Batteries International

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Hook, line and sinker

Insurance fees to rocket for BESS fires

Solid state batteries: the next generation arrives

Urgent wake-up call as Europe slides into uncompetitive mess

Antimony shortages drive wedge into deep cycle profits

Why batteries are adding a new fillip to powered flight

TALES OF DARKNESS REVEALED: THE LAST WORD

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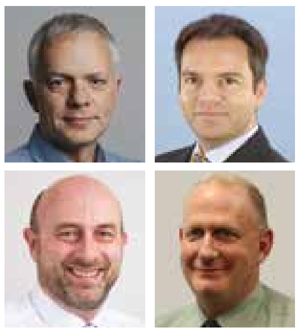

Industry focus: the year ahead 18-23

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Saddle-up! Fear and greed, that's what's needed in the wild west of energy storage…

Anybody who knows anything about investments has heard of Warren Buffet, once nicknamed the "Oracle of Omaha," for his insights on the financial markets.

At the grand old age of 94 and with a Forbes estimated net worth of $146.9 billion, he is still remembered for that famous quote: 'It's wise for investors to be fearful when others are greedy and to be greedy only when others are fearful."

Fear and greed. A lifetime ago, as a young financial journalist, I learnt those were the key ideas to inject into any investment story.

And it was never difficult to fit these powerful emotions into the very first paragraph. That way I grabbed the reader and took them on a journey right to the end of the entire article.

So, fear? "Are you going to miss out on the opportunity of a lifetime with this investment? The time to act is now!"

And greed? It's simply an oblique variation of fear. Just think of the money you could make. Don't we all kick ourselves today to think if we had made a $1 investment in Bitcoin in 2009 we would be worth $103 million today.

Just think — a hundred bucks then and you might be throwing a party on your super yacht with Musk, Bezos and Zuckerberg. Donald could even come too.

So why mention this at the start of a magazine about batteries and energy storage? The simple answer is that these are two major themes underpinning the direction ahead for all of us.

The fact of the matter is that the whole of the energy storage industry is up for grabs. That includes chemistries and technologies as diverse as lead, lithium, flow batteries, supercaps and many more.

Some buyers are looking for a quick exit. The predominance of private equity and venture capital firms in the sector is quite extraordinary given their investment timelines between buying and selling is rarely longer than five years.

Others are looking at it as a long term play on an industry that is going to be pivotal for the future of mankind. Could any of these tiny start-up firms pestering our news desk with outrageous claims be the next Apple or Amazon in the years to come? Could they be the next CATL or BYD?

Perhaps the oddest thing of all that investor turmoil has been one of the constant themes of the battery business for the past half century and probably more.

One only has to think of the merger and acquisition frenzy that characterized the last 30 years of the 20th century to realise that batteries — for both the manufacturers and their suppliers — have offered rich pickings to two generations of corporate raiders.

And, of course, what went up, sometimes went down too.

Who could have imagined in 1980 that the UK battery giant Chloride — then one of the top three battery makers in the world — would virtually disappear overnight?

Or that the huge Johnson Controls would reinvent itself as an Irish subsidiary of Tyco before being snapped up for $13 billion by the investment fund Brookfield Business Partners?

Who would have envisaged in the 1990s that Exide Technologies would have even filed for Chapter 11 bankruptcy protection three times since 2002?

The lead battery world outwardly prides itself as being a solid, respectable industry but, in fact, if there is one constant it is change.

As one commentator told us a decade ago, "the battery business is one of the most restless industries on earth — not even the airline business can compare with the changes we see year-on-year in this sector."

If fear and greed are the underlying themes in this ants-in-its-pants industry, it probably explains the palpable sense of unease right now as the lead battery world contemplates the future.

Forget brave talk from some of the leaders in the business. The CBI (Consortium for Battery Innovation) may be gung-ho about the future of lead, but that is in the nature of their endeavour — indeed, call it their mission. We too hope and believe that the CBI may be able to deliver tangible benefits within the next three years.

However, many also see their participation in the CBI as a last chance saloon, their last hope before the world of lithium finally destroys the lead battery universe.

And some are also, secretly, heading for the door.

For legal reasons we can't name three family-owned firms that we have on good grounds to believe are looking to be bought.

But what is certain is that some institutional investors are wary of them and not just because of an inflated price tag. Some are questioning the long term future of the chemistry. If lead is dead what will replace it?

Another fascinating feature of today's energy storage universe is that many investors are also — shock horror — questioning the long term future of lithium as the chemistry of choice.

The price per kWh may have plummeted in over a decade of invention — was it just $800kWh in 2015? — but another generation of game-changing battery chemistries are clearly just around the corner.

Sodium ion, solid-state batteries and even large scale flow batteries — think ESS and its iron-flow offering — may prove to make LFP and its variations something for the history books.

And if that happens where will the humble lead starter battery be?

It's practically the wild west out there — especially in terms of energy storage. It's a shame Clint Eastwood hasn't made an appearance yet, because not all players are ethical and decent.

Again, for legal reasons we can't name, but we know of at least four companies we believe are touting impossible technologies or are potentially criminal if it can only be proved.

And we can think of at least another half a dozen that are making extravagant claims almost certainly so close to the boundaries of reality that we are having trouble with our wilful suspension of disbelief.

Fear and greed have their corollaries: gullibility and stupidity.

So this all boils down to a lesson from another age. *"Caveat emptor, quia ignorare non debuit quod jus alienum emit"* as the Romans would have put it.

Put simply: *"Caveat emptor"*. Or in normal parlance with fear and greed being kept in balance: Buyer beware. ■

Mike Halls, editor

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Europe needs to face up to its needs to be competitive

Will Europe be seduced by the Italian Draghi act in 2025 wonders Steve Binks, senior director of regulatory affairs, ILA.

The European Commission will start the year with a raft of initiatives designed to answer the questions put to it in the report on EU competitiveness by Mario Draghi.

If you are of a sensitive nature and have an interest in the future of the European economy don't read this report.

The former Italian prime minister and central banker has penned a strongly worded critique that is designed to shock EU decision-makers into action and reignite stagnating growth. He pulls no punches blaming the failures of past policies on procrastination and a lack of co-ordination and cooperation.

It is an essay that reads more like a letter from a lost love, tinged as it is with sadness and regret.

Europe, he says, is stuck in a static industrial structure. There are no companies with a market value of more than €100 billion. "The lack of dynamism is self-fulfilling," he warns.

But he claims there is hope if — and it's a big IF — the EU matches its climate targets with a coherent economic plan to achieve them. He warns that failure to do so will run contrary to competitiveness and growth.

And so the newly-appointed president of the European Commission Ursula von der Leyen will publish a Clean Industrial Deal in February which is designed to do two things: maintain a focus on decarbonisation while committing to reindustrialisation and supporting European manufacturers. And it's a tricky balancing act.

All of Draghi's recommendations come with an eye-watering price tag. €800 billion a year to be precise. And that's on top of current budgets.

There has been a change in mood in Europe. In the corridors of power in Brussels and in Strasbourg there is real concern about Europe's future competitiveness, its ability to manage potential tariff wars, and the threat posed by China flooding the EU market with goods and undercutting EU companies.

For our industry and wider value chain there is the looming threat of regulatory pressures continuing to pressurise battery production and the use of lead in economically significant applications.

Whether it is the 2025 review of the 12V lead battery exemption to restrictions of the use of lead in vehicles described in the End of Life Vehicles Directive, or the raft of delegated acts in the new Batteries Regulation, it is important that policy officials and legislators understand the significant role of the battery and lead industry in Europe's industrial success, now and in the future.

So, if the time were ever right to make sure decision makers understand the importance of our industry — one that generates more than 180,000 jobs across many member states, making products and applications that underpin Europe's economic and social fabric — then it is now.

We are talking with an increasing number of legislators and officials and working with downstream users to increase awareness of the role the lead battery value chain plays in Europe's industrial future and the transition to a low carbon future.

The new Commission's work programme will soon be published, and we know there is a risk that there will still be a "rising weight of regulation" as Draghi calls it.

We need EU institutions to understand the value of our industry now, and to actively help it to thrive on the pathway to greater electrification. Delivering on the promises of the Critical Raw Material Act, reducing energy prices and finding solutions to risks created by Chinese overcapacity in goods required for the green transition are critical in this regard.

We may be just one piece in Mario Draghi's European industrial competitiveness and innovation jigsaw, but we are an essential one.

Beyond the battery capacity we already supply in Europe, there is massive additional demand for battery energy storage systems as part of a new and integrated approach to energy policy and security.

According to KPMG, advanced lead batteries could supply a major slice of that market, worth in excess of €12 billion, and help address some of the concerns about over reliance on imports of batteries from Asia.

With an uncertain outlook for Europe's economy, it remains to be seen if the presidency of Donald Trump will create the kind of economic ripples that will further shock Europe into action.

Or will China's efforts to shore up its economy with trillion-dollar fiscal packages, trigger a big response from European capitals?

As Draghi says throughout his report, Europe needs to collaborate more, co-ordinate and make the most of its "common resources" or face economic "paralysis."

In the year ahead we will see if EU decision-makers heed his advice by providing much needed economic incentives to European manufacturers and reducing unnecessary regulatory burden. ■

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Every two years, the battery and lead recycling industry's biggest names pack their bags and head to Asia for two of the most important conferences in our collective calendar. Here's what goes on behind the scenes to prepare for your arrival...

It's all go, go, go, in Borneo

BI: What made you choose Kota Kinabalu?

21ABC: Well, first off, KK — as the locals call it — is easily accessible because there's an international airport. It's a place where industry, commerce, and nature all collide in the best way possible. Think tropical paradise meets buzzing city life. For those who don't know, it's the capital of Sabah, Malaysia, and the gateway to Borneo, home to some of the most unique wildlife in the world (yes, we're talking about the famous Orangutans!).

Borneo is the world's third-largest island, and still contains some of the planet's most incredible flora and fauna. The equator almost divides the island in half, with the southern section belonging to Indonesia and the northern part divided between Indonesia, Brunei Darussalam, and Malaysia.

We'll be using the newly built Sabah International Convention Centre located on the waterfront to host 21ABC, while RECYCLE100 the 9th International Secondary Lead Conference) will be held at the Hilton Kota Kinabalu.

That sounds incredible. What can attendees expect from the conference itself?

21ABC: Planning for both conferences is well underway. We're lining up some top-tier speakers and workshops that will tackle the latest innovations, challenges, and trends in the lead battery sector. And we urge experts from within the lead-acid battery industry to contact us about presenting.

Our Call for Papers closes on April 4, and we've already seen strong interest — so expect a packed program with some less familiar surprises!

And if you're in the recycling and secondary lead space, you'll want to mark your calendar for RECYCLE100, which runs immediately before 21ABC at the Hilton Kota Kinabalu. It's the go-to event for anyone involved in the circular economy of batteries and attendance for this event has grown tremendously.

What about the exhibition? Any big news there?

21ABC: The exhibition is always a huge draw, and this year is no different. Booths have been snapped up fast, which is a great sign that the industry is more engaged than ever. Expect to see cutting-edge tech, meet key players, and maybe even form your next big partnership.

And we hear the One Minute Giveback is back — can you tell us more?

21ABC: Absolutely! This has become a staple of the event, and we're thrilled to have Sorfin Yoshimura supporting it again. It's our way of giving back to the local community. We'll be announcing which organization we're supporting soon —s o stay tuned!

Final thoughts: why should people make the trip to KK?

21ABC: Besides being a must-attend industry event, it's an opportunity to visit one of the most breathtaking destinations on the planet. Where else can you spend the day networking, connecting with suppliers, gaining insight from top-tier technical programs before unwinding with industry leaders at our well-renowned, signature evening events?

All this, and you've also travelled to one of the earth's most beautiful, unmissable places. KK is calling and we can't wait for September! ■

Kota Kinabalu in Malaysian Borneo will play host to the 21st Asian Battery Conference (21ABC) and the RECYCLE100 (9th International Secondary Lead and Battery Recycling Conferences). Both conferences will be held back-to-back September 1-5.

EnerSys CEO Shaffer to retire, O'Connell named successor

EnerSys president and CEO David Shaffer is to retire in the new year and will be succeeded by Shawn O'Connell — currently president of the company's energy systems global business.

EnerSys said on November 6 that Shaffer will retire effective May 2025 and that the board has appointed O'Connell as president and chief operating officer, with immediate effect, as part of a planned succession.

Upon Shaffer's retirement, O'Connell will also join the EnerSys board. In the interim, both will continue to work closely together to ensure a smooth transition, the company said.

O'Connell has served as president of energy systems global since November 2023, leading what EnerSys said was a significant business transformation that included reducing annual costs by nearly $50 million. He will continue leading that unit while EnerSys searches for a successor.

O'Connell joined EnerSys in 2011 and has held several leadership roles including VP of both EnerSys advanced systems and reserve power sales and service for the Americas, as well as president of motive power.

EnerSys chair, Paul Tufano, said Shaffer's leadership had transformed the group from a "traditional lead acid battery company with limited scale into a global leader in energy systems solutions".

The group has seen revenue grow under Shaffer's leadership by ~35% through strategic acquisitions and groundbreaking product innovations, Tufano said.

"Dave was also lead architect of EnerSys' lean operating system (EOS), an award-winning framework and a gold standard recognized amongst the manufacturing industry.

"His efforts have built a unique portfolio of smart battery and energy management technologies, including both lithium ion and lead chemistries, leaving an indelible mark on the company and our industry."

Shaffer said he was excited about the future of EnerSys and the entire market. He said O'Connell's ethics and character, commitment to doing things the right way, and natural leadership capabilities, have supported our customer and supplier relationships and added to our culture. ■

Partnership honour for SCHMID Group

Germany-based SCHMID Group has been honoured with the best new partner award from Chinese printed circuit board producer Founder PCB.


Heiko Vogel

SCHMID, whose industrial expertise and activities span sectors including battery storage, said on January 14 the award underscored the strong partnership between the companies.

Founder PCB, established in 1986, is part of the Huafa Group — a subsidiary of the Guandong province-based Huafa Technology Industry Group. The company operates advanced manufacturing facilities in Zhuhai and Chongqing and is set to start operations at a business unit in Thailand.

Heiko Vogel, CEO of SCHMID Technology Guangdong said: "Together we are committed to breaking new ground, achieving significant milestones, and advancing our industries while ensuring mutual growth and success." ■

Schneider Electric announces executive appointments


Frédéric Godemel


Chris Leong

Schneider Electric has appointed Frédéric Godemel as executive vice president for energy management, effective January 1.

Godemel, who started at Schneider in 1990, is taking over from Olivier Blum, who was appointed CEO last November.

He was most recently power systems & services EVP. He will become the new energy management EVP and is joining the executive committee.

Meanwhile, Chris Leong has been appointed chief sustainability officer and Jing Ren as EVP for strategy, brand and communications, also effective January 1.

Schneider said Leong's new mission will be to advance the company's sustainability commitments and goals.

Before this, Leong was chief marketing officer for a decade.

Ren will lead a newly formed strategy, brand & communications team and join the executive committee. ■

Ex-Daramic head Frank Nasisi passes away

Frank Nasisi, a former head of Daramic, died in his sleep on October 18. He was 84 years old.

Frank was born on a leap day on February 29, 1940 to Sarina and Salvatore Nasisi in Basico, Italy but immigrated to the US in his early 20s.

Frank was a mechanical engineer and served in a variety of positions at General Tire, and WR Grace before becoming the president and CEO of the multinational company Daramic. He travelled extensively for his job and represented the firm at a senior level while becoming a well known industry figure in 1990s and early years of this century.

He is survived by his sister Rosetta Nasisi of Boston, who lived in the apartment next to him, his sister Maria Tiano of Messina, Italy, his three children and grandchildren, and many nephews and nieces in Italy. ■

Auto sector group sustainability prize for Clarios

Clarios has been honoured for its commitment to sustainability by international automotive aftermarket trading group ATR.

ATR said on January 16 that its 'excellence in sustainability' prize had been awarded to Clarios for establishing best-in-class circular economy with a global footprint and demonstrating the highest engagement to the transformation of sustainable mobility solutions.

Clarios' VP for the EMEA aftermarket, Theres Gosztonyi, said the company was the first recipient of ATR's award, which was presented at the ATR International Preferred ATR Suppliers Forum in Germany held last month.

Clarios team at the ATR award presentation (from left) Alexander Bruchwald, senior international key account manager, Lisa Klein, director brand marketing EMEA and Bernd Evers, sales director EMEA.

VP for sustainability and corporate affairs EMEA at Clarios, Christian Rosenkranz, said: "Regulatory demands for lower emissions are increasing power needs for low-voltage batteries in all vehicles, driving up the demand for more advanced batteries.

"Circularity is essential for our sustainability efforts. Globally, 76% of the lead and 54% of the plastic in our batteries comes from recycled or remanufactured content."

Clarios' lead acid batteries are designed so that 100% of the battery materials can be responsibly recovered, recycled, and reused to make new batteries or other products.

Batteries International reported last year that Clarios had been recognized as one of the world's most ethical companies by Ethisphere for the second consecutive year. ■

Aschke takes over as Sunlight chief commercial officer

For the record Holger Aschke (pictured above) has formally succeeded Martin Hartmann as chief commercial officer of lead and lithium battery manufacturer the Sunlight Group.

Hartmann remains as a member of the board and a group shareholder.

Aschke has previously held various senior leadership positions in the energy industry, including EMEA president for EnerSys and VP of sales and marketing for Reserve Power.

He later served as MD of Germany-based Triathlon Holding, where he focused on business development and international.

Sunlight announced in July 2023 that it had acquired 100% ownership of Triathlon.

Labros Bisalas, CEO of Sunlight, said the appointment marked a new chapter for the group's leadership team. ■

Lohum appoints Exide's Mittal as CEO

Lohum, the lithium recycling company, has appointed Arun Mittal (pictured above) as its new CEO. It became effective at the end of November.

Mittal, who was previously MD and CEO of Exide Energy, has nearly 30 years of leadership experience in the battery industry. At Exide, he led lithium-ion technology initiatives for e-mobility applications and expanded the company's presence in southeast Asia.

Mittal stepped down from Exide Energy Solutions (EESL) on October 31. He has also ceased to be director of the company.

Mittal is a member of the Institute of Company Secretaries of India (ICAI) and the Institute of Cost Accountants of India (ICMAI).

