

The battery manufacturer announced on March 16 that Courts was joining its executive leadership team.

Courts joins Clarios with more than 24 years of international legal and governance experience including in the US and Europe.

He most recently served as executive VP and chief legal officer at aluminium rolling and recycling business, Novelis, where he oversaw global legal strategy, corporate governance, risk management and regulatory affairs.

Clarios president and CEO Mark Wallace said Courts has a strong track record of partnering with businesses to drive sustainable, long-term growth.

"His leadership, industry expertise, and commitment to the highest ethical standards make him an outstanding addition to our executive leadership team."

Wallace praised Morfe's decade of service to the company, saying he would continue to support the transition until his retirement. ■

US Battery Manufacturing mourns former CFO Steve Kay



US Battery Manufacturing Company has announced the death of former CFO Steve Kay.

Kay, who was the company's CFO/partner for more than 30 years, died on January 15 aged 69, co-owner and COO Don Wallace told Batteries International on April 15.

Wallace said Kay's

knowledge of business and finance had played a huge role in the long-term success of the company.

"He will be sadly missed by everyone who has had the good fortune to have known or worked with him over the years," Wallace said.

Batteries International reported last February that US Battery Manufacturing, which celebrates its centenary this year, had become the latest member of the Consortium for Battery Innovation.

The CBI said the move highlighted the firm's portfolio of deep-cycle batteries as the 'go-to' energy storage solution for a variety of applications. ■

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Rob Wilson succeeds von Steinkeller as ILA chair

Rob Wilson was appointed chair of the International Lead Association in March, succeeding Florian von Steinkeller.

Von Steinkeller, who announced his departure from Glencore in March after a 17-year career with the group, was ILA chair for more than 10 years.

The ILA said Wilson, who is director of metal sales and marketing at Teck Resources, had been elected by the association's board.

He has been with Teck for more than 30 years. He was recently appointed to his current post, as well as chairing Teck's materials stewardship program, after holding several commercial strategy posts in the firm.

Wilson praised the work of his predecessor and colleagues on the board,

noting that the ILA is the only global association representing the interests of the industry.

"The lead mining and recycling industry worldwide plays a critical role underpinning economies and delivering resources that support many vital applications and services," he said.

ILA executive director Andy Bush said Wilson brings a wealth of industry experience and a global perspective to the organization.

Bush thanked von Steinkeller for his work as chairman, saying ILA membership had grown substantially along with its program of work supporting the industry worldwide.

Steinkeller said: "Today, the industry is increas-



Rob Wilson



Florian von Steinkeller

ingly recognised as part of the solution — setting the benchmark for battery recycling efficiency, enabling the recovery of critical metals, and contributing innovative pathways to decarbonisation.

"This progress is a testament to the outstanding collective effort of the ILA team, which I am confident will continue to thrive under Rob's leadership."

Von Steinkeller most recently worked as CEO of metallurgical assets for the UK and Germany.

Von Steinkeller said in March that his first order of business would be to take a short break "to recharge" — but signalled he would still be a presence in the industry because of his passion for the commodities world.

He said it had been a privilege to work with some of the most inspiring, entrepreneurial and dedicated individuals in the industry and singled out the team at Britannia Refined Metals, part of the Glencore group, for demonstrating that "lean operations are safe operations", achieving over seven years with no lost-time injury.

"I could not be prouder of the cultural change we accomplished and with the newly-commissioned electronic scrap recycling plant, we have laid the foundation for the future of the company."

Von Steinkeller also praised achievements at the firm's German operations, where he said a long-term vision for operations had been developed leading to a far-reaching restructure and where a comprehensive investment program is now underway.

Battery industry analyst and CTO and CCO of Zero Carbon Technologies, Farid Ahmed, said von Steinkeller had shown tremendous leadership, not just as chairman of the ILA, and would be a hard act to follow. ■

Clarios wins BCI Amplify Award for Product Marketing

Clarios has won BCI's annual Amplify Award for Product Marketing in another tight competition for top slot in this category for the relaunch of its *Autobatteries.com* website as a consumer education resource. The announcement was made on May 5 at this year's BCI convention held in Nashville, Tennessee.

The platform was designed by Clarios to help drivers understand car batteries in a clear, practical, and unbiased way. The website's purpose is to provide reliable information, tools, and guidance so consumers can better understand their vehicles, recognize battery issues early, and make informed decisions with confidence.

The *AutoBatteries.com* website was recently rebuilt and optimized as part of a coordinated, education-first campaign. This included pairing the



redesigned website with a brand-new social media presence, including Facebook and Instagram, to create an education-first ecosystem geared primarily toward consumers.

"As the battery industry continues to innovate and evolve, forward-thinking approaches to marketing efforts are an important way to empower consumers through education," said Roger Miksad, president and executive director of BCI. "This tremendous digital marketing campaign from Clarios helps make sense of an increasingly complex marketplace for automotive batteries."

Cecily Cappaert, US/Canada aftermarket marketing specialist with Clarios said: "This recognition reinforces our belief that education is one of the most powerful tools in marketing. By helping drivers better understand their vehicles and battery needs, we're able to build trust, create more confident consumers, and ultimately support better outcomes across the industry."

A panel of judges reviewed Amplify Award product marketing entries and ranked them on four criteria: innovation, uniqueness, clarity, and design aesthetic. ■

Sunlight appointments to bolster global operations

European battery manufacturer the Sunlight Group has announced promotions for two executives and recruitment from outside the firm as it ramps up its international expansion.

The Greece-based lead and lithium company said on March 19 Antonis Papadas had been appointed CFO, with Antonis Theologitis taking up the post of COO.

Meanwhile, Eleni Drakopoulou, who has more than 20 years of experience in human resources management at multinationals including Coca-Cola Hellenic, has joined the company as chief human resources officer.

Papadas, who has most recently led Sunlight's finance and M&A departments, has more than 20 years of experience in finance and accounting, with 13 years in executive positions at the battery group.

Sunlight said Papadas had significantly contributed to the group's financial stability and its development as an international organization, responsible for overall financial planning, optimizing the investment portfolio and ensuring the group's growth globally.

Theologitis has more than 15 years of experience in supply chain and operations. Since 2020, he has played a key role in the group's operational



Antonis Papadas



Antonis Theologitis

transformation, progressively assuming positions of increasing responsibility.

He will focus on deploying artificial intelligence and robotics to boost operations at facilities in 14 countries and boost the group's supply chain serving 115 countries.

Group CEO Lambros Bisalas said: "The promotions of Papadas and

Theologitis, two executives who have grown within Sunlight, reaffirm the importance we place on developing our people. The addition of Drakopoulou further strengthens our leadership team."

Sunlight, part of the Olympia Group, announced the appointment last July of Matthias Fischer as its new chairman. ■

BCI names Hollingsworth & Vose 2026 Innovation Award winner

Lights! Videos! Action! Moments after John Ellis' stunning presentation of the future world we will be living in, the videos rolled highlighting some of the astonishing advances made in battery innovation this year,

And then the action began with Roger Miksad, BCI chief, greeting a hushed crowd with the winner of this year's Innovation Award. And the glory went to H&V which, working with ArcActive, had developed a stunner of the next iteration in performance of a bipolar battery,

Bipolar batteries are clearly a lead battery sector to watch — Silicon Joule is set to make further inroads into the sector, and Ed Shaffer's Advanced Battery Concepts is moving ahead.

H&V won the award for its development of a unique glass fibrous matrix electrode. Known

as GEM — Glass Electrode Material — this helps generate and support a unique microporous structure within the lead active mass of a battery to enhance chargeability performance and cycle life reliability without impacting water loss.

"Battery innovation is thriving, and Hollingsworth & Vose is a great example of technological leadership and product evolution that advances the capabilities of the storied lead battery," said Roger Miksad, president and executive director of BCI.

GEM technology improves recharge efficiency through enhanced charge acceptance, reducing fuel-related emissions while improving battery performance, durability, and cycle life reliability.

These performance gains translate into a number of application benefits:

- A reduction in CO₂ emissions by up to 4g/

km in start stop applications.

- Improved safety in electric vehicles applications where the auxiliary battery can be more easily maintained at higher states of charge.
- Increased utilization or smaller size requirements of batteries in forklift applications, due to improved lifetime performance.
- Improved performance over time.

Also receiving Honorable Mention recognition for their 2026 Innovation Award submission was the

joint work of East Penn Manufacturing and Silicon Joule, for their collaboration on the first commercial bi-pole battery based on lead chemistry and treated silicon wafers.

Battery Council International annually presents this award to celebrate innovation in equipment, processes, services, and products that advance the lead battery industry.

The award was established to honor industry leader, Sally Breidegam Miksiewicz, the former CEO of East Penn Manufacturing. ■



Leclanché appoints Emrich as CFO as new financing deal agreed

Swiss energy storage group Leclanché said on February 25 Jens Emrich had been appointed chief financial officer effective March 1.

Emrich succeeds Hubert Angleys, who left the company last November, on completion of what Leclanché said was his temporary assignment to the post.

Emrich brings more than 25 years of international finance leadership experience across industrial and energy-related sectors, the firm said.

Most recently, he was a senior executive at Li-Cycle Europe — part of the troubled lithium ion battery



recycling group that was acquired by mining giant Glencore last year.

Pierre Blanc, CEO of the Leclanché Group, said Emrich's expertise will be instrumental as the firm continues to bolster its financial structure and support the company's next phase of development.

The appointment was announced five days after Leclanché said it had concluded a financing arrangement with strategic partners in the amount of CHF 16.7 million (\$22 million) to support its near-term operational requirements.

Leclanché said the arrangement provides additional liquidity for the coming months and enables the company to meet its ongoing obligations, including employee salaries, suppliers and project-related commitments.

The agreement also provides operational stability and allows teams and

management to focus on execution of current activities, the firm said.

Meanwhile, the board and executive committee continue to assess options aimed at strengthening the company's capital structure in the long-term.

Batteries International reported last June that Leclanché was pushing ahead with efforts "to achieve and maintain a positive equity position" and to demonstrate the firm's ability to continue as a going concern through at least June 2026. The company had said previously that it was in a situation of negative equity as of the end of 2024. ■

Baterias Moura wins Amplify Award for Industry Leadership at BCI convention

Baterias Moura won the tightly contested Amplify Award for Industry Leadership at this year's annual BCI convention for its video campaign highlighting the company's support for its workers, its community, and a circular economy for lead batteries.

Moura, a battery manufacturer with more than 90 distributors across South America, produced a video highlighting its new Recycling and Metals Unit in Pernambuco, Brazil.

The campaign introduced a new industrial facility by focusing on why battery recycling is essential to a secure and circular energy future, and reinforced Moura's position as a trusted partner in the communities it serves.

"Moura has been a valued BCI member for decades, and we have been incredibly impressed with their growth and success in Latin America," said BCI president and executive director Roger Miksad.

"Moura has a powerful story that is worth sharing with the rest of the world, and we're proud to honor their campaign that illustrates the shared values of the battery industry."

The video campaign placed recycling at the center of an agenda that unites industrial development with environmental preservation. By making the step-by-step recycling process and lead recovery visible, Moura's video highlighted how this approach reduces pressure on raw material extraction, lowers emissions, and strengthens more resilient value chains that are fully aligned with global best practices.

"The arrival of our Recycling and Metals Unit reflects much of what Moura stands for," said Antonio Júnior, general director of Baterias Moura. "We have always believed in doing things right, with full process control, and above all with responsibil-

ity at every stage. That's why, more than 40 years ago, we chose to develop our own reverse logistics system, ensuring safety, efficiency, and continuous learning over the years.

"More than recycling batteries, we have built a complete, end-to-end system that sustains the competitiveness of our business and reinforces our commitment to the future.

"When the challenge arose to show, in a short period of time, the importance of our new Recycling and Metals Unit, we chose a simple and authentic path: telling this story through the people who make it happen.

Andréa Lyra, director of marketing, products, and institutional communication at Moura said: "At the same time, we brought to the forefront the relevance of the circular economy for Moura, for the ecosystem of which we are part, and for the planet.

"The video shows how communication can go beyond promotion, acting as a connector and a builder of image and reputation, always having human stories and our culture as the guiding threads of our institutional narrative. These are what truly sustain and bring life to our company's processes. ■



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Third-time supplier award for East Penn

East Penn Manufacturing has been honoured with a supplier of the year award for the third time from a North American auto parts major.

The award for 2025 from O'Reilly Auto Parts, which serves the aftermarket in the US, Canada and Mexico, was announced by East Penn on March 27.

The accolade is presented to suppliers who show exceptional overall performance, specifically in high-quality product delivery, a reliable supply chain and superior customer support.

Colombo to host 10th ISLC and Learning Lead events

The 10th anniversary edition of the International Secondary Lead Conference (ISLC-10) is to be held in Sri Lanka later this year.

The conference will be held alongside the Lead Training Academy's 2026 Learning Lead course, both events taking place from October 25-28 at the Cinnamon Life City of Dreams hotel in Colombo.

Fourth consecutive global ethics honour for Clarios

Clarios has been recognized as one of the world's most ethical companies for the fourth consecutive year. The lead and lithium battery giant said on March 18 it had again secured the designation from Ethisphere — a global organization that dedicated to defining and promoting ethical business practices.

Clarios said the recognition, which it first achieved in 2023, underscores its ability to operate successfully in a highly competitive, global environment while maintain-

ing clear values, robust ethics and compliance practices and a deeply embedded ethical culture.

East Penn shines in best workplace honours

Battery giant East Penn Manufacturing has been ranked as one of the best places to work in Pennsylvania and Texas in 2025 — as well as one of the 2026 best places to work in manufacturing nationally and at a national level.

The lead battery producer confirmed the honours on March 24. The rankings came from the Best Companies Group (BCG), an independent research and consulting firm that specializes in identifying and recognizing the best places to work around the world.

US Battery is latest CBI member

US Battery Manufacturing, which celebrates its centenary this year, has become the latest member of the Consortium for Battery Innovation.

The CBI announced the move in a LinkedIn post on February 13, highlighting the firm's portfolio of deep-cycle batteries as the 'go-to' energy storage solution for a variety of applications.

Hoppecke celebrates gold sustainability honour

Lead battery manufacturer Hoppecke has hailed a golden endorsement for its operations from global business sustainability ratings firm EcoVadis.

Lead battery manufacturer Hoppecke announced in January it had been awarded gold status— following two consecutive platinum awards from EcoVadis in recent years.

The latest accolade means that the battery

maker continues to be among the top 5% of all companies that EcoVadis evaluates worldwide.

In addition to the EcoVadis accolade, Hoppecke said it had again been included in a list of Germany's '500 world market leaders', as compiled by Switzerland's University of St Gallen in cooperation with German business magazine WirtschaftsWoche.

Moura and Stolberg join lead battery certification program

Battery Council International said on February 10 that Acumuladores Moura in Brazil and Nyrstar Stolberg in Germany are the latest facilities joining the pioneering international Lead Battery 360° Certification (LB360°) program, taking the total to 10 — following the first cohort of eight sites including plants from Clarios, East Penn Manufacturing, Ecobat and Boliden unveiled last June.

All certified participants undergo independent third-party assurance checks to confirm they have successfully implemented policies and practices that meet the performance expectations described in the LB360° Code.

LB360° was formed in 2019 by a global alliance of lead and lead battery industry groups including the Association of Battery Recyclers, BCI, EURO-BAT and the ILA.

East Penn supercharges sustainability with Power2Recycle event

East Penn Manufacturing has hailed its 'double reward' return-to-recycle event a success in the firm's bid to turbocharge support for battery recycling.

The company said its first public Power2Recycle drive-thru battery return, held on April 25, drew more than 300 vehicles and collected more than 800 batteries in just four hours.

Designed to make lead battery returns more convenient and rewarding, the event near East Penn's manufacturing site in Lyon Station, Pennsylvania, offered double the standard reimbursement for qualifying batteries, including automotive, truck, marine, lawn and garden, and golf cart batteries.

Participants also received family-friendly Power2Recycle giveaways and had opportunities to win prizes — all from the convenience of their vehicles.

Supplier award honour for ENTEK Asia

For the record, ENTEK Asia has scooped a prestigious supplier of the year award from Tokyo-based industry supplier Energywith.

The Asian arm of the lead and lithium battery separator group said on March 6 it had been presented with the award last month.

Energywith, whose business includes battery systems that monitor the status of power supply systems and lead acid batteries for forklifts, said the annual award is presented to a supplier that has made outstanding quality improvements, on-time delivery, cost reductions, and significant efforts to preserve the environment.

The company also produces a range of backup power systems, together with battery storage for various applications including communications equipment, datacenters and substations. ■

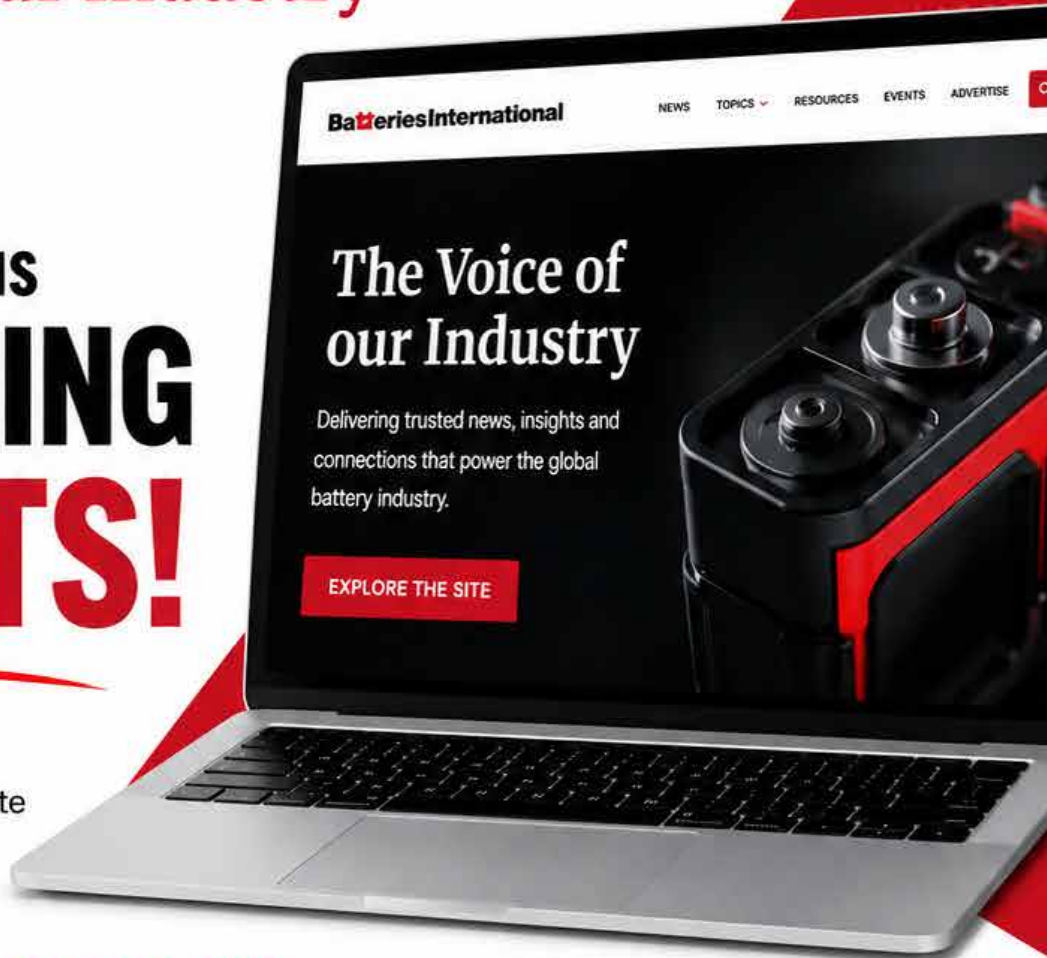
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China launches digital battery passport scheme

China launched a digital battery passport-style scheme on April 1 aimed at boosting recycling and traceability in what it terms the NEV (new energy vehicle) sector.

This follows interim measures jointly issued in January by several government departments including the Ministry of Industry and Information Technology (MIIT), China's Xinhua state news agency reported.

Each power battery of NEVs — which include electric vehicles and plug-in hybrid electric vehicles — has been assigned a digital identity under the new measures.

MIIT said the measures would help establish a national NEV power battery traceability information platform alongside a digital ID management system, as part of a “full-channel, full-chain, and full-lifecycle” management framework.

With power batteries from earlier NEVs reaching the end of their service life due to capacity degradation, the volume of retired batteries is growing significantly, MIIT

said.

The move comes as China's NEV industry has expanded rapidly. According to government data, EV production and sales both in 2025 exceeded 16 million units, accounting for over half of domestic new vehicle sales.

Industry experts note that the regulation is timely, given that China is entering a phase of large-scale battery retirement, with projected used battery generation exceeding one million tonnes by 2030.

China's approach is less a voluntary membership program and more a mandatory national compliance system.

The regulations require participation from battery manufacturers, EV/NEV makers, importers, battery-swapping operators, maintenance/service firms, recycling and second-life battery companies.

One important distinction from the EU model: is that China's system is currently more focused on lifecycle tracking, recycling, and operational traceabil-

ity inside the domestic EV ecosystem, rather than the EU's broader “cradle-to-grave” sustainability disclosure framework.

Publicly named companies linked to pilot or related battery-passport cooperation efforts include: BAIC Arcfox, BMW Group, BYD, CATL, GAC Aion and NIO.

Some firms are more advanced than others. Chinese battery major CATL and European auto giant BMW agreed a memorandum of understanding signed in Beijing on February 25 to strengthen work on pilot projects and collaborate on cross-border data exchange in relation to the EU's Battery Passport scheme.

CATL had already participated in European-style battery-passport schemes since 2024.

CATL and BMW said the MoU would support “innovative practices” for China-EU regulatory compliance as well as drive the demonstration and wider adoption of global battery information and data standards.

The firms said they would also bolster their cooperation in sustainable development and take technological innovation to a new level.

Data exchange will include carbon accounting methodologies and innovative accounting tools for calculating battery carbon footprints.

China initiated a three-year special campaign targeting illegal dumping and the disposal of solid waste in June 2025, including scrapped motor vehicles, waste electronic products, retired new energy equipment and used power batteries.

A report published last August by Wood Mackenzie said China was on course to open up a new route in the global race for EV market dominance — steering away from price wars to innovation.

The report said as the sector faces substantial lithium chemical oversupply, initiatives in China would include a focus on recycling investment, stricter environmental impact approvals and supply chain diversification. ■

SoftBank launches ‘GWh-scale battery business’

Investment conglomerate SoftBank has launched a Japan-based battery business in a bid to cash in on increasing demand for systems to power energy hungry AI systems at home and overseas.

The Japanese multinational said on May 11 it will work with partners to develop and manufacture zinc-halogen battery tech and BESS products.

SoftBank aims to achieve annual revenue of more than JPY100 billion (\$637 million) for its domestic battery business within the next few years. SoftBank's AI Data Center, under development on the former Sharp Corporation factory

site in Osaka Prefecture, will serve as the core hub to host the battery unit's new ‘AX’ and ‘GX’ plants.

AX will serve as a hub for AI data center operations and AI infrastructure hardware manufacturing, while GX will be the manufacturing hub for next-gen batteries, solar panels, and related products.

Manufacturing will start at GX from the end of March 2028, with the aim of achieving mass production on a gigawatt-hour-per-year scale by the following month — the start of Japan's 2028 fiscal year (FY).

SoftBank's battery business involves collaborating with two other companies that

have expertise in advanced technologies, Cosmos Lab and DeltaX.

By using a halogen-based material for the cathode and zinc for the anode, the batteries will offer charge-discharge characteristics with minimal energy loss and achieve energy efficiency equal to or greater than lithium ion batteries, the partners claim.

Mass production of the batteries is expected to start around FY2027.

For BESS systems, DeltaX said it has already achieved a storage capacity of 5.37MWh in a standard containerized lithium ion BESS and aims to achieve comparable or greater capac-

ity with innovative battery cells.

Cell-to-pack technology developed by DeltaX will be used in the partnership and integrated with an energy management system equipped with AI-based power demand forecasting capabilities already developed by SoftBank.

All batteries produced will be used at large-scale AI data centres SoftBank is developing as well as for power grid applications in Japan.

In addition, the batteries will be deployed in industrial and residential BESS systems, with a view to expanding into global markets in the medium term. ■

Colocation to ease European market revenue lurches in run-up to 2040

Battery revenues across Europe are projected to fall by around 20% by 2040 as a result of market saturation, according to new analysis.

However, co-located storage could help to mitigate these risks by shifting generation, reducing curtailment and improving capture prices, said Aurora Energy Research in its 'European Co-location Markets Attractiveness Report', released on May 11.

The global power markets analytics firm identified Germany, Great Britain (and Bulgaria as Europe's most attractive co-location investment markets in the report, which covers 20 regions.

Aurora also highlighted Spain, Hungary, and France as key markets to watch, citing recent ongoing regulatory changes and reforms.

Europe's co-located renewable capacity reached 6.3GW in 2025, led by solar-

plus-storage (over 60% of deployments), according to the report.

Aurora said while maturity varied widely, a significant pipeline is expected online within five years. Spain, GB and Germany lead in total capacity, while Bulgaria and Romania stand out relative to size, with co-located solar exceeding 40% of installed PV.

Grid access and policy design are key drivers, with more than 1,600GW of renewable and storage capacity awaiting grid connection across Europe, including around 550GW in GB alone.

In markets such as the Netherlands, Greece and Hungary, co-location can improve grid access or reduce costs, the report said. High grid charges in the Netherlands and regions such as the integrated single electricity market (I-SEM)

arrangement for Ireland and Northern Ireland, further strengthen the case for pairing storage with renewables.

Meanwhile, the report said subsidies remain the dominant route to market, although hybrid power purchase agreements are gaining traction.

Twosided contracts for difference — agreements between buyers and sellers to exchange the difference in the price of an underlying asset between the time the contract is opened and closed — open to co-location continue to play a central role, with markets including ISEM, GB, France, Romania and Estonia offering attractive subsidy scheme designs.

Additional dedicated, ring-fenced support is available in Bulgaria, Greece and Germany, alongside growing CAPEX support for co-located batteries.

Sameer Hussain, research

senior analyst at Aurora, said co-location was no longer a niche solution, rather it was increasingly critical to protecting project economics and sustaining investment momentum.

Jörn Richstein, Aurora's research lead for pan-European power markets, policies and technologies, said: "Co-location is not a one-size-fits-all investment across Europe. In some markets it is driven by merchant upside, in others by subsidy-supported stability, and elsewhere by the need to overcome grid constraints and limit curtailment."

Last March, Batteries International reported that the European Commission was proposing a fresh package of support to encourage private investments in long duration energy storage projects and "novel" renewables. ■

Amara Raja mulls potential US activities with new subsidiary

India's Amara Raja Energy & Mobility has announced plans to launch a US subsidiary — creating a potential foothold for future battery manufacturing or assembly in the country.

Amara Raja said in a filing to the National Stock Exchange of India on February 11 that its board had given the go-ahead for the wholly-owned subsid-

iary in a bid to support global business expansion.

The lead and lithium firm will initially invest up to \$5 million to incorporate the subsidiary.

The new entity could be called 'ARE&M US Inc' although other names might also be used, subject to the approval of regulatory authorities.

No specific governmen-

tal or regulatory approvals are required, other than routine approvals, filings and compliances under laws regarding setting up or incorporating a subsidiary in the US by an Indian entity.

The subsidiary is expected to be incorporated within three to six months and will be part of operations relating to Amara Raja's battery and components distribu-

tion.

The US unit is intended to improve customer service and provide faster responses for batteries sold in the country as well as opening new business opportunities, the company said.

Establishing a US presence also paves the way to evaluate future localization, including potential manufacturing or assembly, although details were not disclosed.

Batteries International reported last September that Amara Raja had opened a base in Dubai to boost business in the region and serve as a hub for customers in Europe, the Middle East and Africa.

In November, the firm said its mainstay automotive lead acid business remained strong, despite a tumultuous global market. ■

Gridtential rebrands as Silicon Joule ahead of 'commercialization phase'

Bipolar lead battery developer Gridtential has rebranded to Silicon Joule and is relocating its pilot operations and battery design from California to the Midwest US.

The name change took effect on March 1, as the company said it was entering its commercialization

phase. CEO Ray Kubis said final discussions are being finalized over facilities in Indiana and Ohio, with site selection expected soon.

Meanwhile, the firm says its joint assembly line with East Penn Manufacturing in Pennsylvania for the new 24V GC2+ battery continues to expand, supporting

increased production capacity and customer deployment.

Kubis said the move positions the firm closer to strategic partners involved in next-generation power and hybrid energy storage systems, while boosting access to an efficient and scalable supply chain. ■

Speculation rises following Rosendahl Nextrom's acquisition of TBS

Rosendahl Nextrom, owner of BM-Rosendahl, announced on June 3 that it has acquired TBS Engineering for an undisclosed sum.

While the deal offers clear synergies between the two businesses, it also removes a long-standing competitor from the market. TBS Engineering and BM-Rosendahl have competed directly for years in the supply of plate enveloping equipment and COS machines.

The acquisition is the latest sign of ongoing consolidation within the lead battery industry, a trend that has accelerated in recent years.

What makes the deal particularly noteworthy is the identity of the seller. TBS Engineering had been owned for several years by Marmon Holdings, the Berkshire Hathaway-backed industrial group. Unlike private equity investors seeking short-term returns, Marmon is known for acquiring businesses and operating them for the long term, with sales of portfolio companies relatively uncommon.

With approximately 120 autonomous businesses under its umbrella and annual revenues of around \$13 billion, Marmon has built its reputation on long-term ownership and operational improvement rather than frequent deal-making.

Indeed its commitment to focusing on long term operating performance and the fact that it rarely sells them on is fuelling speculation as to the reasons behind the sale.

Market rumours for the past three years have focused on the fact that TBS was itself on the acquisition trail using the vast funds behind it backed by Berkshire Hathaway. There is now speculation that TBS, which is smaller than BM Rosendahl, has been the victim of a reverse takeover.

The reasons for Marmon agreeing to the sale have not been given but could include a recent decision to focus on non-lead energy storage.

The official announcement by Rosendahl Nextrom talked about the two firms' complementary expertise in battery manufacturing.

"For the battery industry, this creates the greatest opportunity in battery manufacturing: the opportunity to benefit from joint R&D,



The acquisition is the latest sign of ongoing consolidation within the lead battery industry, a trend that has accelerated in recent years.

accelerated innovation and broader support and service," said the statement.

"BM will focus on enveloping with autoloading and lithium-ion battery machines, TBS will drive their COS, Assembly and ActivMat technology forward.

"This acquisition brings together two leading technology partners with deep process know-how and a clear understanding of battery manufacturing. ... both brands will remain focused on their respective areas of expertise in research and development.

"This move marks a major opportunity not only for our company, but for the entire industry. We are confident that our customers and employees alike will benefit from this acquisition," said Gerhard Jakopic, CEO of Rosendahl Nextrom.

Whether this is the case is debatable. The broader market expectations are that the larger firms will be able to leverage their financial muscle and force out the smaller players — squeezing out their profits and then effectively buying them at a discount.

The announcement in 2024,

although the initiative started in 2023, of the formation of ESEMA — the Energy Storage Equipment Manufacturing Alliance — was a first step by a group of five smaller lead battery industry firms to compete with larger integrated OEMs.