Lohum has planned an investment of Rs1,000 crore ($118 million) to develop next-generation manganese-rich LMFP lithium-ion batteries over the next three years. Earlier in 2024, the company hired Tesla expert Chaitanya Sharma to lead the development of these advanced batteries.

Lohum says it has also signed several strategic agreements to accelerate growth, including an MoU with ReElement Technologies Corporation and American Metals to establish a battery recycling and repurposing facility. Additionally, the company signed an EV battery Futures contract with Stride Green and a black mass offtake agreement with UK-based Recyclus Group.

"I'm committed to driving Lohum's vision of fostering material circularity and advancing energy sustainability through the next stage of its growth," said Mittal. "Our goal is to lead the transition towards a more sustainable future by reclaiming critical minerals and minimizing our environmental footprint."

Rajat Verma, CEO of Lohum Corporation, said, "Arun's extensive background in the energy sector will be invaluable as we strive to enhance our position as a leader in sustainable battery materials. His strategic vision, operational excellence, and motivation for sustainability align perfectly with our goals of achieving zero waste and ensuring a responsible supply chain for critical minerals." ■

January's new chief exec of Trafigura

Richard Holtum (pictured above) took over as chief executive of Trafigura from January, becoming the group's third CEO after only 10 years at the company. He follows founder Claude Dauphin and outgoing chief executive, Jeremy Weir.

Insiders say that the rise of former Sandhurst-trained Holtum within the Swiss trading house, one of the world's largest, signals a new era for the company as it moves beyond its roots in oil and metals trading and expands into renewable power and gas.

Holtum joined Trafigura's LNG team in 2014 via its junior trading programme and rose rapidly through the ranks becoming global head of LNG and Gas in 2019 and playing a significant part in growing the company's integrated LNG and natural gas trading activity into a global business.

He was then appointed global head of gas and power in 2022, with responsibility for building Trafigura's presence in the fast-evolving gas, power and carbon markets. His job was expanded to include responsibility for renewables in 2023.

Board member Sipko Schat said Holtum would take the company "through the next phase of its evolution", and praised his record of building Trafigura's gas, power and renewables business.

He takes over following a series of changes at the top of the business in the past 12 months.

Before Trafigura, Holtum worked on rival trader Glencore's crude oil desk. Outgoing CEO Jeremy Weir, who held the position for over 10 years, will take up the task of group chairman on January 1. ■

ACE Green Recycling hires SVP Europe

Eric de Compiègne has joined ACE Green Recycling as its senior vice president of European operations.

He has over 20 years' experience in maritime logistics, offshore renewable energy, and decarbonization where he managed large-scale industrial and infrastructure projects across Europe, the Americas, and Asia.

For the past six years he was director of operations at EnergieIP a French-based start-up created in 2017 with the aim of re-thinking the world of so-called "smart building". French group ACOME, a manufacturer of high-tech cables and components for the telecoms and automotive sectors, took over EnergieIP in February 2022.

"The dynamic European battery market — across both lithium and lead — is at the forefront of sustainability and the circular economy. As ACE expands and grows, Eric's prudence, insight, and experience will enable and lead our developments across Europe," said an ACE Green spokesperson. ■

Eric de Compiègne

Trojan marks 100 years of battery innovation

Deep cycle battery manufacturer Trojan Battery is celebrating its centenary with a pledge to power ahead into the next 100 years with a commitment to increasing innovation and investment.

Trojan said on January 6 the company plans to expand R&D, boost products' energy density, extend cycle life, and use artificial intelligence for smarter battery management.

Founded in 1925 by George Godber and Carl Speer, the firm started as a small automotive battery repair shop and was acquired by C&D Technologies in 2019.

Today, Trojan is also a player in the lithium market, having unveiled its Lithium OnePack 48V battery last year that offers up to a 60-mile range on a single charge. The battery is revolutionizing the performance of golf cars and utility fleets, the company said.

Also last year, Trojan won Battery Council International's Amplify Award for generating awareness for its new advanced energy storage AGM battery. C&D Technologies had won the award the year before with its Power of the Plus campaign.

CEO Rick Heller said: "Trojan Battery's legacy is one of constant evolution and innovation. We've come a long way since our humble beginnings and we are extremely proud to be recognized as the leader in energy solutions.


Rick Heller

"As we celebrate this milestone, we look forward to charging into the next century with the same passion, quality, and commitment to excellence."

Batteries International reported last July that Tim Bossman had joined the C&D Trojan Organization as general manager of sales. ■

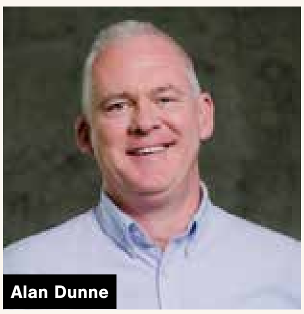
"We look forward to charging into the next century with the same passion, quality, and commitment to excellence."
— Trojan Battery CEO, Rick Heller

Alan Dunne named UK Aggreko MD

Aggreko has appointed Alan Dunne as managing director in the UK and Ireland which the company said was 'to strengthen its provision of energy transition solutions'.

Dunne has 30 years of commercial experience behind him.

He joined Aggreko in 2014 working in senior operational and commercial positions across Europe and North America. His remit is to develop strategic partnerships to provide 'flexible energy solutions, spearheading Aggreko's growth strategy'.


Alan Dunne

Robert Wells, Europe president at Aggreko, said: "We are committed to supporting our customers make their energy transition a success. We also understand that there are different challenges, regulations and variables that can impact achieving this in different parts of the continent.

"By appointing Alan as a dedicated managing director for the UK and Ireland, we can ensure we are working closely with customers there to find the right solutions for their needs."

Dunne said: "With the significant investment in new technologies, services and skills, and with further investments planned, this is clearly an exciting time for Aggreko and I am more than delighted to lead our continued innovation across sectors in the UK and Ireland." ■

EnerSys in 'most responsible' ranking hat-trick

US lead and lithium battery major EnerSys has been included in Newsweek's list of America's 500 most responsible companies for the third consecutive year.

EnerSys said on January 8 the listing underscored the company's commitment to environmental stewardship, social responsibility, and corporate governance.

Newsweek's annual ranking, supported by research and data firm Statista, evaluates the top 2,000 public companies in the US based on their performance across environmental, social, and corporate governance.

The assessment incorporates more than 30 key performance indicators, including energy usage, charitable contributions, and board diversity.

EnerSys CEO David Shaffer said: "We integrate sustainable practices into every aspect of our business, we not only enhance our operations but also contribute meaningfully to the global energy transition."

Batteries International reported in 2023 that EnerSys was making substantial progress in its drive to reduce operational carbon emissions, after the company pledged in an inaugural sustainability report to reduce its environmental footprint. ■

Natalia Scherbakoff joins Orion as CTO

For the record, a global specialty chemicals manufacturer with expertise in carbon black and battery additives, announced that Natalia Scherbakoff (pictured right) has been appointed the company's new chief technology officer.

She will succeed David Deters, who for nearly a decade led a global innovation program that, the firm said, "made Orion a leader in developing sustainable materials, battery additives and other technology in the carbon black industry".

Deters announced his retirement earlier this year and will remain with Orion until the end of 2024 to ensure a seamless transition.

Scherbakoff joins Orion from Trinseo, a specialty materials company, where she was the vice president of technology & innovation, overseeing global research, development and technology innovation with sustainability and circular solutions being a key underlying focus.

She also supported key growth initiatives as well as mergers and acquisitions. Scherbakoff was a member of Trinseo's Corporate Environmental, Social and Governance Council.

"Before Trinseo, Scherbakoff was the vice president of Research Innovation & Product Lines at Plastic Omnium, a French automotive supplier now known as OPmobility. She also worked as the general manager of Specialty Composites and the director of Global Innovation at Owens Corning, a building materials maker.

"Natalia has broad global experience, a track record of moving ideas through the development process to successful product launches and commercial savvy. She combines strong people skills with a passion for driving innovation and achieving tangible outcomes," said Orion CEO Corning Painter.

Scherbakoff is a non-executive board member at specialty materials producer Clayens NP and is also a member of the Forbes Technology Council. ■

UK BESS developer Apatura names Wildash CSO

UK National Grid veteran, David Wildash (pictured above), has joined renewable energy storage firm, Apatura, as chief strategy officer, the company announced on November 11.

Wildash, who was most recently head of connections at National Grid, will be responsible for boosting Apatura's grid connection portfolio to increase revenue and expand market opportunities.

"The UK energy sector is at an inflection point as the country makes key decisions on how to scale up its renewable energy capabilities," Wildash said.

"By collaborating across the renewables value chain — including developers, network owners, the system operator, and industry regulator — we can transform the UK's existing energy infrastructure and fast track progress towards cleaner energy and achieving net zero."

Apatura has secured planning permission plus grid connectivity and near-term connection dates for a range of high-value BESS projects across Scotland.

The company has a 10GW pipeline of clean energy capacity in development in the UK, including Scotland's largest energy storage pipeline.

Last month, Apatura said it received permission for a 100MW battery storage site near the city of Dundee in eastern Scotland. This followed approvals for five projects over the past year, including its 700MW Port Glasgow facility. ■

Sunlight's Bondelu takes control of French subsidiary

For the record, Sunlight has said it has acquired full control of its Triathlon subsidiary and that Arnaud Bondelu has been appointed as the new MD, succeeding Patrick Kuster, who is stepping down after 15 years of successfully leading the company.

Sunlight said Kuster was to provide support until the new year to ensure a smooth transition.

Bondelu has extensive experience in the energy storage market, with a strong track record in strategic planning, business development, and risk management, Sunlight said.

Lambros Bisalas, Sunlight Group CEO, said the takeover was an important step in one of the most exciting battery markets in Europe, offering high growth potential.

"This move also reinforces our commitment to supporting the talented team in France, ensuring a smooth transition and long-term success in the French market."

Bondelu said: "France is a key market for Sunlight Group and is currently undergoing a dynamic development, in particular when it comes to the adaptation of the lithium ion technology."

The French deal comes just over a year after Sunlight acquired 100% ownership of Triathlon in Germany. ■

Northvolt's Paolo Cerruti steps aside as CEO

Gridtential, the bipolar lead battery developer, has appointed Amber Hetzendorf (pictured above) as its new CEO.

She replaces John Barton, who stepped down after six years with the firm last July. In the interim, battery veteran Ray Kubis, chairman of Gridtential, and Roger Strauch, chair of The RODA Group filled in as co-CEOs.

Hetzendorf, who moves from Freyr Battery as an EVP for the lithium battery firm was previously a director at Koch Strategic Platforms.

Kubis said she would advance the commercialization and partnership plans for the company.

"We are continuing on our path targeting a $10 billion plus slice of the fast-growing energy storage market across multiple applications thanks to the performance potential of our bi-pole designs, complemented by low cost, safety, and low capital costs for our partners for production.

"These developments include new key personnel, funding progress, product focus, and partnership agreements."

Kubis said Gridtential had entered into a collaborative agreement with a major US battery producer to optimize design and process for that high performance, low cost and deep cycle product, and was now finalizing agreements in Europe and India to introduce those products into field trials." ■

Amber Hetzendorf joins Gridtential as new CEO

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In this new guest section of the magazine we invite those with a particular perspective on the battery and energy storage market to air their understanding of the issues affecting the industry. Mike Dunckley from Catalyst Solutions opens this section.

Lessons from Northvolt: a reality check for startups

The recent news of Northvolt's troubles was disappointing. The company had become a symbol of hope for a European-based and owned lithium battery industry, positioning itself at the forefront of the sector. At the time of writing, efforts are underway to salvage and possibly revitalise the company. Something will emerge, perhaps leaner, with more realistic expectations.

Those of us in the battery industry remember the immense hype and optimism that arose a few years ago about the redevelopment of a European battery sector.

We saw frequent diagrams mapping out where various companies would establish their operations across Europe, all pointing toward a projected 500 GWh of production by 2030.

This vision was largely tied to the rapid growth of electric vehicles, particularly cars. However, much of that momentum has faded, slowed by COVID-19, the war in Ukraine, and broader economic challenges.

Having been involved in multiple startups throughout my career, I know firsthand how difficult they are. I was a manager inside a major US startup (Vectrix), a board member of one of Europe's first lithium battery ventures in Finland (European Batteries), and involved in acquisitions and fundraising for many others.

What you learn along the way is that startups are incredibly tough.

They require constant battles to develop the idea, secure early investors, assemble the right team, and scale the business all under intense pressure. Investors push managers for updates, and there's an old but accurate saying: everything will take twice as long and cost twice as much as you initially estimate.

We may never know the full details behind Northvolt's struggles, but some facts are documented. The original plan was to build a 16 GWh plant at a cost of $4 billion, employing 2,500 people.

Many other companies were making bold claims about large-scale European battery production at the time, but Northvolt stood out because it was based in Sweden; an interesting choice given its distance from major car manufacturers and skilled labour pools.

The company projected full production by 2024.

By 2019, Northvolt had 300 employees and was still developing its own cell chemistry, yet it positioned itself as the "Tesla of the North". It was an ambitious vision, competing directly with Tesla, which was also scaling up at the time.

Progress was slower than expected, but the company continued to push forward, even building an R&D center in San Francisco, hiring aggressively, and raising ever-larger sums of money.

Its plans expanded from 16 GWh to 32 GWh, then to 40 GWh. By the time of its collapse, Northvolt had raised $13 billion, though much of this funding was pledged rather than delivered.

There are key lessons to take from Northvolt story. While this is just one example, the challenges it faced are not unique.

Securing investment is always a difficult pitch. A strong plan and the right team can inspire confidence and attract funding, but success is never guaranteed. Hindsight is easy, and this analysis is no exception, but there are underlying lessons for both investors and startups.

Mapping out the landscape for a new business is inherently tricky. When an industry rides a wave of excitement as the European battery sector did with the promise of a rapid shift to electrification companies rush to seize the opportunity.

The theory goes that whoever gets there first owns the mountain. But without a clear understanding of the road ahead, this approach is risky.

Some might argue that without COVID-19, the war in Ukraine, and the resulting European energy crisis, Northvolt's plans could have succeeded.

I am not so sure.

Why did Northvolt increase its planned capacity from 16 GWh to 32 GWh and then 40 GWh while still finding its footing?

Developing core technology and scaling production is already a massive challenge. Hiring hundreds of employees is another.

In today's corporate language, onboarding is a major task and new hires must be integrated, trained, and aligned with company goals. A few new employees can be a challenge; hiring hundreds before production is fully ready can be a nightmare.

Many likely joined Northvolt drawn by its bold vision, only to find that the reality inside the company was very different from the hype.

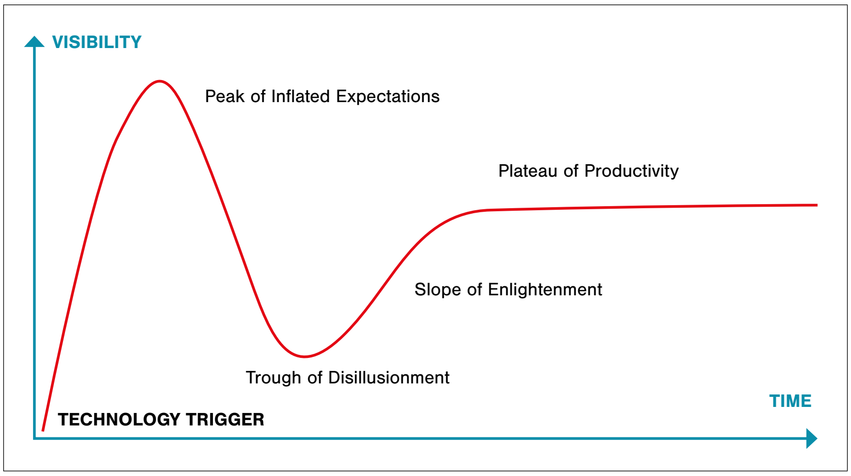
I firmly believe our society must transition to an all-electric future. We have no choice if we are to slow the environmental damage caused by industrialization and modern life. I also support ambitious entrepreneurs tackling these challenges. But it must be done pragmatically.

Every business needs a solid foundation with skilled and strong people, effective processes, and a proven product. From that base and when a product begins to emerge, the market (that is with real customers) will determine whether the business had had the right formula for success.

Some investors may disagree with this cautious approach. We all have our own perspective. But founding and scaling a business is complex. It requires careful evaluation of many factors, not just an aggressive push for growth. The Northvolt story highlights the risks of overinflated expectations, the challenges of executing such an ambitious project, and the flawed belief that simply pouring in more money will accelerate success.

Northvolt's trajectory follows a familiar pattern seen in many ambitious tech ventures. The well known, but still useful, Gartner Hype Cycle illustrates how new technologies often begin with immense enthusiasm and inflated expectations, followed by a trough of disillusionment when reality sets in.

In Northvolt's case, the initial excitement surrounding European battery production led to rapid expansion plans. However, as challenges in scaling, technology development, and external factors (COVID-19, war, and economic uncertainty) emerged, the company struggled to maintain momentum.



The hype and the reality of scaling, courtesy Gartner

Whether Northvolt (or a successor) will reach the plateau of productivity remains to be seen, but the lessons from this experience are valuable for any ambitious startup. ■

VOLUME, INNOVATION OR SERVICE: YOU CHOOSE

Recently, a series of discussions with a major Asian group about the changing dynamics of the global battery industry evolved into deeper conversations about future opportunities.

The focus was on the shifting role of lead-acid batteries as the primary energy storage solution and the rise of lithium and other advanced battery technologies. This is a critical issue for any legacy business built on lead-acid foundations.

One of the challenges businesses face is the willingness of management teams to accept risk and confront the realities of market conditions. Addressing these issues often requires delivering hard truths that are not always easy to hear.

Several key insights emerged from these discussions:

- Lead-acid is no longer dominant. The global vision of lead-acid supremacy from a decade ago is now contested by lithium, necessitating a new approach and industry evolution.
- A return to regionalism. Markets in Europe, North America, and Asia are increasingly diverging, with economic restrictions potentially reinforcing this trend.
- Organizational growth requires structural evolution. Expanding businesses must adapt their management structures
- Increased complexity demands skilled teams capable of driving organizations forward with clear, strategic plans.

These conversations led to an opportunity to collaborate with the company's leadership on the next phase of growth. Initial engagements involved sharing plans and ideas, introducing key account management concepts, and exploring strategies for future investments.

However, a critical difference became apparent: many Asian businesses continue to operate with a "push" mindset — producing standardized products in large volumes for global markets.
In contrast, a more customer-centric approach emphasizes deep, collaborative relationships with large, complex customer organizations.

These customers seek solutions rather than just products and value partnerships where knowledge is shared, with suppliers acting as integral contributors to their innovation processes.

While this distinction is easy to outline on paper, embedding such a shift within a different cultural and operational context takes considerable time and may not always succeed.

Every business must decide how to compete in the market. There are three primary strategies:
- **High volume/low cost**
- **Service leadership**
- **Technical excellence**

Each path dictates the business's identity, strategy, and investment priorities. Choosing the right approach defines how a company is perceived in the market.

Ultimately, the Asian company remained committed to a volume-driven approach — a valid strategy, but one suited to markets where price and standardized products are the primary drivers. An alternative approach would involve moving to a higher level of structure, learning, and innovation, building long-term partnerships that foster shared knowledge and drive future advancements.

This engagement provided valuable insights. In international business, it is essential to continually adapt and understand how markets, cultures, and industries evolve. Business moves faster than ever, and companies must not only capture opportunities but also transform themselves to stay ahead in a constantly changing environment.

Supply chain diversification to continue into 2025

Michael Lennartz,
chief technology officer, Nexeon

China has long controlled much of the world's mineral supply chains — producing 60% of the world's rare earth materials and processing almost 90%, giving them a long-standing monopoly on elements needed to produce electric vehicles, defence technologies, batteries, consumer electronics and more.

Moving into 2025, supply chain sourcing for these materials will continue to rapidly expand outside of China as the US and countries across Europe look to shift away from reliance on materials produced in the region.

Alternative supply chain and extraction methods for these critical elements is quickly growing in response to rising geopolitical tensions. In the years ahead, we'll see manufacturers increasingly invest in building infrastructure and leveraging regionalized partnerships to source critical rare materials.

I see an accelerating transformation in EV charging infrastructure. Particularly when it comes to electric vehicle technology, silicon-anode battery adoption is continuing to grow – with auto manufacturers like Mercedes, Porsche, and GM looking towards the technology in recent years to power better range and energy efficiency for their vehicles.

The number of charging stations in the US alone predicted to grow from 4 million in 2024 to 35 million in 2030 (as well as the electric vehicle supply equipment market forecasted to grow from $7 billion today to $100 billion by 2040).

In 2025 and beyond, these transformations in battery technology will directly drive advancements in EV charging technology across the globe to meet demand — as consumers and automakers alike increasingly adopt alternative battery technologies to power efficiency.

From our perspective 2025 will prove to be a pivotal year in silicon-anode technology adoption and advancement as manufacturers of electric vehicles and electronics look to meet surging consumer demand for high-performing products. ■

From our perspective 2025 will prove to be a pivotal year in silicon-anode technology adoption and advancement

Uncertain times for lead prices ahead

Neil Hawkes,
lead analyst, CRU

Perhaps tariffs may be aimed further downstream to slow the inflow of lead batteries into the US, to encourage the manufacture of more locally-made batteries to lift domestic lead demand

President Trump's US import tariff hiking — threatened vs actual — is going to remain the main focus of lead and other metals markets for many months to come. Lead has so far dodged this bullet and may well continue to slip under the radar, given the US's structural shortfall in lead.

Perhaps tariffs may be aimed further downstream to slow the inflow of lead batteries into the US, to encourage the manufacture of more locally-made batteries to lift domestic lead demand.

Though this would take a while for battery makers to respond, it would also have to be met with even higher lead imports in the shorter-term, as there is only limited spare US secondary smelter capacity to be utilised at the moment and large expansions would take time and money.

The wider world ripple effects of a US-led trade war threaten to shift supply chains, but also to rekindle inflation and dampen demand. That said lead demand could once again prove its resilience, given the importance of the replacement battery sector.

The real question around lead prices for 2025 is whether it can maintain a steadier path through these turbulent times. ■

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The growing void when legislative aspirations face the real world

Farid Ahmed,
international business development manager, Ace Green Recycling

I have little doubt that 2025 will be a pivotal year for batteries. Let's start with the new-ish European-battery regulations, due to come into force in 2031. Combined with national declarations about when individual countries will enforce a ban on ICE car sales, these regulations set ambitious targets that simply may not now be achievable.

There is a clearer gap growing between legislative ambition and practical reality, a dampening of sentiment towards certain battery chemistries and an elevation of attitudes towards others. And all of this is set against a backdrop of geopolitical uncertainty, restrictions on critical minerals trade and tariffs. Hopefully, by the end of 2025, the industry will have a better sense of direction.

For example, from these EU regulations, by 2031 85% of the total lead in batteries must come from recycling. We can make batteries with 100% recycled lead, no problem. But the total global lead production from recycling, ex-China, is 75% — a commendable proportion but, as around 90% of all lead is used for batteries, there just won't be enough recycled lead available to reach a minimum 85% across all batteries for Europe.

A similar dilemma exists for the required recycled lithium, nickel and cobalt contents.

In addition, EV penetration has rather stalled in Europe and North America, although still pushing ahead quite strongly in China. EVs produced in developed countries are still proving too expensive for most buyers, partly because Western automakers are too focused on higher-end vehicles with NMC batteries that produce better margins for them.

For EVs, buyers who want inexpensive 'everyday' cars may turn to low-cost Chinese cars powered by cheaper LFP batteries. To stay competitive in the global marketplace, it will take Western automakers to ramp up their focus on producing smaller LFP-powered EVs to snatch market share from the Chinese in 2025.

There are many indications that LFP will be the chemistry that supercharges the growth for both EV and energy storage systems in the coming year. Already, over 90% of new ESS deployments are LFP and many believe that the ratio of NMC to LFP for EVs will reach 60:40 in just a few years.

By the end of this year, we should have a much clearer picture of which Li-ion chemistry is leading the race. ■

There is a clearer gap growing between legislative ambition and practical reality, a dampening of sentiment towards certain battery chemistries and an elevation of attitudes towards others

Business chiefs back batteries as 'top climate tech investment'

Batteries are seen as a top choice for investments in climate tech this year, according to a Capgemini survey of international business leaders.

Climate tech priority areas — where 72% of executives plan to spend more — included batteries, which respondents ranked first, according to the Capgemini Research Institute's findings published this January.

Other climate tech priority sectors included in the institute's latest report, '*Navigating uncertainty with confidence — investment priorities for 2025*', included renewables, hydrogen, nuclear and carbon capture.

Capgemini said the survey showed business leaders feeling more confident about the year ahead than they were 12 months ago. More than 60% were optimistic about their organization's prospects for 2025, up six percentage points on the same time last year and up 20 points since 2023.

But in the current uncertain market environment, 56% expected to prioritize cost reduction over revenue growth for 2025.

Capgemini CEO Aiman Ezzat said technology has a key role to play to improve competitiveness and productivity, while reducing costs and making efficiencies.

"With a focus on innovation, supply chains and sustainability, which is increasingly being harnessed for its value-driving potential, leaders will set themselves up to succeed in an uncertain environment and build resilient, adaptable organizations."

A total of 2,500 business leaders from 2,500 organizations across 17 countries in North America, Europe and Asia-Pacific took part in the survey, which was conducted over a month toward the end of 2024.

Respondents were drawn from sectors including energy and utilities, capital markets and telecoms, with 70% coming from organizations with more than $1 billion in annual revenue. ■

Automation to reduce costs, add safety

Doug Bornas,
president MAC Engineering

Most of 2024 was let's try and wait out the US elections, the economy and everything else.

2025 is going to be people finally getting back to doing business the way it used to be done. We are going to see more investments into the future.

People are not only going to invest in the same things that have made them successful over the years but also into new and exciting technologies for the future of energy storage.

We are going to see a continued strategy of using automation, to not only reduce labour but to make it safer for the individuals who work in the plants. I see the future as still strong for the lead acid battery and I also believe most companies will continue to invest in alternative methods to compete in the market.

I am hopeful that prices (cost) may finally start to stabilize and that we can all start to relax a little bit that the prices will not be going up every day like they seemingly have been. ■

I see the future as still strong for the lead acid battery and I also believe most companies will continue to invest in alternative methods to compete in the market

The move away from a global trade model to regionalization

Scott Fink,
president, Sorfin Yoshimura

The world has been transitioning from a globalized world to a more regional model over the past several years.

Nearshoring, onshoring, regionalization… all are essentially terms representing the same trend. We are moving away from the globalized model where mass manufacturing had been centralized in the developing world.

Governments around the globe are investing heavily in local infrastructure. The goal is to create homegrown manufacturing and supply chains for the goods their populations consume.

This has had a positive impact on supply chains for materials routinely used by the battery world. Since 2020, lead times have become unpredictable, and this is not relenting. Volatility in freight costs has been challenging for buyers as well.

All of this has been financial inefficient for buyers forcing a lose-lose scenario to either increase inventory or spend wildly on rushed airfreight shipments. Local supply sources obviously minimize the risks of long transit routes. This type of regionalization will increase the number of supplier options for standard products, building a more robust supply network for customers to choose from.

Regionalization will also have a positive impact on battery manufacturing equipment that our industry consumes. As the level of automation increases, users need real-time service and support from vendor partners for electrical issues, programming, and mechanical issues that arise.

Bringing vendors and customers closer together will inherently increase communication between partners, lead to optimization of machines, increase uptime, and allow for even faster and more targeted innovations.

Finally, the environmental benefits of regionalization should not be ignored. Consuming products closer to the origin of their production will reduce transport-driven emissions dramatically. Obviously, this must be supported by solid environmental safety practices in the developing local manufacturing base; but legislation and common sense are already leading us in this direction.

Globalization trends of the last two decades is over and abruptly shifted to the creation of a more regionalized world. Sorfin Yoshimura is positioned appropriately to survive and thrive in a such an environment. Are you?? That's something to consider for 2025. ■

Bringing vendors and customers closer together will inherently increase communication between partners, lead to optimization of machines, increase uptime and allow for faster and more targeted innovations

As ENTEK reaches 40 years of service to the battery industry, **Shona Sibary** sat down with **Rob Keith** and **Clint Beutelschies** to talk about the origins of the Oregon based company and the successful path they've taken to become the world's largest manufacturer of lead-acid battery separators.

Four decades behind it, and a clear route ahead

ENTEK hit the headlines at the end of 2024 on the 40th anniversary of its founding. The firm which has been developing a new giga-separator plant in Indiana for lithium separators closed a US government loan to support the new manufacturing site dedicated to expanding this critical part of the battery supply chain in the US.

"The new plant is an important milestone for us," says Rob Keith, president of ENTEK's battery separator divisions. "We've successfully grown the business by understanding the market and supporting our customers time and again with investments to support their businesses with regional supply globally."

ENTEK was already committed to the Terre Haute community — it broke ground on the facility in September 2023 after scouting for the right location for over a year and construction is well underway — at over a billion dollars the new plant will be its largest investment to date.

The loan will help to finance the construction of a plant that will have capacity of 1.4 billion square metres of lithium separators. The plant will be an integral part of the US supply chain for lithium batteries critical for energy storage applications which support the electrical grid, provide backup power for data centers, and growing xEV applications.

We are the only separator supplier to offer separator products for all three major vehicle and energy storage battery applications (PE and AGM for lead-acid and lithium separators)

— Rob Keith, president of ENTEK's battery separator divisions

Beginnings

The firm has come a long way from 1979 when Peter Johnson and Jim Young invented a machine for enveloping microporous polyethylene membrane material for battery makers to use in separating the positive and negative plates in lead-acid batteries. The first design could replace 40 people manually stacking plates with leaf separators in a battery line.

In the early 1980s Jim Young was encouraged by General Motors to begin separator production, and in 1984 ENTEK International was launched to produce polyethylene (PE) separators. Relying on its roots as an equipment manufacturing company, ENTEK designed, fabricated, and installed its own battery separator production lines.

By 1998, ENTEK had gained a reputation for making excellent twin-screw extruders and process equipment for its own production facilities and identified the opportunity to design and produce its speciality equipment for applications beyond battery separators.

ENTEK Manufacturing Inc. (EMI) was created as a separate business unit to sell equipment to a variety of end use extrusion markets (packaging, construction materials, healthcare, automotive, etc.). Over the years EMI has grown and flourished, carving out an impressive share of the US market for process equipment.

In 2001, ENTEK International brought to market a new separator material for energy-dense lithium batteries and has been pioneering new processes ever since. It is this experience and expertise that it is leveraging in the new Indiana plant.

By 2006, the company was leading the market with its production of its RhinoHide branded lead battery separators in plants in Lebanon, Oregon and Newcastle-upon-Tyne, England. Since then, the business has grown through expansions and acquisitions and now has a global footprint of manufacturing operations with plants in the US, UK, Indonesia, Japan and China.

“The company has had 40 years of growth, innovation, and success behind us, and I feel like we’re just getting started”

— Clint Beutelschies, Clint Beutelschies VP of global sales

The firm’s strategic US investments in lithium battery separators began with the installation of two lines for Lithium-ion separator production, followed by an investment in a commercial coating line in a new clean room facility in Oregon, and continues with the expansion to Indiana.

Over the years Entek has also invested heavily in capacity and innovation. Beginning in 2001, ENTEK became the only US producer of wet process lithium battery separators, and the new Indiana plant will grow ENTEK’s capacity to serve the growing US lithium battery market.

“We already compete head-to-head with other well respected separator suppliers in the lead-acid market,” says Keith. “But we are also the only separator supplier to offer separator products for all three major vehicle and energy storage battery applications (PE and AGM for lead-acid and lithium separators).

ENTEK is the only US-owned and US-based producer of wet-process separators for lithium batteries.

“Thanks to the unique manufacturing approach we’ve developed, we can produce our ultrahigh molecular weight polyethylene separators with outstanding mechanical properties, performance, and relative cost,” says Keith, “we also have developed and are expanding our production of AGM separators for the growing production of AGM lead-acid batteries.”

ENTEK’s lithium separators can be customized to all battery designs and all existing lithium-ion battery chemistries — NMC, NCA, LMFP and LFP. ENTEK’s research department has also developed technological solutions to some of the new applications such as sodium, zinc, flow batteries and the like.

“Innovation is at the heart of everything we do. For example, our new Terre Haute facility will provide the lithium battery industry with best-in-class sustainable practices including a patented non-chlorinated solvent extraction process developed by ENTEK.

“This technology was pioneered by ENTEK and is currently operating on a commercial scale in our Oregon plant, providing an environmentally sustainable process that is beneficial to our employees, customers, and regulatory authorities in the communities where we operate. This is another example of how we live our core values of respect, integrity, commitment and innovation,” says Clint Beutelschies VP of global sales.

Once the new plant is up and running in 2026 it could well be producing almost half of the US requirement for lithium separators by the end of the decade and reduce reliance on economic competitors such as China.

The company’s approach has always been to work closely with our customers. ENTEK International joined the Consortium for Battery Innovation (CBI) in December 2021 as a partner in its research of lead battery technologies.

Beutelschies says: “CBI’s research focus ties in well with our own efforts for increased battery performance in sectors as diverse as automotive, industrial, and renewable energy storage. Frankly, we’re excited to participate in this group.”

CBI works with technology leaders such as ENTEK across the spectrum of the battery industry and has created a roadmap for identifying key research projects to advance lead battery technologies.

Although ENTEK is happy to work collaboratively with other companies and research groups, it has a world-class R&D group of its own. For instance, its patented next generation battery separator technology recently won the 2024 BCI Innovation Award last April.

Roger Miksad, BCI’s President & Executive Director said ENTEK’s

“Thanks to the unique manufacturing approach we’ve developed, we can produce our ultrahigh molecular weight polyethylene separators with outstanding mechanical properties, performance, and relative cost,” says Keith, “we also have developed and are expanding our production of AGM separators for the growing production of AGM lead-acid batteries.”

technology offers "a more environmentally friendly alternative that does not sacrifice strength or performance."

He praised the fact that: "Innovation is a core value and centred in ENTEK's culture and passion for using materials science expertise and technical capabilities to solve the industry's most complex challenges."

Over the years ENTEK has concentrated on perfecting its offering to the lead and lithium battery manufacturers through strategic partnerships and acquisitions.

In 2017, ENTEK acquired the Separindo battery separator plant in Indonesia and invested to triple the capacity. Following, in 2021 it acquired the battery separator division of Nippon Sheet Glass (NSG) in Japan and China, adding additional PE manufacturing capacity to its portfolio along with AGM technology and manufacturing capacity. "These strategic partnerships and acquisitions broadened ENTEK's product offerings, its opportunity to serve global customers, and added significant research and development staff to the team," said Keith.

In January 2022 ENTEK acquired Adaptive Engineering & Fabrication (AEF) a long time material handling design and manufacturing supplier to ENTEK's equipment division. The acquisition allowed ENTEK to offer integrated and standalone material handling solutions to its customers.

ENTEK said the acquisition was a "natural next step in the relationship and an opportunity to provide a more streamlined platform for customers".

The team at ENTEK sees opportunities at every turn and is strategically well positioned to execute and succeed within its core competencies – material science, engineering, and process technology.

"The company has had 40 years of growth, innovation, and success behind us, and I feel like we're just getting started" says Beutelschies. ■

"Innovation is a core value and centred in ENTEK's culture and passion for using materials science expertise and technical capabilities to solve the industry's most complex challenges."

— Roger Miksad, BCI's President & Executive Director

Above: ENTEK broke ground on the Terre Haute facility in September 2023 after scouting for the right location for over a year and construction is well underway (below)

"Innovation is at the heart of everything we do. For example, our new Terre Haute facility will provide the lithium battery industry with best-in-class sustainable practices including a patented non-chlorinated solvent extraction process developed by ENTEK"

Antimony price soars to $40,000 tonne with no near-term respite in sight

The price of antimony closed 2024 just under $40,000 tonne leaving battery manufacturers wondering how much further the price of the metal will go in the year ahead.

Antimony is a key alloy component in stationary lead batteries.

The price of antimony has risen by 250% since the start of the year. This follows a decision by China in August — that came into force on September 15 — whereby six antimony-related products became subject to restrictions of 'critical mineral shipments in the name of national security'.