The firms were Kusten, which deals with electrolyte handling and chemical process systems, MAC Engineering making mechanical assembly and production machinery, Digatron, dealing with electrical systems, testing, formation, and software as well as Sorfin Yoshimura, a global systems integrator and supplier, and CMW Tec, a mechanical systems specialist for battery production lines.

Their aim has been to turn their complementary capabilities into full line solutions as well as expand beyond the confines of lead battery products.

Consolidation is not necessarily a bad thing. "I think it's healthy for the market, and can be healthy for the consumer," a respected industry source told Batteries International. "What it forces smaller folks to do is not necessarily go away, but refine what it is that they do well."

Indeed, Richard Jonach, SBU director for BM-Rosendahl said he had high expectations for raising the game for battery manufacturers.

"The industry standard currently stands at 4.5 batteries per minute. Together, we have clear ambitions to exceed this benchmark significantly," he said. "With TBS, we are bringing together highly complementary competencies in a targeted manner." ■

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Lead and nickel BESS ‘exclusion’ fear in draft ‘Made in Europe’ laws

Battery industry leaders are calling for an urgent overhaul of draft EU ‘Made in Europe’ legislation saying the move could discriminate against lead-based and nickel-based battery systems.

The Industrial Accelerator Act proposals were published by the European Commission on March 4, paving the way for requirements for the procurement and auction of industrial products including energy storage technologies.

However, trade body EUROBAT said the proposed rules appear to tie BESS eligibility to the presence of a battery management system (BMS) alongside EU assembly and component requirements.

EUROBAT is calling for the “specific inclusion” of BMS-free industrial battery systems to ensure critical energy infrastructure and backup power is not excluded.

Lead-based UPS systems for applications and sectors such as datacenters, telecoms and hospitals, typically VRLAs, work without a BMS, the trade body said.

Nickel-based batteries used in substation/switchgear protection and emergency systems also operate without BMS.

Around 80% of these lead and nickel-based systems deployed in Europe are also manufactured in Europe,

according to EUROBAT executive director Patrick Clerens.

For industrial stationary lead and nickel-based applications a BMS adds no value but increases the safety risk, such as from hacking, as well as the cost and complexity of projects.

Clerens also stressed the key benefits of both battery technologies in terms of lower lifecycle costs compared to lithium alternatives, availability of the supply chain and an established recycling infrastructure across the EU.

“Without explicit clarification in the legislative text, that the requirement for ‘Made in Europe’ regarding the BMS is only valid for batteries which use a BMS, these BMS-free lead-based and nickel-based systems that are vital for critical infrastructure resilience, including the ability to clear faults and restart the power grid itself, would be automatically excluded from public procurement, auctions and support schemes.”

Energy Storage Europe’s senior policy officer said the introduction of EU-origin requirements across the battery supply chain must be gradual. ■

Battery leaders warn on gigafactory investment delays

Gigafactory projects vital to powering Europe’s developing battery cells industry risk being stuck in the ‘waiting room’ for investment, business leaders have warned.

The European Battery Association (EBA) said at its annual meeting in Brussels on April 16 that despite improved access to capital, investment decisions remain sensitive to cost structures, risk allocation and market demand.

Frédéric Lucenet, global head of manufacturing and services at the European Bank for Reconstruction and Development, told around 100 top policy, industry, finance and inno-

vation leaders at the event: “There is a kind of waiting room today. Projects are there, but investment decisions take time.”

The EBA said the challenge is no longer to launch projects, but to bring them to industrial scale, ensure their competitiveness and secure long-term market viability.

That means initiatives such as the EU’s ‘battery booster’ facility, including €1.5 billion (\$1.8 billion) in the form of interest-free loans and other measures targeting critical raw materials, are urgent and important steps to support European cell manufacturers during the ramp-up

phase, the EBA said.

The event showcased a range of technologies including alternative chemistries such as sodium ion, advanced materials and processing technologies, next-generation battery components and recycling tech.

Baptiste Buet, director of the EU Business Unit at EU-backed tech developer EIT InnoEnergy, said: “Europe has built a strong project pipeline. The focus now must be on execution — ensuring that projects can scale, attract investment and reach the market. Policy signals and the EU public finance toolbox are decisive enablers. ■

EV batteries ‘can outlive their vehicles, UK BPI study claims

Mileage alone is an increasingly unreliable indicator of battery condition in EVs — with uncertainty around condition now the principal determinant of used EV confidence, residual values, performance and risk, according to new analysis.

Generational, the UK-based innovator in EV battery condition diagnostics, released details on February 18 in its 2025 Battery Performance

Index (BPI).

According to BPI, which Generational said is the largest analysis of EV battery condition undertaken in the UK, the average battery state of health (SoH) across more than 8,000 tested passenger cars and light commercial vehicles stands at more than 95% of capacity compared to new.

Drawing on battery assessments conducted across 36 manufactur-

ers, vehicle ages from 0-12 years and mileages from 0 to over 160,000 miles, Generational’s data showed eight to nine-year-old vehicles retain a median 85% capacity.

High-mileage EVs (100,000+ miles) frequently return 88%-95% SoH while, even with the four to five-year cohort, median SoH remains strong at nearly 94%.

Warranty thresholds of original equipment manu-

facturers (OEMs) — typically 70% SoH over 8 years/100,000 miles — are rarely approached, according to the data.

In terms of age, among four to five-year-old vehicles the 25th (lowest-performing) percentile sits at nearly 92% SoH and the 75th (top-performing) percentile at over 96%.

In the eight to 12-year-old cohort, the 25th percentile is 82%, median and 75th percentile 90%. ■

CATL claims EV ‘first’ for sodium ion with Naxtra battery tech

CATL and Chinese auto firm Changan have unveiled what the partners said is the first mass-production car equipped with sodium ion batteries.

Changan said the vehicle was rolled out in Inner Mongolia on February 5 and the model is set for market release by the middle of this year — marking the move of sodium ion tech from pilot applications to large-scale commercial passenger use.

The launch represents a major step in the industry’s transition toward a dual-chemistry ecosystem, where sodium ion and lithium ion batteries comple-

ment each other to meet diverse customer needs, Changan said.

CATL, as Changan’s exclusive battery partner for sodium ion, is supplying its Naxtra brand across the auto firm’s range.

Naxtra was revealed along with two other EV battery types last April. According to CATL, Naxtra achieves an energy density of up to 175 Wh/kg, setting the current benchmark for mass production.

Its advanced cell-to-pack system and intelligent BMS enable a pure-electric range exceeding 400 km, the Chinese battery giant claimed.

As the sodium-ion supply chain advances, ranges are projected to reach 500-600 km for pure-electric variants and 300-400 km for range-extended/hybrid configurations — covering over 50% of the range requirements in the new energy vehicle market.

CATL said Naxtra operates reliably even under extreme cold, delivering nearly triple the discharge power of equivalent LFP batteries at -30°C, while maintaining over 90% capacity retention at -40°C and stable power delivery at temperatures as low as -50 °C.

Additionally, the battery maker said testing condi-

tions including crushing and drilling has shown the battery “stays smoke and fire free and continues to provide power, setting a new standard for safety and reliability”.

Batteries International reported CATL’s launch of its second-generation sodium battery last November.

Speaking at the World Young Scientists Summit on November 18, CATL chief scientist Wu Kai said the launch marked a significant leap forward in battery technology, especially for colder regions where traditional lithium ion batteries may falter. ■

CBI-backed BESS tech innovation handed over in Africa

Lead-based battery-electrolyser technology developed by a UK university has been formally handed over to support activities at a hospital in Malawi.

The solar microgrid and hydrogen installation, developed at Loughborough University and supported by the Consortium for Battery Innovation, was presented to the Mwanza District Hospital.

Loughborough confirmed the move on May 12, noting that the system had been commissioned last November and had subsequently been upgraded to enhance operation.

At the core of the system is the world’s first 20kWh-scale lead-acid battery electrolyser, producing >99% purity green hydrogen for use in clean cooking to replace charcoal.

The technology uses abundant, highly recyclable lead acid materials and avoids scarce, supply constrained metals. The system integrates a solar

microgrid, battery-electrolyser and a battery energy storage from European lead major Monbat, delivering both hydrogen and electricity from a single platform.

It provides hydrogen to a Falcon cooker in a kitchen for patient guardians and electrifies this kitchen and wards for maternity and under-fives.

The handover included onsite verification and a short walkthrough of the hydrogen system, the

university said. The technical development and deployment are part of the £1.5 million (\$2 million) Innovate UK Modular Energy Storage with Clean Hydrogen (MESCH) project.

The consortium includes the CBI, Ultima Forma, Monbat and Malawian partners Renew’N’able Malawi (RENAMA) and INFLO.

A patent application has been filed for the technology, which reduces system complexity and capital

cost, which the university said supports a more scalable route to deployment than separate battery and electrolyser installations.

Project lead Dani Strickland, who is also director of EnerHy, the Engineering Hydrogen Net Zero EPSRC Centre for Doctoral Training, said: “This takes the battery-electrolyser from testing into live operation, providing the safety and reliability evidence required for replicating systems.

“With deployments progressing in Côte d’Ivoire, Zambia and the UK, the focus now is proving repeatable performance across multiple sites.”

Meanwhile, Loughborough University pro vice-chancellor for research and innovation, Dan Parsons, said the next step for the technology is spinning out a start-up to take it to market — scaling manufacturing and delivery to realise its wider impact. ■



Handover ceremony at Mwanza District Hospital, attended by CBI’s research and innovation director Carl Telford (fifth from left). Photo: EnerHy

Building new EU battery plants is ‘totally irresponsible’, says ACC chief

One of Europe’s flagship gigafactory developers is set to permanently drop plans for two new plants — blaming EU leaders’ faltering support for the battery sector amid intense Chinese competition.

Yann Vincent, CEO of the Stellantis-backed Automotive Cells Company (ACC), said on February 16 it would be “totally irresponsible” to go ahead with building factories in Kaiserslautern, Germany and Termoli, Italy.

Vincent’s statement said the projects faced “possible termination”. However, Italian trade union, UILM, said on February 7 workers had already been told work at both sites had been permanently shelved.

ACC had announced in 2024 it was pausing work to evaluate the viability of developing LFP technologies at the sites.

Now Vincent says ACC’s two customers, Stellantis and Mercedes, are suffering from the high level of uncertainty surrounding the market, which has been made unstable by fierce competition from China.

In rebuking EU leaders over investment policies to shore up the bloc’s nascent battery industry, Vincent added: “We have repeatedly said the European battery industry is at a turning point in its young history... and this is now the case.

“There is an urgent need for action to turn it into a massive financial instrument worth €750-800 billion (around \$1 trillion) per year.”

He bemoaned the lack of progress within the EU. One year after the European Commission unveiled its ‘competi-

tive compass’ initiative*, aimed at reducing dependencies on raw materials for batteries and boosting investment in clean energy tech, this was “still only a framework for guidance”.

No one could doubt the inevitability of the ongoing shift towards EVs and their importance to supporting decarbonization. However, who will manufacture batteries for European cars is still a crucial question, Vincent said.

He noted that Asian players, particularly Chinese firms, “already supply 99% of the market — putting the strategic independence of European car manufacturers in the hands of battery makers such as BYD, CATL, South Korea’s LG and others.

“ACC’s 2,300 employees have been fighting every day for more than five years to show that alternatives exist,” Vincent said.

He revealed that the ramp-up of another ACC’s gigafactory, in Hauts-de-France, was taking longer, costing more than anticipated, and weakening the firm’s financial position.

“But we are too close to our goal to give up now.

Several thousand Peugeot, Opel and DS vehicles (to name but a few brands) are already equipped with ACC batteries, which are unanimously recognised as being at the cutting edge of technology.

“Our production lines are currently producing twice as many modules as they were two months ago. Our scrap rates, the lifeblood of this industry, are steadily decreasing thanks to the many actions we have taken and the internal and external resources we have mobilised.”

Meanwhile, ACC’s ‘upstream’ operation, made up of teams based in Bordeaux-Bruges and Nersac, France, is experiencing a decline in activity proportional to the delay in our portfolio of future products, he said.

Vincent’s criticism is the latest in a plethora of reports warning that the EU is doing too little and too late to underpin the bloc’s aspirations for a home-grown EV battery industry.

Last October, EU leaders were urged to take urgent action to support European battery manufacturers — after being warned

the industry faced costs that are some 20% higher than Asian competitors.

Earlier this year, the European Court of Auditors (ECA) said lengthy and complex permitting was still a significant bottleneck, delaying the start of EU mining projects.

Most EU recycling targets “neither incentivise the recycling of individual materials nor encourage the uptake of recycled materials”, according to the ECA.

*The ‘competitive compass’ Vincent referred to in the wake of recommendations made by Mario Draghi, a former European Central Bank president, in his 73-page report ‘The future of European Competitiveness’, published in 2024.

Draghi said in the report the EU should develop an industrial action plan for the automotive sector. “In the short term, the main objective for the sector should be to avoid a radical delocalization of production away from the EU or the rapid takeover of EU plants and companies by state-subsidised foreign producers.” ■

Yuasa cedes control of Turkish battery venture to İnci Holding

Turkish industrial group İnci Holding is taking full control of its battery joint venture company with Japan’s GS Yuasa under an equity transfer agreement.

The partners announced on March 27 that İnci would acquire Yuasa’s 60% stake in the İnci GS Yuasa lead battery operation.

Yuasa said the deal, scheduled for completion in May, was agreed after both sides decided management of the battery

company by an İnci-led team would be in the best interests of all concerned.

However, İnci and Yuasa will continue to collaborate under a new technology and supply arrangement, with Yuasa supporting expanded sales in Europe as a contract manufacturer to the Turkish operation.

The joint venture was formed 11 years ago and the partners opened their third battery factory in Turkey in 2019.

İnci Holding CEO and board member Zeki Şafak Ozan said the new partnership structure would see the companies preserve their expertise and launch a new period of strategic cooperation.

Despite global economic pressures, some \$210 million has been invested in the battery operation over the past five years, securing an export performance valued at more than \$2.5 billion, Ozan said. ■



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Long duration ESS tops 15GWh but technology ‘squeeze’ looms

Long duration energy storage systems increased by nearly 50% year-on-year in 2025 – exceeding 15GWh, latest industry analysis has shown.

However, according to Wood Mackenzie’s Long Duration Energy Storage (LDES) Trends report released on March 9, the sector is facing growing challenges due to declining investment and increasing competition from lithium ion batteries.

Compressed air energy storage (CAES), thermal storage and vanadium redox flow batteries (VRFB) accounted for 45%, 33% and 21% of 2025 installations respectively, the report said.

Meanwhile, China continues to dominate, representing 93% of cumulative global

deployment, driven by strong national and regional government policy support.

Under Wood Mackenzie’s net zero scenarios, the global average energy storage duration must increase from 2.5 hours to around 20 hours. As countries like Germany, Australia and Denmark push for variable renewable energy beyond 50% by 2030, wider deployment of LDES will be critical for grid reliability.

However, LDES comprises only 6% of 2025 global energy storage installations, while Li ion battery projects typically average for two hours of storage, VRFB and CAES averages about four hours and thermal storage around eight hours, according to the report.

Revenue certainty is

strongest in the UK, Italy, the US and Australia, with technology-specific procurement also emerging in markets like Spain, Ireland and Germany.

However, most markets lack capacity mechanisms, and multi-day arbitrage alone cannot justify LDES investment.

Global funding for LDES, according to the report, fell by 30% year-on-year in 2025, excluding the US Department of Energy’s \$1.8 billion commitment to CAES tech developer Hydrostor. Venture capital investment fell even more sharply, dropping by 72% and placing increasing financial pressure on a growing number of LDES start-ups.

Between 2021 and 2025,

only three companies — Hydrostor, EOS Energy and Form Energy — raised more than \$1 billion in funding each, collectively raising over \$4 billion. However, even well-funded companies continue to face significant financial challenges.

“Despite impressive installation growth last year, LDES technologies are caught in a strategic squeeze,” said Jiayue Zheng, energy storage managing consultant at Wood Mackenzie.

“Lithium ion batteries have captured the economically critical four to eight-hour storage market through superior cost and supply chain advantages, while the LDES lacks sufficient demand and pricing mechanisms to achieve commercial viability.” ■

EU bid to ‘de-risk investment’ and expand LDES, novel renewables

The European Commission is proposing a fresh package of support to encourage private investments in long duration energy storage projects and “novel” renewables.

The Commission said on March 10 it plans to work with the European Investment Bank Group to step up financial support for investments in LDES and a range of clean energy tech such as floating wind, floating solar and wave and tidal power.

Levels of financial support likely to be available were not specified, but the Commission said it would launch a pilot scheme with the EIB this year aimed at securing €500 million of financing to accelerate “energy efficiency as a service” models, alongside specialised investment funds.

The Commission will also establish the Energy Transition Investment Council, to include key investment partners.

EU institutions will look to provide better access to

finance for grid operators by freeing up banks’ lending capacity, allowing banks to grant new loans to grid operators without direct reliance on public subsidies or state budgets, while crowding in private institutional capital.

The Commission will explore with the EIB how to better support access to finance for grid operators by freeing up banks’ lending

capacity, allowing banks to grant new loans to grid operators without direct reliance on public subsidies or state budgets, while crowding in private institutional capital.

Public capital has a vital role to play in lowering risks and mobilising private finance for the clean energy transition, the Commission said.

“The de-risking of clean technologies, especially

where we depend on high-risk third country providers, such as for solar inverters, needs to be reinforced at national and EU level.”

However, the Commission said it would be essential to undertake a thorough analysis of cybersecurity risks for all energy infrastructure projects considered for financing, and define appropriate risk mitigation measures. ■

Fitch: Iran-US war to prove positive for BESS and China

Analysis released by Fitch Ratings on March 25 said China’s dominance in the global manufacturing sector is likely to be further strengthened as a result of the Middle East conflict between the US and Iran which started in February and is still continuing.

Prolonged oil and liquefied natural gas supply disruptions add upside by strengthening energy security-driven investment in renewables and BESS across energy-importing economies, Fitch said.

“This should support volume visibility and utilization for scale Chinese producers, who dominate the global LFP-cathode battery cell market and its supply chain.

Demand for BESS should rise even if the Iran conflict is resolved shortly, as the related gas disruptions make electricity supply more expensive and less stable in markets reliant on gas-fired generation, and energy security becomes a more immediate policy priority.

Fitch said the main incremental overseas growth channel is likely to be solar-plus-BESS systems, particularly in emerging markets that rely on imported energy and have not yet secured stable, reliable electricity supply.

“The sharp decline in combined system costs in recent years strengthens the economic case versus fossil-based power generation, although raw material cost inflation may lead to some price rebound from this year.” ■

Regulators to review clean-up at US battery superfund sites

US environmental regulators have announced they will review clean-up work at ‘superfund’ sites, including a former lead battery plant and a smelting facility, this year.

The Environmental Protection Agency (EPA) said on March 11 the Prestolite Battery Division and US Smelter and Lead Refinery (USS Lead) will undergo a five-year review to ensure ongoing or completed remediation efforts continue to protect public health and the environment.

Both sites are among

nine on the country’s list of national priority superfund sites across Indiana to undergo reviews.

Superfund is a US federal government program designed to fund the clean-up of sites contaminated with hazardous substances and pollutants.

The 18-acre Prestolite site manufactured lead acid batteries, primarily for use in cars and trucks, from 1945 to 1985. Plant operations contaminated soil with lead and polychlorinated biphenyls (PCBs) and groundwa-

ter, sediment, and surface water with volatile organic compounds and metals. Long term monitoring is ongoing.

Between 1972 and 1973, the USS Lead facility was converted (from copper smelting) to operate exclusively as a secondary lead smelter, recovering lead from car batteries and other sources of secondary lead.

“As required by the superfund law, five-year reviews are a critical checkpoint to verify that completed clean-ups are still doing their job —

protecting people, drinking water and ecosystems — and to course-correct if new data or site conditions warrant action,” said EPA region 5 administrator Anne Vogel.

Operations ceased in 1985. The EPA said while USS Lead was a significant contributor to contamination in the area, investigations indicate that other facilities were also significant sources of contamination to the surrounding residential area.

In 2024, a \$7 million settlement deal was announced for costs linked to the remediation of a former C&D Batteries superfund site in New York State. ■

Clarios selects Michigan for supercap assembly site

Clarios has announced plans to use its Meadowbrook plant in Michigan as an assembly site for supercapacitor systems.

The February 12 announcement came less than a year after Batteries International reported that Clarios was evaluating sites in the US for a next generation technology campus anchored by new supercap system production.

The lead battery giant followed that last November by acquiring supercap manufacturer Maxwell Technologies from California-based UCAP Power for an undisclosed sum.

Clarios’s supercap systems — also referred to as ultracapacitors in certain original equipment manufacturer applications — are designed for 12V and 48V automotive architectures.

They provide rapid charge discharge performance and enhanced reliability for critical functions such as steer-by-wire, chassis stabilization, voltage stability and redundancy, particularly when paired with AGM batteries.

Clarios said they also serve as a “foundational building block” within

integrated power and stability architectures increasingly adopted across the industry, which is in line with the company’s systems-oriented approach to low-voltage energy management.

Details of assembly operations and capacities were

not disclosed, but Clarios said the site would build on the capabilities of Maxwell Technologies — which now operates as an independent business unit within Clarios.

Maxwell was previously owned by Tesla, which finalized its purchase of the

firm in 2019. Tesla sold Maxwell to UCAP two years later.

In March 2025, Clarios unveiled a 10-year, \$6 billion plan to expand battery manufacturing and help boost US energy and critical minerals independence. ■

Cuba turns to solar-BESS lifeline amid US blockade blackouts

Cuba has launched load testing of what will be a 200MW BESS in Havana, as the island nation is scrambling to tackle widespread rolling blackouts in the face of an effective oil blockade by the US.

The state-owned Union Eléctrica (UNE) announced on March 10 that testing of the first 50MW BESS unit at the El Cotorro substation.

UNE said this was the first of four systems with a combined capacity of 200MW. The battery chemistry involved — and supplier — was not disclosed.

However, China has already helped Cuba develop 49 new solar parks with more on the way by 2028, according to the International Action Centre. The US-based advocacy group said solar power

production had grown from 6% of total energy generation in 2025 to more than 20% now.

According to UNE, each unit of the new BESS is designed to act as an instantaneous regulator of the grid’s primary frequency, to counteract sudden fluctuations that would otherwise lead to widespread blackouts or technical failures.

In the case of the capital city, the BESS will be powered by energy harvested from the country’s Guana-bacoa, Cotorro and Boyeros solar parks.

UNE said while the BESS investment will not automatically eliminate power outages, battery storage can help ensure greater grid resilience.

Cuba’s US embassy welcomed the development in a statement issued on March 10.

“This strategic project represents a crucial step in our energy transition, with batteries acting as instant regulators and neutralizing sudden frequency fluctuations to prevent technical failures and mass outages.”

By improving voltage and frequency quality, we are protecting sensitive electrical equipment and optimizing the use of clean energy, reducing our reliance on thermal generation, the embassy said.

Cuba currently relies on oil products for more than 80% of power generation, according to the International Energy Agency. ■

Mercedes-Benz Korea penalised over 'misleading' EV battery data

Antitrust chiefs in South Korea have fined Mercedes-Benz 11.2 billion Korean won (\$7.6 million) for allegedly misrepresenting information about batteries used in some vehicles.

The Korea Fair Trade Commission said on March 10 the auto giant had advertised its EQE and EQS models as using premium cells from China-based battery giant CATL — when in fact some vehicles involved were equipped with batteries from China-headquartered Farasis Energy.

However, Mercedes-Benz Korea said it disagreed with the Commission's findings and would take "necessary legal measures" to challenge the decision.

The Commission said it

decided to launch an investigation after it discovered battery cells in a Mercedes EV involved in an August 2024 fire at an underground parking lot in Incheon were made by Farasis.

About 3,000 vehicles containing Farasis battery cells were sold between June 2023 and August 2024, with total sales amounting to roughly 281 billion won, according to the Commission.

Four out of six EQE

models and one out of seven EQS models released at the time were equipped with Farasis cells. This was not disclosed in dealer guides and marketing material.

CATL holds an overwhelming advantage over Farasis in terms of market share, brand recognition, and technological capabilities, the Commission said.

"Furthermore, Farasis has a history of a large-scale recall in China in March 2021 due to battery

fire risks, just prior to the domestic launch of the Mercedes-Benz EQ electric vehicle in 2022, and in the domestic market, Farasis battery cells were installed only in the Mercedes-Benz vehicles involved in this incident."

The Commission accused Mercedes-Benz Korea and the firm's headquarters in Germany of concealing information and deceiving consumers.

Mercedes-Benz was also ordered to publicize the fine to the media, to alert affected car owners that they may need to take legal action over the issue. ■

The Commission accused Mercedes-Benz Korea and the firm's headquarters in Germany of concealing information and deceiving consumers. Mercedes-Benz Korea said it disagreed with the Commission's findings and would take "necessary legal measures" to challenge the decision

Monbat targets growth taking a majority stake in UK's Alpha House

European lead battery major Monbat has acquired an undisclosed majority stake in UK-based power solutions specialist Alpha House.

Monbat said the deal, announced on April 9, builds on a five-year exclusive supply partnership and aims to strengthen the battery supply chain and boost sales and services.

Bulgaria-headquartered Monbat said the deal also underlines its long-term commitment to the UK market — seen as a major driver of business growth for services combined with its batteries including VRLA industrial AGMs, its 'UPM range' of high-rate UPS systems, and high cycling carbon batteries.

The acquisition is a direct result of the exceptional growth and operational excellence Alpha House has demonstrated — most recently with the award of a major telecoms contract, Monbat said.

Monbat CEO Victor Spiriev and Alpha House CEO Meryl Bagguley said in a joint statement: "We aim to get closer to our customers with greater control over supply chain resilience, improved coordination in an uncertain global

business environment, and a platform to enhance service levels, improve responsiveness and enable greater delivery flexibility."

Last month, Monbat posted record consolidated sales revenue of BGN403 million (\$206 million) and

increased net profit for 2025.

The group said consolidated sales revenue was up by nearly 5% over 2024 and net profit rose by 13% to BGN 5.6 million — an increase of 12.7% compared to the previous year. ■

Suzuki enters solid-state fray with Kanadevia acquisition

Suzuki Motor Corporation is set to acquire all-solid-state Li battery tech business of Japan's Kanadevia Corporation for an undisclosed cash deal.

Suzuki said on March 4 that it had entered into a business transfer agreement with Osaka-based Kanadevia to acquire the firm's all-solid-state lithium ion battery business, effective July 1, 2026.

The auto firm is keen to boost development of next-generation battery technologies for EVs.

Kanadevia, formerly Hitachi Zosen Corp, started developing the battery

business in 2006 using its proprietary dry manufacturing process.

The battery developer said its batteries offer high safety, including the absence of liquid leakage, excellent environmental resistance, and operation across a wide temperature range.

These characteristics make them particularly strong for specialized applications such as in aerospace or in high-temperature, vacuum conditions, Kanadevia said.

Suzuki said it plans to further develop the battery technology, although did not disclose details.

However, the company

will join an ever-increasing cohort of car giants keen to develop solid-state battery tech for future vehicles.

In 2024, management consultants Bain & Co said solid state lithium and sodium ion batteries would be the only commercialized emerging technologies by 2030.

However, the company said their joint share of the global battery market would still be small, and since they are still in the prototype and pilot manufacturing stages their market share would stay in the single digit range until 2030. ■



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Morrow Batteries files for bankruptcy in Norway

Norway's Morrow Batteries said on May 6 its board had decided to file for bankruptcy for the firm and subsidiaries Morrow Technologies and Morrow Industrialization Center.

The LFP and high-voltage LNMO-X tech developer said it had failed to secure extra time to complete the process of securing a new industrial investor and financing the group.

The announcement came just four months after Morrow announced its priorities included conserving cash and closing an office in Oslo — despite entering the final phase towards fullscale

series production.

Morrow had recently entered into a long-term master supply agreement with the Finnish company Proventia Oy and concluded its first commercial agreement within the defence industry, involving deliveries to a German company.

However, the company said its financial situation had further deteriorated over recent months.

"The company has been operating in an early and capital-intensive industrialisation phase, while at the same time the global battery market has become more competitive with oversupply and

resulting price pressure," Morrow said.

"In addition, increased capital costs, delays in the industrialisation process, and a more restrained investment market have made it significantly more difficult to secure financing."

The Agder District Court is expected to appoint a bankruptcy administrator shortly for the Norwegian companies, who will assume control over the company's assets and operations.

Morrow said its management would fully assist

the administrator in establishing oversight, preserving value, and facilitating any solutions that may contribute to the continuation of parts of the business.

Jon Fold Von Bülow, acting CEO, said: "What has been achieved at Morrow is the result of extraordinary dedication, resilience, and belief through a period of significant challenges. While this chapter comes to an end, the knowledge, technology, and capabilities developed here represent lasting value." ■

Allianz acquires 51% stake in 2.6GW Germany BESS developer GESI

Allianz Global Investors has acquired a 51% stake in Germany's Green Energy Storage Initiative (GESI), which is developing 2.6GW of BESS capacity in the country.

AllianzGI confirmed the deal on April 23, as GESI continued its development of three large-scale battery storage projects across Bavaria and Lower Saxony.

The three projects, with an aggregate grid connection capacity of around 2.6GW, rank among the largest BESS projects in Germany and are located at strategically critical nodes of the transmission network, GESI said.

Sites for the facilities include decommissioned power plants. Commissioning of the battery storage facilities is scheduled by 2029.

"For a successful and affordable energy transi-

tion, Germany urgently needs additional storage capacities," said GESI chief executive Walter Raizner.

The AllianzGI-GESI deal, for an undisclosed sum, came just days after TotalEnergies said it was selling a 50% stake in 11 of its BESS projects under construction in Germany to AllianzGI under a joint development deal. ■

Go-ahead for takeover of battery testing group Aviloo

The European Commission has given the green light for the acquisition of international battery testing firm Aviloo by German and Austrian investors.

The Commission said on April 22 Invest KG and Armira Growth had been given the go-ahead for the deal — which includes a €30 million (\$35 million) investment in Aviloo by Armira.

Austria-based Invest KG and Germany's Armira have jointly acquired all shares

previously held by the Commission-backed European Innovation Council Fund — one of Aviloo's earliest investors — becoming key shareholders alongside Austria's Raiffeisen KMU Invest.

Financial details of the acquisition were not disclosed, but Aviloo said CEO Marcus Berger and founding team Nikolaus Mayerhofer and Wolfgang Berger will continue to hold an undisclosed significant stake in the company. ■

Leoch shelves US spin-off, looks to 'new opportunities'

Leoch International has shelved proposals to launch a US spin-off company, Batteries International can exclusively reveal.

Chairman Dong Li said in filing with the Stock Exchange of Hong Kong on April 1 the company had "decided at this time

not to proceed with the project".

The announcement came just two days after Leoch announced the latest in a series of delays in the schedule to formally establish the proposed US spin-off — Leoch Energy — citing time required to complete the procedures

of approvals from US authorities.

In the April 1 filing, Dong Li said the decision not to proceed with the project and its proposed listing in the US followed consideration of several factors, including prevailing market and regulatory conditions. ■

Li batteries become ‘increasingly urgent safety risk’ for air cargo

Lithium batteries represent an increasingly urgent safety risk for global air cargo shipments, according to latest analysis from UL Standards & Engagement’s Thermal Runaway Incident Program.

(TRIP) is a collaborative initiative led by UL Standards & Engagement (ULSE). It provides a secure, voluntary surveillance system for the aviation industry to track and analyze lithium-ion battery thermal runaway incidents.