It is this shortage, and the previous anticipation of a decision by the Chinese authorities earlier in the year, that has driven up the price.

"Deep cycle batteries using tubular grids require a much higher antimony content in their lead alloys than automotive alloys, using antimony typically up to 5% or more for strength and the greater fluidity needed to cast those long, thin grid spines. This makes up around a third of the lead in such a battery, so the extra antimony cost piles on quickly," said Farid Ahmed, VP global strategy & business development at Ace Green Recycling.

Another lead battery consultant told *Batteries International*: "I'm now receiving calls from manufacturers wanting to know what levels can be lowered without dramatically affecting performance and what alternatives are open."

And a third consultant approached by this magazine said he had already held a similar conversation about the subject.

The implications for battery manufacturers are serious. "For a couple of decades now, as most automotive batteries become maintenance-free, the industry was expecting to be awash with excess antimony coming back in scrap," said Ahmed.

"This hasn't happened because there's only been a very gentle downward trend towards reduced antimony content and, at best, recyclers are squeaking by with just enough of this alloying addition, while the majority are still forced to supplement their feed with expensive purchases of the pure metal to make up a shortfall.

"I'm now receiving calls from manufacturers wanting to know what levels can be lowered without dramatically affecting performance and what alternatives exist"

"On the upside for smelters, they are only paying for the antimony in scrap at the price of lead, but charging for it in finished alloys at elevated levels, if not right up to the price of new antimony.."

China produces around 48% of the world's antimony. (It also accounts for 63% of US imports of the metal.) According to DDIQ Analytics in 2023 Tajikistan also produced around 25% of the world's supply of the metal. This falls to 7% Turkey, 6% Myanmar, 5% Russia and 4% Bolivia. Australia has recently announced that it has gold-antimony mines that could soon challenge other countries' stake in the business.

Other industries aside from batteries use antimony most notably in photovoltaic cells — a rapidly growing area of business as well as fire retardants, ammunition and radiation shielding.

But how serious is this? One of the consultants who talked to *Batteries International* said: "We've had similar politically-induced shortages like this before. One of the odd things about these situations is that we tend to ride through them — or at least until the next alloy shortage of another metal happens.

"They loom large, for a while, and then fall out of sight."

China has also banned exports of gallium and germanium to the United States, but this will have limited impact as the US has stopped buying these critical minerals from China.

The US has already diversified its supply chains away from China where possible, buying more from southeast Asia. However, it is unclear in the near-term how they will be able to fill the gap now left by China.

China's dominance in critical minerals has fuelled concern about which other metals could be marked for the next round of export curbs. One analyst reckoned that manganese and bismuth could be targeted in the future. ■

US gold/antimony mine advances

Perpetua Resources announced on January 6 it had achieved a major milestone with the US Forest Service's issuance of the Final Record of Decision for its Stibnite Gold Project in the US state of Idaho. Antimony and gold are frequently found together — like lead and zinc — and gold is extracted from the antimony ore.

The FROD decision clears the path for the redevelopment of the only identified antimony reserve in the United States — "a project that could significantly bolster the nation's strategic mineral security," says the firm.

The firm anticipates that the project should produce an estimated 148 million pounds of antimony (67 million kilograms over its first six years), supplying roughly 35% of US annual demand based on 2022 consumption levels.

'Complex' price-fixing probe runs into second year

A probe into alleged price-fixing among major lead battery manufacturers is continuing into its second year, *Batteries International* has learned.

We last revealed in December 2023 that EU competition chiefs had accused Clarios, Exide Technologies, Banner, Rombat, Fiamm Energy Technology and its predecessor Elettra of possible collusion to fix starter battery prices, aided by trade association EUROBAT.

A European Commission spokesperson indicated to *Batteries International* on January 13 that "complexities" could see a long-running investigation.

The spokesperson said: "There is no legal deadline for the Commission to complete antitrust inquiries into anticompetitive conduct.

"The duration of an antitrust investigation depends on a number of factors, including the complexity of the case, the extent to which the companies concerned cooperate and the exercise of the rights of defence."

On November 30, 2023, the Commission informed Banner, Clarios (former JC Autobatterie), Exide, FET (and its predecessor Elettra), and Rombat as well as EUROBAT and its service provider Kellen of its preliminary view that they had breached EU antitrust rules by colluding to increase the prices of automotive starter batteries sold to car producers in the European Economic Area.

However, EUROBAT said subsequently that it would fight the claims.

Clarios has said that while it does not comment on pending investigations, the battery giant did not believe it had any material exposure. They have since been granted immunity. ■

Turkish antitrust ruling clears way for Mutlu Akü sale

The Turkish Competition Board has given the green light to plans for lead mogul Howard Myers' Quexco Incorporated business to acquire Turkey's troubled Mutlu Akü lead battery business from South Africa's Metair Investments.

The $110 million deal was revealed by *Batteries International* in September. It is understood that investigations into the deal had been first considered by Metair some five years earlier.

Metair said on November 12 that Turkey's competition regulator had issued a 'deemed approval' notice, after confirming on November 7 that its consent was not required for the sale.

A further announcement on progress toward fulfilling all conditions linked to the sale will be published in due course, Metair said in a Johannesburg Stock Exchange filing.

Batteries International exclusively revealed in February 2022 that Metair was looking to sell its Turkish operation, along with other battery firms that make up its energy storage division including Rombat and First National Battery.

A sale and purchase agreement between Metair subsidiary Metair International Holdings Coöperatief and Quexco Incorporated was signed on September 16.

Metair said the disposal consideration in respect of its entire shareholding in Metair Türkiye was around ZAR1.95 billion, based on an exchange rate of ZAR17.76 to $1 as of the signature date — payable in cash by Quexco, subject to conditions and customary adjustments, on an as yet unspecified closing date.

The value of Metair Türkiye's net assets as of December 31, 2023 was ZAR2.9 billion and the loss attributable for the same date was ZAR70.6 million.

Metair said the sale would allow it to primarily become an automotive component manufacturing business focused on South Africa, with a strategic focus on the sub-Saharan African mobility sector.

According to its 2023 annual report Mutlu's revenues were derived from local automotive batteries (81%), local industrial batteries (5%) and exports (14%). In total this meant that Mutlu sales contributed some 17% to Metair's group revenue.

The same annual report said: "Mutlu Akü has been an important part of the group since its acquisition in 2013. However, it operates in an extremely difficult macroeconomic and geopolitical context that, together with the current hyperinflationary environment in Türkiye, have introduced significant complexity in the business.

"In 2023, Mutlu Akü faced a number of additional challenges, including a shortage of contract workers and the loss of material export volumes, resulting in a drop in profitability, high debt levels and increased working capital."

Quexco is wholly owned and controlled by Myers as chairman. It was founded in 1984, with its predecessor entity dating back to 1974. ■

Port foils plot to smuggle waste lead batteries

Customs chiefs at the Dutch port of Rotterdam have intercepted a shipment of 825,000kg of used lead batteries on route to India.

The Dutch Transport and Environment Inspectorate said on January 14 it was called in to investigate after a total of 33 containers had been intercepted containing what was described as hazardous old and discarded lead batteries.

According to the agency, the origin of the batteries was Puerto Rico and Jamaica. The cargo was heading for processing in India — possibly in the unregulated sector.

There was no appropriate permit and the cargo was incorrectly labelled as comprising non-hazardous plastic waste and metal residues.

Agency officials said they had never encountered smuggling of hazardous waste on such a scale.

An agency spokesperson said: "Consider the potential injuries caused by corrosive acid in the event of incorrect or unsafe processing or recycling, or contamination of the soil and groundwater. It was also questionable whether processing in India would take place in a responsible manner."

The containers will remain in Rotterdam for the time being before, according to international law, being returned to the countries of origin.

The agency said it is working with authorities in Jamaica and the US to "find appropriate and safe solutions". ■

Here is my foot. Now can I shoot at it?

Nympholepsia. That's the word for it. A state of obsession for the unobtainable. The arrival of the latest EU legislation — CBAM — this January shows once more that Europe's politicians have an overdose of idealism but little understanding for the way businesses run.

CBAM stands for the Carbon Border Adjustment Mechanism. It essentially functions as a carbon tariff on imported goods to equalize the playing field between EU industries, which are subject to strict carbon emissions regulations, and foreign industries that may not face similar environmental constraints.

The tariff and related certification initially applies to carbon-intensive industries such as steel, aluminium, cement, fertilizers, and electricity — sectors that are at high risk of what it calls 'carbon leakage'.

However, other industries and business sectors will inevitably follow.

In the opinion of one European Commission observer: "in the long run, this is going to be a real and present danger to the energy storage and battery industry. Europe's politicians have proved themselves obsessional about decarbonization and have little to no understanding of the costs it might mean in practice."

The import of raw materials for the manufacture of batteries will result in a huge certification bill. One only has to think of the cost of extraction and the airmiles of moving lithium salts in the Atacama desert to Korea or China for processing before shipping batteries on to Europe.

The political thinking, however, sounds reasonable at first glance. How can Europe's industries be subject to rules limiting its carbon emissions when foreign firms aren't allowed to?

But in practice it imposes a huge burden on businesses. Not only will all industries have to find analysts capable of estimating the amount of carbon emitted during the manufacture but also calculate the cost of shipping it and a huge number of often unrelated unnumerables. How deep is the carbon number that you drill down into? How much cement was poured into building the factory? Or paving the road for the goods to be shipped at the port?

To obtain the required certification a new generation of expert bureaucrats will be needed. Not just to check the authentication of the industry's application but then to verify it on site, and then to enforce the rules, and then another level to check the rules have been enforced.

The extra cost of certification for the import of a large wind turbine, for example, has been estimated at around €900,000. If one were to retroactively certify — speaking hypothetically and for the sake of argument— the 107,000 wind turbines Europe already has, then a further €1,000,000,000,000 (approximately) would have been needed.

The result? The whole Aeolic industry which contributes to 19% of all electricity consumed in Europe would very likely not exist. ■

EU invests billions more to shore up EV battery plans

A €4.6 billion ($4.8 billion) investment boost for a range of technologies including EV battery cell manufacturing was unveiled by the European Commission on December 3 — in addition to a €200 million loan guarantee.

The Commission said the move aims to encourage proposals for net-zero technologies that are key to ensure the competitiveness of European industry while meeting agreed climate goals.

The loan guarantee, to be provided by the Commission in partnership with the European Investment Bank, the EU's lending arm, is specifically designed to spur fresh investment in Europe's EV battery-making infrastructure.

Once again, advanced lead battery technology appears to be sidelined under the partnership, which prioritises "technological innovations beyond basic cell or pack assembly" but excludes mining and extraction projects.

However, the partners said the loan guarantee could benefit battery recycling R&D.

Wopke Hoekstra, commissioner for climate, net zero and clean growth, said the Commission's partnership with the bank would strengthen the continent's battery value chain, manufacturing capabilities, and recycling processes.

The announcement which was welcomed by large parts of the industry were slammed elsewhere. One commentator said: "This wouldn't have been a foolish investment 15 years ago but it is now. This is quite simply bolting the stable door after the horse has bolted. The Chinese are so far advanced in almost all aspects of the manufacture of renewables and battery business we haven't a hope of ever catching up. Or catching them up economically,

"The same is true with the US which is still too late for the party. The European Commission have acted like bureaucrats trying to legislate before giving an industry a change to advance."

Batteries International reported last September that lithium ion batteries represented the EU's largest trade deficit of €19 billion ($21 billion) in 2023, amid intense global manufacturing competition.

The li-on deficit was also up more than 20% compared to the previous year, the European Commission's State of the Energy Union Report 2024 said. ■

"This wouldn't have been a foolish investment 15 years ago but it is now. This is quite simply bolting the stable door after the horse has bolted."

Chinese compliance solution for EU Battery Passport regulations

China's battery testing firm, Shenzhen Precise Testing Technology has formed a partnership with Minespider, a technology company offering a blockchain-based traceability platform and EU-compliant battery passports.

The partnership aims to simplify compliance for Chinese battery manufacturers and market players with EU Battery Regulations, as well as streamlining the flow of batteries between Europe and China.

From February 2027, all EV batteries, light means of transport batteries, and industrial batteries exceeding 2kWh must have a Battery Passport to enter the European market.

The Battery Passport is designed to address EU regulations on its manufacture location and source of its materials and includes information on the battery type, chemistry and performance details, as well as sustainability data.

"Our collaboration with Precise Testing Technology marks a crucial moment in streamlining compliance for Chinese battery market players entering and operating within the EU," said Nathan Williams, CEO of Minespider

"Battery regulation is complex and many points are yet to be fully clarified, with much uncertainty in place. At the same time, battery passports are the future. Each global battery market player will have to have a battery passport and enable seamless communication of important battery data across the supply chain. With the regulatory landscape evolving rapidly, this partnership couldn't come at a better time."

Meanwhile, 10 consortia representing some of the world's leading battery cell manufacturers have completed the largest pre-competitive effort to establish harmonized battery passports, the Global Battery Alliance said on November 7.

The GBA, a public-private collaboration initiative founded in 2017 at the World Economic Forum, said the move is a milestone towards more transparent and sustainable battery value chains.

All manufacturers involved worked with digital solution providers to determine provenance and flow of seven materials — lithium, graphite (artificial), aluminium, cobalt, copper, iron phosphate and nickel.

Cell manufacturers representing over 80% of the global EV battery market share mobilised their supply chains from mining companies to refiners, manufacturers and recyclers to participate in the pilots, including Contemporary Amperex Technology, Gotion High-tech, LG Energy Solution, Samsung SDI and Sunwoda Electronic.

Participating in the pilot allowed companies to benchmark their preparedness against the due diligence requirements of the EU Batteries Regulation, which will be implemented from 2025.. ■

Amara Raja confirms AGM tech deal 'first' with Hyundai

Hyundai is to become the first automaker to deploy 'made-in-India' AGM tech in partnership with Indian battery giant Amara Raja Energy & Mobility.

Hyundai Motor India will equip its domestic cars range with Amara Raja's AGM batteries, to be used as an SLI battery, as part of an existing procurement deal.

The vehicles are set to be equipped with the batteries during the 2024-2025 financial year — which in India ends in March 2025.

Amara Raja confirmed the agreement in a stock exchange announcement on December 19.

The move is in line with the commitment by Hyundai to supporting locally-sourced innovative technologies for Indian customers, the battery maker said.

Quantities of batteries to be provided under the agreement were not disclosed. However, Amara Raja said the batteries had successfully outperformed conventional 'complete maintenance free' batteries by about 150% in rigorous real-world durability tests.

"With a wider operational temperature and longer life span, AGM batteries are an apt fit for dynamic Indian driving conditions," the company said.

The batteries offer quick charging, longevity, low self-discharge, minimal maintenance and are ideally suited for vehicles with ISG (idle-stop-and-go) systems.

"A smoother start and better energy efficiency for higher electrical load in modern cars, are some of the added benefits of this technology."

Hyundai's chief manufacturing officer Gopalakrishnan Chathapuram Sivaramakrishnan, said: "We are poised to become the first auto original equipment manufacturer in India to introduce indigenously manufactured AGM battery technology in its products."

The car maker has an existing production plant in Chennai and is pushing ahead with plans for another plant in Talegaon, Maharashtra. ■

China cash boost to scrap old Li e-bikes for new lead models

China is increasing subsidies for the replacement of lithium battery e-bikes with new models powered by lead-acid batteries, according to state media.

The Ministry of Commerce is among government departments promoting the higher subsidies for trade-ins "given the higher safety performance and broader applications of lead-acid battery e-bikes", the Xinhua News Agency reported on January 23.

Local governments across the country are being urged to accelerate the approval process for consumers to receive subsidies — or apply subsidies directly at the point of sale.

According to Xinhua, old electric bicycles are already being recycled at the local scrap market price and dismantled, which the Ministry of Commerce said aims to phase out obsolete e-bikes that pose safety risks.

In 2024, the trade-in program saw over 1.38 million electric bicycles exchanged, with subsidy funds exceeding RMB600 million ($84 million), driving sales of around RMB4 billion, according to the Ministry of Commerce. ■

Ameren-Yuasa smart-charge innovation with advanced lead

US energy firm Ameren has commissioned a new EV fast-charging station powered by advanced lead batteries from GS Yuasa.

Battery Council International reported on January 8 that the smart-charge station and micro-grid platform at Ameren's St Louis campus will help power the firm's fleet vehicles.

Stationary batteries along with planned solar panels will provide critical energy storage support for a 1MWh microgrid.

Bill Moll, president of GS Yuasa Energy Solutions, said: "This innovative EV fast-charging facility by Ameren clearly illustrates the value proposition of advanced lead battery technology, and GS Yuasa is proud to support continued innovation in domestic energy infrastructure projects like this one."

By some estimates, the US will require 500,000 public charging points for EVs, with 100,000 fast chargers, which is almost 5x the footprint of current EV charging nationwide, according to BCI.

Roger Miksad, BCI president and executive director, said the real-world business case for advanced lead batteries proved the importance of end-users putting their applications first when selecting an energy storage solution.

"It's not practical or realistic to think that one kind of battery can rise to every energy storage challenge that the future holds. Instead, organizations focus on selecting the right battery for the right application." ■

Exide Technologies unveils new AGM and Li BESS

European lead acid manufacturer Exide Technologies has launched a new AGM battery and a lithium-based BESS for the telecoms sector.

Exide said on January 23 its new EK013 was a key addition to its automotive light vehicle AGN range — extending its coverage in Europe by a further five million vehicles.

Exclusively designed as a backup auxiliary battery, the 12V 1.2Ah EK013 is engineered to support automatic drivetrain electronics and gearbox electric oil pumps.

This addition will play an essential role in allowing motorists to drive their vehicles normally, even in the event of a malfunction or failure within the main 12V battery pack, Exide said.

Meanwhile, on January 30, the battery maker unveiled its lithium ion-powered Solition Telecom to support telecom base transceiver stations in stable, poor, and off-grid applications.

Designed for either new installations or a replacement for existing lithium or lead batteries, Solition blends battery modules, a built-in BMS and LiFePO4 cell chemistry.

Exide said this combination delivers exceptional reliability, performance, safety, and longevity including in extreme climate conditions.

Solition will be available in 100Ah, 150Ah, and 200Ah capacities (4,800Wh to 9,600Wh) and offer up to 3,500 cycles with a modular and scalable design, through which up to 15 units can be connected in parallel.