The program is designed to mitigate the risks of battery fires and overheating in passenger and cargo operations.

UL said in a report released on March 10 that reported thermal runaway incidents in air cargo increased by 40% between 2021 and 2025 — and are increasing at an average yearly rate of 9% — driven by consumer demand for low-cost, battery-powered products.

The report highlighted a supply chain UL said is strained by fragmentation, uneven accountability, and commercial pressures that prioritize speed over safety.

Understanding the core drivers of thermal runaway risk in air cargo, the conditions that allow that risk to persist, and the opportunities to strengthen accountability, coordination, and safety will lead to a stronger and more secure global supply chain, the report said.

Geography is said to be a predictor of cargo risk. With significant differences in manufacturing quality, regulatory oversight, and enforcement rigor across regions, a battery’s country of origin can be an indicator of a heightened threat.

“More than half of known-origin incidents begin in a handful of Asian airports — as do a significant number of battery shipments — contributing to industry perceptions that geographic disparities amplify other risks such as battery quality, shipper behaviour, and third-party involvement.”

However, the report said the issue not about a single country or region, but rather a complex, commercially-driven system that allows for inconsistencies, confusion, and opportunistic noncompliance.

A complex supply chain allows for diffusion of accountability, the report said. Batteries pass through many



The explosion of aircraft flights across the world needs to be balanced by a similar explosion of safety inspections

hands including manufacturers, wholesalers, freight forwarders, consolidators, postal networks, third-party logistics providers, and airlines.

Each link depends heavily on the previous one to comply. This creates a system built on trust, but also one built on plausible deniability.

“When safety issues emerge, the fragmentation offers every stakeholder a scapegoat further upstream or downstream. The complexity of the battery supply chain makes it difficult to pinpoint problems, let alone arrive at solutions.”

UL is now calling for the establishment of clear, enforceable responsibility across the supply chain.

Shippers — especially small and individual ones — need more guidance

than airlines realize, and do not appear to be effectively accessing the guidance currently provided by regulators, cargo carriers, or e-commerce platforms, according to UL.

“Cutting corners on battery safety, packaging, or testing creates greater long-term financial, operational, and reputational risk. Regulators and global standards bodies must lead with uniform rules, training requirements, and enforcement structures that make safety the most economically rational choice. Shipping batteries that meet safety standards can reduce risk, as these batteries have proven to be safer and less prone to fire.”

Batteries International reported on March 6 that a new study by Allianz Commercial warned the growing prevalence of lithium ion batteries meant fire had now become an elevated risk to global business on land and at sea.

The latest edition of the Allianz Risk Barometer, which identified major global business risks for 2026, warned that inadequate handling, storage or transportation of Li-ion batteries had been linked to an increasing number of fires in recent years. ■

With the growing number of portable electronic devices (and the rising reliance on lithium-ion batteries) in-flight or on-tarmac thermal runaway has become a major safety concern. Incidents frequently involve power banks and vaping devices. By leveraging the data collected via TRIP, ULSE and the

broader aviation industry can better understand the scale and complexity of battery-related hazards, develop targeted passenger awareness campaigns and safety standards and guide the testing and certification of new safety equipment, such as in-flight fire containment bags (under standard UL5800).

UN agency limits power banks over Li fire flight risk

The International Civil Aviation Organization (ICAO) has issued new specifications governing onboard power banks in a bid to combat the risk of lithium battery fires during flights.

The UN agency said the devices should be limited to two per passenger as of March 27 and recharging power banks during flights should be prohibited.

However, crew will still be allowed to use power banks in line with the operational requirements of aircraft.

The decision reflects “emerging expertise” around risks presented by passengers’ lithium batteries, the ICAO said.

Third lithium battery recall for Mercedes

Mercedes-Benz is recalling selected EQB models in the US for the third time, amid warnings the vehicle’s high-voltage lithium ion battery might catch fire due to an internal short circuit.

The National Highway Traffic Safety Administration (NHTSA) confirmed the recall relating to the electric crossover model on February 6.

The automaker is recalling 11,895 EQB EVs sold in the US, some of which have already been part of two separate recalls for the same issue, but the fixes that were applied have not eliminated the issues.

NHTSA said owners are advised to park outside and away from structures until the recall repair is complete. Owners are also advised to only charge their vehicles to a maximum of 80% battery capacity until the remedy has been completed.

Dealers will replace the high voltage battery free of charge. Vehicles previously repaired under an earlier recall will also need to have the new remedy completed, NHTSA said. ■

Independent technical experts on the agency’s Air Navigation Commission endorsed recommendations to amend the Technical Instructions for the Safe Transport of Dangerous Goods by Air, with some revisions, which have now been approved by the 36 states that form the ICAO Council. The addendum to the technical instructions will be provided to all 193 ICAO member states.

While the agency’s technical instructions are not a standalone law, they are part of the broader legal framework governing the international transport of dangerous goods by air.

The move comes a year after Hong Kong’s aviation regulator issued a ban on passengers using lithium battery power banks during flights or stowing the devices in overhead compartments. Earlier, several international

airlines had introduced strict bans on power banks being used on flights after onboard fires.

Last month, a report published by UL Standards & Engagement’s Thermal Runaway Incident Program on March 10 said thermal runaway incidents in air cargo increased by 40% between 2021 and 2025 — and are increasing at an average yearly rate of 9%. ■

‘Too costly’ to repair part of California BESS after fire

Part of Vistra’s Moss Landing lithium ion BESS in California will never return to service following the two-day fire at the facility last year.

Vistra said in an April 17 update it is continuing to evaluate the potential restart of another part of the 300MW facility—and revealed the cause of the battery fire in January 2025 is still unknown.

‘Moss 100’, one of three BESS systems at the site, will not return to service because the cost of recommissioning will outweigh potential future revenues.

‘Moss 350’ is under evaluation in the hope it can be

returned to service sometime this year, Vistra said.

Meanwhile, as of April 17, more than 28,000 intact battery modules have been removed, de-energised, and shipped to approved recycling facilities.

Vistra expects removal of intact batteries and demolition activities to continue for the next several months.

“Investigations like these take time, and we ask for your patience as our teams examine a myriad of data points to understand what happened,” the utility said.

“In the coming weeks and months, we will continue to be transparent with local officials, regulatory agencies,

and the public on the next steps for the Moss Landing battery facilities and the findings of our investigation.”

Batteries International reported last August that Moss Landing contained around 100,000 lithium ion battery modules, of which about 55% were damaged in the fire. There was also a subsequent flare-up of the fire and representatives of the battery manufacturer, LG Chem, has been assisting post-fire activities on site.

In October last year, landmark new BESS safety standards were signed into state law in California in the wake of the fire. ■

Samsung-Columbia R&D highlights Li-metal safety milestone

Korean battery major Samsung SDI and a joint research team at Columbia University say they have developed a new electrolyte formulation that significantly improves the lifespan and safety of lithium metal batteries.

Samsung said on February 23 the partners had published a paper on the project aimed at advancing commercialization of next-generation batteries.

The paper, in the latest edition of energy science

journal *Joule*, said the breakthrough followed research by Samsung’s domestic research center, SDI R&D America and the university.

Lithium ion batteries offer the highest energy density among existing battery technologies, delivering more than 1.6x the energy density of conventional NCA lithium ion batteries, Samsung said.

However, commercialization has been constrained by a limited charge-discharge lifespan, which has

typically been restricted to only several dozen cycles.

The research team significantly improved the lifespan and safety of li-ion batteries by applying a gel polymer electrolyte, Samsung said. By developing a fluorine-based gel polymer electrolyte that forms a stable interphase on the anode surface, the team effectively suppressed dendrite formation, a key factor that has long degraded the performance of li-ion batteries. ■

CATL innovations energize EV battery sector

China's CATL has rolled out its latest innovations in battery tech — showcasing fast-charging, high energy and heightened safety innovations to maintain global dominance of the EV battery market.

The launch came just weeks after CATL and Chinese auto firm Changan unveiled what the partners said was the first mass-production car equipped with sodium ion batteries.

Now CATL has used its April 21 'Super Technology Day' in Beijing to highlight its third-generation Shenxing superfast charging battery, third-generation Qilin battery, Qilin condensed battery, second-generation Freevoy super hybrid, the Naxtra sodium ion battery and a fully integrated super-charging and battery swapping system.

The third-generation Shenxing

This has reached what is claimed to be the industry's strongest capability — an equivalent 10C and a peak 15C charging rate. Charging from 10% to 35% SOC takes just one minute, with 10% to 98% SOC taking six minutes and 27 seconds.

Even at -30°C in extreme cold conditions, charging from 20% to 98% SOC takes

about nine minutes.

The third-generation Qilin battery

This is designed for premium long-range EVs, achieving a cell energy density of 280 Wh/kg and enabling 1,000 km range while supporting 10C superfast charging.

Qilin delivers 3MW peak power, doubling the output of the second-generation Qilin track battery which competed on the Nürburgring (1,330kW). The entire battery pack weighs only 625kg. Compared with equivalent LFP systems, this represents a weight reduction of 255 kg and space savings of 112 litres.

Building on the national standard for NP (no thermal propagation), safety is strengthened through what CATL said is thermal-electrical separation, with each cell incorporating an independent sealed exhaust channel to isolate thermal events and prevent propagation, ensuring "heat takes the heat path, electricity takes the electrical path".

Qilin condensed battery

This applies aviation-grade technology to passenger vehicles for the first time, achieving 350 Wh/kg cell energy density and 760 Wh/L volumetric energy

density — setting a new record for mass-produced batteries. This enables 1,500 km range for sedans and over 1,000 km for large SUVs, with pack weight controlled within 650 kg.

The condensed battery features a high-nickel cathode and low-expansion silicon carbon anode, boosting energy density by 50 Wh/kg.

According to CATL, the technology builds on the group's electric aviation program, where 500 Wh/kg systems are said to have completed maiden flight validation on four-tonne aircraft, with further validation underway on aircraft exceeding eight tonnes.

Second-gen Freevoy Super Hybrid

This battery extends all-electric range to up to 600km and standardizes 10C superfast charging. The product integrates LFP and NCM materials through gradient-uniform mixing, with the olivine crystal structure of LFP serving as the core backbone, enabling a uniform hybrid of LFP and NCM materials at the powder particle level.

CATL said this achieves an energy density of 230 Wh/kg and increases range by over 15% without increasing

pack weight compared with single LFP systems.

Naxtra sodium ion battery

This marks the firm's transition from laboratory breakthrough to large-scale manufacturing, CATL said. By systematically overcoming hundreds of engineering challenges, CATL has achieved GWh-level industrialisation.

CATL chief scientist Wu Kai summarized the strengths, limitations, and development of various material chemistries, noting that LFP is nearing its theoretical energy density limit — making it better suited for a technology roadmap centred on extreme fast charging to achieve optimal balance.

He said NCM's high energy density keeps it at the forefront of global competition — underscoring that energy density remains the core metric for leadership.

On sodium ion, Wu said these batteries offer broad potential for extreme temperatures and energy storage applications.

And he said what the future needs of consumers, energy security and social development, the lithium battery industry must pursue coordinated development across multiple chemical systems. ■

BMZ unveils hybrid dual LFP-NMC cell system for electric buses

Engineers at the Polish operation of European battery manufacturer BMZ have developed a new generation battery system designed for the global market of electric buses and special-purpose vehicles, the company has announced.

Germany-based BMZ said on March 31 the key distinguishing feature of its Versora battery was its scalable architecture, enabling vehicle manufacturers to configure the system like building blocks

— in terms of energy, power, operating voltage and dimensions.

Another design feature is Versora's ability to use two cell chemistries, NMC and LFP, while maintaining identical dimensions and nearly identical weight.

BMZ said this allows the battery system to be tailored to vehicle requirements without redesigning the system architecture. As a result, both a premium variant, offering high energy density and extended range or operating time, and a

cost-efficient variant meeting basic market needs can be developed.

Looking ahead, this also enables the use of cells produced in Europe and worldwide without modifying the system design, the firm said.

The new battery type was developed at BMZ Poland's EV competence centre, where it will also be manufactured.

According to BMZ, the scalable voltage and energy mean the system can support both low- and

high voltage applications (400V and 800V architectures).

In addition, Versora's modularity and compactness means the battery can be used in retrofit projects — vehicles upgraded by replacing combustion engines with electric drives.

BMZ said the battery's low profile allows installation both in the floor and on the roof of a vehicle. The system design also enables batteries to be stacked, further increasing integration flexibility. ■

Yuasa 10% price rise for batteries in Japan

GS Yuasa has announced a price increase of at least 10% for certain lead acid traction batteries, related parts and EV chargers sold in the Japanese market.

Yuasa said on March 27 the company had been forced to revise prices in the face of surging costs of raw material costs, energy and logistics.

The battery maker's Tokyo Stock Exchange announcement said the increase would apply to orders received in Japan starting in April.

The cost of materials including iron, steel, plastics and non-ferrous metals such as copper has continued to increase steeply over the past two years, Yuasa said.

Global markets instability has also contributed to rising costs — including maintaining the supply chain needed for sustainable production, the company said.

Yuasa said it had made diligent efforts to drive down costs and improve production efficiency and would continue to do so.

"However, we have determined that it is difficult to maintain conventional prices through corporate efforts alone. In order to build strong, long-term partnerships with our customers and business partners through mid-to-long term product development, maintaining a stable supply of products, promoting technological innovation, and improving services, we have decided to implement a price revision."

Yuasa announced a similar price hike three years ago for lead and lithium ion batteries and other products sold in Japan because of increased raw material costs.

Birla secures €2m Spanish energy project grant boost

Carbon additives specialist Birla Carbon has secured a €2 million (\$2.3million) grant to boost energy autonomy at its plant in Spain.

Birla said on March 5 the grant, from the Society for Regional Development of Cantabria (SODERCAN), forms part of a broader investment project by the firm aimed at strengthening energy self-sufficiency at the facility.

The grant from SODERCAN, an arm of the regional government of Cantabria, will support the installation of a 4 MW back-pressure steam turbine to generate electricity and steam for internal operations.

Lyten ramps up Swedish battery sites following Northvolt takeover

California-based lithium sulfur developer Lyten said on February 27 it had completed its \$5 billion takeover of European battery maker Northvolt Sweden.

Batteries International reported last October that Lyten had already put a new management team in place in Sweden and Poland for Northvolt.

The Northvolt Sweden acquisition includes 16GWh of existing battery manufacturing capacity, more than 160 hectares of land, infrastructure and buildings to support expanded manufacturing and industrial activities, in addition to what Lyten said is the largest and most advanced battery research and development center in Europe.

Lyten plans to immediately begin the restart process for Northvolt Ett and Northvolt Labs. Ett will produce lithium ion NMC batteries serving a broadened segment of customers, including BESS, automotive and diverse mobility markets.

The company said it expects commercial sales of cells from Northvolt Ett to supply Lyten's BESS manufacturing facility in Poland, Northvolt Dwa, in the second half of 2026.

Lyten also announced the formation of the Lyten Industrial Hub, located in Skellefteå, at the Northvolt Ett site. The hub will use the infrastructure built by Northvolt and access to abundant, clean hydro power to co-locate battery manufacturing with AI datacenters and complimentary industrial operations of strategic importance to Sweden and the European Union.

The company said it expects commercial sales of cells from Northvolt Ett to supply Lyten's BESS manufacturing facility in Poland, Northvolt Dwa, in the second half of 2026.

Northvolt Labs in Västerås will continue development of long-life lithium ion NMC cells and will collaborate with the Lyten Silicon Valley team to industrialize Lyten's Li-S battery technology for gigascale manufacturing.

Meanwhile, EdgeConneX, a global

developer of datacenters and a portfolio company of EQT, plans to acquire a datacenter site from Lyten in Skellefteå. The site has potential to scale to a 1 GW datacenter campus, which would be one of the largest such facilities in Europe, Lyten said.

Formal opening for NextStar cells plant in Canada

NextStar Energy has formally opened what it said is Canada's first and only commercial-scale advanced battery manufacturing company.

The March 5 ceremony in Ontario followed the recent announcement that LG Energy Solution planned to buy the 49% stake held in NextStar by auto giant joint venture partner Stellantis.

More than C\$5 billion has been invested in the 4.23sq million Windsor facility to date.

The site has already produced more than one million battery cells since production began in November 2025 — three years after the start of construction.

LG said NextStar aims to become Canada's leading provider of battery cells to power everything from AI datacenters to municipal and provincial utility grids, as well as e-commerce and technology infrastructure.

David Kim, LG's CEO, said: "When (we) decided to become the sole owner of NextStar Energy, we did so with absolute confidence. As Canada's first large-scale battery manufacturing facility, NextStar Energy will play a critical role in powering the nation's next chapter of electrification."

CATL reports 40% boost in global LIB sales

CATL has reported near 40% year-on-year growth in global lithium battery sales for 2025 — increasing its dominance of the global market.

The China-based manufacturer for EV and BESS batteries said on March 10 that annual lithium sales reached 661GWh.

Global production capacity reached 772GWh in 2025, with 321GWh under construction by the end of 2025.

Revenue reached Rmb 424 billion (\$60 billion) in 2025, up 17% year-on-year, with net profit of Rmb 72.2 billion, an increase of 42%.

Meanwhile, CATL cited analysis by South Korea's SNE Research show-

ing the battery maker's global power battery market share increased by 1.2 percentage points to over 39%, ranking first globally for nine consecutive years. The firm said its overseas market share rose to 30%.

To date, CATL batteries have been installed in more than 24 million vehicles worldwide.

In terms of energy storage, CATL said SNE data confirmed ESS battery shipments accounted for 30.4% of the global market in 2025, ranking first globally for five consecutive years, with around 2,300 projects deployed worldwide.

Shipments from CATL's BESS integration business grew by more than 160% year-on-year.

TotalEnergies-Allianz in €500m BESS partnership for Germany

TotalEnergies (TE) is selling a 50% stake in 11 of its BESS projects under construction in Germany to Allianz Global Investors under a joint development deal.

Financial details of the transaction were not disclosed, but TE said on March 3 the 11 projects represent a total investment of €500 million (\$576 million).

All BESS projects will be operational by 2028 and have a total capacity of 789MW/1628MWh.

Moment Energy raises \$40m for EV battery repurposing boost

Canadian second-life battery company Moment Energy has secured \$40 million in a series B funding round, bringing its total capital raised to over \$100 million.

The financial boost will support funding for the British Columbia (BC) EV battery repurposing firm's development of a gigafactory in Texas and facilities in BC, Moment said on May 5.

The company said it has advanced battery repurposing from experimental use cases to enterprise-grade commercial deployment — having achieved key safety milestones, including UL 1974 and UL 9540A certifications. Moment claims this makes it the only provider proven capable of deploying second-life battery storage systems in the built environment without special dispensations or regulatory loopholes.

The funding round was led by

Evok Innovations, with participation from Liberty Mutual Investments, W23 Global Fund, and Acario (the corporate venture capital arm of Tokyo Gas). They joined Moment's major investors — Amazon's Climate Pledge Fund, Voyager Ventures and In-Q-Tel.

Moment said its proprietary pack-swapping architecture extends system lifespans to 30 years — which doubles the typical 15-year lifecycle of conventional systems. Combined with domestic tax incentives, this is said to enable up to 3x lower net costs, reducing cycling costs to a breakthrough 3 cents per kWh for industrial users.

New battery pilot line supercharges innovation in UK

A 'flexible' battery pilot line to bridge the gap between lab-scale research and full-scale production for innovators and developers has been opened in the UK.

The line at the government-backed UK Battery Industrialisation Centre gives companies a cost-effective way to develop their products — aimed at supporting rapid development, feasibility and early-stage manufacturing.

The centre said on March 12 that organizations using the line, near Coventry, are given the agility to move from lab-based concepts to

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The pilot line is the latest addition to the centre's battery manufacturing capabilities, which include a battery development lab offering cell characterisation ability and a cell cycling facility in addition to an electrode process development area.

According to the centre, the line can accommodate multiple solvents, chemistries and cell formats.

Centre managing director Sean Gilgunn said the pilot line is the missing piece in the jigsaw of the UK's battery ecosystem that "can now go from laboratory testing all the way to gigafactories.

He said the line gives startups and smaller businesses the opportunity to bring their innovative chemistries and materials to prove at scale before moving onto full commercialisation.

Last year, new UK business Volklec said it would manufacture advanced lithium ion batteries at the centre under an exclusive technology transfer deal with China's Far East Battery.

US hits new 58GWh BESS installations record

The US energy storage industry installed a record 58GWh of new capacity in 2025, the largest single year of new battery capacity additions on record, according to latest industry data.

The Solar Energy Industries Association (SEIA) said on February 23 that despite increased federal government pressure "targeting" clean energy, BESS installations were up 30% from the previous record set in 2024 — and are now four times what the industry installed three years ago.

According to the US Energy Storage Market Outlook Q1 2026, released by SEIA and Benchmark Mineral Intelligence, as of 2025, 137GWh of utility scale storage had been installed in the US.

A total of 19GWh of commercial and industrial storage was installed, along with 9GWh of residential storage.

As of 2025, lithium ion battery cell manufacturing for stationary electricity storage applications rose to more than 21GWh according to SEIA's Solar and Storage Supply Chain Dashboard. That is the equivalent of powering the city of Houston from sunset to sunrise, the association said.

Meanwhile, American manufacturing facilities now have the capacity to manufacture 70GWh of battery storage systems.

Standalone storage made up nearly 30GWh of new capacity added in 2025, while storage paired with solar accounted for 20GWh. The residential energy storage sector added more than 3GWh in 2025, marking a 51% year over year increase.

SEIA said an expansion of virtual power plant programs in states like Massachusetts, Texas, Arizona, and Illinois were driving residential storage deployment.

Despite actions in Washington, over 600GWh of energy storage is expected to be installed by 2030. This rapid deployment will help lower energy costs, enhance reliability, and boost American energy independence, SEIA said.

Iola Hughes, head of research at Benchmark Minerals, said: "The US energy storage market has entered a new phase of sustained, high volume-deployments.

"At a time of rising electricity demand, driven in part by the growth of data centers and AI infrastructure, energy storage will be critical to ensuring the grid can scale reliably and efficiently."

LGES to buy Stellantis stake in Canadian battery joint venture

Energy Solution has announced plans to buy the 49% stake that is held by auto giant Stellantis in their NextStar Energy Canadian battery joint venture.

LGES said on February 6 the move would give it full ownership of NextStar, which was established to build Canada's first large-scale battery manufacturing facility in Ontario.

The purchase price was not disclosed in press releases issued by the partners. However, according to several media reports, LGES will acquire the stake for a nominal amount of \$100 — although this has not been independently verified by Batteries International.

The deal follows a mutually agreed, strategic decision by both NextStar partners, LGES said. The decision was informed by extensive engagement with NextStar Energy's leadership team to ensure a seamless transition and strengthen the company's long-term growth and investment outlook.

Under the new ownership struc-

ture, NextStar will use LGES's technological and global operational expertise to better serve a broader customer base, including the ESS industry.

The move will also give NextStar greater agility to market conditions and demand to pursue future growth opportunities, LGES said.

Meanwhile, Stellantis will continue to be a customer and source battery products from NextStar.

More than C\$5 billion has been invested in the Ontario facility to date.

David Kim, CEO of LGES, said the South Korea-based battery maker sees growth opportunities in North America by having a key production hub in Canada.

"Full ownership of NextStar will enable us to respond swiftly to the growing demand from the ESS market and position us to play a key role in Canada's EV industry by securing additional North American-based customers," Kim said.

Antonio Filosa, CEO of Stellantis, said: "This is a smart, strategic step that supports our customers, our Canadian operations, and our global electrification roadmap."

Batteries International reported last November Stellantis and Chinese battery major CATL had broken ground for a \$5 billion LFP battery plant in northeast Spain.

The plant is expected to operate entirely on renewable energy when it starts production by the end of 2026 — delivering up to 50GWh of LFP batteries annually for EVs.

Taiwan's ProLogium kickstarts French Li ceramic gigafactory

Taiwan-based ProLogium Technology broke ground on for the phased construction of a solid-state lithium ceramic batteries gigafactory in France on February 10.

The Dunkirk facility will be home to production of ProLogium's European fourth generation 'superfluidized all-inorganic solid-state lithium ceramic battery'.

ProLogium said the groundbreaking ceremony for its first facility outside Taiwan marked the transition from project planning to execution, thanks to the support of the French government and local authorities.

Completion of the second and final phase of the Dunkirk site, set for 2032, will take total annual production capacity to 12GWh.

ProLogium has secured reserved land around the initial construction site for the potential expansion of the manufacturing plant to 48GWh.

ProLogium will use its Taiwanese gigafactory in Taoyuan gigafactory, operational since 2024 and having delivered more than 750,000 cells, to support the scale-up of operations at Dunkirk.

Vincent Yang, founder and CEO of ProLogium, said: “We are bringing our mass-production platform to Europe and will build the Dunkirk lines with a platform mindset — from equipment installation and process windows to quality systems — to ensure consistent, industrial-scale output.”

French president Emmanuel Macron said support for the project was an issue of French and European sovereignty, as well as an economic, social, and climate imperative.

Maurice Georges, chairman of the board of Dunkirk Port, said ProLogium’s facility is the second gigafactory to be established in the region, known as the ‘Hauts-de-France battery valley’.

WEG plans new BESS manufacturing plant in Brazil

Brazilian electric engineering and power company WEG said on February 4 it will build a BESS manufacturing plant in the country.

WEG said it secured financing of BRL (Brazilian reals) 280 million (\$53 million) from a Brazilian Development Bank-backed innovation program for the project, in the state of Santa Catarina.

Construction of the new plant will begin soon, with completion scheduled for the second half of 2027, the company said.

The plant will expand the firm’s annual BESS production capacity to 2GWh, equivalent to 400 systems of 5MWh.

The facility will feature a high level of automation, including automatic and semi-automatic assembly lines, as well as the use of autonomous mobile robots. In addition, the complex will house a laboratory for product testing, development.

Alberto Kuba, president of WEG, said: “This investment is aligned with the strategic objective of positioning WEG and Brazil more competitively in the global energy transition landscape, mitigating risks and strengthening the country’s presence in this

growing segment.”

In 2024, Brazil announced plans for the country’s first large-scale battery storage auction to promote battery technology and attract large manufacturers such as Huawei from China and other nations.

Batteries International reported then that while Brazil’s battery storage market was still in its infancy, with only a limited number of projects in operation, the country boasted one of the cleanest energy grids globally, with more than 80% of its electricity generated from renewable resources.

Planned 4.5GWh BESS with solar launched in Philippines

Initial grid synchronization for an eventual 4.5GWh BESS and 3.5GW solar project in the Philippines has been completed by the Manila Electric Company (Meralco).

Meralco announced the launch of the MTerra Solar facility on February 14 and its connection to the regional Luzon grid.

The facility will have an initial 250 MWac of solar capacity and 112.5MWh of battery energy storage capacity.

During this period, the project is set to begin exporting 85 MW of constant power to the grid to demonstrate MTerra Solar’s stability and reliability as an integrated renewable energy and energy storage system.

A total of 622 BESS units have already been installed although the battery chemistry and technology supplier were not disclosed. This is in preparation for a ramp up in its capacity in the following months, Meralco said.

As development progresses through its phases, MTerra Solar is expected to become the world’s largest integrated solar PV and BESS facility once fully completed — in support of the Philippines’ renewable energy targets of 35% by 2030 and 50% by 2040.

QuantumScape launches Silicon Valley solid-state battery pilot

US solid-state battery developer QuantumScape has launched pilot production at its Eagle Line in Silicon Valley.

The company said on February 4 that Eagle Line, at its San Jose facility in California, forms the blueprint

QuantumScape said it also plans to demonstrate scalable production of QS technology to enable licensing partners to manufacture at gigawatt-hour scale in their own facilities.

for its ‘QS system’ — QuantumScape’s innovative solid-state lithium-metal battery technology.

The QS system incorporates the firm’s ‘Cobra’ process, a unique and highly scalable method for producing the proprietary QS separator.

Upon ramp-up, the Eagle Line will produce QS battery cells to support customer sampling and testing, technology demonstrations, and product integration efforts.

QuantumScape said it also plans to demonstrate scalable production of QS technology to enable licensing partners to manufacture at gigawatt-hour scale in their own facilities.

Meanwhile, the Eagle Line will serve as a platform to develop and test further technology and process improvements at meaningful scale.

Siva Sivaram, president and CEO of QuantumScape, said: “This is the next major step in the commercialization of our technology.”

In July 2024, QuantumScape and PowerCo, the battery subsidiary of Volkswagen Group, announced a deal to industrialize QuantumScape’s next-generation solid-state lithium-metal battery tech.

Statkraft, OX2 agree Finnish BESS projects deal

Renewable energy company Statkraft has signed a seven-year deal with Swedish renewables developer OX2 for battery storage projects in Finland.

Statkraft said on February 25 the 235MW agreement is its largest BESS power purchase agreement in the Nordics to date.

The deal covers two BESS facilities with capacities of 110 MW (220MWh) and 125 MW (250MWh) respectively. Both projects are under construction although details of the battery chemistry to be deployed were not disclosed.

Statkraft will optimise the batter-

ies over a seven-year term, starting in 2028, and support financing of the facilities at the same site as OX2's wind projects Kannisto in Halsua and Korkeamaa in Soini.

Yuasa's expansion plans gain traction in Europe

GS Yuasa has revealed plans to expand traction battery operations and its distribution network across European markets.

The Japan-headquartered lead and lithium battery giant announced the move on February 25 — as it confirmed it would make its debut visit at the European intralogistics trade show LogiMAT 2026 in March in Germany.

The announcement came just weeks after the corporation's president, Takashi Abe, said Yuasa was considering a fresh investment boost in production overseas — as reported by Batteries International last October.

East Penn seeks tax break for \$110m Texas expansion proposal

US-based lead battery giant East Penn Manufacturing is seeking a tax abatement for a proposed \$110 million-plus investment in a major expansion of its plant in the City of Temple, Texas.

Temple City Council will hold a public meeting on March 19 to consider approving an abatement deal with the battery maker for a percentage of the increase in the taxable value relating to the 175,000 sq. ft. site expansion.

Council documents seen by Batteries International say the enlarged industrial park facility would house equipment related to manufacturing, distribution and auxiliary support, although details were not disclosed.

Site work modifications would include water and gas connections along with extensive electrical upgrades to satisfy electrical demand, the council said.

The expansion is expected to create 48 new full-time jobs in manufacturing and warehouse duties.

Jupiter Power in upsized \$500m BESS expansion credit boost

Black Rock-backed Jupiter Power has closed a \$500 million facility to support an expansion of its BESS

portfolio across the US.

Jupiter said on January 28 the senior secured green revolving loan and letter of credit facility boosts the company's existing \$225 million facility, originally closed in September 2024.

CFO Jesse Campbell said: "This upsizing represents another big step in Jupiter Power's growth and underscores the confidence our banking partners have in our ability to continue delivering high-quality BESS projects with long-term contracted cash flows."

Jupiter currently has nearly 8,000MWh of BESS projects operating, under construction or under contract, with a development pipeline exceeding 12GW nationwide.

For the latest facility, Barclays Bank, HSBC Bank USA, ING Capital, National Association, Societe Generale and SMBC acted as coordinating lead arrangers.

BESS with solar, wind 'more cost competitive' versus coal and gas

Battery storage systems paired with hybrid solar and wind energy can deliver 24/7 power at lower costs than fossil fuel electricity generation, according to a new report by the International Renewable Energy Agency (IRENA).