In a related move, on February 3, the company unveiled its 'Solition Powerbooster Mobile', targeting various off-grid uses such as for events, construction sites, or outdoor EV charging. ■

Eternity Technologies, Enexa launch Italy joint venture

Lead battery manufacturer Eternity Technologies is joining forces with Enexa to ramp up sales of industrial batteries in Italy.

The companies said on January 17 the 'Eternity Enexa' joint venture aimed to redefine power solutions for the material handling and reserve power markets in Italy.

The move combines Eternity's expertise in manufacturing high-performance batteries with Enexa's experience in providing industrial battery solutions.

Eternity CEO Mark Stevenson said: "By combining our strengths we are confident in our ability to support businesses in Italy with reliable, high-performance products that meet the demands of modern operations."

Enexa specializes in the sale and rental of industrial traction batteries for a wide range of industries. CEO Renzo Crivellari said the partnership with Eternity was based on a shared vision of expanding the industrial battery market.

"Under the Eternity Enexa brand, we will redefine industry standards and empower businesses in Italy to adopt more efficient and dependable battery technologies."

The agreement comes just three months after Eternity announced it had been chosen to supply full battery management systems for one of the Middle East's largest cold storage projects.

Under the deal with the Dubai-headquartered logistics major Ocean Fair International Group, Eternity is deploying its QUASAR Motive Power range.

QUASAR was selected for its exceptional performance, efficiency, and reliability, which are all key factors for the demanding conditions of cold storage environments, Eternity said.

Details of the project were not disclosed, but Eternity said its advanced technology had been chosen for its optimal battery management, which was needed to provide the power required to maintain the integrity of temperature-sensitive products while minimizing energy consumption and operational costs.

This collaboration underscores our commitment to enhancing the region's logistics and supply chain capabilities, Eternity said.

"We are proud to play a role in fostering a sustainable and efficient energy future in this rapidly growing market."

Eternity launched its QUASAR Carbon Nano Gel Bloc in March 2022 to serve global markets and demanding applications such as light traction, leisure and solar. ■

Sunlight eyes efficiency boost in systems overhaul

Sunlight Group, the Greece-based lead and lithium battery manufacturer, said it expects to boost production efficiency by 40% after a major upgrade of the group's software systems.

Sunlight said on January 14 it has also expanded its global business, digital and IT team, including setting up a new IT hub in Germany.

The battery maker said the implementation of the new cloud-based enterprise resource planning (ERP) software SAP S/4HANA was needed to streamline operations and maximize synergies follow the rapid growth of the group through a series of acquisitions and an expansion of operations in recent years.

Sunlight said the move was achieved without any disruption to its three Greek factories and core activities across its entire Greek operations including battery production, recycling, shipping and invoicing.

The ERP software, which Sunlight said significantly improves decision-making processes and data analytics, will be implemented in phases across the group's entire operations globally and should be completed by 2026.

The consultants involved in the implementation of the project were Deloitte Business Solutions, Real Consulting and StepOne.

Sunlight CEO Lampros Bisalas said the move would unlock the full potential of its recent acquisitions. ■

Asahi Kasei, Honda agree to form separator joint venture in Canada

Asahi Kasei and Honda announced in November that they had signed a shareholders' agreement to convert an existing Asahi Kasei subsidiary called E-Materials in Canada into a joint venture to be renamed Asahi Kasei Honda Battery Separator Corporation (provisional working name).

The new venture, should start manufacturing the base film and coating of Asahi Kasei's Hipore lithium battery separator in 2027. The aim is to make 700 million m2 per year of coated film.

Honda Canada will acquire a 25% stake by subscribing to new shares to be issued by E-Materials through a third-party allotment. Honda will invest some C$417 million (approximately $300 million) combining the subscription of new shares and other investment in this joint venture.

The Asahi Kasei-Honda joint venture should become active in early 2025, subject to obtaining permits and approvals from relevant authorities.

"The two companies will combine each other's strengths, such as high value-added material technologies and electrification technologies, to produce high-quality separators to be utilized for lithium-ion batteries that will accelerate the realization of high-performance electrified vehicles," said a joint statement.

Ryu Taniguchi, president at Asahi Kasei Battery Separator Corp, said: "At the beginning of October, we launched Asahi Kasei Battery Separator as a new company for the Hipore separator business to achieve more nimble management for this essential component of lithium-ion batteries. ■

Acwa Power, Gotion Morocco launch $800m plant in region's first gigafactory

Saudi energy giant, Acwa Power, has partnered with Gotion Power, Morocco — the Chinese battery firm's North African subsidiary — to build a $800 million, 500MW wind power plant with a 2,000MWh energy storage facility.

Acwa signed the joint development agreement with Gotion High-Tech to build the $1.3 billion EV battery gigafactory in Kenitra, Morocco, construction of which is to begin in June 2026. The plant will start with a capacity of 20GWh, eventually reaching 120GWh, and will export 85% of its output.

Gotion Power, Morocco will be the first gigafactory in the EMEA region with its own dedicated solar and wind farm, the company said.

The investment is the first of its kind in Africa and the Middle East and represents Morocco's push to be a leader in EV battery manufacturing. The gigafactory will create around 17,000 direct and indirect jobs, including 2,300 highly skilled positions.

The battery production facility forms part of a larger, $1.8bn suite of partnerships signed by Acwa Power on the sidelines of the 8th Future Investment Initiative (FII8) held in Riyadh from October 29 to 31. These encompass renewable energy, battery storage, and R&D initiatives across Gulf nations, China, Central Asia, and North Africa.

Gotion has been accelerating its overseas expansion in recent years. In addition to the gigafactory in Morocco, the company has established a plant in Fremont, California where the first battery packs have already been produced. It is also planning larger battery factories in Illinois and Michigan.

Gotion is one of the world's largest battery makers, ranking ninth globally with a 2.2% share of the world's installed base of power batteries in January-April, according to South Korea's SNE Research. ■

Grenergy, CATL team together on world's largest energy storage project

Spanish independent power producer, Grenergy, has signed a strategic agreement with China's CATL for the supply of batteries for phase four of its 2GW/11GWh Oasis de Atacama project in Chile which will begin construction in the coming weeks.

Located in the Chilean Atacama Desert, the facility — the world's largest energy storage project — has a capacity of 11GWh and a solar capacity of 2GW. With an overall investment of $2.3 billion, it will produce 5.5TWh of energy annually.

Grenergy has already agreed to sell the energy from the first four phases, with the remaining stages in advanced negotiation.

"The collaboration with CATL is a fundamental milestone to consolidate Oasis de Atacama," said Grenergy executive chairman David Ruiz de Andrés. "We are excited to have signed this first contract and to be working with the world's leading battery manufacturers on a project that will make industry history." ■

Tianqi, IGO suspend Australia Li project in face of weak market

China's Tianqi Lithium and project partner IGO have suspended a major expansion of their battery-grade lithium hydroxide refinery venture in Western Australia, amid a weak lithium market and increasing stockpiles at the refinery.

Chinese premier Li Qiang visited the Kwinana plant last year to trumpet the project as a key link in the Asian battery tiger's EV battery global supply chain.

But Tianqi confirmed in a Hong Kong stock exchange announcement on January 23 that its board had approved a cessation of investment and construction of the second phase at Kwinana.

Tianqi said the move was "a prudent decision in response to market dynamics", while the first phase at Kwinana would continue its "capacity ramp-up".

Tianqi holds a 51% controlling stake in the company developing Kwinana — Tianqi Lithium Energy Australia (TLEA) — with IGO holding 49%.

IGO said it expects to substantially write down the value of its Kwinana investment, although it had yet to work out the potential size of the impairment. ■

Echion and CBMM open niobium anode production plant

British battery developer, Echion, and Brazilian niobium company, CBMM, have opened a niobium-based anode material production plant in Araxá, Brazil which they say is poised to revolutionize the lithium-ion battery industry by enabling ultra-fast charging and enhanced performance.

According to the companies, the plant is the largest of its kind in the world, with an annual production capacity of 2,000 tonnes, and marks a major step forward in the companies' joint goal of expanding the use of niobium in battery production.

The new plant will facilitate the first mass production of Echion's patented XNO anode material which enables production of lithium-ion batteries that can be charged quickly and safely. Echion claims the production capacity is sufficient for an annual battery production of approximately 1GWh.

The anode material is also said to maintain high energy density even at extreme temperatures and deliver high performance for more than 10,000 charge cycles. Echion say the material is specifically designed for use in heavy-duty industrial, commercial, and public transportation vehicles.

Jean de La Verpillière, CEO of Echion Technologies, said the opening of the production plant created robust supply capacity to meet the significant commercial demand: "XNO is already having a positive impact on our cell manufacturing customers, downstream OEMs, and end-users. Echion is beginning to trade at scale." ■

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CATL unveils new product for hybrid cars

CATL, China's king of EV batteries, in November revealed its new Freevoy battery offering twice the current 'normal' capacity of driving range, the company said.

The Freevoy Super Hybrid battery has been designed to make leaps in sustainable travel amid huge rising demand. It is the first on the market to offer more than 400km of driving range before resorting to the fuel tank, as well as an ultra-fast 15 minute charge.

CATL says the new battery will optimize the electric range of hybrid vehicles, addressing the current common problem in batteries such as slow charging and poor performance in extreme cold conditions.

The updated technology will allow users to reach up to 280km in just 10 minutes of charging, a feature that will alleviate the well-known 'range anxiety' among hybrid car drivers today.

According to the company, the features of the Freevoy battery come from an integration of advanced CATL technologies such as the modification of the cathode surface and the development of a high-conductivity electrolyte, a development favorable to its autonomy. These innovations, together with the new BMS management system, allow for more precise control of the state of charge, improving energy efficiency by 20%.

In addition, the integration of a protective layer on the cathode helps to increase the battery's lifespan and performance in extreme temperature conditions.

The firm expects the Freevoy Super Hybrid Battery to help grow its global market share and redefine plug-in hybrid vehicles, as more consumers in mainland China opt for cars powered by a combination of battery packs and combustion engines to overcome range anxiety.

"Freevoy is not just a battery, it is also an investment that can generate economic returns for car owners," Gao Huan, chief technology officer of EV business at CATL, said at the product launch in Beijing. "We expect Freevoy to take the hybrid vehicle market into a new era of higher standards."

It's a smart move as China's market share of hybrids has risen over the past year with drivers seeking to overcome worries about range and cost. Plug-in hybrids are about 10% cheaper than pure EVs, with EV buyers preferring them as a safety net to ensure they can reach their destination without hiccups. All major EV assemblers in China, bar Nio, have developed extended-range EVs, or announced plans to do so, to capture rising demand. ■

Epsilor has military in crosshairs with high energy 25.2V battery

Battery developer Epsilor Electric Fuel is to unveil a new 4,400Wh/174Ah capacity lithium ion battery later this month targeting the military vehicles market.

Epsilor said on January 7 the new 25.2V battery, which it claims has an energy density six times higher than comparable lead acid batteries and 50% higher than any lithium competitor, will be presented at the International Armored Vehicles Conference at Farnborough, in the UK, from January 21-23.

The new NATO 6T battery, named 'ELI-52526-GM', is designed for use in defence vehicles and deployable defence systems. It will provide military users with extremely high energy capacity in a 28kg pack.

Rigorous testing of the product by US-based independent laboratories include bullet penetration, heat up to 500°C, performance in cold and hot temperatures and long cycle life — part of the battery maker's bid to obtain US army military performance specification compliance.

Epsilor is part of the Michigan-based AROTECH Corporation, which develops and manufactures advanced electronic subsystems for defence applications and simulation systems for aerospace and vehicle applications.

Ronen Badichi, president of the AROTECH Energy Solutions Division and Epsilor's general manager said the new battery had overcome "the major obstacle of the lithium battery safety issue.

"By using a unique energy absorbing design, we are offering the highest energy capacity in the 6T category, while staying within the demanding safety and operational requirements of the US army." ■

Largo, Stryten, formalize the launch of VRFB joint venture

Largo and Stryten Energy said on February 4 they had finalized formation of a 50-50 joint venture to lease vanadium electrolyte and boost US commercialization and adoption of vanadium redox flow batteries.

The move combines Largo Clean Energy (LCE), a Largo subsidiary, with Stryten's VRFB business Storion Energy — nearly a year after outline plans for the deal were reported by *Batteries International*.

Storion has exclusive rights to offer the flow battery market vanadium from holding company, Largo Physical Vanadium, in the form of leased vanadium electrolyte. That model provides a vehicle for investors to invest in physical vanadium assets while those non-degrading assets are stored in VRFBs.

Largo is known for its high-quality VPURE and VPURE+ vanadium products sourced from its Maracás Menchen Mine in Brazil.

Stryten president and CEO Mike Judd said Storion will create a much-needed, cost-effective domestic supply chain for vanadium electrolyte and component parts for VRFB technology in utility-scale BESS applications.

He said Storion's proprietary continuous manufacturing process and patented purification process could offer domestically produced electrolyte to support the US Department of Energy's Long Duration Storage Shot goal to reduce the levelized cost of storage to $0.05/kWh by the end of the decade.

Francesco D'Alessio, president of LCE, said: "Storion's competitive VRFB pricing model is expected to challenge the dominance of lithium for utility-scale deployments, increase the adoption of this technology and secure leadership for the US in this key energy infrastructure application." ■

Mercosur strikes EU battery materials deal

Brazil and Argentina have signed up to a proposed landmark deal to supply critical raw materials to battery manufacturers in Europe.

European Commission president Ursula von der Leyen said on December 6 the supply of critical raw materials formed part of an agreement with the two Mercosur nations, along with Paraguay and Uruguay, that extended to a range of business and trade opportunities.

On batteries, von der Leyen said the EU-Mercosur partnership agreement would help ensure an efficient, reliable and sustainable flow of critical raw materials for the resource-poor EU's green transition.

Materials from Brazil are set to include natural graphite, niobium, manganese and vanadium, in addition to lithium from Argentina.

The agreement, if endorsed by the European Parliament and European Council, will also pave the way for EU firms to invest in the development of local industries in the countries to process critical raw materials.

The deal would also promote corporate social responsibility standards, the EU said.

Analysis published in May 2023 said the EU needed to invest more than €13 billion ($14 billion) by 2040 to guarantee just a quarter of key battery materials from European sources to power its green energy agenda.

The study by European electrochemical and thermal energy storage research center, CIC energiGUNE, assessed the impact of the Critical Raw Materials Act published by the European Commission in March 2023. ■

LG Chem and ExxonMobil sign MOU for lithium offtake

Exxon Mobil Corporation and LG Chem announced mid-November, they had signed a non-binding memorandum of understanding for a multi-year offtake agreement for up to 100,000 tonnes of lithium carbonate.

The lithium will be supplied from ExxonMobil's planned project in the US to LG Chem's cathode plant in Tennessee. LG Chem says it expects to be the largest of its kind in the U.S.

LG Chem's Tennessee cathode plant broke ground in December 2023 and the firm says "it is expected to have an annual production capacity of 60,000 tonnes. The plant offers excellent geographic accessibility for both customer deliveries and raw material imports."

America needs to secure a domestic supply of critical minerals such as lithium. ExxonMobil said it was "proud to lead the way in establishing domestic lithium production, creating jobs, driving economic growth, and enhancing energy security" in the US.

"Building a lithium supply chain with ExxonMobil, one of the world's largest energy companies, holds great significance," said Shin Hak-cheol, CEO of LG Chem. "We will continue to strengthen LG Chem's competitiveness in the global supply chain for critical minerals."

A final investment decision will be subject to various factors including the establishment of commercially competitive regulatory frameworks. "The planned production of Mobil Lithium will utilize direct lithium extraction technology, aligning seamlessly with ExxonMobil's core competencies in subsurface exploration, drilling, and chemical processing.

This approach offers US EV battery manufacturers a domestically extracted and processed lithium supply option which could have substantially lower environmental impacts, including approximately two-thirds less carbon intensity than hard rock mining. ■

Refined lead metal supply surplus grows

The global supply of refined lead metal continued to rise in 2024, with total reported stock levels increasing by 60kt over the year, according to latest analysis.

The Lisbon-based International Lead and Zinc Study Group said in provisional data released in December that world refined lead metal was in surplus by 21kt during the first 10 months of 2024.

The figures were in line with figures published last September, when the ILZSG forecast supply would exceed demand by 63,000 tonnes in the year, leading to a potential surplus of 121kt in 2025.

Meanwhile world lead mine production rose in Australia, Bolivia, Bulgaria, Kazakhstan, Peru, Sweden and the US over the past year, the group said.

These increases were partially balanced by reductions in Ireland, Portugal and South Africa resulting in an overall rise worldwide of 1.5%.

A 1.7% fall in global lead metal production was mainly a result of lower output in China and Canada, where scheduled maintenance at Teck Resources' Trail operations impacted production during the second quarter.

However, in Australia, India, Japan and South Korea output was higher than in the first 10 months of 2023. European production rose by 2.5%, mainly as a consequence of increases in Bulgaria, Germany and Italy that were partially offset by declines in Poland and Sweden.

Rises in refined lead metal usage in India, South Korea and Vietnam were more than balanced by falls in Europe, Turkey and the US, resulting in an overall decrease globally of 1.6%. ■

Piedmont Lithium, Sayona Mining merge

Australia's Sayona Mining will buy US-based Piedmont Lithium, in an all-stock deal that will consolidate its Canadian operations and strengthen its exposure to the North American EV sector. This should create a lithium company with a market cap of $623 million

The deal is a reflection of ultra-tough conditions as the market continues to struggle from a decline in EV sales.

The two companies will merge to create a North American hard rock lithium producer with Sayona becoming the parent entity. Sayona is paying a 6% premium for Piedmont, based on its closing share prices earlier this week. The companies already have a joint venture in Quebec. ■

Development bank partners WTO in critical minerals database

A global database to help tackle soaring demand for minerals to power the green energy transition has been launched by the Asian Development Bank in partnership with the World Trade Organization.

The Trade in Critical Minerals database is designed to track the availability and extraction of key battery minerals including lithium and cobalt and help identify opportunities for reducing the environmental footprint of their mining and processing.