Firm levelized costs of electricity (firm costs) for solar plus storage range from \$54-\$82 perMWh in certain areas, compared with \$70-\$85 perMWh for new coal in China and more than \$100 perMWh for new gas globally, IRENA said on May 6.

IRENA's report, '24/7 renewables: The economics of firm solar and wind', indicates that in prime solar and wind regions, hybrid solutions combined with storage can deliver round-the-clock power at lower costs than fossil fuels.

Analysis by the agency shows firm costs have declined rapidly, driven by falling costs for solar PV, wind power and battery storage.

Since 2010, total installed costs were down by 87% for solar PV and by 55% for onshore wind. Battery storage costs fell even more sharply, declining by 93%.

Specific analysis of solar-plus-battery configurations across multiple countries shows that firm costs have fallen from above \$100 perMWh in 2020 to around \$54-\$82 perMWh

Since 2010, total installed costs were down by 87% for solar PV and by 55% for onshore wind. Battery storage costs fell even more sharply, declining by 93%.

by 2025 at high-irradiance solar regions and strong wind corridors.

IRENA projects further cost reductions of roughly 30% by 2030 and around 40% by 2035, bringing firm costs below \$50 perMWh at the best-performing sites by 2035.

The report cites the United Arab Emirates' Al Dhafra complex, which pairs solar PV with battery storage, as delivering a firm 1GW of clean electricity at around \$70 perMWh.

Firm wind-plus-storage systems are also becoming increasingly competitive. IRENA's estimates for 2025 show that firm wind-plus-storage costs ranged from around \$59 perMWh in Inner Mongolia to around \$88-\$94 perMWh across Brazil, Germany, and Australia, with costs projected to fall to roughly \$49-\$75 perMWh across these markets by 2030.

Microporous secures funding to start work on Virginia plant

Microporous is to start building a new lithium-ion battery separator production plant in Virginia in May, after securing financing for the project.

The Trent Capital Partners-owned firm said the undisclosed financing, confirmed on April 30, is being provided by Trent, and investment firms Eagle Point and Elda River.

With comprehensive financing now in place, construction on the Danville plant is set to begin imminently, Microporous said.

The announcement came nearly 18 months after Microporous pledged to invest \$1.35 billion in the new facility over two phases — each facility phase being around 500,000ft².

Danville is expected to support around 65GWh of battery production annually once operating at full capacity.

Microporous said the investment marks a critical step in expanding its ability to serve the rapidly growing demand for energy storage across

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CEO John Reeves said: “This is a pivotal milestone for Microporous as we move from planning into execution... we are accelerating our expansion and strengthening our ability to deliver high-performance separator solutions for the lithium ion battery market.”

Trent managing partner Ray Desrocher said Danville will represent a significant augmentation of Microporous’s existing Piney Flats li-ion separator production capacity in Tennessee.

TotalEnergies-Masdar in \$2.2bn BESS, renewables joint venture

TotalEnergies is to set up a \$2.2 billion joint venture with the Abu Dhabi Future Energy Company — Masdar — to develop, build own and operate battery storage and renewables projects across nine countries across Asia.

The companies said on April 2 they had signed a binding agreement for the 50-50 JV that will merge their onshore renewable activities.

Once the deal is closed, the new entity will act as both companies’ sole vehicle for driving forward BESS, onshore solar and wind projects in Azerbaijan, Indonesia, Japan, Kazakhstan, Malaysia, the Philippines, Singapore, South Korea and Uzbekistan.

The JV’s headquarters will be in the Abu Dhabi Global Market financial center and free economic zone and staffed by around 200 employees from both TotalEnergies and Masdar.

The JV will have a portfolio capacity of 3GW of operational assets and 6GW of assets in advanced development that are expected to be operational by 2030. Each partner will contribute assets of comparable value.

EU bank in \$45m loan for Ukraine solar-BESS project

Plans for a solar-BESS plant in Ukraine to generate around 140GWh of renewable electricity annually have been backed with a loan from the European Bank for Reconstruction and Development (EBRD).

The bank said on April 24 it is lending \$45 million to Energy RTB 2, a wholly owned subsidiary of Ukrain-

ian agribusiness group Kernel, to finance construction of the 106MW solar power plant with co-located battery storage.

The total project cost is estimated at around \$86 million. The EBRD’s funding will be backed by partial financial guarantees from the European Union.

Battery chemistry and plant location details were not disclosed, but the bank said the facility will be in an energy deficient region of southern Ukraine. A power transmission line will connect the plant to the national grid.

The project is part of Kernel’s plans to establish a portfolio of renewable energy projects with a total capacity of up to 600MW, with expected investments of about \$400 million.

Grenergy secures backing for 1.4GWh Chile BESS-solar projects

Spanish multinational Grenergy has secured an undisclosed package of finance to build 1.4GWh of BESS systems in Chile.

Energy expert and assurance firm DNV said on March 23 it had acted as market consultant for Grenergy’s Central Oasis portfolio, which includes 398MW of solar photovoltaic capacity for the systems in the southern Maule and the BíoBío regions.

DNV said financing was arranged with major institutions including BNP Paribas as coordinating bank, along with Santander and Rabobank, which Grenergy said marks a significant step in boosting Chile’s energy transition.

The announcement came after Grenergy said on March 13 it had registered a new green bond programme on the Alternative Fixed-Income Market for up to €250 million (\$290 million), the largest transaction of its kind in the company’s history and 2.5x the size of its 2022 programme.

Grenergy said funds raised will consolidate growth, international expansion and support plans to allocate €3.5 billion to investments up to 2027.

Brice Le Gallo, VP and regional director for southern Europe, MEA & LATAM, energy systems at DNV, said hybrid renewable projects combining solar and large-scale storage are essential to completing Chile’s coal phase-out and ensuring a reliable, low-cost power system.

Gopher marks 80 years milestone with pledge to boost R&D

Gopher Resources has announced plans to expand R&D activities as the US lead recycler marks its 80th anniversary of operations.

Gopher said on February 17 the expansion was being prompted by rising demand, ongoing supply chain uncertainty – and buoyed by the recent US decision to designate lead as a mineral critical to the country’s economy and national security.

The company said it will boost efforts to improve recovery efficiency, reduce waste, and increase the performance of existing recycling processes.

By refining how materials are recovered, Gopher said it can capture additional value from end-of-life batteries and reinforce secure, domestic supply chains.

In addition to lead, Gopher continues to expand the recovery of other valuable metals present in lead batteries, including tin and antimony.

The company also recovers the polypropylene plastic used in lead battery casings. This material is cleaned, processed, and returned to battery manufacturers for use in new battery cases, supporting a closed-loop system in which nearly every major component of a spent battery is recycled and used again.

“For 80 years, Gopher Resource has focused on doing one thing well: safely recovering materials that are essential to American manufacturing,” said Daniel Leach, senior VP and chief business development officer.

“As demand for secure, domestic battery materials continues to grow, our role in supporting the nation’s economic and supply chain stability has never been more important.”

In 2023, Gopher was awarded Battery Council International’s Innovation Award for its advances in dealing with slag.

Last June, Gopher said it already recycles more than 23 million lead batteries, over 40 million pounds of plastic and saves nearly 70 million gallons of water. ■

In 2023, Gopher was awarded Battery Council International’s Innovation Award for its advances in dealing with slag.



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New report counts global cost of China's battery dominance

New analysis has laid bare the economic might of China's grip on the world's battery sector — with EV plants facing \$17 billion in losses for every month of a potential halt in cell exports.

EV plants in the EU would account for over half of those losses for each month of an interruption in supply chain exports from China, according to estimates published by the International Energy Agency on March 26.

Nearly all BESS systems and over 70% of EV batteries used outside China could not be produced without Chinese-made batteries or components, the IEA's 'Energy Technology Perspectives 2026' report said.

Ownership of battery manufacturing capacity outside China is only around 5% at present but is expected to rise to one quarter by 2030. However, China already wields substantial influence, with export controls on key battery components introduced since late 2023 targeting the most vulnerable links in the battery supply chain.

If the most recent export restrictions announced by China in October 2025 — and later paused for one year following a trade deal with the US — were to be enforced, battery production outside of China could face serious disruption.

Dependencies in the supply chain extend to IT systems, increased digitalization brings exposure to new, evolving cybersecurity risks that can affect energy technologies' control systems, and with them entire distribution grids.

In response to growing unease over China's surplus industrial capacity and surging export volumes, the US, EU and Canada have launched counter initiatives, including import duties targeting China.

In the US, the IEA estimates that average delivered costs increased by around 100% for solar PV modules during 2023-2025 and by around 8% for battery cells during in 2024-2025.

Production costs in China can be less than half those in advanced economies, such as the EU, the report said. On batteries,

China's edge is bolstered by manufacturing efficiency, thanks to integrated supply chains, advanced manufacturing processes and production scale — supported by access to cheap components.

Today, between 60% and 100% of each step of the battery manufacturing supply chain sits in China, the IEA said.

This outsized role is the result of years of sustained investment, public support, technology innovation, integration along the supply chain and the development of world-class expertise.

Nearly all BESS systems and over 70% of EV batteries used outside China could not be produced without Chinese-made batteries or components

"Japan and Korea have also built strong battery industries with global reach, though they are less integrated than China's when it comes to battery component manufacturing and mineral processing. By contrast, producers operating in Europe and North America face higher costs and often struggle to match the prices or quality of Chinese products."

Chinese, Korean and Japanese companies dominate global lithium ion battery cell production, accounting for 99% of output, the IEA said.

In 2024, roughly 80% of all batteries were produced in China, while the EU and US together contributed around 15%, ironically, mostly from factories built by Korean and Japanese firms. Chinese producers are also extending their reach abroad through local

manufacturing investments or technology licensing agreements.

Lack of investment in the midstream battery supply chain poses a growing risk to global supply security. Nevertheless, the size of the overall lithium-ion battery market — about \$130 billion in 2024 — does create opportunities for newcomers to scale up by first targeting niche segments, such as premium applications where performance outweighs cost. "Still, competition will be fierce," the report warned.

In terms of recycling, the IEA said lithium recycling from batteries has jumped from 4% in 2015 to around 20% today. "Even so, recycling rates for battery minerals remain well below those for metals produced at higher volumes: between 40% and 80% globally for key metals like steel, aluminium and copper."

By 2035, recycled lithium and nickel are still only expected to meet around 5% of demand, "as usage far outpaces available end-of-life feedstock". Innovation and shifting technology choices can also limit recycling potential for certain critical minerals, the report said.

The report comes just a few weeks after the European Court of Auditors released damning criticism of EU efforts to diversify supplies of metals and minerals critical to battery manufacturing.

The court said most EU recycling targets "neither incentivize the recycling of individual materials nor encourage the uptake of recycled materials". There are also blind spots in the trade data used for EU critical and strategic materials lists.

European Commission president Ursula von der Leyen admitted last October that Europe's economy was being squeezed by China and the US amid their tit-for-tat battle over battery material supplies and trade tariffs. ■

China already wields substantial influence, with export controls on key battery components introduced since late 2023 targeting the most vulnerable links in the battery supply chain

Battery storage was the ‘fastest growing power technology in 2025’

Battery storage was the fastest-growing power sector technology in 2025, according to latest analysis from the International Energy Agency (IEA).

The roughly 110GW of new BESS capacity added during the year exceeded the largest-ever annual capacity additions for natural gas, IEA said in its latest Global Energy Review, released on April 20.

Meanwhile, global energy demand grew at a slower pace in 2025 than the year before, while electricity consumption continued to rise much faster than overall demand — with solar PV becoming the largest contributor to growth in global energy supply for the first time.

In the electricity sector, the additional 600 terawatt-hours of solar PV generation worldwide in 2025 marked the largest structural increase ever recorded in a single year for any electricity generation technology, contributing to a decline in coal-fired electricity generation globally.

Installed BESS capacity is now 11x higher than in 2021, according to the IEA, with LFP batteries accounting for around 90% of deployments.

While less energydense than rival chemistries commonly used in EVs, LFP batteries are typically cheaper and better suited to more frequent cycling. Just five years ago, the market share of LFP batteries in deployments was well below 50%.

IEA's analysis indicates that around 80% of new battery capacity in 2025 was utility-scale. The remainder was behind-the-meter capacity installed by commercial and residential consumers.

Battery storage durations are gradually lengthening. While most projects still cluster around two hours, an increasing number can be deployed for four hours or more, reflecting the growing value of flexibility in systems with rising shares of PV.

China continued to lead battery deployment in 2025, accounting for around 60% of global additions, followed by the US and Europe. However, the IEA said deployment is widening beyond the largest markets,

with strong momentum in Australia and parts of the Middle East, where storage is increasingly seen as a key building block for electricity security and renewables integration.

Battery-based UPS systems, primarily in data centers, also saw significant growth, with capacity additions rising 30% to 45GW in 2025. However, unlike BESS systems, UPS generally only provide shortduration backup to bridge outages until other backup sources start.

In terms of EV battery tech, the IEA said electric car sales increased by more than 20% year-on-year in 2025, rising to 21 million units, with one in four cars sold being electric.

Almost all the growth in China's electric car sales came from pure

battery electric vehicles, with plug-in hybrids seeing a smaller increase (4%).

In the EU, electric car sales increased by 30% in 2025, with Europe as a whole overtaking China as the fastest growing major market for electric cars.

In the US, electric car sales declined by 2%, largely the result of the elimination both of federal tax credits and of fines for not meeting fuel economy standards.

Separate analysis from the US Energy Storage Monitor report, released by the American Clean Power Association and Wood Mackenzie earlier this year, showed that US installations of energy storage systems set a new market record in 2024 of more than 12GW. ■

Grid connection queues have become a ‘chokepoint for BESS’

Lengthy grid connection queues are increasingly becoming a detrimental factor — and a “chokepoint” for BESS deployment in some countries — according to latest analysis from the International Energy Agency (IEA).

Globally, at least 1,700 GW of renewable energy projects in advanced stages and more than 600 GW of battery storage projects were in connection queues as of 2025, says the IEA's Electricity 2026, analysis and forecast to 2030*, released on February 6.

In countries such as Germany, these queues have already become a chokepoint for battery-storage deployment, with the federal regulator (BNetzA) noting that, in 2024 alone, network operators received 9,710 connection requests for battery storage at or above medium-voltage level, corresponding to around 400 GW (661 GWh) of capacity.

A lack of grid capacity is emerging as a critical bottleneck in many regions, driving higher levels of congestion and slowing the deployment of new electricity generation, storage and demand, the IEA said.

Over 2,500 GW of renewable,

large-load and storage projects are currently stalled in grid queues worldwide. With grid investment lagging far behind that for generation projects, many power systems already face rising congestion-related curtailment.

According to the IEA, meeting electricity demand through 2030 will require annual grid investment to increase by around 50% by 2030 from today's \$400 billion, “alongside a scale-up in alongside a scale-up in grid supply chains and more effective management of work force challenges”.

The report follows analysis released by the IEA last December revealing the electricity sector is now the largest energy employer globally, with employment in energy storage, power generation, transmission and distribution up by 4 million over the past five years.

While battery storage currently represents a small share of grid employment, at around 2%, it has experienced rapid growth, with jobs increasing by 17% year-on-year in 2024, led by a surge in global battery storage investment and falling costs of utility-scale batteries, by material supplies and trade tariffs. ■

A comprehensive JRC report examined EU member states' progress in implementing the European Commission's recommendations on energy storage, highlighting differences in national deployment practices and grid flexibility planning frameworks.

EU energy storage planning lacks 'concrete action'

Plans for the rollout of much needed energy storage capacity across Europe are uneven, fragmented and hindering investment, according to a stark new report published by the EU.

Despite clear recognition of energy storage's importance, there is still limited evidence that most of the bloc's 27 member states have translated this into concrete action, according to analysis released on March 30 by the Joint Research Centre (JRC).

The JRC, the European Commission's science and knowledge service, said in many cases, storage is acknowledged conceptually but not evaluated as a genuine substitute for conventional grid expansion.

Released just days after the Commission proposed a fresh package of support to encourage private investments in long duration energy storage projects and "novel" renewables, the report said 10 member states show limited or fragmented treatment of storage in their national energy and climate plans (NECPs).

While some EU nations show structured and measurable integration across NECPs and network plans, there is misalignment between operational deployment, target-setting, and planning methodologies among others, the report said.

Meanwhile, transmission network development plans (TNDPs) across all member states show uneven progress in integrating flexibility and energy storage.

Around 55% of member states include quantified flexibility or storage targets at transmission level, while around 37% refer to flexibility without quantification, and the remainder provide limited treatment.

"Many NECPs lack measurable storage targets or timelines, and network development plans often fail to account for storage as a viable alternative to traditional grid reinforcements," according to the report.

"This disconnect between strategic ambition and practical implementation

creates uncertainty for investors, slows market development, and risks undermining system reliability as renewable shares grow. Closing this gap is critical to ensuring that energy storage can fulfil its enabling role in the clean energy transition."

Despite its strategic value, the rollout of energy storage across the EU has been uneven and remains fragmented and constrained. Many member states face persistent barriers, including inadequate market signals, regulatory uncertainty, limited access to financing, and insufficient recognition of storage's multiple value streams.

These challenges hinder investment and slow down the pace of deployment needed to meet the EU's climate and energy objectives.

Some countries still demonstrate small capacities of energy storage. Croatia, Cyprus, Denmark, Estonia, Hungary, Latvia, the Netherlands, Romania, and Slovenia each operate less than 0.5GW of storage with some — such as Cyprus and Latvia — effectively having no significant storage assets.

Combined, these nine countries contribute only 1.4GW, representing around 2.5% of total EU-27 operational storage. "Overall, the distribution of operational storage capacity across the EU reveals a pronounced asymmetry, with a small number of member states

accounting for a disproportionate share of total installed capacity."

Only a small group of member states have embedded storage systematically as an alternative at both transmission and distribution level. Notably, Italy, France, Luxembourg and Sweden are classified as 'comprehensive' in both their TNDPs and distribution network development plans.

In these countries, storage and flexibility are integrated into formal planning methodologies, economic screening processes, and structured comparisons with conventional grid reinforcement, indicating a high degree of regulatory alignment and methodological maturity.

By contrast, most other member states fall into 'mixed' or 'moderate' categories, "demonstrating that flexibility is still not treated as a default planning option across Europe".

The report recommends that network operators be required to systematically quantify flexibility needs and explicitly define the role of energy storage in meeting those needs. This assessment should become a mandatory and standardized component of all network development plans. Meanwhile, regulatory incentives must be better aligned to ensure procuring flexibility is financially neutral or preferable to traditional grid investment. ■

The major players, the also-rans

A small group of EU countries accounts for the vast majority of the EU's operational energy storage capacity. Austria, France, Germany, Italy, and Spain, each operating more than 3GW of storage, largely driven by extensive pumped-hydro storage installations.

Together, these five countries hold around 36.5GW, representing about 68% of total operational storage across the 27 member states.

A broader group of member states

— including Belgium, Bulgaria, the Czech Republic, Finland, Greece, Ireland, Lithuania, Luxembourg, Poland, Portugal, Slovakia and Sweden — demonstrate "meaningful levels of storage deployment", with operational capacities ranging from 0.67GW in Sweden to just under 3GW in Portugal.

In total, they account for about 16.2GW, equivalent to approximately 30% of total EU-27 storage capacity, the report said. ■



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US 'needs to innovate away from China' for BESS growth

US manufacturers of BESS systems would struggle to compete with low-cost Chinese imports without crucial manufacturing and clean electricity tax credits, according to research by ING, the international merchant bank, on April 29.

Even under the current tariff regime, US four-hour turnkey battery systems using batteries that benefit from federal 45X tax credits are still 31% more expensive than systems using imported Chinese batteries, said report author Coco Zhang, of ING's environmental, social and governance research unit.

Structural cost reductions will be critical as tax credits are phased out and this will be best achieved through technological innovation, the report said.

Meanwhile, only when the 45X tax credits are combined with new clean electricity tax credits — regulations

48E/48Y, which replaced (i) the production tax credit to focus on technology-neutral facilities and (ii) the investment tax credit for certain technologies — can US projects using US-made batteries in four-hour energy storage developments enjoy a cost advantage.

US battery storage growth in 2026 looks strong, but supply chain risks could limit expansion, the report warns.

Rising demand for non-Chinese components would push prices higher and greater investment in technology and cost reduction is needed for the eventual subsidy phase-out.

However, the report says it will be difficult to quickly dismantle China's dominance, which accounts for nearly 90% of global lithium ion battery manufacturing capacity.

"It will take time for the US to ramp up domestic manufacturing,

and in turn, it will still need to rely on imports in the near term."

China accounted for the lion's share of US Li-ion battery imports for EVs and non-EVs in 2025, at around 60%. It is worth watching whether tariffs on Chinese Li-ion batteries — currently standing at 25% under US trade regulations to prevent unfair practices — will be raised further, the report said.

But before manufacturing capacity increases meaningfully across all supply chain components, the US BESS industry will remain exposed to tariffs and foreign entity of concern (FEOC) restrictions that target China.

US battery cell capacity remains limited, while China controls more than 80% of global production.

"On top of that, BloombergNEF estimates that roughly half of the current US operating BESS cell capacity may have high FEOC exposure risk due to corporate structure and IP partnership. That could further constrain near-term compliant supply."

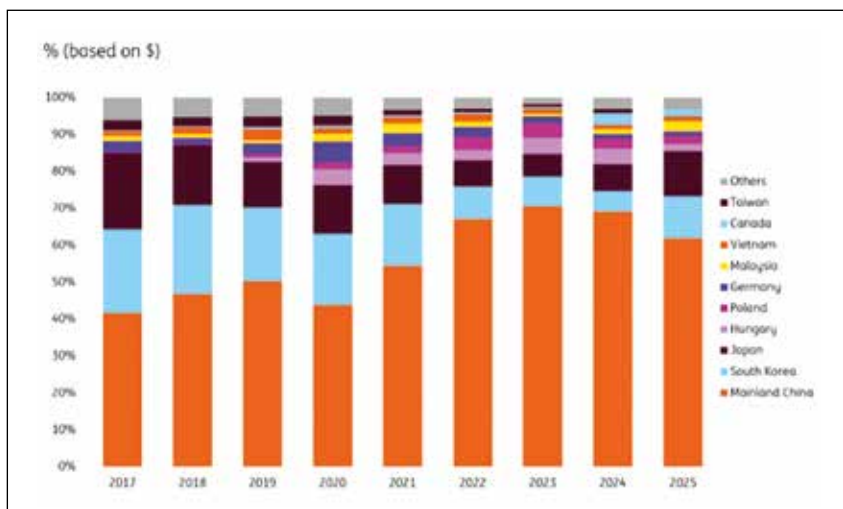
In the near term, rising demand for FEOC-compliant components is likely to push prices higher. Longer term, progress will hinge on the pace of vertically integrated battery manufacturing growth in the US and among non-Chinese partners.

Car manufacturers repurposing EV batteries could also help to boost domestic BESS capacity.

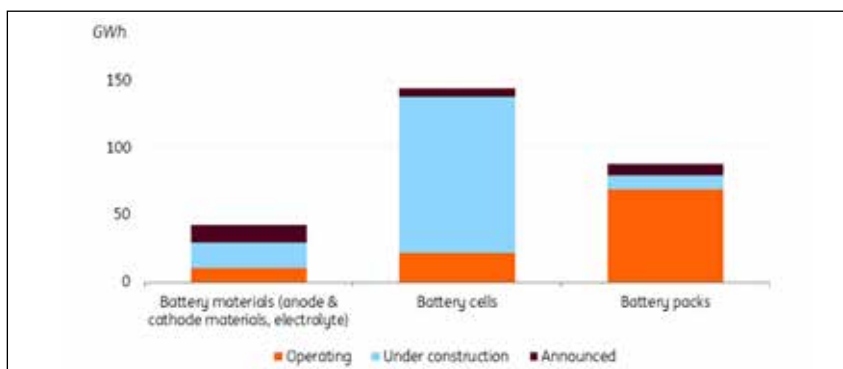
ING's report said as EV tax credits are phased out under the One Big Beautiful Bill Act and demand for battery storage from data centres accelerates, manufacturers are shifting their focus from EV batteries to battery energy storage systems.

Ford, for example, has ended its EV battery joint venture with SK On and is repurposing its Kentucky plant to produce stationary LFP batteries, positioning the site as a BESS hub and exploring licensed CATL technology.

GM is redirecting excess and used EV batteries to partners such as Redwood Materials and SunPower, supplying BESS for customers, including AI data centres. Stellantis's joint venture with Samsung SDI has made a similar shift in production priorities. ■



US import of lithium-ion batteries by origin Source: BNEF, ING Research



US BESS manufacturing capacity across the supply chain

Source: ING Research, SEIA

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Study sets course for ‘new phase’ of US battery industry

Total US battery production increased by nearly 140% over the past five years — but the country needs to shake-off its reliance on imported components and materials, says a new study by the Center for Strategic & International Studies.

China is the main source of non-lead-acid energy storage battery imports, supplying nearly 70% of finished products and around 30% of parts in 2024, according to the CSIS study — ‘*A New Phase for the US Battery Industry*’ — released on April 27.

By absolute value, Chinese imports to the US have increased more than tenfold from pre-pandemic levels, the study said.

However, China’s competitive position is not wholly immovable. Factors such as a market correction in domestic overcapacity and the introduction of alternative supply could erode China’s market pre-eminence.

For example, if all US global projects announced by 2025 come fully online by 2030 China’s share of total cell manufacturing capacity could be reduced by more than 15%.

In a further encouraging move for the US, BESS deployment has increased 25-fold between 2019 and 2025, making the US second only to China in total installed storage capacity.

But limited domestic reserves and processing capacity for key minerals make full self-sufficiency unlikely in the near term, the report said.

“These gaps have reinforced reliance on global supply chains, especially as China remains dominant in most segments.”

Meanwhile, US lithium ion battery imports have grown almost sevenfold between 2018 and 2023. By 2024, Li-ion batteries accounted for nearly 85% of all energy storage battery imports, compared to 17% in 2009.

Since the 2010s, most domestic capacity additions have concentrated in final-stage pack and module assembly, while investment in cell manufacturing only accelerated in the early 2020s.

Capacity for critical battery components — including cathode and anode active materials, foils, and separators — has lagged even further, though electrolytes remain a notable exception.

Meanwhile, the global battery industry is entering a pivotal period, according to the report.

Having already reached a historical high of 1TWh in 2024, total demand for rechargeable chemical batteries could more than quadruple from 2023 levels by 2030. Much of this growth is driven by the shift away from legacy lead-acid chemistries toward Li-ion and other more energy-dense and durable technologies, whose share of total US battery production rose from around 10% in 2013 to nearly 90% by 2022.

Meeting projected demand at this scale requires a complex value chain that could generate over \$400 billion in revenues by 2030.

Battery projects have helped drive a record wave of industrial spending that has seeded new manufacturing clusters across the south and Midwest, the report said.

With more than 180 primary component facilities commissioned since 2019, battery manufacturing sites now span 38 states. As this footprint expanded, battery-sector employment also reached its highest level since 1972 in 2024 — even as overall US manufacturing employment declined — and was projected to create as many as 125,000 domestic jobs by 2032.

Although mobility is expected to remain the primary demand driver, grid-scale storage is emerging as a dynamic growth segment.

The report said lead acid chemistries account for most military batteries in demand today, and specialty designs will continue to be necessary for many bespoke applications.

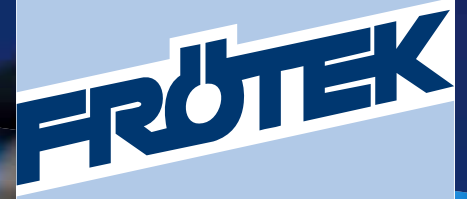
However, Li-ion batteries — mostly nickel manganese cobalt and increasingly LFP — are projected to meet the bulk of defence battery demand by 2050.

Despite concerns of an overreliance on other countries, the report said international partnerships have played an essential role in enabling the recent wave of battery manufacturing in the US, warning that “sweeping, abrupt decoupling that ignores market realities can backfire by undercutting deployment economics and learning curves”. ■

	MINING	REFINING	ACTIVE MATERIALS AND COMPONENTS	CELL	PACK	RECYCLING
DESCRIPTION	Extraction of battery minerals (e.g., lithium, nickel, cobalt, manganese, and natural graphite)	Chemical conversion of ores/brines/concentrates into battery-grade materials (e.g., lithium carbonate/hydroxide, nickel and cobalt sulphates, and synthetic/processed graphite)	Production of electrode active from refined chemicals*, electrolyte, current collector foil, separator	Manufacturing of lithium-ion cells (i.e., coating electrodes, cell assembly, formation, and testing)	Assembly of cells into modules/packs and integration with vehicles or storage	Collection, dismantling, and processing of end-of-life batteries and production scrap to recover and resell feedstock; includes second-life applications
Projected 2030 revenue (US\$ billions)	34	52	110	121	74	13

Table 1: The battery value chain

Note: *The electrode active materials from refined chemicals include cathodes and graphite/silicon anodes. Source: McKinsey & Company.



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Why resilience is replacing efficiency across the global battery industry writes Mike Halls

Supply chain chaos:



From just-in-time to just-in-case

Just over a decade ago, I was shown my first vehicle teardown. Every single part of a BMW i8 was forensically stripped down to show where each bolt, nut or cable came from, how much they cost, and the price of the machinery used to assemble the car.

Sandy Munro, who showed me around his huge workshop, explained the way that these bolts were manufactured in Turkey but the washers attached to them came from Poland, and the clips and fasteners had come from Vietnam.

Sandy had an enormous reputation for accuracy in determining the so called “should-cost” analysis of any vehicle and could identify almost instantly each part, its geographic origin and price.

The result was hugely useful. Competitive auto manufacturers could work out the margin on the vehicle and the profits BMW might be making.

Without going into the mechanics of tier-1, tier-2 and tier-3 suppliers Sandy reckoned that the key to understanding

the supply chain was free markets and globalisation.

Free markets enabled clarity and diversity of price, ease of supply and a more-or less transparency about procurement.

For decades, the battery industry has operated on the assumption that globalisation would continue indefinitely.

Materials would move freely across borders, shipping would remain relatively cheap, geopolitical tensions would remain manageable and manufacturers could source components from whichever region offered the lowest cost.

The entire industrial model was built around efficiency.

Battery manufacturers embraced lean inventories, just-in-time delivery systems and increasingly international supply chains. Lithium supplied from Chile’s Atacama desert could be refined in China, processed into cathode materials in Korea, assembled into cells elsewhere in Asia and finally

integrated into vehicles or industrial systems in Europe or North America.

At one point environmentalists were talking about introducing an air-miles passport — read tax — for shipping lithium products around the planet. To many of us at the time we thought it would prove a counterbalance to the endless propaganda nonsense that EVs provided carbon-free driving.

Lead battery manufacturers developed similarly international supply systems for additives, chemicals, separators, machinery and specialist materials, even if their raw material base was often more regional and heavily dependent on recycling.

That was then, this is now. Globalisation has changed completely. Free trade exists but not in the shape we knew it a decade ago.

It all began with the Covid epidemic. According to industry estimates, the semiconductor and supply chain crisis that followed Covid-19 cost the global automotive industry more than \$500 billion in lost revenues as factories shut down and production schedules collapsed.

Battery manufacturers were deeply affected because they sat directly in the middle of those disrupted industrial networks.

What began as a public health crisis quickly evolved into a much broader industrial and geopolitical

“COVID didn’t break the supply chain so much as reveal how brittle it was. I don’t think anybody realised what the potential implications could be. The just-in-time model now often meant “just too late”

— Mike Dunn, Chloride Technical and Trading

transformation that continues to reshape the battery industry today.

The central issue is no longer simply cost.

Increasingly, the defining question for manufacturers is security of supply. Can materials be sourced reliably? Can critical components continue to move across borders during political crises? Can production continue if one country imposes export controls or another shuts down strategically important shipping routes?

The battery industry, perhaps more than any other manufacturing sector, now finds itself confronting the reality that globalisation may no longer operate according to the assumptions that defined the previous 40 years.

There had been warning signs before Covid-19. Trade tensions between the US and China had already begun unsettling global manufacturing.

Tariffs introduced during the late 2010s forced companies to reconsider their dependence on Chinese production, while growing concerns over strategic technologies such as semiconductors and telecommunications hinted at a broader geopolitical shift.

The primary global rare earth shortage crisis occurred in September 2010. It was triggered when China restricted exports to Japan during a diplomatic spat. China controlled roughly 95%–97% of global rare earth output at the time.

Rare earths are crucial for things like EV motors, wind turbines, missiles, smartphones, magnets, and semiconductors. The restrictions caused the prices of key rare earth elements to skyrocket and highlighted global dependence on Chinese suppliers.

Our cover story at the time anticipated the consequences. After the panic buying and price spikes we saw an immediate expansion of Australia's rare earth industry, the US restarted mining at Mountain Pass, Japan diversified supply away from China and the most important legacy of all — if blindly obvious at the same time — governments began treating critical minerals as geopolitical weapons.

Yet few industrial sectors anticipated with any sense of urgency how

vulnerable modern supply chains had become until the pandemic arrived in 2020.

When factories in Asia shut down during the early stages of Covid, manufacturers initially assumed the disruption would last only a few weeks.

Instead, the global logistics system entered a period of extraordinary instability. Ports became congested, containers accumulated in the wrong regions, freight costs soared and labour shortages disrupted transport networks across multiple continents.

Geographical diversity, the key



Some suppliers adapted early to the changing geography of battery production.

Not every company responded to supply chain disruption by abandoning global manufacturing models altogether. In some cases, suppliers reduced risk by moving closer to the fastest-growing centres of battery production rather than attempting to localise entirely within Europe or North America.

Battery separator manufacturers provide a good example of this strategy.

Companies such as ENTEK, Daramic and Celgard have spent years expanding manufacturing operations in Asia, recognising early on that much of the world's battery production capacity — both lithium-ion and lead-acid — would remain concentrated there.

By establishing production footprints closer to major battery manufacturing hubs, these firms have been able, to some degree, to insulate themselves from some of the worst effects of transcontinental logistics disruption.

That does not mean they have escaped supply chain pressures entirely. Rising freight costs, geopolitical uncertainty and raw material volatility still affect separator manu-

facturers like everyone else in the sector.

However, proximity to major customers and regional manufacturing ecosystems has provided a measure of resilience at a time when long-distance global supply chains have become increasingly unpredictable.

Their experience also highlights an important nuance in the broader debate around regionalisation. The future may not consist of companies simply abandoning Asia and returning production entirely to Western markets. Instead, many suppliers are likely to pursue multi-regional manufacturing strategies, establishing production bases across Asia, Europe and North America simultaneously to serve customers more locally while reducing exposure to single-region disruption.

For suppliers throughout the battery industry, from separator manufacturers to producers of lead oxide and expanders, the lesson increasingly appears to be the same: resilience may depend less on withdrawing from global markets altogether and more on building geographically diversified production networks capable of operating even when international trade becomes unstable. ■

“The era of just-in-time inventory may be drawing to a close for many companies. We don't love to function in a just-in-time inventory situation as it creates risks. That said it keeps your working capital low and you're not sitting on months of inventory” — Bobby Lucas, Hammond Group

“There is a growing recognition that supply chain instability is not a temporary phenomenon but a new paradigm for doing business” – Scott Fink, Sorfin

Companies that had spent decades reducing inventory suddenly discovered that they had little protection against prolonged disruption.

The semiconductor crisis soon revealed the depth of the problem. Relatively inexpensive electronic components became unavailable, halting production lines worth billions of dollars. Modern industrial systems depended so heavily on interconnected supply networks that shortages in one area rapidly spread throughout the manufacturing economy.

Battery manufacturers were especially vulnerable because battery production depends on an unusually broad range of materials and technologies. The industry requires mining, chemical

processing, precision engineering, advanced automation and highly specialised industrial equipment. A disruption in any one of those areas can affect production elsewhere.

The battery sector also found itself competing with other industries for scarce components.

Automotive companies, consumer electronics firms and industrial equipment manufacturers were all trying simultaneously to secure semiconductors, shipping capacity and raw materials. In many cases, battery producers simply could not obtain what they needed quickly enough.

The result was a profound shift in industrial thinking. For years, companies had prioritised efficiency above almost everything else. After

Covid, resilience suddenly became equally important.

The argument for Just-in-Time stock management and keeping inventory off the shelves and the balance sheet changed to Just-in-Case, a more traditional method that stockpiles a “buffer” inventory to ensure operations can continue during unexpected events, supply chain delays, or demand spikes.

COVID didn’t break the supply chain so much as reveal how brittle it had become, according to Mike Dunn, owner of Chloride Technical and a veteran of more than 50 years in the battery industry.

“I don’t think anybody realised what the potential implications could be. The just-in-time model now often meant just too late.”

Bobby Lucas, CEO of Hammond Group, the international lead oxide and battery expander supplier, believes the era of just-in-time inventory may be drawing to a close for many companies.

“We don’t love to function in a just-in-time inventory situation as it creates risks. That said it keeps your working capital low and you’re not sitting on months of inventory,” he says.

“But to some degree that has become unrealistic. You do need to be out in front of it more so that when disruptions pop up — whether war, supply shortages, shipping issues or whatever — you’re not caught unawares.”

Government interventions

One of the clearest consequences of supply chain disruption has been the return of industrial policy.

Governments that once promoted global free trade are now actively intervening in battery supply chains.

The US has introduced major subsidy programmes designed to encourage domestic battery manufacturing and mineral processing. Largely this has gone down well with US based suppliers and manufacturers.

Jimmy Stewart, vice president of sales and marketing for MAC Engineering recalls the disruptions that shortages could create. “At one point, the lack of a \$100 item could delay the shipment of a machine worth hundreds of thousands,” he said.

He welcomes, as do most of the battery industry in the US, an economy that is not at the whim of external disruptions and is aiming for self-sufficiency.

Europe too is attempting to build

A persistent structural problem



Perhaps the most important development is the growing recognition that supply chain instability is not a temporary phenomenon. Industry veterans such as Sorfin’s Scott Fink, for example, calls it a “new paradigm for doing business”.

Initially, many companies believed conditions would normalise once the pandemic ended. Instead, disruption continued through semiconductor shortages, geopolitical tensions, trade disputes, wars, shipping instability and export controls.

The battery industry now sits at the centre of several powerful long-term trends: electrification, strategic competition between major powers, energy transition policy and industrial decarbonisation.

That combination ensures supply

chains will remain politically sensitive and economically significant for years to come.

The companies most likely to succeed in this environment may not necessarily be those with the cheapest products or the largest factories. Increasingly, success may depend on the ability to build resilient supply networks capable of operating within a more fragmented and uncertain world economy.

For the battery industry, the age of assuming that materials will always flow freely across borders appears to be ending. What replaces it is still taking shape, but one thing is already clear: resilience is becoming just as important as efficiency in determining the future of global manufacturing. ■

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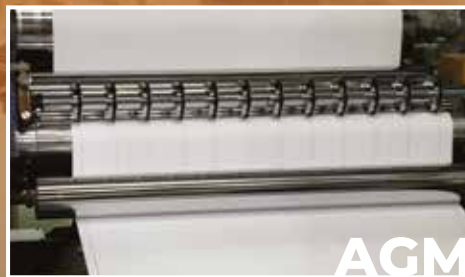
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regional gigafactory capacity while also expanding recycling infrastructure and local refining capability. India is pursuing similar strategies as it seeks to reduce dependence on imported technologies.

The objective is not complete self-sufficiency, which would be unrealistic, but rather the creation of more secure regional ecosystems.

This process is often described as regionalisation, nearshoring or friendshoring. In practical terms, it means manufacturers increasingly prefer suppliers located within politically aligned regions, even if costs are somewhat higher.

For decades, industrial logic dictated that production should move wherever labour and operating costs were lowest. Now the calculation has changed.

Companies are beginning to ask whether low-cost supply chains remain viable if they are vulnerable to geopolitical disruption. The answer increasingly appears to be no.

This does not necessarily mean globalisation is ending altogether. International trade will remain essential to the battery industry because no single region possesses all the resources and capabilities required for complete independence.

However, the world is moving toward a more fragmented system built around regional blocs rather than one fully integrated global market.

That transition is already increasing costs.

Manufacturers are carrying larger inventories, qualifying secondary suppliers and investing in duplicate production capability across multiple regions. All of this reduces efficiency but improves resilience. Companies appear increasingly willing to accept those additional costs because the financial damage caused by supply disruption has proved even greater.

Has free trade ended?

One of the most important questions facing the industry is whether the era of unrestricted global free trade is genuinely ending.

The answer is complicated.

Globalisation is unlikely to disappear completely because the battery industry remains too internationally interconnected.

Raw materials, chemicals and technologies will continue moving across borders because no country or region possesses everything required for total independence. However,

“At one point, the lack of a \$100 item could delay the shipment of a machine worth hundreds of thousands of dollars” — Jimmy Stewart, MAC Engineering

the nature of globalisation is clearly changing.

The previous model prioritised maximum efficiency and lowest-cost sourcing. Production became increasingly concentrated in regions offering cost advantages, while companies reduced inventory and depended heavily on uninterrupted trade flows.

The new model appears likely to prioritise resilience, redundancy and strategic autonomy.

Governments are becoming more interventionist, companies are regionalising production and manufacturers are diversifying supply networks to reduce geopolitical risk.

This transition will almost certainly increase costs across the industry. Regional duplication of supply chains is inherently less efficient than globally concentrated production. Maintaining

multiple suppliers and larger inventories requires more capital. Energy costs and environmental regulation may also make regional production more expensive in some markets.

Yet many executives now appear willing to accept those costs because the alternative has proved more damaging. The financial impact of supply chain disruption has been so severe that resilience increasingly looks less like inefficiency and more like insurance.

So what of the future? Fink predicts more of the same volatility through to 2030, only accelerated. “We will see more supply chain disruptions for different reasons,” he said. The situation in the Gulf with the US-Iran war has clearly exposed two things — the law of expected and unexpected circumstances. ■

Geographic vulnerabilities move centre-stage

The battery industry occupies a particularly vulnerable position because it sits at the intersection of several strategic industries. Batteries are no longer viewed simply as industrial products. They are central to electric vehicles, renewable energy systems, energy security policy and increasingly national industrial strategy.

This has created an enormous scramble for control over supply chains.

Lithium-ion batteries have attracted most attention because their supply chains are heavily concentrated geographically. China dominates significant parts of the industry, particularly in refining and processing.

Although lithium may be mined in Australia or South America and cobalt extracted in Africa, much of the world's processing infrastructure remains concentrated within China.

That concentration creates strategic dependence. Western governments have become increasingly concerned that too much of the battery supply chain relies on one

country, especially as geopolitical tensions continue to rise.

The concern is not theoretical. Export controls, tariffs and restrictions on critical materials are becoming more common. Governments increasingly view battery technology through the lens of national security and industrial competitiveness rather than pure economics.

This represents a major shift from the era of unrestricted global trade that shaped manufacturing during the late twentieth and early twenty-first centuries.

The problem extends beyond raw materials. Battery manufacturing also depends on highly specialised chemicals, separators, carbon materials, electronic controls and precision machinery. Much of this infrastructure has evolved within globally integrated supply chains that were designed for efficiency rather than geopolitical resilience.

As a result, the battery sector has become one of the clearest examples of how vulnerable modern industrial systems can become when production is concentrated geographically. ■

The big hullabaloo about supply chain disruptions has mostly focused on the troubles for lithium battery manufacturers. But the lead business has also been hit hard. Michael Halls and Yves Le Marquand report.

The legacy industry of the future



The globalisation vs regionalization debate

Scott Fink, president of Sorfin Yoshimura, an independent global supplier and marketer of lead battery manufacturing equipment, believes longer-term trends are reshaping global commerce. “The shocks of recent years are not anomalies but a fundamental shift in how global commerce now operates,” he says.

“Disruptions in supply chains are not an anomalous kind of situation,” he said. “This is a new normal, and it’s a new normal that we are going to continue to have to manage and navigate.”

He believes the pandemic only accelerated a pre-existing trend: the unwinding of decades of globalization and the onset of regionalisation.

So what practical steps should battery companies take? His primary recommendation is a strategy of “dual-sourcing or tri-sourcing all of your material or consumable needs”. The goal is to ensure that if one source is disrupted for any reason, there are others that can step in.

The ideal scenario, he argues, is having an approved source for any

given material in the Americas, another in Europe, the Middle East and Africa, and another in Asia. This approach of building twins offers manufacturers maximum protection.”

Bobby Lucas, CEO of Hammond Group, the international lead oxide and expander provider, says geographical flexibility is essential. Hammond operates plants in the UK and Malaysia, a fact he admits was not the result of long-term strategy but has proven invaluable.

“Based on the most current disruptions, whether tariffs or Middle East conflicts, we’ve been able to adapt and adjust to where customers want those products coming from,” he says.

“If a particular country has a big tariff slapped on it with regard to the US, we’ve been able to pivot a number of customers to take product out of our Malaysian plant. That benefits them regardless of whether the freight is a bit more — they still come out ahead from a tariff perspective.” ■

Much of the discussion around battery supply chains focuses on lithium-ion technology — particularly the raw supply of materials — yet the lead battery industry faces similar challenges.

That said, lead batteries possess one major advantage: a highly developed recycling ecosystem. The lead-acid battery sector has spent decades developing one of the world’s most mature circular industrial systems.

In Europe and North America especially, a large proportion of lead used in new batteries originates from recycled batteries. This reduces dependence on newly mined materials and creates more regionalised supply systems.

That circularity makes the lead battery industry structurally more resilient than many lithium-ion supply chains.

However, resilience doesn’t mean immunity.

Lead battery manufacturers still depend on a broad network of suppliers providing lead oxide, expanders, carbon materials, separators, alloying agents and industrial chemicals. They also depend on transportation systems, energy supplies and increasingly sophisticated automation equipment.

Energy costs

Lead smelting, recycling and oxide production require substantial amounts of energy, making manufacturers vulnerable to electricity and gas price volatility. The energy crisis following the war in Ukraine demonstrated how quickly industrial economics can shift when geopolitical instability affects energy markets.

Transport disruption has also become more problematic. Delays in shipping routes or shortages of industrial chemicals can quickly interrupt manufacturing schedules even when lead itself remains relatively available.

The lead battery industry therefore occupies an unusual position. Compared with lithium-ion manufacturing, it benefits from stronger recycling infrastructure and more established regional supply systems. Yet it remains deeply

connected to the wider industrial economy and therefore exposed to many of the same systemic risks.

Suppliers to the battery industry may ultimately become some of the most strategically important companies within the entire sector.

Manufacturers are placing increasing emphasis on supplier reliability, regional proximity and consistency of quality. This potentially creates opportunities for companies supplying specialist materials such as lead oxide, expanders and additives.

Companies such as Hammond Group and Atomized Products Group occupy particularly important positions because their products directly affect battery performance and manufacturing consistency. Lead battery producers cannot easily switch suppliers overnight. Qualification processes are lengthy and technically demanding because small variations in material characteristics can significantly affect battery behaviour.

In the past, manufacturers often focused primarily on cost competitiveness. Increasingly, however, they are prioritising security of supply and regional resilience.

This may strengthen the position of suppliers capable of maintaining reliable production within North America or Europe. Yet suppliers themselves face rising pressures. They must contend with volatile energy prices, transportation uncertainty, labour shortages, environmental regulation and fluctuating raw material costs.

On price volatility for materials like lithium, cobalt and nickel, Lucas notes that Hammond already hedges heavily for lead, a commodity traded on the London Metal Exchange (LME).

“Lead has been very steady for the last three or four years, but the reason we still hedge is there’s no guarantee it will continue to be steady.

“Those other materials — a lot of them on the critical minerals list — have a lot more fluctuations, which makes hedging even more important,” he says.

Many are also carrying higher inventory levels than before Covid, increasing working capital requirements.

The financial burden of supply chain resilience is therefore spreading throughout the industrial ecosystem.

Companies at every stage of production are being forced to rethink how much redundancy they

require and how much additional cost they are willing to absorb in order to reduce risk.

An often overlooked aspect of the battery supply chain crisis involves the manufacturers producing industrial machinery itself.

Battery manufacturing equipment has become highly sophisticated, relying heavily on semiconductors, industrial controls, servo systems, sensors and advanced automation technologies. During the semiconductor shortage, machinery lead times expanded dramatically because machine builders could not obtain critical electronic components.

This became especially problematic as investment in battery gigafactories accelerated globally. Demand for coating systems, formation equipment, oxide production machinery and assembly automation rose sharply at precisely the same

moment supply chains were under maximum strain.

The irony was difficult to ignore. Governments and manufacturers were trying to expand battery production capacity rapidly, yet the equipment needed to build that capacity was itself vulnerable to supply chain disruption.

Machine builders found themselves confronting the same problems affecting their customers. Shortages of relatively inexpensive components could delay entire production lines worth millions of dollars.

The consequences are still being felt today. Many industrial manufacturers now maintain larger inventories of spare parts and are redesigning systems around more available components where possible. Others are trying to regionalise support networks and diversify suppliers to reduce dependence on single-source vulnerabilities. ■

The big squeeze



The new trade paradigm favours larger, better-capitalised firms. Smaller players face significant pressures. Mike Dunn, proprietor of CTT and a 50 year veteran of the battery industry says this trend has been in place for some time. “It’s a structural challenge, bigger players squeezing out smaller, more flexible firms.

“They are now bent on getting rid of as many of the smaller companies as possible to monopolise the industry.”

Sorfin’s Scott Fink takes this further: “Unit costs of production are a real phenomenon. Those that have the ability to make more and make them faster are going to naturally have advantages, despite the disruptions. Smaller firms also face the challenge of liquidity during disruptive periods. Larger firms also benefit from easier access to long-term financing.

“And that also becomes a major advantage for larger companies over smaller ones.”

Nevertheless, consolidation has its plus points. “It’s healthy for the market, and healthy for the consumer,” he says. “What it forces smaller firms to do is not necessarily to go away, but to refine what it is that they do well.”

He also expects continued consolidation as larger battery makers reposition themselves not as lead acid specialists but as comprehensive energy storage providers. “They want to be able to provide stored energy across different chemistries,” Fink says. “Whatever customers manufacturers increasingly aim to provide it.

“Our ability to adapt and pivot quickly are going to be absolutely imperative in the next generation of this business.” ■



The global battery supply chain is being upended by a cascade of unpredictable events stemming from geopolitical upheaval, *Batteries International* discussed the subject with lead market veteran Farid Ahmed.

The law of unexpected consequences reshapes global battery scrap flows

Edward Lorenz, a pioneer of chaos theory, often said, “A butterfly flapping its wings in Brazil can trigger a tornado in Texas.” Essentially, minor changes in a complex system can result in significant and unpredictable outcomes over time.

Welcome to the volatile and disrupted global market of secondary lead.

Farid Ahmed, CTO and CCO of Zero Carbon Technologies, explains a market where one disruption sparks another, creating ripple effects across continents. Literally from the US-Iran conflict to LME warehouses in Singapore, and then impacting the financials of US battery firms.

The Middle East conflict affects more than just oil, gas, and petrochemical supplies. “The immediate impact of closing the Strait of Hormuz was to block a key supply route for scrap batteries to India, a country constantly in need of scrap batteries for recycling to meet its lead demand,” says Ahmed.

“Before the disruption, India was extracting a vast amount of scrap batteries from Africa and the Middle East, much of it shipped through ports like Dubai. That supply chain has now been severed.”

With its usual sources cut off, India’s demand for scrap batteries has led to unusual new trade routes. “For instance, there has been a steady export of large refined lead stocks from LME warehouses in Singapore,” Ahmed notes.

However, the most notable change is India turning to North America. “To meet their scrap battery needs, Indian recyclers have been sourcing scrap from North America, especially the US,” he explains.

This poses a problem since exporting hazardous waste from an OECD country to a non-OECD country is prohibited.

Nonetheless, exceptions seem to have been granted, and the effects on the American market have been swift. “This has driven up scrap prices in the US, making it tougher for US recyclers who depend on competitive scrap prices,” Ahmed says.

US recyclers are already facing challenges because “demand is relatively weak as domestic battery manufacturers aren’t seeing the volumes they once did.”

This is due to a surge of imports. “Despite tariffs, they have been undercut by imports of white-label batteries,” he says.

Competition

“These are produced in countries like India, Vietnam, or Cambodia and can be priced very competitively. Some US battery makers even import small-run battery models to white-label them as their own, a practice that has become quite common recently.”

The outcome is a market flooded with inexpensive, often unbranded, replacement batteries. “This is hurting US smelters and battery manufacturers, impacting their profitability,” Ahmed says. “It is reducing demand for domestically made US batteries due to these low-cost imports.”

Ahmed, who has over 30 years of experience in the metals and battery sectors, recalls a similar trend during the pandemic. “During Covid, there was a rising demand for batteries,” he recalls. “And there was a huge

need in the US for lead to produce those batteries.”

To fulfill that demand, he says, “US companies sourced a lot of low-quality lead from warehouses in Europe, where it had been sitting unused for years. Traders moved these stockpiles in bulk to the US after re-refining at European smelters. A significant amount of lead was also sourced from China for similar reasons.”

Looking ahead, Ahmed says the market could take various directions. “The US market will face difficulties unless something major changes,” he warns. “Lead prices aren’t expected to rise dramatically, so that’s not a concern. The key factors will be how scrap prices respond and how demand evolves.”

Ahmed highlights a geographic shift in refined lead demand. “Demand in China is weak, so they don’t require much refined lead. However, the rest of Southeast Asia, which manufactures many China-branded batteries in countries like Cambodia and Vietnam, is short on lead,” he explains.

This implies that “Australian lead production might be directed more towards Southeast Asia rather than the US, as shipping to the US is much farther.”

Since the US partly depends on Australian lead imports, US battery manufacturers will struggle to secure enough lead for production, and US recyclers will face challenges obtaining sufficient feedstock to compensate for this deficit. ■

Disruption is triggering ripple effects across continents — quite literally from the US-Iran war in the Strait of Hormuz and on to LME warehouses in Singapore, and then on to the bottom lines of US battery companies

Removing the ‘choke point’

The BATT Coalition is urging the US clampdown on China battery materials control as well as stimulate domestic capacities.

A coalition of battery material producers in the US is pushing legislators to do more to remove supply-chain so-called “choke points” and loosen China’s grip on the market.

The Battery Advocacy for Technology Transformation (BATT) coalition said on April 6 it is working with lawmakers to implement enhanced tax credits that can boost domestic production of battery components.

BATT, formed to protect investments in a robust supply chain, particularly for EV batteries, is also urging US trade chiefs to set price floors for critical materials and components, as part of new trade deals with friendly nations to “further undermine Chinese market manipulation”.

On the Advanced Manufacturing Production Credit program — designed to help domestic producers flourish and move away from Chinese-made or control of battery components — BATT has told the US Treasury that defining ‘effective

control’ of foreign entities (like China) of a battery supplier will be “a decisive factor in determining who is eligible for the tax credit”.

Coalition policy director Drew Ronneberg said it was not credible that a downstream supplier would not know that materials supplied for a battery to function included those produced by prohibited foreign entities.

“Treasury should therefore interpret ‘effective control’ to encompass functional and operational control, not merely formal governance rights.”

BATT executive director, Samm Gillard, said the US government and private sector had made significant strides to build a more sustainable domestic industrial base for battery materials and components.

“We now have opportunities to supercharge those investments with more robust policies. But how we implement them will determine whether domestic producers double down on their commitments and we can truly break China’s lock on this strategic industrial sector.”

BATT has cited several examples of how dependency in highly concentrated markets can confer effective control, even where the input represents a relatively small share of total product value.

These include electrolyte salt, produced almost entirely in China and used in nearly all lithium ion batteries. While it only represents 2% to 5% of a cell’s value, Chinese specified foreign entities could effectively control US production because the Chinese government could restrict exports, BATT said.

Graphite, used in more than 95% of lithium ion battery anodes, is also primarily produced by Chinese entities, BATT said. “Although graphite generally represents less than 15% of cell value, US manufacturers remain dependent on Chinese-controlled supply.”

On cobalt, around 80% of production and refining is controlled by Chinese entities. “This concentration enables China to exert effective control over downstream production through

export restrictions, despite cobalt representing only a minority share of total cell value.

“These China-controlled choke points make lithium ion battery supply chains vulnerable to disruption through price manipulation or the imposition of export controls.”

Earlier this year, US assistant energy secretary Audrey Robertson held talks on supply chain resilience and energy security with other nations during the Indo-Pacific Energy Security Ministerial and Business Forum in Japan.

Latest analysis reported by Batteries International last month laid bare the economic might of China’s grip on the world’s battery sector — with EV plants facing \$17 billion in losses for every month of a potential halt in cell exports.

According to International Energy Agency estimates, EV plants in the EU would account for over half of those losses for each month of an interruption in supply chain exports from China. ■



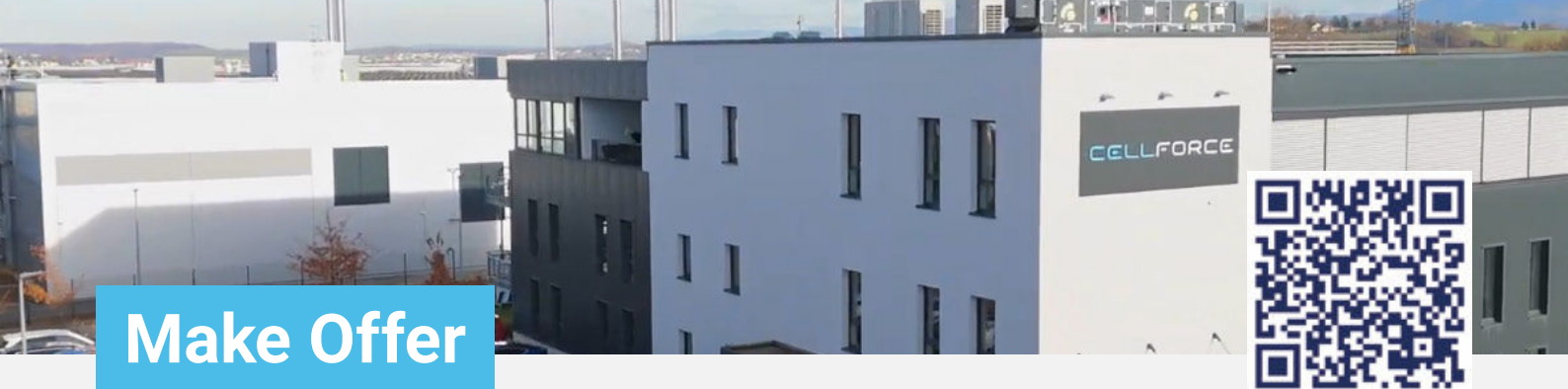
“It’s not credible that a downstream supplier would not know that materials supplied for a battery to function included those produced by prohibited foreign entities”

— BATT coalition policy director Drew Ronneberg



“We now have opportunities to supercharge investments with more robust policies. How we implement them will determine whether we can truly break China’s lock on this sector”

— BATT executive director, Samm Gillard



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One of the most talked about features of recent BCI meetings has been the Sally Breidegam Miksiewicz Innovation Award. This was set up in 2016, as a tribute to East Penn's CEO following her untimely death in June 2014.

From first steps to development, from ingenuity to eventual success

The innovation Award originally celebrated innovation in equipment, processes, services and products that advance the lead battery industry but is now open to all energy storage chemistries.

The range of innovations set up as candidates for the award has been startling.

Some have been as simple as a better design shape for a marine battery; others have embraced the latest advances in our understanding of the way that battery chemistries work.

Some of the nominations have been breakthroughs in the laboratory but struggled to be commercialized.

And yet others — think of advances in EFBs — have been quickly embraced as a new standard in an emerging marketplace that continues to grow exponentially.

Tim Ellis, one of the judges of the Innovation Awards, says: "this is really a celebration of an industry that is not stuck looking at the electrochemistry of 150 years ago but one that is still making strides into a relevance that will continue for a long time."

But, be they large or small, these innovations matter. All advances are worthy of note. Energy storage is the currency of the future on which nations will regard themselves rich or poor.

For the last decade a tonne of investment has been flung at developing better lithium batteries while lead research has been side-lined.

The nominations for the Innovation Award have been impressive. They have varied from new takes on bipolar batteries — a particular concern this year as well as a constant theme

But, be they large or small, these innovations matter. All advances are worthy of note. Energy storage is the currency of the future on which nations will regard themselves rich or poor.



Sally Breidegam Miksiewicz INNOVATION AWARD

Presented by
Battery Council International

in previous ones — to twice-award winners such as Hammond with their exploration of additives that have made cycle life longer, rechargeability shorter and a longer active life.

Mark Thorsby, then head of Battery Council International told Batteries International in 2015 that the lead battery market needed a "shake-up". He said that great ideas were not surfacing through many reasons.

"Part of it it this industry still doesn't know how to communicate itself to the outer world," he said at the time. "Another is too many people are taking a proprietorial attitude to their research findings. It's wrong to be secretive over research findings that could benefit the industry as a while. And last, they're blocking the impact their innovations could have at a time when the whole industry is facing challenges from competing battery chemistries."

Since then the Innovation Award has become a firm favourite of attendees at the annual BCI convention.

Much to his credit Roger Miksad, the current president of the council, has expanded this further. The Innovation Award is now an entrenched part of the spring conference. But so too are the Amplify Awards which he later set up — see later part of this section — which celebrate the idea that the industry needs to be able to communicate itself and its achievements to the broader world of consumers.

Here follows the nominations for this year's Battery Council International Innovation Award. There was a fine cast of nominations for the winner of this accolade but if you want to know who was the eventual winner ...

Go to the PEOPLE NEWS section of this magazine and all will be revealed! ■

**"Innovation is the thing that gives you the opportunity.
It's the promise of our future."**

Sally Breidegam Miksiewicz

Bipolar lead batteries may finally be coming of age, says East Penn Manufacturing and Silicon Joule.

The next generation GC2+ format battery has arrived

For almost a century, a bi-pole design has been seen as the holy grail of advancing lead battery technology. Many have tried but none have been so close to commercializing a product at this scale until now. But this is changed with the arrival, so the developers say, of the first commercial bi-pole battery based on lead chemistry and treated silicon wafers.

They say the design and process offer a low capital pathway to scale production in existing battery factories for 12V to 48V variants for power and energy applications.

The GC2+ follows years of R&D by Silicon Joule and East Penn to overcome the challenges faced by many earlier developers. The current product reaches 2000 cycles, almost three times the cycle life of any maintenance-free based design, and the developer expect to increase this to the 10-year life with daily use requested by many users.

The commercial product uses recycled active material lead and replaces conducting lead material (grids and straps) with an improved bi-pole architecture reducing lead usage by 35%.