Unveiled at the COP29 climate change conference in Azerbaijan on November 20, the database provides information on trade flows, allows visualizations of trade networks and specialization patterns and compiles data on tariffs and other trade policies for 250 critical minerals and related products.

The bank and the WTO said the joint effort aims to enhance transparency and support well-informed decision-making by policymakers and others.

The move came as the bank signed an $820 million loan to provide construction financing for a portfolio of 12 renewable energy projects across Thailand

Under the deal with the Gulf Renewable Energy Company, announced on November 28, the loan will finance eight ground-mounted solar photovoltaic plants with contracted capacity of 393MW and four ground-mounted solar PV plants with battery energy storage with contracted capacity of 256MW and 396 MWh of energy storage. ■

Pure Lithium acquires Dimien in vanadium ploy for US EVs

For the record, Boston-based lithium battery manufacturer, Pure Lithium, has announced its acquisition of Dimien, a producer of vanadium cathode materials. The firm says this could be a major move towards revolutionizing the US EV battery market and reducing its reliance on China for critical battery materials.

Pure Lithium makes a next generation lithium battery (LVO) that replaces nickel and cobalt with vanadium enabling them to make the batteries from scratch going from brine to battery in less than 48 hours. This, the company says, makes it safer, cheaper and more efficient than traditional EV batteries.

The new deal means Pure Lithium will acquire Dimien's intellectual property and manufacturing equipment, along with its team with the aim of advancing commercial development of their pioneering LVO battery.

In September the US government proposed a ban of Chinese software in vehicles and, earlier this year, raised tariffs on Chinese EVs. That said, the US still remains largely dependent on China for its EV batteries.

Dimien has been developing zeta vanadium oxide (ZVO), a cathode material that offers high energy density without the fire risks associated with other cathodes.

Brian Schultz, Dimien's founder, will join Pure Lithium as VP of business development and technology.

Pure Lithium founder and CEO, Emilie Bodoin said: Schultz and his team have "taken ZVO from a university science project to commercially relevant prototypes, which cycle beautifully against our lithium metal.

"We have a lithium metal electrode production technology that dramatically reduces costs, and together with our LVO battery technology, we will bring to market a next-generation battery that is superior to lithium-ion in performance and safety.

"Eliminating graphite, nickel and cobalt is disruptive for the industry, and will ensure US supply chain security dependence."

Neither financial details nor the acquisition's closing date were disclosed. ■

Silvercorp secures 11-year China mine permit renewal

Canadian miner Silvercorp Metals has renewed the mining permit for its lead, silver and zinc mine in China's Henan province for another 11 years until 2035.

Around 64,000 tonnes of lead was produced at the Yuelianggou site between 2022 and June 2024 and overall mine production capacity is now set to increase to 500,000 tonnes per year.

Silvercorp said that the renewal followed completion of a series of studies and reports, including a mineral resource estimate to Chinese standards, a mine development plan and an updated environmental impact study update.

The announcement came as the Lisbon-based International Lead and Zinc Study Group said China continues to be a driving force in lead demand and the country's needs are set to increase by nearly 1% this year and by 0.5% in 2025.

Separately, *Batteries International* reported in September that Aurelia's Federation Mine, formally opened in Australia on September 11, is projected to produce up to 600,000 tonnes of ore annually, focusing on lead, high-grade zinc, gold and copper.

Sale of metal from the New South Wales mine's ores are forecast to earn NSW royalties of around A$74 million ($50 million) over the initial eight-year life of the facility. ■

Approval milestone for Australian Vanadium mine project

Australian Vanadium said on January 13 that plans for a mining and processing project in Western Australia had taken a major step forward after securing key environmental approval.

The state government issued the approval under the Environmental Protection Act for the Gabanintha project, which now forms part of the company's namesake Australian Vanadium Project.

The decision covers plans for a mine, concentrator, processing plant, and other infrastructure.

CEO Graham Arvidson said the decision marked a major milestone toward construction and production at the planned open-cut mine and concentrator near Meekatharra, with a vanadium oxide processing plant some 450km to the west of the state near Geraldton port.

Australian Vanadium said in 2023 it had appointed the Primero Group to build its vanadium electrolyte manufacturing facility in Western Australia. ■

Aircraft thermal runaway incidents soar and head for a five-year high

Thermal runaway incidents on aircraft have soared to a five-year high, according to a new report by the safety and compliance organization Underwriters Laboratories (UL).

Incidents increased by nearly 30% between 2019 and 2023 with an average of two reported a week to UL Standards & Engagement's (ULSE) thermal runaway incident program.

In a report released mid-December, UL said the proliferation of lithium battery-powered personal electronic devices was at the heart of the problem.

UL said its research indicated that while 97% of crew understand the potential for battery fires and explosions on aircraft, only 46% think airlines effectively communicate these risks to passengers.

This perception aligns with findings from separate ULSE surveys of US airline passengers, which revealed that many remain largely unaware of the risks associated with these batteries, UL said.

"This striking dichotomy between crew knowledge and passenger awareness highlights the critical need for improved passenger education through prominent signage, verbal announcements, and more detailed safety briefings."

Airline crew members are largely confident in their ability to identify and respond to battery incidents, thanks to clear procedures and training, but availability of fire containment devices to suppress li-ion battery fires is not universal, the report said.

"A notable minority of crew members still lack full confidence that passenger safety is assured — highlighting critical areas for further improvement."

UL said only 27% of cabin crew surveyed feel "very confident" about passenger safety from potential battery incidents, while 55% are merely "somewhat confident", which the organization said is "a lukewarm assurance at best for such a critical safety concern".

Alarmingly, 18% lack confidence altogether, feeling either "not very confident" or "not confident at all".

Meanwhile, UL said 25% of passengers admit they store one or more rechargeable products in their checked luggage, a practice that heightens the risk of thermal runaway incidents going unnoticed and escalating beyond control. ■

Korean $14.6bn battery lifeline as global EV sales plummet

South Korea has scrambled to shore up the country's faltering battery sector with an initial cash infusion worth close to $15 billion, as a global slump in EV sales takes its toll on the industry.

The Ministry of Trade, Industry and Energy (MOTIE) said on January 15 the KRW21 trillion jumpstart was needed to ensure Korean battery production for EVs and energy storage systems can remain competitive at home and abroad.

The move came after Korea's LG Energy Solution, a major player in the global EV battery market, unnerved investors on January 9 reporting an operating loss of KRW223 billion ($154 million) for the fourth quarter of 2024.

That followed analysis, released on December 10 by BloombergNEF, showing that global battery prices last year saw their biggest annual drop since 2017.

Lithium ion battery pack prices dropped 20% from 2023 to a record low of $115 per kilowatt-hour, BNEF said.

In addition to the slowdown in EV sales, other factors driving the decline included cell manufacturing overcapacity, economies of scale, low metal and component prices and adoption of lower-cost LFP batteries.

MOTIE's announcement came just a day ahead of a report published by Invest Korea — the national investment promotion agency — warning domestic demand for secondary batteries was down nearly 22% and expected to fall further because of "shrinking production and sales of EVs".

MOTIE said the government's intervention, dubbed "measures to strengthen competitiveness of eco-friendly vehicles and secondary batteries", was designed to address the slowdown in demand, develop cutting-edge technology, strengthen the secondary battery ecosystem and respond to external uncertainties.

The lion's share of the investment, around KRW8 trillion, is targeted to support the secondary battery industry — which analyst S&P Global said represented a 32% increase over funding in 2024.

MOTIE minister Ahn Deok-geun said the world in 2024 faced slowing auto sales and an "EV chasm". The auto industry in 2025 will continue to face heightened global uncertainty.

Overall domestic vehicle sales in 2024 in Korea were 1.63 million units, a 6.5% decrease from 2023, largely due to a decrease in consumer sentiment and slowing demand for EVs, the minister said.

However, MOTIE said domestic "eco-friendly" cars, in particular hybrids, are bucking the trend, by showing an increase in sales of more than 18% over 2023 to 650,000 units.

Korea's situation fits a worldwide pattern seen with many car manufacturing firms with large losses derived from the sale of EVs (outside of China). Ford Motor Company, for example, has lost another $1.2 billion on EVs in the third quarter, according to a company statement at the end of October, significantly impacting the carmaker's net income which has dropped to $900 million amid a struggling EV market.

The announcement follows the decision, in August, to scrap plans to build three-row electric SUVs, and follows total losses in 2023 of $4.7 billion.

Ford had responded to challenges in the EV market by offering incentives such as free EV chargers and home installations to boost sales but the company's net income was down $300 million from the third quarter of 2023, according to the company.

The loss was largely due to a $1 billion charge related to EVs, the company said. ■

AEsir agrees NiZn battery deal for US Navy

Nickel-zinc developer AEsir Technologies said on January 17 it had agreed an expanded battery manufacturing deal to support the US Navy.

The firm-fixed-price contract was awarded by the BlueForge Alliance, a non-profit defence industrial base group that supports navy projects.

Financial details were not disclosed, but AEsir said the deal would see it increase its production capacity of its advanced 1,100 Ah NiZn battery cell and obtain state-of-the-art equipment as it expands its manufacturing plant in Joplin, Missouri.

AEsir's technology offers improved high-rate performance and long cycle life for batteries intended for use in subsurface naval applications, the company said.

The company will also undergo a rigorous qualification process to ensure that its large-format NiZn battery cells meet stringent navy requirements.

AEsir CEO Randy Moore said: "This expansion will not only benefit the navy but also position AEsir as an industry leader in advanced NiZn battery solutions."

Batteries International reported last August that AEsir was partnering with Venta Nico to develop and commercialize cutting-edge NiZn batteries for critical infrastructure, 5G telecoms and EV chargers.

Venta Nico, India's sole nickel producer, was named as the preferred supplier of nickel with its sister company, India's Hindustan Zinc, supporting the partnership. ■

Administrators launch bid to sell Redflow's IP, assets

Australian zinc-bromine flow battery maker Redflow ceased operations in the country in October, after unsuccessful attempts to find a buyer for the group.

The move was confirmed by administrators Richard Hughes and David Orr from Deloitte, who were appointed last August at the Australian Securities Exchange-listed firm, after Redflow failed to raise enough equity to fund a strategic plan and entered voluntary administration.

Redflow said on August 23 it had formulated a plan to develop a larger scale X10 battery based on its existing stack design, targeted at larger megawatt-hour scale projects.

The group said it had received significant commercial interest in the X10 battery and was proposing a new factory be built and commissioned in Queensland — but its plans needed 'significant capital'.

In an update issued on October 18, the administrators said they had conducted an assessment of the financial liability of the Redflow Group while trying to seek a sale or recapitalization and trading on a business-as-usual basis. ■

CATL unveils second generation sodium battery

China's CATL, the largest lithium cell manufacturer in the world, has announced its second-generation sodium battery that can operate in temperatures as low as -40C.

Speaking at the World Young Scientists Summit on November 18, chief scientist Wu Kai revealed the development of the battery and said that it marked a significant leap forward in battery technology, especially for colder regions where traditional lithium-ion batteries may falter.

The batteries have exhibited better safety performance and low-temperature resistance while maintaining energy density, he said. Sodium batteries have a lower incidence of battery fires than conventional lithium batteries.

The official energy density of the new sodium-ion battery has not been reported — however, CATL said it aims to exceed 200Wh/kg. Although the battery should launch in 2025, mass production is unlikely until 2027.

CATL is already manufacturing sodium-ion batteries and is using them in its new Freevoy battery pack along with traditional lithium-ion cells. The Freevoy battery is engineered specifically for use in extended range EVs. Freevoy is the world's first hybrid vehicle battery with a range of over 400 kilometers and 4C super-fast charging.

China is leading in subcategories of lithium-based chemistries, like nickel-manganese-cobalt (NMC), nickel-cobalt-aluminium oxide (NCA) and lithium-iron-phosphate (LFP). ■

Clarios hails milestone supercap contract

Clarios announced on January 6 it had secured a significant contract with a major automotive manufacturer to supply its advanced supercapacitors in a 12V and 48V architecture.

The lead batteries major did not disclose details of the deal, but said supercapacitors are designed to store and dispense bursts of high power, suitable for functions like steer-by-wire, adding minimal weight to vehicles.

Clarios said the enhanced system delivers on-demand power in any circumstance, which is especially critical for functional safety features and capable of providing a short burst of power in chassis systems — such as keeping the vehicle level when at high speeds around a turn.

The supercapacitors are complementary to AGM batteries in these vehicle applications and to the overall system architecture to provide power stabilization and fuel efficiency improvements through regenerative braking and redundancy for safety.

Clarios said the milestone agreement underscores industry confidence in the company's innovative technology.

The contract follows announcement that Clarios' Connected Services business unit had signed its first commercial agreement with a European fleet operator for a product aimed at reducing idling times in heavy-duty vehicles.

Clarios had previously said that the unit represented the start of a new era of battery intelligence to transform the management of vehicle power systems. ■

Lithium sulfur gigafactory moves towards reality

A 3D rendering of Lyten's planned gigafactory in the Reno AirLogistics Park at Stead Airport

Lyten, the supermaterial applications company, announced plans in October to invest more than $1 billion to build the world's first lithium-sulfur battery gigafactory in a move that could help break US dependence on China for metals crucial for the energy transition.

The facility will be located near Reno in the US state of Nevada, and will have the capability to produce up to 10GWh of lithium-sulfur batteries — an emerging technology — annually at full scale. The battery does not rely on graphite, nickel, manganese, or cobalt — metals in which the vast majority of the world's supply is controlled by Beijing.

The first phase of the facility is scheduled to come online in 2027. Lyten's factory will manufacture cathode active materials and lithium metal anodes and complete assembly of lithium-sulfur battery cells in both cylindrical and pouch formats.

Lyten has been manufacturing CAM and lithium metal anodes and assembling batteries at its semi-automated pilot facility in San Jose, California since May 2023.

Lyten was approached for details of the financing package but was unavailable to respond by the time of going to press.

Lyten, founded in 2015, says it has received more than $425 million in investment from companies including Stellantis, FedEx, Honeywell, Walbridge, the European Investment Fund, and the Luxembourg Future Fund.

The company lists more than 420 patents granted or pending.

Commercial research into lithium sulfur batteries started in the early 2000s and a leading company at the time, OXIS Energy, based in the UK made huge strides in its development — particularly in its cycle life (it was once even reckoned feasible for EVs). OXIS even pioneered the possibility of solid-state lithium sulfur batteries in 2020.

However, commercialization of the chemistry ultimately proved elusive and the company went into receivership in May 2021. In July that year Johnson Matthey acquired the assets and IP of the company for use in its ability to manufacture green hydrogen.

Lyten's lithium-sulfur cells have a high energy density, which will enable up to 40% lighter weight than lithium-ion and 60% lighter weight than lithium iron phosphate batteries. The firm says the cells are fully manufactured in the US and eliminate the supply chain headaches and need for nickel, cobalt, manganese, and graphite.

In an interview with the Financial Times, Milo McBride, fellow at the Carnegie Endowment for International Peace, called the commercialisation of lithium sulphur batteries a "golden goose" for US battery competitiveness. "The west is not scaling its alternative critical mineral supply chains to the extent that is needed," he said. "What this technology offers geopolitically is a really interesting opportunity for the US to basically put forth a battery that renders some of these minerals and subsequent chemicals less important in the long-term picture."

Lyten says it already has a pipeline of hundreds of potential customers, and the Nevada gigafactory is part of Lyten's strategy to meet this growing demand.

The planned 1.25 million square foot facility, located on a 125-acre campus in the Reno AirLogistics Park, initially will employ 200 people, growing to more than 1,000 at full capacity, including researchers, manufacturing engineers, battery engineers, technicians and operators, in addition to administrative and support personnel.

Lyten has signed an MOU with industrial developer Dermody Properties to locate the facility on land owned by the Reno-Tahoe Airport Authority. ■

EU approves €48m French state-aid for AESC gigafactory

The European Commission has approved state-aid support worth €48 million ($50 million) for AESC, majority-owned by China-based Envision Energy, to build an EV battery gigafactory in France.

The Commission said on January 31 Envision AESC would not go ahead with the project in Douai without the financial support and had given the green light for the French government's proposal for grant aid.

France said its grant would support the first phase of the lithium ion battery plant, which is set to have an annual production capacity of 9 GWh in its first phase.

The announcement came just over a year after the European Investment Bank confirmed an investment of €450 million to build the gigafactory.

Meanwhile, Chilean copper commission Cochilco has warned that a global surplus of lithium is set to continue throughout this year.

Cochilco said in its global lithium market report that production cutbacks by companies in response to low prices had tightened supply forecasts.

However, the global market is still likely to post a surplus of 89,000 tonnes of lithium in 2024 and 141,000 tonnes in 2025, according to the report.

Volkswagen profits plummet as China sales slump

Germany's biggest carmaker, Volkswagen, announced in November, 'the urgent need' to close factories for the first time in its 87-year history, just days before posting a third quarter crash of 64% in profits.

As the crisis in German industry deepens, the bleak results come as the carmaker — parent company of Volkswagen, Audi and Porsche — faces an extended battle with unions representing 120,000 employees over plans to shut three factories in Germany serving its main VW brand in the home market and cutting staff pay.

VW remains profitable but earnings are down from €5.8bn a year earlier. The company said sales in China over the first nine months of 2024 were down 12% with western European sales falling 1% over the same period.

Arno Antlitz, VW's chief financial officer, said the results "reflect a challenging market environment and underline the importance of delivering on the performance programmes we have launched across the group".

He said: "Volkswagen brand reported an operating margin of only 2% after nine months. This highlights the urgent need for significant cost reductions and efficiency gains."

Volkswagen also released a statement on Wednesday from its chief negotiator, Arne Meiswinkel, who said "the situation is getting worse", before talks with unions.

He also highlighted the low profit margin for the VW brand. "This is not enough to be able to invest in our future," he said. "Only those who do business successfully can offer secure jobs. We must increase our efficiency and reduce costs."

Carmakers around the world are struggling as growth in sales of EVs has slowed while producers in China are trying to win market share. There has also been sluggish uptake for new vehicles as higher interest rates take their toll, while several firms — including VW's German rivals BMW and Mercedes-Benz — have reported that demand in China in particular has dropped.

The British sportscar brand Aston Martin also confirmed this week that the "weak macroeconomic

ENTEK gets $1.2 billion US loan for EV separator plant

ENTEK, the international battery separator giant and the only US-based producer of wet-process lithium-ion battery separator materials, has finally received a direct loan of up to $1.2 billion from the US Department of Energy's Loan Programs Office.