The longer cycling life offers lower total cost, higher material utilization and lighter batteries. With one or two less replacements in the application, total mineral use and the energy to

recycle or produce the products is significantly reduced. Additionally, the design increases round trip energy efficiency, offers greater heat tolerance reducing electricity use and provides higher volumetric and gravimetric energy density.

A faster path to market

The pathway to commercialization will vary as with all battery technologies on an application-by-application basis, yet the familiarity with safe lead chemistry is shortening the testing and field trials required for broad, global commercialization.

The materials are familiar and low-cost (lead, plastics, and solar-type wafers) enabling a potential bill of material cost of well below \$100/kWh for cycling products as one example for out of box costs, rivaling existing lead products.

Some processes are very familiar and scaled to lead battery companies, like oxide, pasting and charging, some scaling of assembly equipment and known high volume wafer treatment processes can further assure low initial costs.

However, a significant savings in use comes from the much longer life then any known maintenance free battery which extends the interval for replace-

ment, cutting total system cost of ownership.

Today's lead batteries are virtually all 12V batteries with external connections needed to match the system voltage. The new bi-pole design can be made on the same assembly line to make 12V to 48-volt blocks reducing the risks associated with external connections needed to match system voltages.

With respect to ease of commercialization, the product and process plan does not require new giga factories, and can replace or supplement existing lines within the lead battery industry in steps. The developers say the large global infrastructure and technology for silicon wafers and processing provides a known pathway for cost effective scaling.

Performance

The largest performance and cost benefit of the new GC2+ is the significantly extended cycle life for maintenance free (VRLA AGM) batteries which is already at 2,000+ true deep cycles, which is three times the cycle of the better maintenance free batteries today.

Wider temperature tolerance and higher round trip energy efficiency are further performance advantages which are valuable in different applications, such as data centers where cooling costs and total electricity consumption are key metrics.

Although Toyota broke through first with wide scale use of a bi-pole product with its nickel-based battery for hybrid vehicles, the GC2+ is the first true commercial product being shipped in increasing scale for the lead battery industry.

The voltage flexibility of the technology is also unique to lead battery companies and is needed to compete with lithium and other emerging technologies to better match the user's system voltages. ■

Table 1: Comparison between AGM, Silicon Joule and lithium ion batteries

AGM	Silicon Joule	Lithium ion	
Cycle life @ 80% DoD	Fair 400 to 500	Best 1500 to 3000	Best 1,500 to 5000+
Temperature range (°C)	Good -35 to 45°C	Best -40 to 65°C	Fair 18 to 55°C
Fire/safety risk	Best	Best	Poor
Recycled/re-use (%)	Best	Best	Poor
Levelized cost vs. lithium (\$/kWh*	Poor 250%	Good 85%-140%	- 100%
Energy Density (Wh/L)**	Fair <90	Best-Good >110	Best 110-260

* Levelized Cost of Storage – incorporates upfront costs and performance of the battery.

** At the battery/module level

Rethinking the composition of the negative electrode can offer extensive benefits, says Hollingsworth & Vose and ArcActive.

Taking the GEM idea to a new and logical conclusion

Welcome to a new type of lead-acid battery electrode in which the traditional lead grid is replaced with a glass fibrous matrix. The innovation known as GEM (Glass Electrode Material) helps generate and support a unique micro-pore structure within the lead active mass that enhances battery chargeability performances and cycle life reliability, without impacting water loss.

GEM fully reinforces the active mass with a stable, hydrophilic glass fiber network. This structure results in a unique pore structure with an exceptionally large surface area. The resulting pore structure in GEM electrodes provides various performance improvements.

To date, GEM technology has primarily developed for implementation in negative electrodes. The negative active mass (NAM) is sufficiently conductive enough to allow the removal of the grid structure without adversely affecting current distribution.

GEM electrodes improve the performance of lead batteries in a number of applications. These include higher chargeability and improved long-term stability of performance.

Charge acceptance

GEM-based negative electrodes have been extensively evaluated in charge acceptance testing and enable impressively high charge acceptance. Compared to conventional negative electrodes, GEM can provide up to three times higher charge acceptance, crucially, without any negative impact on water loss. These improvements in charge acceptance have been reliably validated through WTL8 tests during DCRss and PSOC 17.5%DOD test regimes.

Improved charge efficiency has also been demonstrated under simulated forklift discharge cycles (BCIS022), where GEM-based batteries deliver up to 50% higher turnover capacity with no adverse impact on cycle life.

On a scientific level, GEM technology alleviates the overpotential on the negative electrodes and promotes a more energy-efficient recharge strategy. This unique benefit of GEM helps relieve positive sulfation and can boost the battery's performance in absorbing spike energy. The specific study of GEM technology in EV/HEV-type aux battery performance is ongoing.

These performance gains translate into a number of application benefits::

- A reduction in CO₂ emissions by up to 4g/km in start stop applications.
 - Improved safety in electric vehicles applications where the auxiliary battery can be more easily maintained at higher states of charge.
 - Increased utilization or smaller size requirements of batteries in forklift applications, due to improved lifetime performance.
- Improved performance over time.

The pore structure in GEM electrodes has a remarkably positive impact on battery performance over time. Initially, key characteristics, such as discharge capacity and high-rate discharge performance (e.g., CCA), are comparable to those of conventional electrodes. However, the major advantages of GEM become evident with aging.

When a conventional battery is subjected to various applications many performance metrics drop off and stabilize at a level much lower than that seen on day one. In contrast, batteries incorporated GEM based electrodes retain substantially higher performance across these metrics. These improvements ensure that long-term performance remains high, rather than relying on initial performance levels that are not sustained

in real-world applications.

GEM technology is designed to be cost-competitive and readily commercializable within existing lead-acid battery manufacturing infrastructure.

GEM based electrodes can be easily integrated into current battery manufacturing lines and is completely compatible with current battery designs. A lead lug is applied on to the edge of a GEM roll enabling attachment of electrodes to a cast on strap — identical to the process used in conventional lead acid batteries. Following pasting with a low viscosity lead paste, the pasted material is cut into plates, dried and cured in the exact same way as a conventional electrode.

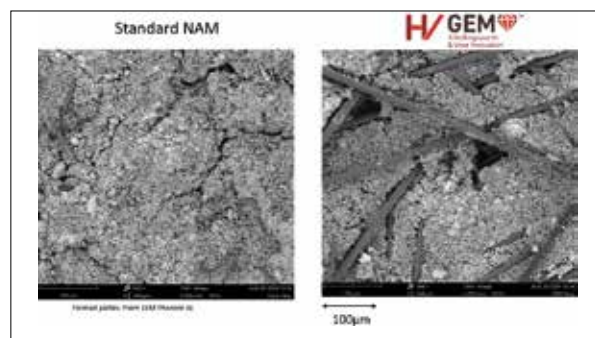
GEM is manufactured from materials already widely used in the industry. This significantly reduces both technical and financial barriers to adoption.

All materials used in GEM-based electrodes are compatible with current recycling processes.

Due to the high electrochemically active surface area and the elimination of the metallic grid structure, a further advantage of GEM is cost reduction. The mass of the negative plate can be significantly optimized when implementing GEM.

In the current development phase, the net mass decrease per negative plate is around 5% to 10%.

With further process refinement and design optimization, weight reductions of up to 25% relative to conventional grid-based negative plates are projected. ■



Dry electrode manufacturing can compete in many non-lead technologies — from lithium to supercaps — and cut costs.

Drying out the EV battery manufacturing process

Battery manufacturing creates a growing share of emissions long before a battery ever reaches a vehicle or grid installation.

Activated Dry Electrode manufacturing directly addresses this challenge by removing toxic solvents such as NMP and eliminating the drying and solvent recovery steps that dominate conventional wet electrode processes. In traditional factories, drying can account for roughly half of total energy consumption, making manufacturing energy use as consequential as materials selection.

This impact reduction already operates at scale. A 300MWh roll-to-roll dry electrode production line in California demonstrated in July last year how solvent-free manufacturing lowers energy demand while producing long-length cathode films for customer validation.

By shrinking factory footprint and cutting energy intensity at the source, this approach enables battery producers to expand capacity without proportionally increasing emissions.

Safety

Manufacturing safety improves most when risk disappears from the process rather than shifting to protective controls. Solvent-free electrode production removes worker exposure to hazardous chemicals and eliminates the large drying ovens that introduce fire and explosion risk in conventional facilities.

Fewer process steps also simplify operations and reduce equipment failure points during continuous production.

Commercial partnerships validate this safety profile. Dürr, a global leader in battery manufacturing equipment, partnered with LiCAP in February 2025 to integrate dry electrode processing into industrial production lines, confirming the process meets real factory safety and reliability standards.

Nissan also selected the technol-

ogy for development of all-solid-state battery electrodes last August, demonstrating confidence in its stability under OEM qualification requirements. These integrations show that safer battery manufacturing can operate at production scale without compromising throughput.

Electrode manufacturing costs increasingly constrain battery scale-up. Removing solvent handling and drying infrastructure eliminates entire categories of capital equipment while cutting ongoing energy costs tied to heating and recovery systems.

This shift reduces both upfront investment and long-term operating expenses in a measurable way.

Customer analysis tied to commercial programs show cost savings reaching millions of dollars per gigawatt hour depending on chemistry, with consistent percentage reductions across material systems. Operation of a 300MWh production line confirms these economics under real manufacturing conditions, making dry electrode processing a cost-effective alternative rather than a speculative improvement.

Performance

Production changes only succeed when performance improves alongside efficiency. Dry electrode processing enables higher energy density electrodes with improved mechanical integrity compared to wet-coated alternatives. These gains allow manufacturers to deliver batteries that store more energy without adding manufacturing complexity.

Nissan's application of the technology to all-solid-state battery development reflects this performance advantage, where electrode quality directly influences cycle life and energy density targets. Performance improve-

ments tied to a simplified process accelerate adoption because manufacturers gain better batteries rather than tradeoffs.

Many dry electrode concepts remain confined to laboratories or limited pilot systems. What distinguishes this innovation is proven commercial readiness. A US-based roll-to-roll production line operating at 300MWh scale already produces long-length electrode films for customer evaluation, demonstrating throughput that aligns with industrial demand.

A robust patent portfolio protects the process, equipment design and materials handling approach. Collaboration with Dürr on gigawatt-scale manufacturing integration and licensing agreements with global OEMs separate this technology from experimental alternatives that lack deployment pathways.

Value in other chemistries

The battery industry benefits most from innovations that apply broadly rather than narrowly.

Compatibility across lithium-ion, solid-state, sodium-ion and ultracapacitor platforms allows manufacturers to adopt the technology without locking into a single chemistry roadmap. Licensing and integration models enable use beyond the originating company, accelerating industry-wide impact.

By lowering manufacturing energy use, improving safety, reducing cost and enhancing performance within a single process change, this innovation strengthens the battery supply chain at a moment when scale and resilience matter as much as chemistry. It enables faster electrification while making battery manufacturing more sustainable and durable over the long term. ■

Commercial programs show cost savings reaching millions of dollars per gigawatt hour depending on the chemistry

HDFs, class 8 trucks and commercial buses are disproportionate emitters of transportation emissions. Proterra's batteries are the answer.

Taking the carbon out of heavy duty transportation

Proterra is solving the decarbonization gap in the heavy-duty transportation and industrial equipment sectors, which is one of the hardest segments to abate. Heavy-duty vehicles (HDFs, including Class 8 trucks and commercial buses) are disproportionately responsible for transport emissions, contributing approximately 26% of transportation GHG emissions in the US, despite representing a small fraction of the total fleet.

Furthermore, the incumbent diesel process (ICE) generates significant local air quality externalities (NOx, SOx, and particulate matter) in port and urban areas. The firm says its aspiration is to bridge the decarbonization gap in the heavy-duty sector by serving as a Tier 1 electrification partner for global OEMs.

Scaling up

It has set clear objectives to scale its modular battery technology beyond transit and into the Class 8 trucking, mining, and port equipment markets, specifically targeting applications to ensure electric fleets maintain payload profitability.

Its roadmap includes advancing its 5th generation technology to improve charge and discharge power, ensuring that zero-emission industrial machinery can meet the rigorous duty cycles of the most demanding job sites without compromise.

The cornerstone of the system is the integrated safety and management architecture:

Passive propagation resistance (PPR): This design is engineered to prevent any thermal event from spreading beyond a single cell, providing industry-leading safety that is critical for passenger transport and tightly-packed heavy-duty applications.

Active thermal management: An integrated liquid cooling and heating system maintains uniform cell temperatures, enabling optimal performance and longevity in even the harshest

conditions.

Intelligent BMS: The integrated Battery Management System provides real-time diagnostics and module-level calibration. This maximizes efficiency and extends battery life, while supporting faster, localized serviceability, significantly reducing vehicle downtime.

Proterra's battery technology works through a four-step process:

Module assembly: Battery modules, the building blocks of energy storage, are precisely structured by weaving together small cells for optimal efficiency, safety, and reliability.

Pack assembly: The battery pack is created by integrating these modules into a complete system, incorporating the necessary structure, thermal management, and safety features for reliable performance throughout its lifespan.

Battery management: Advanced sensors are integrated at the module level to continuously monitor parameters like voltage, temperature, and more, ensuring peak battery health. All necessary electronics are built directly into the pack.

Functional testing: The final packs and modules undergo rigorous electrical, thermal, and mechanical tests to verify overall safety and performance.

The latest variation in the Proterra Onyx Strata series H2-23, built on 5th generation technology, is a holistic battery system that integrates advanced cell chemistry, mechanical robustness, and intelligent software. The system supports up to 1MWh for a Class 8 truck and is highly scalable. It is designed around a modular architecture to provide power density and durability in demanding duty cycles.

Proterra battery packs are competitive in certain applications. In other applications, the company says it has an active roadmap to bring down the cost to meet the needs of those markets. Its aim is to not depend on

subsidies over time.

Proterra battery packs, as well as most electric battery-powered solutions, are at a premium to incumbent conventional (gas and diesel) solutions. The company's objective is to bring down costs in the future to meet TCO parity and be less reliant on subsidies to bridge the pricing premium that exists.

The company's technology is commercially proven. Proterra batteries have powered over 2,000 commercial vehicles on the road and have accumulated over 55 million+ miles in real-world, high-utilization applications, primarily in North American transit fleets, which operate demanding, continuous daily duty cycles.

Data validation

This track record provides an unparalleled level of data and operational validation for deployment into the heavy-duty trucking and off-highway segments. Proterra has a domestic manufacturing footprint in South Carolina with significant production capacity to fulfil near-term and long-term OEM demand.

The company's packs were designed, validated, and proven in transit buses, one of the most severe duty cycles, requiring high power, fast charging, and exceptional longevity.

The company's systems, from pack design in California to manufacturing in South Carolina, are developed as a unified system (hardware, thermal, software), not assembled components. This integrated approach ensures compliance with domestic mandates (like Buy America and Build America, Buy America), offering OEMs a critical supply chain advantage and security over foreign competitors.

The company's packs carry robust ingress protection ratings, specifically designed to withstand the water, dust, and vibration inherent in off-highway and heavy-duty vehicle operation, a critical differentiator for industrial partners like Komatsu. ■

Sometimes it's time to think away from the chemistry of energy storage and look at the way it is set up and works. The answer? LDUPS.

Advancing long-duration storage by architecture

TerraFlow Energy develops long-duration storage systems built for the stability demands of modern power infrastructure. Its LDUPS architecture separates inverter and rectifier functions, which allows power and energy to scale independently and enables continuous, high-throughput cycling without degradation.

The system uses a safe, non-flammable electrolyte reservoir and is engineered to manage fast, frequent multi-megawatt swings at the distribution edge.

"We design, manufacture, and integrate long-duration storage for data centers, industrial facilities, and community substations," says the firm. "TerraFlow's domestic supply chain, modular components, and long-lived electrolyte platform support projects that improve grid resilience, reduce lifecycle waste, and deliver stable performance under real operating conditions."

TerraFlow says it takes a practical view of environmental responsibility. Its systems use water-based electrolytes with no thermal risk or hazardous byproducts. The active material is produced through a zero-waste process that avoids scarce or geopolitically sensitive resources.

The firm says it manufactures with a domestic supply chain, which reduces transport emissions and supports local communities. Long-duration performance improves grid stability and reduces the need for emergency generation during periods of volatility.

"Our model is designed to make the grid safer and more stable for the communities it serves," says the firm. "By combining long-duration storage with continuous power control, TerraFlow helps customers manage volatility,

protect equipment, and reduce stress on local systems. It is a disciplined and purposeful approach that turns complex challenges into clear, responsible paths forward." Key points are:

- One platform that unifies hardware, operations, and software
- Clear guidance from evaluation through deployment
- A consistent experience across every market and segment
- Built for long-term infrastructure, reliability, and growth
- Reduce PPA costs by more than 50%
- Unlock new revenue through ancillary services and export
- Lower operating expenses with 4CP avoidance and peak shaving
- Improve return on capital through stability and equipment protection
- Maintain uptime while improving economic performance

"We validated the power path, response behavior, and operational stability through lab testing, system modeling, and commercial project readiness," says the firm.

"The Bellville 9.6MW/48MWh project represents a fully engineered commercial deployment, proving that the architecture, supply chain, and financial model are ready for large-scale delivery."

LDUPS supports environmental stewardship by addressing one of the largest sources of waste in stationary storage: degradation under high cycling. The system uses a non-flammable, water-based electrolyte that does not degrade with use and can be reused throughout the system's life.

By decoupling power from energy,

LDUPS avoids overbuilding and reduces embodied carbon. Modular components allow refurbishment instead of full replacement, extending asset life and minimizing material waste.

Long-duration stability also reduces the need for emergency fossil-based generation during periods of grid volatility.

LDUPS is engineered for safety through both chemistry and architecture. The electrolyte is non-flammable and does not present thermal runaway risk. Separating inverter and rectifier functions improves electrical stability and reduces cascading failure modes under high-throughput operation.

The system behaves predictably across continuous cycling conditions and does not rely on procedural safety layers or complex suppression systems. This enables safe commercialization and siting near substations, campuses, and communities.

LDUPS reduces total cost of ownership by eliminating degradation-driven replacements common in conventional batteries. Because energy and power scale independently, systems can be right-sized for actual operating needs, avoiding unnecessary capital expense.

The long-lived electrolyte and modular architecture lower maintenance and lifecycle costs. High-throughput cycling allows a single system to deliver multiple services, improving capital efficiency. These attributes support cost-effective commercialization at scale.

LDUPS is designed to manage fast, frequent, multi-megawatt power swings at the distribution edge. The architecture supports thousands of deep cycles per year without loss of capacity. It provides rapid response for voltage and frequency stabilization while delivering multi-hour duration.

System behavior has been validated through lab testing, modeling, and commercial-scale project readiness. Performance remains stable under operating conditions that degrade or constrain many other storage systems. ■

TerraFlow's domestic supply chain, modular components, and long-lived electrolyte platform support projects that improve grid resilience, reduce lifecycle waste, and deliver stable performance under real operating conditions

The joys of bipolar batteries

Terra Supreme Battery has developed and commercialized a fundamentally re-engineered lead-acid battery architecture that delivers lithium-comparable performance while preserving the intrinsic safety, recyclability, and cost advantages of lead-acid technology.

TSB's Bipolar Valve-Regulated Lead-Acid Battery (VRLAB) platform replaces the primary failure modes of conventional lead-acid batteries — positive grid growth, electrolyte stratification, and non-uniform current distribution — with a stable bipolar architecture, composite current collectors, and horizontal electrode orientation.

The technology has been deployed in demanding land-based, marine, and airborne applications for more than three decades and is manufactured today in a highly automated US facility capable of scaling to multi-gigawatt-hour annual output. TSB's Bipolar VRLAB technology materially improves sustainability through reduced lead usage, extended service life, and compatibility with existing recycling infrastructure; enhances safety through inherently stable, passively protected cell construction; lowers levelized cost of storage through long cycle life; and provides broad value to the battery industry by enabling safer, longer-lasting energy storage at commercial scale without reliance on lithium-based chemistries.

While the electrochemistry remains conventional lead-acid, nearly every aspect of cell architecture and manufacturing has been redesigned to improve material efficiency and durability.

A key sustainability benefit derives from TSB's composite current collector technology. The lightweight composite grid design significantly reduces lead content while maintaining corrosion resistance and structural stability. Applied across US production of Group 31 batteries alone, this technology would reduce annual lead consumption by approximately 230 million pounds, while remaining fully compatible with the industry's

Reduced metallic lead content shortens curing time and supports efficient, automated production. Bi-directional formation power supplies

recover discharged energy and return it to the facility electrical bus, reducing net energy consumption. All production processes comply fully with federal and state environmental regulations and are demonstrated in a modern, environmentally responsible Indiana facility.

The technology maintains stable performance across a wide operating temperature range (-40°C to $+60^{\circ}\text{C}$) without temperature dependent derating.

Scalability success

Manufacturing scalability to multi-gigawatt-hour annual output has been demonstrated without compromising safety or environmental standards.

TSB's Bipolar VRLAB technology is designed for cost-effective commercialization at scale. Significant investment in robotics and automation at the Indiana manufacturing facility has minimized manual labor, improved quality consistency, and reduced per-unit manufacturing cost.

While unit pricing remains competitive with premium lead-acid products, the principal economic advantage of TSB's technology lies in its substantially lower Levelized Cost of Storage (LCOS). The Bipolar VRLAB is designed to deliver approximately 4,000 charge-discharge cycles at 50% depth of discharge and 2,000 cycles at 80% depth of discharge, reducing replacement frequency and lifetime ownership cost.

The LCOS advantage derives primarily from extended service life and reduced replacement frequency rather than chemistry-specific tradeoffs, while avoiding the safety, transportation, regulatory, and end-of-life cost burdens associated with lithium-based batteries.

Horizontal electrode orientation eliminates electrolyte stratification, ensuring uniform electrochemical conditions over the full surface area of every plate throughout service life.

Unlike conventional tab-and-bus-bar designs, TSB bipolar plates incorporate multiple parallel current paths, eliminating concentrated current entry points and vibration-transmitting busbars.

TSB's bipolar VRLAB architecture exhibits exceptional durability under partial-state-of-charge operation, a regime that rapidly degrades conventional lead-acid batteries. Uniform current distribution, elimination of electrolyte stratification, and mechanically stable composite grids prevent localized sulfation and dendrite formation during extended PSOC cycling. This capability has been demonstrated in high-cycle industrial and scientific applications operating continuously at partial state of charge over multi-year periods.

TSB is not aware of any bipolar AGM VRLAB technology manufactured at commercial scale in the US. The company's innovation lies not in a single advancement, but in the tightly integrated combination of composite current collectors, bipolar series connections, horizontal electrode architecture, metal-free oxide processing, and continuous-flow automated manufacturing.

This integrated system is protected by over 300 trade secrets and has been demonstrated in sustained commercial production. The integration of these elements into a single scalable manufacturing platform distinguishes TSB's technology from prior bipolar concepts that failed to achieve durable commercial deployment, making rapid replication by competitors unlikely and establishing a technological advantage.

By offering lithium-comparable performance with lead-acid safety and recyclability, TSB's technology enables industry participants to address growing demands for sustainability, safety, and cost efficiency while preserving the proven strengths of lead-acid chemistry.■

The battery is designed to deliver approximately 4,000 charge-discharge cycles at 50% depth of discharge and 2,000 cycles at 80% depth of discharge, reducing replacement frequency and lifetime ownership cost.

The art and artifice of a successful marketing strategy

It's time, once again, to shout the urgency of the battery message to the outside world. Here we detail the way the judging system works behind the awards and what makes the winner, the winner.

To misquote Henry Ford: "Stopping marketing to save money is like stopping your watch to save time." Marketing, promotion, advertising has been part of the core business of all successful firms — but getting it right and doing it well is equally vital.

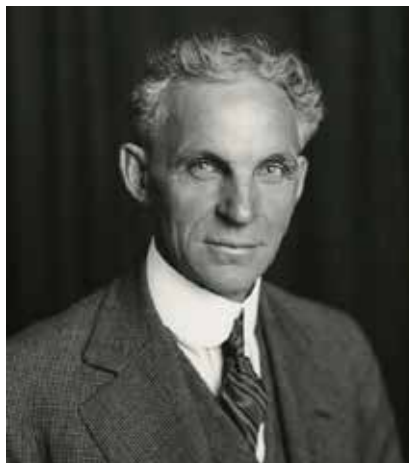
In acknowledgement of this, BCI four years ago set up the Amplify Award. This looks to highlight campaigns by its members which have the most positive impact in advancing the lead battery industry, and which incorporates innovation and design to achieve outstanding results.

The award recognizes a highly effective and top-rated internal or external campaign, program or communication that serves to inform, educate and promote lead battery products, components, services or the industry as a whole on the basis of four key pillars: innovation, sustainability, essentiality and safety.

Campaigns can include elements from all forms of marketing, branding, public relations, corporate social responsibility and education programs, including digital or print collateral, training programs, consumer marketing, awareness campaigns, commercials, websites, social media, point-of-sale materials, tradeshow booths and more.

The goal of the award is to recognize strategic communications designed to address a need and provide a platform to showcase innovative ideas that support the lead battery industry, particularly campaigns that highlight the key pillars of lead batteries: innovation, sustainability, essentiality and safety.

This year's award was again divided into two sections — one for product marketing and another for market leadership. It would be fair to say that there was an astounding range of nominations. They came from: Atomised Products Group/Addenda/Black Diamond



"Stopping marketing to save money is like stopping your watch to save time" — Henry Ford (well almost)

Structures • Bulldog Battery • Clarios • Club Assist • East Penn • Moura • Optima • Stryten • Terra Flow. The judging panel awards marks out of 20 for five categories. These were:

Innovation — The campaign demonstrates a high level of uniqueness and creativity;

Clarity — The campaign communicates clearly, is easy to understand and engages the audience;

Results — The campaign achieved its goal with measurable results;

Design/aesthetic — The campaign has visual appeal and highly effective design components;

Value — The campaign elevates and benefits the lead battery industry in some way by raising awareness of key issues, advocating on behalf of the industry or sharing a positive lead battery story. ■

POSTER RESEARCH

This is another positive initiative at flagging the innovations lurking in the research laboratories of some of the world's top academic institutions and also opening the doors for their findings to an international and US audience.

The Poster Research Showcase is an opportunity for researchers to share their cutting-edge science and technology with the battery industry and to build awareness about the scientific opportunities, advancements, and career objectives within the field. Topics for consideration include material science, advanced battery design, manufacturing processes, battery architecture, and more, with a focus on lead batteries and related topics.

BCI executive vice president and general counsel, Roger Miksad said, "I'm looking forward to the exciting battery research that will be presented at the Poster Research Showcase and encourage all interested researchers to consider participating in this."

This experience is open to undergraduate, graduate, and post-doctoral level researchers and assistants working in university, government, and commercial settings.

Participants in the Poster Research Showcase will have had the chance to gain free registration to the BCI Convention, network with industry experts, be recognized for their research achievements, attract funding for their projects, explore industry innovations, and collaborate with academics.

What's next? Showing the power of strategic alliances

The What's Next marketing initiative serves as a shared platform for a strategic alliance between three firms — Black Diamond Structures, Addenda, and Atomized Products Group— to engage with battery manufacturers, partners, and industry experts.

Through real discussions, insights, and forward-looking conversations, the campaign helps us understand evolving challenges and align our technical and commercial strengths to deliver practical, future-ready solutions for the lead-acid battery industry.

The “What's Next” campaign is uniquely successful in that it is raising awareness and spurring discussion of all of BCI's core values. By setting up targeted interviews with a wide variety of characters in the lead-acid battery market we help the industry as a whole to learn more about these core values and what can be done to optimize each of them depending on the topic and the interviewee involved.

The true beauty of “What's Next” is the inclusiveness and the product/company-agnostic nature of our interviews and discussions. While we as an Alliance (APG, Black Diamond Structures, and Addenda) can certainly assist battery manufacturers and battery end-users with our own products and expertise, what we are really striving for is to present different perspectives from all parts of the industry to analyze the critical issues we are facing.

Then we work to engage with the industry as a whole via social media and in-person discussions to present the right solution to that issue, regardless of personal gain to the Alliance.

The What's Next campaign is built on the premise of widespread engagement on the topics at hand. By bringing in battery manufacturers, battery suppliers, advocacy group representatives, materials science and battery chemistry experts, and other key battery representatives we can incorporate a wide variety of perspectives and access the vast knowledge base that is the foundation of the industry.

Then we open the floor via social media and any other available platforms to get other points of view involved.

The custom What's Next logo and intentionally concise interview sessions allow us to target a certain issue and then allow follow up engagement without getting too mired into minute details.

Via our combined LinkedIn pages (primarily run through Black Diamond Structures' profile) we have already achieved the following reach with our What's Next series, with the intention to continue to circulate and expand reach leading up to the BCI conference (can submit full data separately if preferred):

Since our launch of What's NEXT campaign we organically had

- Around 4,000 impressions
- Reached 7,108 members

And keeping our page at 12.53 % engagement rate on an average, it's just a matter of time to go viral.

Our objective with this campaign

is to bring attention to the current energy storage landscape, where emerging chemistries such as sodium-ion, lithium-ion, and flow batteries are rapidly expanding into applications traditionally served by lead-acid technology

Through this initiative, we aim to bring together the entire value chain — suppliers, OEMs, battery manufacturers, and industry partners — to share knowledge, exchange ideas, and promote innovation within lead-acid technology. By working as one community, we can improve performance, enhance sustainability, and expand the relevance of lead-acid in a rapidly evolving energy landscape.

This is more than a campaign. It is a collective effort to ensure the survival, growth, and long-term position of lead-acid batteries in the future of energy storage.

Together, as an alliance, we believe we can shape the future — and ensure that lead-acid remains a strong, competitive, and trusted solution for years to come. ■



This is more than a campaign. It is a collective effort to ensure the survival, growth, and long-term position of lead-acid batteries in the future of energy storage

Water Week: premature battery failure

Water Week is a multi-media campaign that Bulldog nominated for the product leadership section of the Amplify Award. It tackled a long-standing industry challenge: premature battery failure caused by neglect or improper watering. Rather than promoting a product in isolation, the campaign reframed battery watering as a critical performance and cost-of-ownership issue, positioning proper watering as essential to battery longevity.

By partnering with Flow-Rite, the campaign introduced best-practice watering solutions in a way that was educational, approachable, and actionable. This shifted the conversation from reactive battery replacement to proactive maintenance, helping both dealers and end users understand how small behavior changes can significantly extend battery life and reduce downtime.

Unlike traditional product related campaigns, Water Week was a campaign that our team created to combat the ever-present neglect of lead acid batteries. Pieces of the campaign include:

- long form YouTube videos
- an email newsletter
- social media cut-downs
- a dedicated water week video post

Battery watering is often overlooked because it is inconvenient, and our campaign demonstrates proper watering techniques while connecting maintenance with longer battery life and better cost savings.

The hope was to expose our customers (dealers and end users) to the importance of watering your battery correctly with a partnership with Flow-Rite.

Our hope was that customers would feel more confident in watering their batteries and dealers more confident with selling water kits/ explaining the need for a single point watering system.

We wanted to use a multi-media campaign with social, email and video to drive home the point and expose the audience to the message in a few different ways.

The audience for this media campaign are both end users and dealers since it takes both legs of the audience to understand and imple-



The video used dark lighting and familiar horror elements, which is odd for our business, to illustrate a higher stakes need for reliable power. The masked man represents that ever present danger of not having reliable power source.

ment better battery maintenance practices. If the end user isn't knowledgeable about battery maintenance and the dealer isn't either then we as the manufacturer need to educate them on best practices.

Product marketing — “Don’t Get Caught with the Wrong Battery”

Bulldog also nominated another campaign for the product marketing side of the Amplify Award. Rather than introducing a new product, this campaign innovated through message reframing shifting the conversation from product specs and capacity; to risk, consequence, and trust. Don't Get Caught illustrates the need for reliable power and what could happen if you don't have a battery you can trust.

We wanted to use a horror stereotypes to get across the need for a dependable battery. This is different from a lot of our industry content. Where competitors typically rely on safe, technical messaging. Don't Get Caught with the Wrong Battery used suspense, tension, and cinematic storytelling to break through industry noise.

The masked man serves a metaphor

for the constant threat of power failure

Competitors and the industry, tend to shy away from edgier pieces which is why the “Grim Reaper” that Stryten produced last year was so refreshing.

Rather than explaining the technical benefits in yet another “our batteries are good” video, we used the horror element to delight and educate the real threat of battery failure. The simple message is “If you can't trust your battery, you're always at risk”.

The video used dark lighting and familiar horror elements, which is odd for our business, to illustrate a higher stakes need for reliable power. The masked man represents that ever present danger of not having reliable power source.

The video was well received because of its dark, more cinematic tone and was a complete departure from the common media Bulldog Battery produces.

The audience that will be interested in this campaign is any end user that needs a more powerful product. Being stuck without a battery is the worst and Bulldog Battery strives to get customers a reliable power source in a timely manner. ■

Autobatteries.com: battery understanding

Autobatteries.com is a consumer education platform designed to help drivers understand car batteries in a clear, practical, and unbiased way. Its purpose is to provide reliable information, tools, and guidance so consumers can better understand their vehicles, recognize battery issues early, and make informed decisions with confidence.

The site was completely rebuilt as part of a coordinated, and education-first campaign. A core element was pairing the redesigned AutoBatteries.com website with a brand-new social media presence, including Facebook and Instagram, to create an education-first ecosystem geared primarily toward consumers.

AutoBatteries.com's Facebook page and Instagram account were launched simultaneously to actively bring that education to people where they already spend their time and increase engagement in a failure driven category.

Instead of waiting for users to search for help, this campaign proactively uses Facebook and Instagram to share battery education, provide seasonal reminders, and answer common questions. The social content drives users back to Autobatteries.com, where they can explore in-depth articles on how batteries work, compare different battery technologies, identify early warning signs of battery failure, learn how to test and replace their batteries, gain a better understanding of their vehicles, and use the battery finder to identify the best battery for their vehicle.

Most battery-related digital marketing efforts rely on search traffic or product-driven messaging, focused on a time of need or purchase. This campaign took a different approach by building a comprehensive educational platform and using social media to proactively reach and engage users.

Posts address real-world moments such as warning lights, seasonal battery issues, and common misunderstandings. That same educational content is expanded in greater depth on AutoBatteries.com, creating a connected experience rather than disconnected digital channels.

On social media, short, digestible content introduces key battery concepts in an easy-to-understand way



On social media, follower counts continue to grow month over month, and the campaign has reached more than 250,000 consumers across Facebook and Instagram since the summer launch.

without overwhelming the audience. On the website, those same ideas are expanded through structured articles, step-by-step guides, and visual explanations, allowing for deeper learning.

Visual design is a key driver of how this campaign educates and engages users across both the AutoBatteries.com website and its social media channels. AutoBatteries.com was refreshed with a strong emphasis on visual storytelling including images, diagrams, and infographics that immerse readers in the experience and make learning about batteries feel less technical and intimidating.

On social media, visual strategy plays a different but complementary role. Posts often lean into humor or unexpected visual concepts to capture attention in busy feeds and spark curiosity drawing users in and encouraging engagement with topics they might otherwise scroll past. Those moments of visual engagement then lead users back to AutoBatteries.com, where deeper educational content and tools are available.

Website analytics show that users are spending more time on educational pages and interacting more deeply with content supported by visuals and infographics. Social audiences on Facebook and Instagram are growing month over month, with visually driven posts consistently generating strong engagement and click-through to the site.

Overall reach for this campaign is driven through a combined strategy of social media audience growth and increased engagement on AutoBatteries.com. Since launching the refreshed

site and new Facebook and Instagram channels, both website traffic and social audiences have steadily increased month over month.

On social media, follower counts continue to grow month over month, and the campaign has reached more than 250,000 consumers across Facebook and Instagram since the summer launch. Posts consistently drive users back to AutoBatteries.com to learn more about battery basics, vehicle-specific considerations, and proper battery fitment. This growing exposure allows the campaign to introduce battery education to a broad consumer audience and build awareness beyond traditional search-driven traffic.

Together, these trends demonstrate that the campaign is successfully reaching a growing consumer audience, delivering educational content that holds attention, and encourages continued learning across multiple touchpoints.

The continued growth in engagement across the website and social channels demonstrates that drivers are seeking out education that respects their time, intelligence, and real-world needs.

This work demonstrates that education-led marketing can make a meaningful impact. By prioritizing clarity, accessibility, and human connection, the AutoBatteries.com refresh and social media launch elevates how battery education is delivered and proves that thoughtful design and content can transform a traditionally overlooked topic into one that consumers actively engage with and value. ■

The Battery Crank Up Revamp

The BCU Revamp is a groundbreaking newsletter that redefines how AAA and CAA clubs communicate and engage with members about their mobile battery service.

By introducing a dual-content strategy, quarterly issues, and monthly marketing blasts. This reimagined approach ensures timely access to content, enhances operational planning, and keeps battery service top of mind year-round. With measurable results, creative enhancements, and future scalability, the BCU Revamp sets a new standard for innovation in the battery industry.

The BCU Revamp represents a transformative leap in how AAA and CAA clubs communicate, engage, and deliver mobile battery service messaging. Originally launched as a monthly newsletter, the BCU has evolved into a dynamic, data-driven platform that integrates automation, personalization, and sustainability principles.

The BCU Revamp prioritizes environmental stewardship through a digital-first strategy, eliminating printed materials and reducing its carbon footprint. By leveraging cloud-based distribution and centralized asset management, it minimized waste and optimized energy use.

Future goals include integrating AI-driven content optimization to reduce redundant campaigns and further decrease resource consumption, aligning with AAA/CAA's commitment to a greener tomorrow.

Safety and cost

The platform delivers secure data handling, strict compliance with privacy protocols, and robust content validation to prevent misinformation while promoting accuracy across all clubs.

To further strengthen safety awareness, we provide dedicated educational resources. These assets empower members with practical, proactive guidance that supports safer driving behaviours and reinforces AAA/CAA's commitment to safety-driven communication.

The BCU Revamp delivers significant cost advantages by centralizing content creation and automation, reducing manual labor and design redundancies.



Compared to previous models, the BCU has reduced production costs by an estimated 30%, while increasing output quality and scalability.

Performance and uniqueness

The BCU Revamp introduces a dual-content strategy: quarterly issues and monthly marketing blasts. Quarterly issues are comprehensive newsletters structured by season, with content dedicated to each month in the quarter.

Monthly marketing blasts provide exclusive, bite-sized updates for larger clubs featuring a new social post, marketing tip, and editorial feature to encourage DAM use.

Results include a 53% increase in organic posts and an impressive 52% newsletter open rate from clubs, boosting overall engagement and growth. It has also increased operational efficiency with a 40% reduction in campaign preparation time.

Unlike traditional marketing tools, the BCU Revamp delivers a modern, data-driven communications ecosystem uniting AI-powered personalization, seamless cross-platform integration, and built-in gamification to elevate engagement across every club.

A standout differentiator is the program's integration of October Car Care Month, a nationally recognized

automotive awareness initiative that aligns perfectly with battery-service education.

During this campaign, clubs receive an enhanced package of seasonal, safety-driven content. This is designed to increase visibility, member readiness, and conversion at a time when vehicle and battery failures naturally rise. This strategic tie-in consistently translates into higher member engagement and a measurable lift in battery-related inquiries, testing, and sales, positioning the BCU as a proactive partner in member safety and revenue growth.

Quarterly social contests further amplify momentum, with October routinely generating peak participation and highly shareable success stories that are showcased in subsequent issues to recognize and inspire clubs.

Value

The BCU Revamp delivers measurable value beyond AAA/CAA. Its industry impact sets a replicable model for other service providers. The member benefits enhance awareness of battery safety, the Mobile Battery Service, and its convenience. Looking ahead, future updates could include a modular design that allows expansion into EV battery education and predictive maintenance campaigns. ■

Results include a 53% increase in organic posts and an impressive 52% newsletter open rate from clubs, boosting overall engagement and growth.

Armor Alloy

East Penn set out to develop an extensive marketing campaign targeted at battery decision makers and users in critical datacenter applications. Specifically, to showcase the features and benefits of East Penn's advanced lead battery technology featured in the new Deka HRC battery line.

The product features pure lead but also includes critical alloys that were scientifically proven to protect the battery — resulting in greater strength, durability and performance.

A campaign was needed to position and promote this new battery line and technology as a proven, long-life, established, and sustainable energy solution. The overall goal was to increase awareness of the product, drive traffic to the website, reinforce key messaging, and ultimately increase sales.

We started with intensive listening sessions with both internal and external experts to gain essential insight and determine the needs and critical issues of the industry. Based on the results we decided to create a completely new brand and campaign, position the product, and launch a multi-media campaign.

Finally we landed on a unique and visually descriptive brand: Armor Alloy.

The deliverables and execution of the campaign followed the structure of a product launch such as announcing the brand and product. However, where it differed from any other campaign, we've seen was that it made the customer and end user the focus of the campaign, rather than the focus on the product and its capabilities.

The primary goal was to have customers see themselves in the suit of Armor, protected by Armor Alloy. This made them part of the story.

Targeted core messaging:

- Created through years of scientific research which has resulted in today's most protected lead battery technology.
- Protected by the perfect blend of strategic alloys, pure lead, and strengthening processes.
- Ensures dependability, durability and uncompromised performance.
- Increased corrosion tolerance, conductive performance, tensile strength, shear strength, toughness, and hardness

One especially unique aspect of this campaign was a featured launch video that was developed with an original script and shot over several days by a professional film studio which included set design and a model.

The video described the challenges of the current market and technology, highlighted the benefits of Armor Alloy Technology, and how that would benefit the datacenter operator.

This video was initially launched at an internal sales meeting to much excitement and publicly launched at the 7x24 Exchange Fall tradeshow on a very large 12' x 8' LED video wall which was very well received.

Understanding battery technology can be daunting. That is why Deka Armor Alloy consists of three key and easy-to-understand attributes: Engineered Alloys, Compu-Press, and Hydroformation.

The campaign was created and developed in-house. This included logo design, hero image, coloration, animation and all element aspects. Each aspect from design style to colour palette was designed with strength, boldness, and futuristic elements to convey those themes across all deliverables.

The reach and execution of the campaign was delivered across multiple digital and traditional offerings. This included:

- New website – dekaarmorally.com
- Studio quality video – used on both YouTube and when launched at 7x24 Exchange Fall 2025 in San Antonio, Texas
- Technical whitepaper
- E-blast campaigns
- Blogs
- LinkedIn posts - including geo-targeting and videos
- Tradeshow launch – Launched at the premier North American datacenter show – sold out with over 1,500 attendees
- Armor Alloy Hero – created a high-end custom suit or armor that was worn in the booth to interact with show attendees and their families
- 12' x 8' six panel video wall that replaced traditional booth
- Photobooth kiosk with custom Armor Alloy background – attendee photos and lead generation



- Hero cards featuring the Armor Alloy Hero
- New tabletop booth graphic featuring Armor Alloy (additional display unit separate from video wall)
- Live social videos from show
- Show website ads and e-blasts to attendees
- Custom apparel for the sales team and as a VIP promotional item
- Unique branded show promotional item – lip balm (protection theme) with look/feel to fit campaign
- Digital advertising
- Product specifications sheets
- Press release

While all aspects of the campaign were well received and successful, the most concrete results were in the social, e-blasts, and tradeshow efforts.

The launch was in October, but East Penn's social posts started 30 days before. From October date to the end of the CY, 12 unique posts which tallied over 5,700 impressions, an average engagement rate of over 13% and a click-through rate of over 6%. There were more than 800 video views. The best post on the show floor had over 1,500 impressions, an engagement rate of over 24% and a click-through rate of over 22%.

E-Mail blast campaign was successful and were sent out to a lead database of over 10,000 prospects and featured an open rate of 32% and a click-through rate of 4.5% — both well above industry standards. This campaign also provided close to 1,000 unique clicks/redirects to the website.

In 2026, the campaign continues to go full speed incorporating the aspects from 2025 and also creating new opportunities such as an additional e-blast campaign (10 planned e-mails), featuring both designed and personal emails, a graphic novel featuring the "Adventures in Armor Alloy", additional videos, and a VR experience for the next 7x24 event in 2026 Fall. ■

Explaining: Recycling and Metals Unit

By unveiling to the country Moura Group's new **Recycling and Metals Unit** in Pernambuco, Brazil the largest investment in our history — we presented more than an industrial facility; we showed why battery recycling is essential to ensuring a secure and circular energy future.

The narrative placed recycling at the center of an agenda that unites industrial development with environmental preservation. By making the step-by-step recycling process and lead recovery visible, we highlighted how this approach reduces pressure on raw-material extraction, lowers emissions, and strengthens more resilient value chains, fully aligned with global best practices.

The direct connection with the “*Nova Indústria Brasil*” program — especially its Green Economy pillar reinforced our position as a reference in responsible innovation, demonstrating that sustainability is not a complement: it is a structural part of how Moura thinks, invests, and does business.

In the end, the campaign didn't just tell a story about batteries — it told a story about the future, about how an industry can grow while generating positive impact, and about the essential role circularity plays in Brazil's and the world's energy transition.

The campaign's originality stemmed from the boldness of turning an industrial inauguration into a public movement to elevate Circular Economy — the essence of ESG within the organization.

A unified message

Rather than adopting the traditional format, Moura chose to integrate Communication and Institutional Relations into a unified message directed at internal audiences, the industry, and the broader national discussion around industrial policy, regional development, and the future of lead use in Brazil and its impact on clean energy.

The narrative gained strength because it was grounded in real, deeply impactful facts:

- the largest lead-recycling plant in Brazil, the result of a historic R\$850 million investment;
- doubling national recycling capacity to 140,000 tonnes a year;

- solidifying Moura as responsible for about 40% of all lead recycled in the country;
- an operation powered by 100% renewable energy, aligned with the company's climate commitments;
- the creation of over 300 direct and indirect jobs in Belo Jardim, strengthening the local economy in the semi-arid region.

The campaign translated technology and sustainability into social purpose. Lead was positioned as a critical resource for global energy transition — whose value only endures through responsible recycling.

This approach resonated with opinion leaders, authorities, and especially the surrounding community. The symbolism of the new unit led Brazil's acting president, Geraldo Alckmin, to publicly recognize the facility as strategic for the country's new industrialization phase, acknowledging its contributions to low-carbon value chains and green industrial policy.

The impact extended far beyond Moura's walls: in less than 24 hours, it reached 6 million people, generated over 100 spontaneous media stories, and sparked a wave of social-media posts from state governments and federal agencies — all reinforcing the central message: lead recycling is not just an industrial process, it is a socio-environmental legacy.

Few campaigns in the sector achieve this level of institutional and social resonance without paid media, relying solely on purpose, concrete data, public relevance — and, above all, on our people, who echo and amplify our actions with pride. Here, originality came from transforming an industrial milestone into a national conversation about a more sustainable, safer and more human future.

The campaign's clarity emerged from the decision to transform highly technical topics — such as lead recycling, reverse logistics, industrial safety, and the circular economy — into simple, understandable, and relevant content for anyone, even outside the battery sector.

We explained that lead is one of the most circular materials on the planet, with recovery rates reaching 99% and that Brazil — thanks to initiatives such

as the Moura Environmental Program — already recycles 140,000 tons of batteries per year.

We presented the cycle simply: from consumers to retailers, from transporters to the recycling center, and back to new batteries through recovered lead and plastic. We showed not only environmental benefits, but also social impacts — job creation and regional development — illustrated with real testimonials and process videos.

The numbers spoke for themselves, but in a human way:

- over 300 direct and indirect jobs created in Belo Jardim;
- Brazil positioned as an international reference in lead circularity;
- protection of 347 hectares of Caatinga, one of the country's most threatened biomes;
- emission reductions through oxy-combustion and exclusive use of clean energy;
- strengthened regional income and support for green manufacturing.

Extensive reach

The campaign demonstrated its strength not only through its message, but through the scale of mobilization it achieved. Within hours, the narrative about the new Recycling and Metals Unit transcended Moura and reached the country:

- nearly 6 million people reached in 24 hours;
- more than 100 spontaneous media stories, including Tier 1 outlets;
- media value equivalent to one third of Moura's entire annual ESG performance. This reach wasn't bought — it was earned.

The governor of Pernambuco and the mayor of Recife amplified the narrative to over 3 million people, while official federal government and vice presidency accounts projected it to a combined audience of more than 4.7 million followers, adding legitimacy and institutional reach.

In person, the impact was equally symbolic: the event gathered municipal, state, and federal authorities, industry leaders, suppliers, community members, and employees — a complete ecosystem validating Moura's role as a protagonist in the ESG agenda and in large-scale lead recycling. ■

The Optima Unleashed show

OPTIMA, the battery company, hosted OPTIMA Unleashed, a week-long motorsports showcase at the 2025 SEMA Show in Las Vegas in November.

Outdoor exhibits have become a hallmark of the SEMA Show, transforming parking lots into immersive destinations filled with featured vehicles, interactive displays and live motorsports, noted the release. “The SEMA Show provides OPTIMA with a unique platform to showcase our brand directly to both businesses and enthusiasts,” said OPTIMA marketing director Cam Douglass. “Our activation allows us to demonstrate performance in real-world conditions, giving attendees an authentic experience they can see, hear and feel. The opportunity to engage with the industry and the public in one place, plus generate content to share with those following online, is what makes the SEMA Show so valuable to us.”

The OPTIMA Ultimate Street Car Invitational (OUSCI) competitions showcased how dependable, high-performance batteries are essential to vehicle control, data systems and safety when performance margins are razor thin.

The OPTIMA Tech Team staffed a dedicated education hub where attendees could engage directly with experts to diagnose issues, learn charging and maintenance best practices, and discuss the differences between AGM and lithium technologies.

This real-time troubleshooting and product education helped drivers, builders and everyday enthusiasts understand how correct setup, care and power management maximize safety, prevent premature failures and extend battery life. Additionally, more than 130 OPTIMA-powered cars, trucks and unique builds were on display, enabling visitors to explore wildly diverse power demands, from trail rigs to drift cars to EVs. Builders and pro drivers were available for one-on-one conversations, connecting innovation in design and engineering to tangible real-world applications and helping enthusiasts understand how OPTIMA technology fuels performance across categories.

By merging high-stakes perfor-



By pairing high-energy motorsports with direct education and accessible experts, OPTIMA Unleashed turned complex technical concepts into intuitive understanding

mance with accessible education and direct human interaction, OPTIMA Unleashed made battery technology visible, essential and exciting, advancing BCI's core values of innovation, safety, essentiality and sustainability in a format that inspired both learning and participation.

Instead of banners, static displays and sell sheets, OPTIMA took over an entire outdoor footprint and turned it into an interactive ecosystem, where enthusiasts could see, touch and experience power in action.

The activation uniquely blended multiple engagement layers: professional drifting demonstrations, the OPTIMA Ultimate Street Car Invitational competition, tech walk-throughs, charging tutorials, and Q&A sessions with OPTIMA's in-house experts. Attendees could watch batteries pushed to their limits on the track, then step directly into a Tech Team Station to learn why performance mattered and what differentiated OPTIMA's products.

OPTIMA Unleashed made complex battery technology simple by translating it directly into lived experience. Instead of relying on charts or product claims, the activation showed how OPTIMA batteries performed in high-pressure environments — on the track, under load and in real time.

Professional drift drivers put OPTIMA-powered vehicles through high-stress runs that pushed electrical systems, auxiliaries and engine management systems to the limit. Ride-alongs allowed attendees to feel the impact

themselves, understanding concepts like voltage stability, instantaneous power delivery and repeated cycling not through explanation, but through visceral, first hand demonstration and interaction.

By pairing high-energy motorsports with direct education and accessible experts, OPTIMA Unleashed turned complex technical concepts into intuitive understanding, making battery technology clear, memorable and meaningful for every audience.

The design of OPTIMA Unleashed was intentionally built around movement, sound, and live action, using the track itself as a central visual element. With professional drifting demonstrations, live OUSCI Speed Stop competition, and constant vehicle activity, the activation was inherently eye-catching and impossible to ignore within the SEMA environment.

Branded vehicles in motion, tire smoke and engine noise created a high-energy spectacle that drew attendees from across the Las Vegas Convention Center.

Rather than relying solely on static displays, the OPTIMA Unleashed aesthetic leveraged real-time performance as its primary visual asset.

Attendance: 160,000 motorsport athletes with 25 ride-alongs given and 430 consumer engagements

Adjusted advertising value: \$16,000 branded social posts and 142 impressions \$2.9 million

Consumer leads captured: 9,644

More than 130 OPTIMA-powered vehicles were showcased across the footprint, enabling attendees to explore wildly different power demands, from drift cars and trophy trucks to EVs and the OUSCI competitor vehicles. Builders, pro drivers and their crews were accessible throughout the week, turning brand storytelling into genuine dialogue and allowing enthusiasts to learn directly from the people who rely on OPTIMA technology every day.

OPTIMA Unleashed didn't just showcase product performance, it elevated the entire category and demonstrated how batteries play a foundational, essential role in automotive innovation. ■

Positioning LDES for the future

The campaign objective was to educate data center operators, utilities, and infrastructure stakeholders on a new class of long-duration energy storage designed for large, volatile loads by replacing oversimplified battery marketing with technically grounded, accessible communication.

This positions the work as deliberate, time-bound, and campaign-driven without pretending it was a flashy launch. It was held between January and December 2025.

The campaign introduced a new way of communicating long-duration energy storage by shifting the conversation from chemistry novelty and duration alone to system architecture, power stability, and real-world performance.

Rather than marketing storage as a generic energy asset, the campaign reframed it as infrastructure. Messaging focused on continuous power conditioning, microsecond response, safety, and operational stability for data centers and other large, volatile loads. This approach helped audiences understand how long-duration storage behaves within modern power systems, not just how long it discharges.

Innovation was expressed through disciplined messaging choices that avoided buzzwords and speculative claims, favouring technical accuracy, transparency, and application-specific explanations.

Restraint and harmony

In a market crowded with aggressive claims and simplified comparisons, the campaign distinguished itself through restraint, clarity, and technical honesty.

While many energy storage campaigns prioritize speed, cost curves, or chemistry breakthroughs, this effort focused on explaining why architecture, control, and safety matter for infrastructure-scale deployments.

The campaign deliberately avoided broad claims about market dominance or generalized use cases, instead addressing specific operational challenges faced by data centers and grid operators.

This disciplined approach created a clear contrast with prevailing

industry marketing and positioned TerraFlow as a serious, credible voice focused on long-term reliability rather than short-term hype.

The campaign focused on translating technically complex concepts, including power volatility, grid interaction, and long-duration system behaviour, into clear, usable language for infrastructure decision-makers. Content was segmented by audience and delivered through written technical materials, structured presentations, earned media, and industry speaking forums.

This approach allowed the campaign to elevate the quality of conversation around long-duration energy storage while maintaining technical credibility and precision.

Focused conversation

The campaign targeted data center operators, utilities, infrastructure investors, and industry stakeholders engaged in grid-scale energy systems.

Execution spanned earned media coverage, industry speaking engagements, customer-facing materials, and direct sales support tools. Throughout 2025, the campaign supported increased inbound engagement, higher-quality technical conversations, and expanded visibility within industry forums focused on grid reliability and long-duration storage.

By maintaining a consistent message across channels and audiences, the campaign successfully advanced understanding of long-duration energy storage as a critical infrastructure solution rather than a speculative technology.

This campaign was intentionally designed to prioritize education, technical accuracy, and long-term credibility in an industry often shaped by oversimplified narratives. Rather than positioning energy storage as a one-size-fits-all solution, the work focused on clarifying where long-duration systems create the most value and how they behave within real power systems.

This campaign advanced core values shared by the battery industry, particularly essentiality, innovation, and safety, by demonstrating

how energy storage can be communicated responsibly as critical infrastructure.

The campaign emphasized the essential role of long-duration energy storage in supporting grid stability, large-scale load growth, and the reliability requirements of critical infrastructure such as data centers. Rather than framing storage as optional or supplemental, the work positioned it as foundational to modern power systems.

Innovation was presented as disciplined engineering applied to real-world system challenges, reinforcing the importance of architecture, control, and reliability over novelty-driven claims.

In contrast to prevailing narratives that oversimplify storage performance or prioritize speculative claims, this work focused on factual system behavior, defined use cases, and deployment realities. The campaign avoided abstract positioning in favor of concrete explanations grounded in operational context.

Dealing with confusion

The campaign addressed persistent confusion around long-duration energy storage by providing technically accurate, accessible explanations of system behavior, grid interaction, and safety considerations.

Communication emphasized context, constraints, and tradeoffs rather than simplified comparisons.

The campaign engaged industry stakeholders across utilities, data centers, policy forums, and infrastructure investment communities through earned media, speaking engagements, and direct engagement.

By maintaining consistent messaging across channels and forums, the campaign contributed to broader understanding of energy storage as a safe, reliable, and essential component of modern power systems, reinforcing shared industry values around credibility and responsibility.

This campaign sought to model that responsibility by prioritizing technical integrity, safety, and real-world performance over simplified narratives. ■

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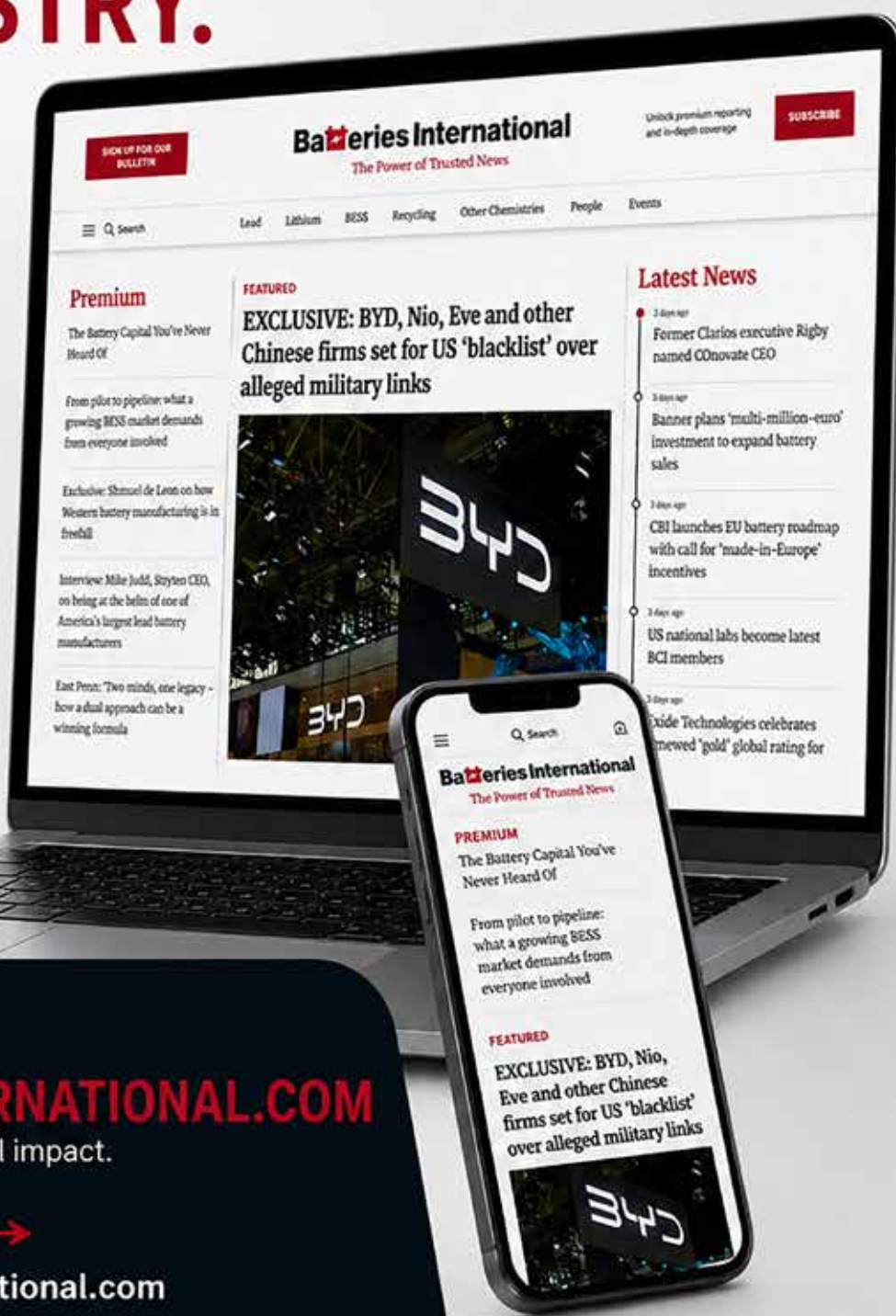
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EU environment chief praises lead recycling in Campine visit

EU environmental policy supremo Eric Mamer has praised the lead battery industry's near 99% recycling record as a good example of a functioning circular economy business model.

Eric Mamer, director general of the European Commission's environment directorate, was speaking during a visit in March to Belgium-based metals recycling and speciality chemicals group Campine — a member of the International Lead Association.

The ILA said representatives from the trade association joined Campine CEO Wim De Vos and his team to welcome Mamer at the plant in Beerse.

Mamer said: "During the visit, we learned how the recycling of batteries produces three key material streams, metals, plastics and acid — all of which can be recovered and reintroduced into industrial production cycles from the car industry to the chemical industry and for important applications such as fire retardants and marine cable isolation or even roofing products so many of us use.

"In today's geopolitical context, it is particularly pertinent to hear from and to support actors who are contributing to Europe's strategic autonomy, especially as part of the recovered materials are reused in European industry, including in sectors such as defence."

Mamer said talks at the plant included work the EU still has to do in supporting the circular economy, including on the difference in treatment between new and used batteries.

"It was particularly interesting to hear that around 80% of global lead demand is used for lead acid batteries."

De Vos stressed the essential role of lead metal and lead battery recycling as Europe's circular economy success story and reinforced the significance of lead as an essential metal for batteries and its use in a variety of applications.

Last October, Campine pledged to expand use of battery recycling and speciality lead manufacturing operations that the firm had acquired from Ecobat in France.

Campine said on October 1 that the

acquisition deal, including two battery recycling plants and one semi-finished lead-products facility, had been finalized on September 30. Together, the sites added 70,000 tonnes of annual battery recycling capacity and expanded Campine's downstream offering with lead anodes for the zinc and copper industries.

Mamer's visit to Campine came as ILA regulatory affairs director Lisa Allen called for Europe to protect the foundations of its existing industries while nurturing innovation.

Allen said in an article posted on the ILA's website on March 5 that as Europe moves to boost its industrial capabilities with the draft Industrial Accelerator Act — comprising so-called 'made in Europe' proposals — one aspect of the EU's approach to industry needs more attention.