The facility which had been widely anticipated — *Batteries International* carried the news in July — goes to ENTEK Lithium Separators LLC.

The loan will substantially finance the new facility in Terre Haute, Indiana to manufacture lithium-ion battery separators to be used primarily in electric vehicles.

"This project will strengthen and onshore the lithium-ion battery cell supply chain, enabling the creation of batteries used in advanced technology vehicles, said the firm.

"For 40 years, ENTEK has been serving the battery separator component needs of its customers with a commitment to productivity and innovation that our customers require for their battery applications," said ENTEK CEO Larry Keith.

"ENTEK is a technology company at its core with expertise in equipment design and fabrication, said technologies, and materials science," SAID ENTEK CTO Richard Pekala, "These competencies make ENTEK the right company to lead the U.S. expansion of separator component manufacturing."

ENTEK will be able to customize battery separators to accommodate numerous EV battery designs. The separators produced will be able to accommodate all existing lithium-ion EV battery chemistries, including NMC, NCA, LMFP, and LFP. Additionally, ENTEK will be able to sell its separators to manufacturers of lithium-ion batteries for energy storage applications.

ENTEK aims to become the US's first end-to-end, domestic supplier of "wet process" battery separators for the North American lithium-ion EV battery market. The project will make a significant contribution to domestic separator capacity and help US EV battery manufacturers satisfy the 2022 Inflation Reduction Act's domestic content rules under the 30D Clean Vehicle Credit.

The firm says the project should create 763 construction jobs and 635 operational jobs. ■

environment in China" was holding it back.

The bleak financial picture highlights the hurdles Germany's flagship automaker faces as it struggles to remain competitive in the transition to EVs, not helped by an economic downturn at home leading to lower demand as consumers pull back on big expenditure.

Germany's chancellor, Olaf Scholz, held an emergency summit earlier this week calling on VW not to lay off workers, saying: "Possible wrong management decisions from the past must not be at the expense of employees."

But Bavaria's premier and leader of the conservative Christian Social Union, Markus Söder put the blame on green policies followed by Sholz's governments and the EU — specifically the 2035 phaseout of the sale of new combustion engine cars and next year's lower pollution limits that the industry claims will cost them billions in fines.

"The development at VW is brutal for Germany as a car location," he said.

LGES to supply batteries for Ford vans

For the record, South Korea's LG Energy Solution, the world's third-largest EV battery manufacturer, announced on October 15 it had signed supply agreements with Ford Motor Company to power the electrified models of Ford commercial vans in Europe.

Under the contracts, LG Energy Solution is forecasted to supply a total of 109 GWh of batteries to Ford for its electric commercial vans, starting in 2026 with contract duration ranging from four to six years. The batteries will be manufactured in LGES's plant in Poland.

The two companies also agreed that batteries for the current Ford Mustang Mach-E will be produced at LG Energy Solution's Michigan facility in 2025, instead of Poland, to enhance business efficiency and capitalize on competitive market conditions, such as the IRA tax credits.

The deal with Ford follows a signing with a Mercedes-Benz affiliate in North America. LGES, whose customers include Tesla General Motors and Hyundai Motor said in a regulatory filing it would supply 50.5GWh in batteries — enough for about 630,000 EVs — from 2028 to 2038, but said it could not disclose the monetary size of the contract, citing a non-disclosure agreement with the customer.

TÜV SÜD acquires sole ownership of battery testing firm

Germany-based TÜV SÜD has become the sole owner of TÜV SÜD Battery Testing, in a move aimed at strengthening the certification and testing group's foothold in the international battery tech industry.

TÜV SÜD said on November 11 it had acquired full control of the firm, established in 2010, after buying the remaining 30% stake held by Germany company LION Smart, a subsidiary of LION E-Mobility. Financial details of the deal were not disclosed.

TÜV SÜD Battery Testing provides services for the automotive and energy storage industries and operates centers in countries including Germany and the US, where battery systems are tested for thermal stability, mechanical load resistance, performance, and functioning. The range of services includes high-voltage safety tests and conformity testing to verify the products' compliance with international standards.

"By increasing our shareholding to 100%, we are confirming our goal of maintaining our leading position in this sector," said Holger Lindner, CEO of the product service division at TÜV SÜD.

"At the same time, we are setting a clear course for further growth, particularly in the area of highly advanced safety testing for batteries."

Camel sues over US accusations of 'forced labour' blacklisting

The US subsidiary of China's lead battery manufacturing Camel Group is suing the federal government after being blacklisted over allegations of using forced labour, *Batteries International* can reveal.

The Department of Homeland Security (DHS) announced in August 2023 that all Camel Energy goods would be restricted from entering the US.

The DHS cited the alleged participation of the Camel Group and others in business practices targeting members of persecuted groups, especially from the Xinjiang Uyghur Autonomous Region, including Uyghur minorities in China.

Camel has now launched legal action in the US Court of International Trade against the DHS and other federal agencies and individuals involved for "arbitrary and capricious actions".

In papers seen by *Batteries International* that were filed with the court on January 17, Camel said the group, with its US subsidiary, conducted over $100 million in business in the US market, including over $75 million in gross sales in 2022.

Camel claimed it has suffered significant commercial and reputational damage, including the loss of opportunities with tier one original equipment manufacturers and other major customers totalling over $100 million.

The group said it continues to accumulate commercial damages and reputational harm each day it unfairly remains on the DHS Uyghur Forced Labor Prevention Act (UFLPA) Entity List.

Camel said it presented evidence to disprove the allegations in November 2023 and petitioned to be removed from the UFLPA list. However, the bid was denied last July, still without a clear explanation, according to Camel.

The battery company said its due process rights have been "utterly disregarded, ignored and trampled in a flawed and poorly executed process".

China's government has repeatedly denied all allegations of human rights abuses in Xinjiang.

Camel launched pilot production at a lead battery line at its Michigan plant in July 2023. ■

Birla Carbon completes sustainability certification for plants

Birla Carbon announced on November 5 it had secured sustainability certification ISCC PLUS for all of its global carbon black manufacturing plants.

John Loudermilk, president and CEO, said the achievement was a testament to the firm's leadership in driving sustainability and circularity in the industry.

"This accomplishment, and the recent announcements of our first Asia Post Treatment Plant in India and the introduction of Continua 8030 sustainable carbonaceous material, further reinforces our commitment to setting new benchmarks and meeting the growing demand for sustainable products."

The ISCC PLUS certifications validate compliance with sustainability standards for bio-based and circular raw materials, ensuring traceability throughout the supply chain.

In May 2023, Birla's manufacturing plant in Italy became the firm's first to be awarded ISCC PLUS.

Last February, Birla said it had also received ISCC PLUS certification for its manufacturing plants in the US (Hickok) and South Korea (Yeosu).

BYD to sell 4.25 million EVs this year

BYD looks likely to sell 4.25 million EVs in 2024, according Lian Yubo, BYD chief scientist. BYD sold 506,804 EVs in November, the second consecutive month of more than 500,000 units, according to data it released earlier this month.

"Today, one out of every three electric vehicles in China is made by BYD. In the global market, one out of every five electric vehicles is BYD's," he said.

The company is rapidly ramping up its production capabilities. Between August and October, BYD added nearly 200,000 units to its production capacity, the company's executive vice president, He Zhiqi.

BYD's increase in volumes has been spectacular. In the last two years sales have more than doubled to this year's figure.

BYD's sales of more than 3 million vehicles in 2023 make it the world's top-selling EV maker. This is the first time in 40 years that a local Chinese brand has overtaken foreign brands, Lian said.

East Penn, first US company to get UL1973 certification

Lead batteries major, East Penn Manufacturing, announced on October 1 that its reserve power battery offering had been certified to UL1973.

This makes it the first company with lead battery manufacturing in the US to be certified to this safety standard for its entire line of telecommunications, UPS, utilities and railway products.

Having batteries certified to UL1973 is an instant recognition that UL has acknowledged East Penn's products to perform to specified levels within critical safety tests. The types of tests include overcharging, impact, and overcharging thermal runaway.

Batteries with UL1973 certification surpass the need for the multiple safety tests for many other standards, codes, and certifications that are becoming more broadly adopted and stringently enforced by customers and government regulatory agencies.

Also under the NFPA855 2023 standard, UL1973 certified batteries are allowed to be grouped in 250kWh configurations compared to non-certified product, which is limited to 50kWh units that require three feet of spacing on all sides.

"Being the first company with battery manufacturing in the US to offer the UL1973 certification for lead batteries to our reserve power customers is a significant accomplishment for our division and East Penn," said Bruce Cole, SVP of industrial sales.

"We appreciate the dedicated collaboration between UL and our team to truly understand the safety characteristics of this battery technology in these types of applications."

US provides $2 billion to protect grid, boost for renewable energy and storage

The US Department of Energy announced in October nearly $2 billion of funding for 32 projects that will protect the US power grid against growing threats of extreme weather and help pave the way for the integration of renewable generation and large-scale BESS.

In a Zoom meeting, attended by *Batteries International* the then-US secretary of energy Jennifer Granholm, said: "The Administration's Investing in America agenda has provided the largest grid investment in US history helping us add more energy to the grid faster, improve reliability and resilience, and invest in innovative technologies so customers across the county can have access to more renewable energy and pay less for their electricity.".

A DoE statement said; "The selected projects announced through the Grid Resilience and Innovation Partnerships (GRIP) program will deploy new, innovative transmission and distribution infrastructure and technology upgrades to enable over 7.5GW of grid capacity, speed up interconnection for clean energy projects, support nearly 6,000 good-paying jobs, and catalyze over $4.2 billion in total public and private investment to bring reliable, affordable, clean energy to Americans."

The projects, which span 42 states and the District of Columbia, includes six projects across the southeast that IS president Jo Biden announced during his trip to Florida last week. Those six selected projects included utilities that were hit by Hurricanes Helene and Milton.

The new projects will upgrade more than 950 miles of transmission by constructing more than 300 miles of new transmission lines and reconductoring or adding grid-enhancing technologies to more than 650 miles of transmission lines to increase the capacity of existing lines

Funded by the Bipartisan Infrastructure Law, the GRIP program is investing $10.5 billion in communities across the country to enhance grid flexibility and improve the resilience of the power system against growing threats of extreme weather and climate change.

The first round of GRIP funding, announced in October 2023, included $3.5 billion for 58 projects in 44 states. In August 2024, DOE announced an additional $2.2 billion for eight additional selections. "With today's selections, the Grid Development Office has now announced a cumulative $7.6 billion in Federal funding for 104 projects through the GRIP program. In total, GRIP projects are expected to enable 55 GW of grid capacity, equivalent to powering more than 40 million homes each year," the DoE statement said.

The DOE said it had received applications requesting more than seven times the amount of funding available, an oversubscription rate of nearly 800%, demonstrating the tremendous need for these types of investments across the country. Improving grid resilience in the face of extreme weather events was a key need nationwide.

Brazil announces first battery storage auction to be held this year

For the record Brazilian minister of energy and mining, Alexandre Silveira de Oliveira, has announced the country's first large-scale battery storage auction to be held in 2025.

A public consultation ahead of the auction will be held in the coming days and, according to a draft of auction rules published by the ministry, the procurement exercise will be held for systems with a power output of at least 30MW that can store energy for at least four hours a day.

The draft also specified that the contracts would cover a period of 10 years, with operation scheduled to start in July 2029.

Silveira said that the goal of the battery auction was to promote battery technology in Brazil and attract large manufacturers such as Huawei from China and other nations.

The news was welcomed by the country's renewable sector, with the Brazilian Association of Electric Energy Storage Solutions (ABSAE) saying they considered the announcement as a "significant progress".

The launch of a dedicated BESS auction in Brazil could help boost the growth of the technology in the country and further enhance the use of renewables such as solar PV and wind.

Winners of the auction will receive payments for their commitment to ensure availability when needed, whether or not electricity is actually dispatched, in a system designed to ensure grid reliability during periods of high demand or unexpected events, such as extreme weather or outages in generation capacity.

Brazil's battery storage market is still in its infancy, with only a limited number of projects in operation. However, the country boasts one of the cleanest energy grids globally, with 84% of its electricity generated from renewable resources. Hydropower dominates this mix, but with increasing drought conditions hurting hydroelectric production, the government is pushing for greater investment in wind and solar energy.

Silveira noted the importance of using batteries to support intermittent energy sources, such as wind and solar, without rushing the process or overburdening consumers. He said the government's priority is reducing energy costs and ensuring energy security despite pressure to speed up projects.

The minister claimed that Brazil has sufficient contracted energy to meet demand, even during severe droughts. He highlighted the activation of thermal power plants to offset the reduced hydroelectric generation.

"We have enough contracted energy," Silveira said, noting that future auctions aim to guarantee energy security for six to seven years.

Silveira added that Brazil's energy demand is rising due to climate effects, indicating the need to double the country's thermal power capacity by 2031. He also requested a contingency plan to maintain system stability during the summer months.

UK's largest BESS goes live

For the record, the UK's largest battery energy storage system went live in October in North Yorkshire.

Clean energy company TagEnergy's plant, Lakeside

Energy Park, in Drax, near Selby, is a 100MW facility that can provide power to about 30,000 homes a day across England and Wales.

The 200MWh BESS is now the largest transmission-connected project in the UK, according to a media release. It is 100% owned and operated by TagEnergy. Tesla, Habitat Energy and RES are project partners.

TagEnergy acquired full ownership of the facility from RES in December 2021, began construction in August 2023 and achieved financial close with a non-recourse debt package in October 2023.

"We're pleased to be working with our Lakeside project partners Habitat Energy, Tesla and RES to realise the full value of battery storage by connecting more people to more renewable power in our relentless pursuit of net zero," Woitiez said.

Monbat lead batteries power Antarctic project forward

European lead battery company Monbat is donating equipment and batteries for a new research lab in the Antarctic.

Monbat said the agreement continues its support for the Bulgarian Antarctic Institute, which organizes annual Antarctic expeditions and operates the Bulgarian Antarctic base St Kliment Ohridski on Livingston Island.The announcement, on November 6, follows Monbat's agreement in June 2023 to recycle more than 3.5 tonnes of lead acid batteries that have been used to support research projects in the Antarctic.

Monbat is supplying the institute with the batteries and cabinets for external mounting for a new generation of resilient and reliable lead-based BESS systems to be deployed at the newly built lab in the harsh Antarctic conditions.

The company said the units will provide greater available capacity and be part of an integrated system that will support the operation of the research equipment even while the base is uninhabited.

The successful partnership between Bulgarian polar researchers and Monbat dates back to 2018, when the first batches of industrial batteries were delivered. Bozhidar Nekeziev, commercial director of Monbat's industrial batteries division, said the firm is also working on an engineering project to test the construction of an integrated system meant to provide electricity for the base all year round.

CATL launches Hong Kong new energy R&D hub

Chinese battery giant Contemporary Amperex Technology has launched a major R&D hub in Hong Kong as part of plans to boost new energy technology innovation and sustainable development in the territory.

The inauguration ceremony of the 800sq metre CATL Hong Kong Research Institute was held on October 15 – almost one year after the battery manufacturer announced plans to invest HK$1.2 billion ($154 million) in the sector and work with the Hong Kong Science and Technology Parks Corporation (HKSTP) on developing the institute.

HKSTP was set up by the Hong Kong special administrative region government to boost the deployment of new energy technologies.

In its first phase, the institute will set up nearly 100 R&D projects and plans to recruit 200 scientific researchers.

Meanwhile, CATL said it will also work with local universities to promote industry-university-research cooperation and accelerate the construction of Hong Kong's new energy value chain and zero-carbon scenarios.

Exide's EESL agrees solar power supply deal

October 25, 2024: Exide Industries' subsidiary in India has agreed a solar power supply deal for its li-ion cells manufacturing project in Karnataka.

Exide confirmed in a National Stock Exchange of India announcement on October 15 that the deal was a result of Exide Energy Solutions (EESL) agreeing to purchase not less than 26% in renewables developer Clean Max Beta Private.

Under the agreement, Clean Max is set to develop and supply solar power of 17MWp (megawatt peak) for EESL's production of lithium ion cells, modules and battery packs.

EESL's activities include a collaboration deal with China's SVOLT Energy. The partners are building the lithium ion battery cells manufacturing plant on an 80-acre site in Karnataka state — the first phase of which is scheduled to become operational by the end of this year.

ESS, low-carbon investments, hit record $2.1tn in 2024

Investment in the low-carbon energy transition including battery storage grew 11% last year to hit a record $2.1 trillion, according to latest analysis.

BloombergNEF said in its 'Energy Transition Investment Trends 2025' study, published on January 30, investment in proven technologies such as energy storage, EVs and renewables accounted for the vast majority of investment — $1.93 trillion, up 15% on the previous year.

However, the study said the pace of overall growth was slower than the previous three years.

The largest market for investment was mainland China, which alone accounted for $818 billions of investment, up 20% from 2023.

Investment was stagnant in the US, reaching $338 billion, and down in the EU ($381 billion) and UK ($65.3 billion).

Of the large markets included in the report, India and Canada also added to overall global growth, increasing their investments by 13% and 19%, respectively.

Tesla starts Megapacks battery production in Shanghai

Tesla launched production at its Megapacks ESS battery plant in Shanghai on February 11, just eight months after construction began.

China's State Council said the plant, with an annual production capacity of 10,000 units, or around 40GWh, would support Tesla's ambition of a 50% increase in the firm's global energy storage system projects this year.

Investment in the Shanghai facility, which spans around 200,000m2, was the equivalent of about $202 million, according to officials in the Shanghai pilot free trade zone, where the plant is sited.

Plans to invest in the plant were originally announced in 2013, although no figure was confirmed at that time.

Work started on building Tesla's car manufacturing plant in Shanghai in early 2019 and the facility went into operation within a year.

Tesla VP Mike Snyder said the battery plant would be a cornerstone of Tesla's global production network.

Tesvolt Energy debuts for BESS energy trading

German lithium battery storage systems specialist Tesvolt has launched a spin-off business, Tesvolt Energy, targeting the energy trading market using BESS systems of 100kWh and above.

Tesvolt said on February 5 that, to date, battery storage systems of that magnitude have been excluded from highly complex energy trading or only accepted on less lucrative terms.