"While it's great to see base metals being proposed for recognition as a strategic sector, policymakers still risk neglecting value chains and foundation industries that underpin the EU's economic strength and security today.

"Europe's lead battery value chain is just one home-grown success story, as it plays an essential part in a wide range of economically vital industries."

Allen said it is critical to build on the EU's existing strengths — from producing lead metal to recycling and battery manufacturing — while boosting new innovation and manufacturing capabilities.

Advanced lead batteries are not only manufactured across multiple member states, but the raw materials are supplied by European producers and recyclers. They are made in Europe and recycled in Europe.

"These are batteries used in conventional and electric vehicles, batteries that back-up datacenters and other essential services, as well as batteries in defence applications, ranging from armoured vehicles to submarines."

Europe is a centre of excellence for this strategically significant battery technology, with ongoing research and innovation taking the batteries to new levels of performance and durability, Allen said.

While it is important to strengthen the EU's battery capabilities in other technologies, legislators must



In today's geopolitical context, it is particularly pertinent to hear from and to support actors who are contributing to Europe's strategic autonomy, especially as part of the recovered materials are reused in European industry

— Eric Mamer, DG for the environment, European Commission

continue to nurture and support Europe's existing highly successful lead battery value chain.

"Above all Europe must create a battery eco-system that fosters all relevant technologies."

Batteries International reported on March 6 that battery industry leaders are calling for an urgent overhaul of the draft Industrial Accelerator Act, saying the move could discriminate against lead-based and nickel-based battery systems.

Trade body EUROBAT has said the proposed rules appear to tie BESS eligibility to the presence of a battery management system (BMS) alongside EU assembly and component requirements.

EUROBAT is calling for the "specific inclusion" of BMS-free industrial battery systems to ensure critical energy infrastructure and backup power is not excluded. ■

Clarios nears decision on making investment in US recycling plant

Clarios is close to a decision about where to launch a critical minerals recycling facility in the US, as the firm ramps up investment in the battery manufacturing supply chain.

Indiana, South Carolina and Texas have already been named as the first of several possible contenders for the new recycling centres — and Clarios said on May 8 it expects to have invested more than half-a-billion dollars in its US plants by the end of September.

The update came just over a year after the global lead battery major unveiled a 10-year, \$6 billion plan to expand battery manufacturing and help boost US energy and critical minerals independence.

These investments are increasing advanced battery production capacity to meet growing demand, improve competitiveness and make its factories better places to work for employees, Clarios said.

The firm said its increased

investments have been underpinned by section 45X of the Advanced Manufacturing Production Credit, which incentivizes the production of eligible components in the US — especially for clean energy technologies — allowing manufacturers to claim tax credits based on their production and sales.

Clarios CEO Mark Wallace said: “These investments demonstrate our commitment to US manufacturing, our employees, and building a more secure and sustainable energy future.”

The company operates 16 manufacturing plants across the US employing more than 5,500 in 32 states and supplying auto manufacturing and the aftermarket across America.

In 2024, Clarios expanded production of advanced low-antimony batteries in the US by 1.5 million units. In 2025, the company invested in upgrades to its facility in Oconee, South

Carolina, to increase battery component manufacturing capacity by 30 million parts.

Meanwhile Clarios has formally completed its acquisition of three lead battery recycling plants in Europe from Ecobat.

The lead battery major confirmed on May 4 it had completed the deal through which it will expand the European closed-loop battery supply chain and boost lead recycling capacity.

With all regulatory approvals now finalised, Clarios said it is integrating recycling operations in Freiberg and Braubach, Germany, and Arnoldstein, Austria.

The deal means a substantial increase in Clarios’ ability to recover critical materials, including lead and polypropylene, and reuse them in the production of new low-voltage batteries.

Werner Benade, Clarios EMEA president, said: “This acquisition is a strategic step forward for Clarios in Europe. By expanding

our recycling and material recovery capabilities, we are building a more resilient and sustainable supply chain that supports upcoming EU battery regulations and delivers real environmental benefits for customers and communities alike.”

Clarios told Batteries International last August it intended to continue operating the facilities it was taking over, which would bolster the firm’s EMEA presence with advanced recycling technologies and deep technical expertise including in lead and polypropylene processing.

Individual plant recycling capacity figures have not been disclosed, but a spokesperson said Clarios recycles around 8,000 vehicle batteries globally per hour.

In Europe, including the UK, the company collects nearly 100% of used lead acid batteries through certified take-back systems and partnerships with garages, scrapyards, and retailers. ■

Sunlight’s ReLiFe paves way for ‘industrial Li recycling’

European lead and lithium major the Sunlight Group has completed a three-year project aimed at expanding battery recycling tech capabilities.

Sunlight said on February 3 completing the ‘ReLiFe’ initiative included setting up a pilot lithium battery recycling unit, with a capacity of around 500 tonnes per year, at the group’s facilities in Xanthi, Greece.

The pilot has the capacity to process all types of lithium ion battery chemistry (such as LFP, NMC, LTO), confirming the group’s position as a provider of solutions for the entire spectrum of battery recycling, Sunlight said.

Focused on developing advanced LFP battery recycling

technologies, ReLiFe’s results demonstrate that critical raw materials can be recovered in a sustainable manner, the battery maker said. This directly strengthens the European circular economy and reduces dependence on primary mining.

Results from the project will form the basis for the next step — a ‘techno-economic due diligence’ study for an industrial-scale lithium battery recycling plant.

ReLiFe also mirrors Sunlight’s technical expertise in the management and recovery of metals from lead acid batteries at its recycling plant in Komotini, Greece.

That plant is one of the largest producers of

secondary lead in Europe and is certified by the EU Eco-Management and Audit Scheme.

ReLiFe project coordinator and Sunlight recycling expert Panagiotis Xanthopoulos said ReLiFe proved that LFP battery recycling is technologically feasible and economically viable.

“The successful completion of the project and the delivery of the pilot line in just three years is due to the excellent cooperation of the partners.”

Sunlight chief technology officer Nikos Tsiouvaras said: “Recycling is Europe’s new ‘mine’. It is the most responsible way to secure critical raw materials and strengthen our

industrial autonomy. We are transitioning to practices that significantly reduce our dependence on primary extraction and make the most of the resources we already have, laying the foundations for a truly sustainable and resilient energy chain.”

ReLiFe was co-funded by EIT RawMaterials — a European initiative driving innovation and competitiveness in the raw materials sector — backed by the European Union.

Collaborating partners included Germany’s Technische Universität Bergakademie Freiberg, the Helmholtz Institute Freiberg for Resource Technology and the Greenhouse Investment Group. ■



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EU-India calls for bids for joint lithium battery recycling pilot

India and the EU are calling for bids to build a joint pilot lithium ion recycling plant and transform battery waste in India into a ‘virtual mine’ of high-purity materials for new batteries.

A combined funding pool of €15.2 million (\$18 million) was set aside on May 6 to kickstart the project, which both sides say would mark a significant leap in bilateral cooperation to secure raw materials critical to economies in Europe and Asia.

Project proposals, which must be jointly developed by EU-India consortia that can include SMEs, start-ups, academia and others, should be submitted by September 15.

The partners said as demand for EVs surges, both the EU and India are prioritizing the recovery of strategic materials like lithium, graphite, and cobalt to reduce reliance on international imports.

A key feature is the establishment of a pilot line that enables real-world validation and industrial deployment.

Technical priorities should include high recover rates, involving advanced processes for lithium and CAM-ready purity.

Proposals should also demonstrate flexible recycling methods for current and future battery types and ‘digitalized’ collection and sorting systems to help keep batteries out of the informal, unregulated recycling sector.

Technologies should also highlight advanced diagnostics for second-life applications and active safety monitoring.

The call for proposals has been made under the framework of the EU-India Trade & Technology Council’s working group on green and

clean energy tech. Funding has been drawn jointly from the EU’s Horizon Europe program and India’s Ministry of Heavy Industries.

By 2030, India alone is estimated to have 128 GWh of recyclable battery capacity.

EU ambassador to India Hervé Delphin said: “Batteries sit at the core of the green transition, with their components far too strategic to be discarded after a single use.

“We are uniting European and Indian expertise into a single team to solve one of the most pressing challenges of our time. Our goal is to take these innovations

all the way from the development phase to real-world deployment— a move that represents a direct investment in our mineral security and our shared climate goals.”

Principal scientific adviser to the Indian government, Ajay Kumar Sood, said creating a robust domestic recycling ecosystem was essential for national resource security and environmental commitments.

“By integrating advanced digital solutions and engaging the informal sector, this collaboration will turn battery waste into a high-value resource, fostering an innovation-led virtual mine

that supports our vision of a sustainable, self-reliant future.”

Last January, Batteries International reported that Indian lead battery recycling giant Gravita had launched its first lithium recycling plant — converting EV batteries into black mass — in the country with an investment cost of around Rs14 crore (\$1.6 million).

Gravita said the newly-commissioned facility in Mundra, Gujarat — already home to one of the firm’s lead recycling plants — has a processing capacity of 145,100 tonnes annually. ■

US ‘super smelter’ moves ahead with Nyrstar-Korea Zinc deal

Plans to build a US-based super smelter and boost domestic supply of critical materials, including lead, have taken a key step forward with Korea Zinc’s acquisition of Nyrstar assets in the US.

Batteries International revealed last December that Korea Zinc was partnering the US government in building the smelter, at a total investment cost of \$7.4 billion, after lead was added to the nation’s list of critical minerals.

Trafigura-owned Nyrstar has now confirmed the sale of its US assets — including the East Tennessee and Mid Tennessee mining complexes and the Clarksville smelter — was completed on April 1.

Nyrstar said the deal received all required regulatory and governmental approvals, paving the way for Korea Zinc to work with the US departments of war and commerce to establish the 650,000m² smelting facility in Clarksville, Tennessee.

Under the terms of the agreement, Trafigura will continue to market and sell the Clarksville smelter’s total production of zinc metal and supply concentrate and oxide to the operation throughout 2026.

Korea Zinc said previously construction of the new US smelter will begin with site preparation in 2026, followed by phased commercial operations from 2029. The facility will process around 1.1 million tonnes of raw materials annually and produce a total of 540,000 tonnes of finished products.

The total of 13 planned products include industrial metals zinc, lead, and copper, precious metals including gold and silver and key strategic minerals such as antimony, indium, bismuth, tellurium, cadmium, palladium, gallium, and germanium. The list also includes sulfuric acid and semiconductor-grade sulfuric acid.

Design of the smelter will

be based on Korea Zinc’s Onsan facility in Ulsan, which it said is the world’s largest single-site smelter by production capacity, using world-leading smelting technology, optimal processes, and state-of-the-art control systems.

Nyrstar CEO Guido Janssen said: “It has been our privilege to operate in the US for almost 20 years. The Clarksville smelter and Tennessee mines have a proud heritage of producing high-quality zinc concentrate and metal.”

Batteries International reported last December that US commerce secretary Howard Lutnick had hailed the smelter deal as transformational for America.

“Our country will now produce, in volume, 13 critical and strategic minerals that are vital to aerospace and defence, semiconductors, AI, quantum computing, autos, industrials, and national security.” ■



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Lead batteries still a hit for BCI showtime in Nashville

In his final address as BCI chairman, Mike Judd told the trade body's Nashville Convention + Power Mart Expo in May to focus on the core business of the lead battery industry – reminding delegates that the products their companies make every day keep America running.

He said the road for lead batteries was still paved with opportunities, despite the rise of alternative chemistries such as NMC, LFP and sodium, urging delegates to ensure “we’re minding our own house and making sure that we’re improving the products that, for the most part, pay the rent”.

The ‘keep calm, carry on and innovate’ approach was also at the heart of a presentation on the second day of the event by lead industry stalwart and convention favourite, Ray Kubis.

Kubis, CEO of bipolar lead battery developer Silicon Joule (formerly Gridtential), focused on what he termed as the ‘technology squeeze’, taking his audience on a whirlwind tour of the globe’s manufacturing majors, battery chemistry runners and riders, and highlighting how the battery market is impacting everything from golf carts, to EVs, material handling and the booming data centre market.

In case anyone was in any doubt, he stressed it should come as no surprise that he favoured lead-based technology from Silicon Joule.

Nonetheless, Kubis said global battery makers that had achieved such scale, such as China’s CATL, had to be acknowledged.

CATL reported the equivalent of more than \$10 billion in after-tax profits in 2025. “I estimate, given the losses reported by so many others, that potentially that \$10 billion in profits was larger than the entire lithium-based battery sector last year, including CATL,” he said.

Food for thought indeed if you



“We’re minding our own house and making sure that we’re improving the products that, for the most part, pay the rent”.

include the rest of the Chinese, EU, and US players alone for 2025, from cell producers through to integrators. It was not easy to make money in lithium either last year, except for the very big players, Kubis said.

At CATL, there are 23,000 R&D personnel and a capacity of nearly GWh700 — which exceeds the combined lead battery capacity globally of about GWh600.

“The implications are many in the cost of production, purchasing and developments for incumbents and innovators anywhere in the energy storage space,” he said.

However, back in the land of lead,

Kubis said vehicle makers and other battery users had clearly recognised the continued improvement in lead-based batteries, noting that AGM products now represent over half of all new OE batteries used by vehicle producers in North America and Europe. And the replacement cycle impact for these is growing.

The CapEx to make today’s better AGM batteries is significant for all the familiar items such as rolling and punching, cast on strap, required formation capacity.

Not all companies are willing or can afford to make those investments, not just in the equipment, but

Pictures from the BCI Convention



Stephanie Wright and Lee Puckett (APG), LeAnn Gray and Nick Busche (TSB)



Andritz Sovema's Terry Hartman & Paolo Pighi with Natalie White, Andritz Bitrode



CBI's Alistair Davidson and BCI Favorite Pam O'Brien



Marianne and Terry Murphy (Hammond)



Jay Frankhouser, Brian Gunnin (CSB), Roger Miksad (BCI) and Eric Hill (CSB)



BCI names Hollingsworth & Vose 2026 Innovation Award winner



in the personnel and time to assure the tighter tolerances needed are achieved.

For those not willing to invest there, the obvious consideration is flooded battery capacity across different applications, he said.

“Meanwhile, lead battery prices have remained low and stable as an exception to other battery materials, owing in large part to the large recycling infrastructure.”

In what might be regarded as a bold prediction for some, Kubis suggested lead prices may possibly dip even lower in the mid-term based on two factors beyond the recycling flow...

The substitution shift in lithium in many applications may flatten global demand for lead (think of batteries for golf carts, forklifts, and other applications). Secondly, miners striving to supply against higher silver or zinc prices will continue to deliver lead as a mining by-product, regardless the value for the lead concentrates.

Whatever lies ahead, Kubis urged continued advocacy of BCI and others in terms of stewardship, collection and processing of used batteries beyond US shores — to protect critical materials in North America, particularly the US, and to protect environments.

He left his audience with a blast from

the past, borrowing a quote from former East Penn executive Bruce Cole, apparently said “after talking with some of the folks in the data center world”: It was basically S-O-L or S-O-L, meaning ‘speed of light’ or ‘shit out of luck’.

“That’s the perspective he shared, it kind of rings well for me and I think it’s fair.

“In some markets, they’re clearly moving slower, but some are moving very quickly. So, whether we compare to CATL, China or other companies and markets, we need to innovate as quickly as we can to deliver competitive system solutions.” ■

The rise and continued rise of the International Flow Battery Forum

Anthony Price turned a niche meeting of energy storage enthusiasts into an international forum shaping the future of long-duration energy storage.

When Anthony Price launched what would become the International Flow Battery Forum (IFBF) in 2010, he had modest expectations. The event was intended as a one-off gathering for a small group of specialists working in a technology that, at the time, sat firmly on the fringes of the energy industry.

Today, the conference attracts hundreds of delegates from around the world and is widely regarded as the premier international meeting place for the flow battery sector.

Yet for Price, the conference's success has never been measured simply by attendance figures. Instead, it has been driven by a simple philosophy: bring the right people together, create meaningful conversations and ensure every event reflects the rapidly changing world around it.

Price's own journey into energy storage began long before the conference was conceived. In the early 1990s, while working for one of Britain's newly privatised power companies, he was tasked with acquiring rights to a flow battery technology developed in the US and exploring its commercial potential in the UK.

Between 1991 and 2002, he worked to establish a flow battery business within the utility sector. However, when his employer was acquired, the new owners concluded that there was no future in energy storage and shelved the project altogether.

Rather than abandoning the technology, Price doubled down on his belief that energy storage would eventually play a critical role in the global energy system. He established himself as an energy storage consultant and became involved with industry organisations, including the American Energy Storage Association.

The idea for the IFBF emerged when colleagues in the flow battery sector approached him with a problem. Despite growing technical advances, flow batteries were receiving little attention on the conference circuit.

"They asked if I could run a conference on flow batteries because they simply weren't getting any presence," he recalls.

The first event was planned for around 30 attendees. Instead, more than 80 delegates arrived, including several who paid cash on the door.

What happened next surprised even the organisers.

Delegates enjoyed the event so much that they immediately asked for another one the following year. A one-off conference had inadvertently become an annual institution.

Over the following decade and a half, the forum expanded across Europe, moving between locations and developing its own distinct identity. Price believes that willingness to evolve is one of the reasons the conference has remained relevant.

Many industry events, he argues, risk becoming predictable by repeating the same formula year after year. The IFBF deliberately takes a different approach.

Each venue is selected not only for practical reasons but also because it offers a fresh perspective on the industry. Conferences have been hosted near manufacturing facilities, installation sites and technology developers, allowing delegates to see real-world projects in action.

"Every conference picks up its own identity," Price explains. "The venue gives you an opportunity to focus on different things."

That adaptability extends to the programme itself. A successful conference, he believes, must strike the right balance between technical expertise, commercial realities, politics, finance and business strategy.

One of the most common compliments the event receives, he says, is its ability to blend these different perspectives.

"We somehow manage to get the right mix of technical, commercial, business and political discussion."

That balance is increasingly important as the energy storage industry matures. When the conference began, most people had never heard of energy storage, let alone flow batteries. Today, the sector sits at the centre of some of the world's most pressing challenges, including renewable energy integration, energy security and the explosive

growth of artificial intelligence.

The industry's current focus, according to Price, is on scale.

Interest in very large flow battery installations is growing rapidly, driven by the need to support renewable energy projects and the emergence of vast data centres powering AI applications. Some facilities now require hundreds of megawatts of capacity, creating entirely new technical and commercial challenges.

As a result, conversations at the conference have evolved far beyond chemistry and engineering. Questions of manufacturing capability, financing, supply chains and geopolitics now dominate many discussions.

This year's programme reflects those shifts, with sessions exploring how the industry can scale production, improve performance, attract investment and navigate increasingly complex regulatory and political landscapes.

For Price, however, the most valuable aspect of any conference is often what happens outside the formal agenda.

He is unapologetic about the importance of networking and has built a reputation for ensuring delegates have opportunities to connect in informal settings.

"If people don't have a good time, they don't network," he says.

The results speak for themselves. Over the years, countless business relationships have been forged at the IFBF. Investors have met entrepreneurs, suppliers have found partners and students presenting research have secured careers in the industry.

In one case, Price reveals, a company that has since achieved unicorn status can trace its origins back to conversations held during a previous forum.

Those stories illustrate what he believes is the true purpose of a conference: not simply sharing information, but creating an environment where opportunities emerge.

Although Price transferred ownership of the IFBF in 2024, watching others take responsibility for an event he founded has not been difficult. He sees the conference as something that continues to grow and evolve.

"You are not handing over something static," he says. "You are handing over something that is still developing."

That outlook mirrors his view of the flow battery industry itself. Progress may have taken longer than many expected, but the sector is now entering a period of unprecedented opportunity. ■

INTERNATIONAL FLOW BATTERY FORUM 2026



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The Battery Show Europe

June 9-11

Stuttgart, Germany

The Battery Show Europe returns to Stuttgart, Germany, providing attendees with opportunities to learn how to navigate complex industry challenges and supply chain risks, network with existing and new suppliers and partners, and keep their business future-proof.

Connect with engineers, OEMs, Tier 1 & 2 suppliers and innovators shaping the future of battery and H/EV technology during three days of conference and expo education, networking opportunities, and face-to-face demonstrations of the latest technology and solutions from leading exhibitors across the globe.

This event is more than just a trade show, this is a strategic platform where the entire electrification eco-system comes together.

Reasons to attend:

Discover cutting-edge products and solutions Explore the latest in battery design, manufacturing processes, materials, and technological advancements.

- Network with industry leaders
- Forge strategic partnerships with OEMs, cell manufacturers, and Tier 1 integrators for future developments.
- Gather technical and strategic knowledge
- Learn how new R&D and innovations can optimise battery performance, cost, safety, and longevity.

Contact

<https://www.thebatteryshow.eu/en/home.html>

E-mail: thebatteryshowcs@informa.com

Phone: +44 20 8052 0660

ees Europe 2026



June 22-26

Munich, Germany

Each year, ees Europe, Europe's largest and most international exhibition for batteries and energy storage systems, provides a networking opportunity for the industry's key players, such as manufacturers, distributors, project developers, systems integrators, as well as professional users and suppliers – all under the motto “Innovating Energy Storage”. It focuses on the latest technologies, trends and market developments.

As part of this, the organizers of ees Europe, working together with the experts from the ees Europe Conference committee and the prestigious conference partners, have also put together a highly topical two-day program focusing on the most important market and technology trends for energy storage.

We welcome everyone who would like to deepen their knowledge of the latest developments and trends in the battery and energy storage industry.

ees Europe conference is particularly interesting for C-level managers, executive managers and decision makers of the solar industry, storage industry and energy industry, especially in the following areas:

- EPC / project development
- Business development
- Manufacturers / suppliers
- Energy supply / grid management
- Consulting
- Investment / financial consulting
- Research & development

The energy industry is evolving: renewable energy, digital technologies and economically viable solutions are already shaping tomorrow's energy supply. The four conferences within The smarter E Europe offer diverse insights – from innovations in solar energy and energy storage to e-mobility, charging infrastructure and smart grids with digitalized energy solutions.

Discover how electricity, heating and mobility are being efficiently integrated, which economic opportunities arise and which technologies are driving the energy future.

Connect with leading decision-makers, deepen your expertise and strategically grow your international network – actively shaping a secure and future-ready energy world

Contact

<https://www.ees-europe.com/conference-quick-facts>

18th Lithium Supply and Battery Raw Materials Conference 2026

June 22-25
Las Vegas, Nevada, USA

The 18th Lithium Supply & Battery Raw Materials Conference is the industry's largest and longest-running event, bringing together 1000+ delegates from 550 companies across 40 countries. It's where the leaders forge

partnerships, close deals, and tackle the critical issues and innovations shaping the sector's future.

With insights on supply-demand dynamics, pricing trends, refining tech, battery innovation, recycling and sustainability, this is the must-attend event for growth and data-driven decisions.

Contact
<https://globalevents.fastmarkets.com/>



Battcon 2026

July 26-29
Orlando, Florida, USA

The premier conference for end users, battery engineers, and manufacturers to learn, collaborate, and connect with experts and peers across the data center, utility, and critical power sectors.

Battcon is where battery engineers, manufacturers and end users come together to tackle critical power challenges — a must-attend event for professionals in data centers, utilities and other sectors relying on stationary batteries.

Stay ahead of the curve! Gain access to cutting-edge industry knowledge from thought leaders and experts. Stay informed on the latest trends, innovations, and future directions in the world of batteries, all from professionals shaping the industry's landscape.

Meet like-minded professionals, thought leaders, and innovators across the battery sector. Whether it's through informal receptions or structured meetups, you'll have countless opportunities to build

valuable relationships and explore new business prospects.

Gain in-depth knowledge from expert-led seminars covering the latest advancements in battery technology, standards and applications. These sessions provide a focused environment for technical discussions, giving you an edge before the main event begins.

Our workshops go beyond theory — participate in discussions, case studies and problem-solving exercises led by top professionals in the field. Whether you're troubleshooting battery system challenges or exploring emerging trends, these sessions offer valuable, real-world takeaways.

From relaxed evening receptions to structured networking meetups, Battcon's social events offer the perfect atmosphere to forge new partnerships and strengthen industry relationships. Expect great conversations, valuable connections and a dynamic mix of attendees from across the battery sector.

Contact
www.battcon.com

7th Oslo Battery Days Conference

August 24-25
Oslo, Norway

The 7th OBD Battery Conference will meet to discuss and provide a platform for technological innovations and business opportunities with the latest updates in that field in Norway and abroad.

Contact
www.oslobatterydays.com
E-mail: post@oslobatterydays.com
Phone: +47 90 73 91 59

ees South America 2026

August 25-27
São Paulo, Brazil

ees South America, recognized as Latin America's leading event dedicated to batteries and energy storage systems, is hosted at the Expo Center Norte in São Paulo, Brazil.

The conference emphasizes advanced storage solutions that reinforce energy systems with a rising share of renewable resources, while facilitating the integration of prosumers and electric vehicles.

Contact
www.ees-southamerica.com/home

Intersolar Mexico 2026

September 1-3
Mexico City, Mexico

Intersolar Mexico 2026 is an international trade fair and conference dedicated to the solar energy sector. Held at the Centro Citibanamex in Mexico City, the event highlights the latest innovations and trends in photovoltaics, solar thermal technologies, and energy storage.

It also provides a vital networking and business hub for manufacturers, distributors, investors, and industry professionals engaged in Mexico's growing renewable energy market and the wider region.

Contact
www.intersolar.mx/home

The Battery Show Indonesia 2026

September 2-5
Jakarta, Indonesia

The second edition of The Battery Show Indonesia will take place alongside the renowned Electric & Power



ELBC

15–18 September
Vienna, Austria 2026

2026's Premier **Lead Battery Innovation** Conference



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Indonesia and Data Center Asia – Indonesia events, fostering an exciting synergy across the energy and engineering sectors.

Scheduled for September 2–5, the event will cover the full battery industry value chain, from upstream research and development to downstream applications. As part of the globally recognized Battery Show series, it offers an exceptional platform for the Indonesian energy market to showcase its innovations and opportunities. The Battery Show Indonesia aims to spotlight the entire spectrum of battery technology, delivering valuable insights and business opportunities for stakeholders across the energy sector.

Contact

<https://www.thebatteryshowindonesia.com/>
E-mail: budi@pamerindo.com

Battery Tech Europe 2026

September 8-9
Barcelona, Spain

Battery Tech Europe 2026 is a must-attend event for professionals involved in developing new stationary and industrial battery applica-

tions, bringing together thousands of experts from high-value battery sectors.

Contact

<https://batterytechexpoeurope.com/>
E-mail: david.reeks@104-media.com
Phone: +44 1283 381 719

International Congress for Battery Recycling ICBR 2026

September 8-9
Berlin, Germany

ICBR 2026 is the international platform for reviewing the challenges faced by the battery recycling industry on a global basis.

For 31 consecutive years, ICBR has brought together the international community of experts and decision makers of the entire battery recycling value chain, including battery recyclers and manufacturers, collection organizations, OEMs, policy makers, materials and services providers, and many more.

Contact

Email: info@icm.ch
Phone: +41 62 785 10 00
www.icm.ch



ELBC 2026

September 15-18
Vienna, Austria

ELBC 2026 is the leading conference for lead battery innovation, uniting experts, researchers, companies, and suppliers from around the world. Its technical program highlights the latest advances in electrochemical research and technological developments, spanning applications from energy storage to automotive lead batteries.

The conference's technical programme showcases cutting-edge advances in electrochem-

ical research and technical improvements, covering key applications from energy storage to automotive lead batteries.

ELBC typically attracts more than 1,000 attendees who are actively engaged in lead battery innovation. The event is organized jointly by the International Lead Association and the Consortium for Battery Innovation.

Contact

<https://www.elbcexpo.org/>
E-mail: elbcexpo@ila-lead.org
Phone: +44 207 833 8090

The Battery Show North America 2026

October 12-15
Detroit, USA

Last year the Battery Show & EV Tech Expo 2025 brought Detroit to life with four days of innovation, exploration, and industry collaboration, celebrating 15 years of growth and progress.

Thousands of engineers, executives, and innovators came together to discover the latest breakthroughs from over 1,300 exhibitors driving the future of electrification.

With engaging conference sessions, exciting product launches, and vibrant networking opportunities, the 2025 event set a new standard for innovation and industry connection.

Each conference day kicks off with a notable keynote address followed by a roundtable panel of top industry leaders discussing the most important market disruptors.

Gain insights from 150+ thought leaders as they discuss the latest developments in battery chemistry, manufacturing scalability, EV integration, sustainability, and beyond.

There are five reasons to attend the conference

Focused conference tracks — gain clarity on critical issues like battery safety, recycling, and policy shifts, with strategies to tackle them head-on.

Keynotes from industry leaders — hear how executives are navigating disruptions in EV adoption, supply chain volatility, and investment uncertainty.

Actionable insights — leave with solutions to address your organization's challenges—whether it's cost reduction, scaling production, or regulatory compliance.

Interactive learning formats — participate in workshops and Q&As to get tailored advice on problems you're facing right now.

Collaborative networking — build relationships with OEMs, suppliers, and policymakers who can help you overcome obstacles and accelerate growth.

Held on day one of the event, six 3-hour workshops explore topics in great depth and breadth, offering a detailed and interactive learning experience on core subject matters in battery and EV tech.

In all there will be 136 hours of education and some 21,000 attendees are expected to visit.

Contact

<https://www.thebatteryshow.com>



2026

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www.ees-europe.com
- **AUGUST 25–27, 2026, SÃO PAULO, BRAZIL**
www.ees-southamerica.com
- **SEPTEMBER 1–3, 2026, MEXICO CITY, MEXICO**
www.intersolar.mx

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The Battery Show India 2026

October 22-24
Greater Noida, India

Welcome to the 4th edition of The Battery Show India, where innovation and expertise converge! Join us as we bring together engineers, business leaders, leading industry companies, and visionary thinkers from around the world.

Together, we'll explore cutting-edge advancements, unveil groundbreaking products, and create impactful solutions that will define the future.

Contact

<https://www.thebatteryshowindia.com/>
E-mail: Pankaj.sharma@informa.com
Phone: +91 99713 65776

Battery Recycling Expo 2026 (North America)

October 28-29
Atlanta, Georgia, USA

Battery Recycling Expo is North America's premier trade show and conference focused on battery recycling, reuse, and sustainability. This technology-driven event brings together manufacturers, recyclers, material processors, and industry innovators dedicated to advancing the circular battery economy and supporting a sustainable future for electric vehicles, energy storage, and consumer electronics.

Discover cutting-edge recycling technologies, recovery solutions, and circular supply chain strategies that are reshaping the industry. Join thousands of professionals at this free, two-day expo and conference to connect with battery recycling

experts, technology leaders, and policymakers driving the future of battery sustainability in North America.

Contact

<https://criticalmineralssexpona.com/battery-recycling-expo-north-america>
E-mail: info@trans-worldevents.com
Phone: +1 404 737 8307

Battery Asset Management Summit Europe

December 2026
Rome, Italy

The second edition of the Battery Asset Management Summit Europe was a remarkable success, receiving an outstanding response from the community. Europe experienced unprecedented growth in energy storage last year, installing a record 12GW, with Battery Energy Storage Systems (BESS) at the forefront of this expansion.

The 2025 Summit arrived at a pivotal moment for the industry. Building on the momentum of previous years, it focused on the evolving challenges faced by developers, operators, and investors in managing operational assets across the continent.

Contact

<https://batteryEurope.solarenergyevents.com/>
E-mail: larisa.barclay@informa.com



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