Now Tesvolt Energy — officially launched at the E-world energy trade fair in Essen this week — will work with German firms Enspired, Entrix and The Mobility House for front-of-meter energy trading.

The aim of the cooperation is to open additional sources of income for operators while also supporting grid stability.

Tesvolt Energy will focus on pooling the capacities of BESS systems between 100kWh and 10MWh to form a virtual power plant.

The start-up said it has developed software that ensures battery storage systems in the pool generate the greatest possible revenue with the least intensive operations.

This means higher revenues and lower risk because all revenue goes into a pot and is distributed in the style of a cooperative at the end of each month.

Tesvolt Energy said it already has battery storage systems with a total capacity of 100MWh in the pipeline.

Tesvolt co-founder and CEO Daniel Hannemann, said: "Commercial and industrial companies have enormous potential for bringing urgently needed flexibility to the utility grid with battery storage systems."

Exide Technologies in Dutch ESS and solar power partnership

Exide Technologies has partnered with Dutch energy broker Vrijopnaam for an energy storage and grid management system in the Netherlands.

Exide said on January 29 its Customized Energy Systems (CES) unit had deployed the group's 3.4MWh Solition Mega Three lithium ESS with liquid cooling as part of a bespoke solar power system.

Exide and Vrijopnaam jointly developed the overall power system, which stabilizes fluctuations in solar energy and includes in-front and behind-the-meter capabilities. The former sends power through a meter before it reaches its destination, while the latter supplies energy for on-site use, without passing through a meter. Exide said the set-up allows greater control over energy consumption while allowing better grid integration — giving Vrijopnaam the flexibility to offer both energy storage and power generation to consumers. ■

Lead giant Leoch proposes US-listed spin-off

International lead battery giant Leoch International has revealed a proposal to spin off its Leoch Energy Inc subsidiary and list the entity separately in the US.

Leoch chairman Dong Li told *Batteries International:* "We want to expand our business in the West, for sure. We want to get good people in the marketplace and this spin-off will help us. It will make the management of our organization easier because the culture between East and West is quite different.

"Once this proposal goes through our Chinese management can focus just on China and vice versa. It benefits everyone both ways and helps the company to grow.'

Leoch has yet to give details of the proposal, but said on February 12 that the move could improve corporate operations, increase shareholder value and boost market visibility.

The proposal would create two independent businesses to expand market share, maximize growth and drive sales of existing and new battery products throughout the region.

The main business of the spun-off company, to be listed on the New York Stock Exchange or NASDAQ, would be to sell backup and starter batteries in the Americas and worldwide.

The proposal has received initial approval from the Hong Kong Stock Exchange, subject to conditions.

However, Leoch has told shareholders and potential investors that the proposal is in the early stage and there is no guarantee that the spin-off will go ahead.

When interviewed by *Batteries International* last September, Dong Li also said that demand for the group's lead batteries continued to be robust — but warned geopolitical tensions and other challenges were affecting lead availability and pricing. ■

LGES signs billion dollar supply order with Mercedes

For the record, South Korea's LG Energy Solution (LGES) the world's third-largest EV battery manufacturer, signed a deal in October to supply cells to a Mercedes-Benz affiliate in North America, in a deal estimated to be worth billions of dollars.

The battery maker, whose customers include Tesla General Motors and Hyundai Motor said in a regulatory filing it would supply 50.5GWh in batteries — enough for about 630,000 EVs — from 2028 to 2038, but said it could not disclose the monetary size of the contract, citing a non-disclosure agreement with the customer.

Industry sources believe that the order is for the next-generation cylindrical batteries known as the 46 series. These 46 series batteries boast a fivefold increase in energy capacity, a sixfold increase in power output, and a 16% increase in driving range compared to the existing 2170 batteries.

The batteries will be produced at its factory in its Arizona production complex where it has been building a production line dedicated to the high-performance batteries since laSt April with a schedule to complete the line by 2027.

The contract announcement was made even as major automakers including General Motors and Ford reported weaker EV sales for the latest quarter with buyers continuing to shy away from purchases on affordability concerns, and Tesla reported a smaller-than-expected rise in quarterly deliveries earlier this month. ■

CIP fund in £800m Scottish BESS plans

Copenhagen Infrastructure Partners has given the go-ahead to invest around £800 million ($984 million) in two 500MW BESS projects in Scotland.

Copenhagen, through its flagship fund CI IV, said on January 8 it had taken a financial investment decision and issued a notice to proceed on building the systems.

The Coalburn 2 BESS will be in South Lanarkshire, adjacent to Copenhagen's Coalburn 1 BESS site, which received a positive financial investment decision a year ago. The second project, Devilla, will be in Fife.

Canada's CSI Solar is supplying its LFP-based SolBank system for all projects.

Once commissioned, Copenhagen said the latest projects will expand its UK BESS construction portfolio to a total of three and make the firm the largest battery storage investor in the UK.

Coalburn 1, Coalburn 2 and Devilla will have total power capacity of 1.5GW and will be able to store and supply the grid with a total of 3GWh of electricity, equivalent to the electricity demand of over 4.5 million households, across a two-hour period, Copenhagen said.

Copenhagen manages 12 funds and has to date raised about €31 billion for investments in energy and associated infrastructure from more than 180 international institutional investors. ■

EnerSys secures $199m gigafactory funding

EnerSys has finalized a $199 million funding deal with the US government to support construction of a lithium battery gigafactory in South Carolina.

EnerSys announced the completion of contract and funding negotiations with the Department of Energy on January 17 — less than a year after choosing the site in Greenville.

The 500,000 sq ft plant will have an annual production capacity of 4GWh, manufacturing lithium ion cells exclusively for EnerSys products, targeting key applications across commercial, industrial, and defence end markets.

In particular, the factory will support the needs of critical customers including the US defence department, which EnerSys said has specific requirements for domestically sourced batteries.

Funding for construction — expected to start this year followed by commercial production in 2028 — will be via the energy department's Office of Manufacturing and Energy Supply Chains.

The company confirmed last September it had been selected to negotiate for the DOE funding under the federal $62 billion Bipartisan Infrastructure Law's battery materials processing and battery manufacturing grants. ■

Northvolt files for Chapter 11 protection

Northvolt AB and some of its subsidiaries in the US announced mid-November it had filed for Chapter 11 bankruptcy protection in the US.

Chapter 11 protection enables a firm to continue trading while it re-organizes itself. The voluntary restructuring should release access to $145 million in cash and $100 million debt-or-in-possession financing (this allows them to continue operations).

The following day Peter Carlsson, who has been CEO of Northvolt since 2016 said he would step aside.

The company, employs about 6,600 staff across seven countries, said it expects to complete the restructuring by the first quarter of next year.

The pace of momentum had stepped up a notch when the Sweden's minister for energy, business and industry and deputy PM, Ebba Busch announced it does not plan to take a stake in battery maker.

Busch categorically ruled out investing in the struggling battery manufacturer, reiterating the government's position that there are no immediate plans to help, despite Northvolt's strategic importance.

"There are huge investments happening in the green transition in Sweden whether or not the Northvolt project gets fully completed or not," she said. But she went on to underscore Northvolt's role "in the industrial fight with China and the US."

Northvolt, founded in 2016 by former Tesla engineers, has been at the forefront of Sweden's efforts to develop a competitive battery manufacturing sector. But the company has been blighted with difficulties in recent months as it fights to survive amid production problems, sluggish demand and competition from China.

In another shot across its bows, it was also announced this week that Sven Fuhrmann, head of investments at German auto maker Volkswagen, is leaving Northvolt's board.

The German group is Northvolt's biggest owner with a stake of 21%, according to its annual report. It's also the largest offtaker — Volkswagen ordered $14 billion of battery cells in 2021 to be delivered across 10 years.

Northvolt, once seen as Europe's best hope for a homegrown EV battery maker, has been seemingly fire-fighting in recent months as it continues to explore options to stay afloat. Industry insiders immediately saw the latest comments from the Swedish government declining to help, were a prelude to the end.

"To go in and have state ownership in Northvolt, for example, is not on the table."

Busch said. "To go in and have state ownership in Northvolt, for example, is not on the table."

Her comments echoed those of prime minister Ulf Kristersson who had said in September that the government did not have plans to invest in the cash-strapped battery maker, which was shrinking its operations and cutting jobs `to stay afloat. ■

€400m BESS investment for Germany's Green Flexibility

German BESS developer Green Flexibility has secured an initial €400 million ($413 million) pledge from Swiss private equity firm the Partners Group to expand battery storage projects.

Green Flexibility said on January 14 the investment, complemented by debt financing, should eventually provide it with a total projects volume worth more than €1bn.

CEO Christoph Ostermann said the company would deploy the best available battery storage tech on the market as it scales up projects and expands its activities including stabilizing grids, enhancing energy flexibility, and supporting wider integration of renewable energy.

Green Flexibility, founded in Bavaria in 2023, said it already has a BESS development pipeline of 10GW, more than 100MW of which are said to be construction ready, although it did not specify the battery chemistry involved. ■

EDF Renewables secures energy storage PPA

EDF Renewables, North America, has entered a 20-year power purchase agreement with Arizona Public Service for a 1,000MWh energy storage project in Arizona.

The Beehive BESS in Peoria, Maricopa County, will be a standalone system with a 250MW capacity for a four-hour duration and construction starting in 2025.

The facility, expected to reach commercial operation in 2026, will consist of lithium-ion battery enclosures, inverters, transformers, and substation that will absorb energy from the power grid during periods of high renewable energy generation and release it back during peak demand times to support APS's increasing energy needs.

Earlier this year, EDF Renewables UK rolled out over 300MW of battery storage to support the UK's grid decarbonization initiatives. The company has six storage projects in progress, all expected to go live within the next year. ■

Microporous invests $1.35bn in battery plant

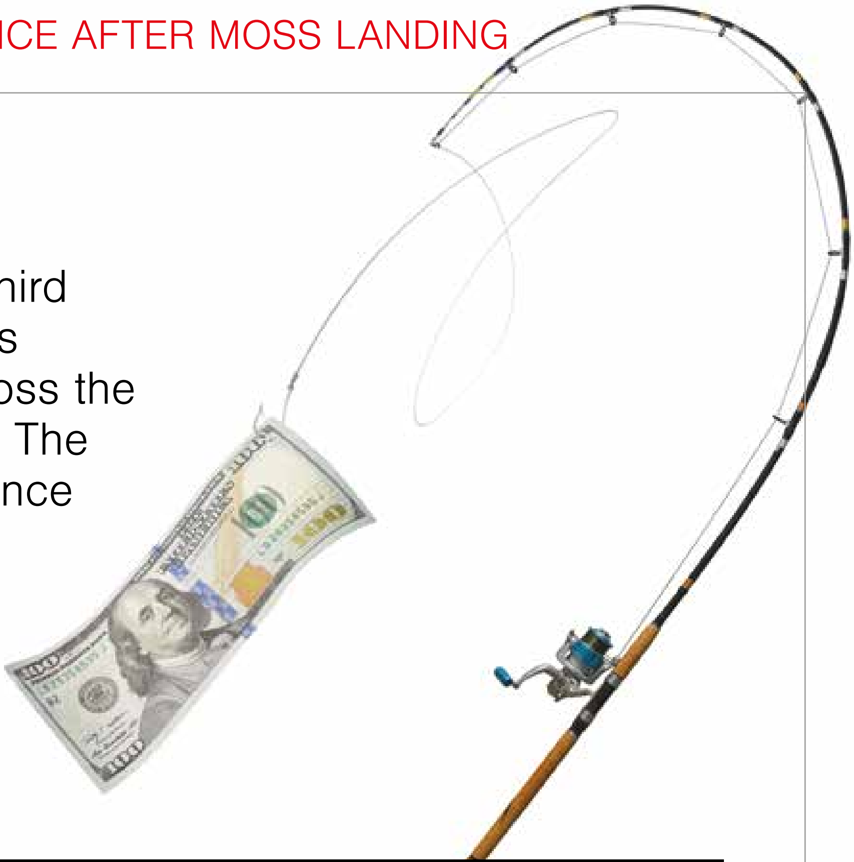
Microporous, the battery separator manufacturer, announced plans in November to invest $1.35 billion to establish a manufacturing facility in Pittsylvania County, Virginia.

The new plant, which the company says will expand its capability to develop battery separators for lithium-ion batteries, should create 2,015 new jobs. Virginia successfully competed with North Carolina for the bid.

Microporous said that it will develop two phases of the project on Lot 1 of the Southern Virginia megasite, each facility phase being approximately 500,000 square feet. Lot 2 of the Megasite is anticipated to be under consideration for future expansion.

"With the new facility in Berry Hill, we are taking a major step toward the future of energy storage technology," said Microporous CEO John Reeves. ■

This January's fire on the third largest BESS in the world is sending ripples of fear across the project finance community. The reason? More costly insurance premiums. Some may be cripplingly high.



The money men cometh … and the money men taketh

When the second Boeing 767 smashed into the World Trade Center on 9/11 it was clear, putting the human tragedy to one side, the cost of the insurance pay-out would be astronomical. In the event it worked at around $40 billion. The immediate logic was that premiums would have to rise astronomically for all skyscrapers around the world.

But as one clever underwriter spotted just two days after the catastrophe, that didn't have to be the case. With tens of millions of dollars of business at stake, he scrambled to get 3D maps of the skyscrapers in Manhattan. And what he looked for, he found.

What if your skyscraper were surrounded by taller ones, surely your risk would be mitigated? You'd clearly be safe from one form of attack. A new underwriting policy had been formed.

More than two decades later underwriters in a similar vein are looking at what has clearly been the worst disaster in the history of the renewable industry: the Moss Landing Power Plant fire on January 16 this year.

How could the insurance risks be reduced? Premiums kept down? And insurance made affordable for an industry that was already being challenged — by some at least — for being too costly to warrant the expense.

The initial cost of the Moss Landing fire — already called by one city official as a Three Mile Island event for the industry — is now reckoned to be around half a billion dollars.

But as the smoke clears and investigations start, the reverberations from the fire have spread across the world as regulators and insurers pour over the smouldering remains.

"This is going to make the whole investment landscaper for renewable energy projects problematic," a local commentator said. "Moss Landing was a flagship project highlighting the way that renewable energy can be integrated with the grid. It was responsible for 2% of the input into our state's grid."

Bonfire of the Vistras

It all started on January 16 on what would have otherwise been a quiet Thursday afternoon. At 3pm a fire suppression system at the Moss Landing Power Plant in Monterey County, California failed and what should have been a minor problem quickly escalated into a major one.

Within minutes the fire had spread across the site and within an hour it had turned into a conflagration that caused the evacuation of 1,500 local residents and the closure of the local highway.

It burned for five days and destroyed some 80% of the batteries housed in the building. It will result in a hefty insurance loss of as much as $500 million, one of the biggest associated with renewables ever. But the ramifications could, in fact, be much further felt than that.

"It's probably one of the biggest renewables claim, excluding natural catastrophe, ever," Tom Harries, partner of specialist energy and infrastructure insurance broker NARDAC, who leads its BESS insurance practice told Batteries International. "It is significant; not in the context of the wider industry, but in the context of what is an emerging sector. And there will be a fallout from that."

Because of the way insurance is structured around such risks, a number of insurers will face losses from the event. Even insurers that wrote the higher layers of the programme, associated with high severity, low frequency events, could face losses, he says.

In turn, this could lead to increased scrutiny on the chemistries used, the safety procedures and other factors. The knock-on effect of this will almost certainly be higher insurance costs for many in the industry.

Not the first time

Their concern does not stem from this incident alone. The Moss Landing Power Plant was the fourth at Moss Landing since 2019, and the third at buildings owned by Texas-based Vistra Energy, according to local media reports.

That had already prompted growing calls for caution and an investigation, especially against a backdrop of California broadly being otherwise very supportive of the use of renewable energy, electric vehicles and other battery-powered devices.

California governor Gavin Newsom, an advocate of clean energy, has backed calls for an investigation to determine the fire's cause. Daniel Villaseñor, his spokesman, said: "The Moss Landing facility has represented a pivotal piece of our state's energy future, however this disastrous fire has undermined the public's trust in utility scale lithium-ion battery energy storage systems.

"If we are to ensure California moves its climate and energy goals forward, we must demonstrate a steadfast commitment to safety."

An investigation will focus on some of the ways in which battery technology has changed — and assess the implications of this. In the context of the speed of change in the world of batteries technology, The Moss Landing Power Plant is a relatively old project.

Engineering standards, chemistries, safety guidelines and technology have all changed. "This is going to bring greater scrutiny of older projects," Harries says.

The first focus could be on the chemistries used. Older sites tend to contain batteries using lithium nickel manganese cobalt oxides (NMC) whereas newer sites tend to use lithium iron phosphate (LFP) as the cathode material alongside a graphite carbon electrode with a metallic backing as the anode.

While LFP, like NMC, can go into thermal runaway, it does have a higher thermal runaway onset temperature. Drew Leibowitz, managing director at BESS consultancy Powerswitch says LFP now accounts for more than 80% of battery storage projects.

"Indoor BESS projects are rarely built today, partially because of the fear that fire can spread throughout the system unchecked. Instead, most new installations are outdoor, pad-mounted systems which make fires less likely to spread," he said.

Leibowitz's view was backed up by the events of January 16, the battery that burned was the oldest of the four systems installed at the site and utilized a lesser-used, more fire-prone type of chemistry.

It was housed indoors in an old building; current industry standards call for large batteries like this to be sited outdoors on physically spaced concrete pads to prevent the fire from spreading.

Water leakage ... again

Moreover, the fire suppression system used has been implicated in starting all three previous fires experienced at this site since 2021, all of which were started by water leaking from pipes onto the battery cells directly or on other electrical equipment in the room

A second difference involves the spacing between the battery containers. Older projects using NMC chemistry may pack things in a little tighter; newer projects using LFP chemistry will have more space between units.

Linked to this will be the cooling method used. Older facilities will tend to be air cooled, while newer ones will use liquid cooling, now widely regarded as being more reliable and efficient.

However, it is not the case that one technology or chemistry will be under the spotlight. Rather, projects that are older could see greater analysis from insurers — and potentially higher premiums as a result.

"When insurers renew older projects, they'll bring a lot greater scrutiny now than the new stuff," Harries says. "It is the difference between having the latest software and battery management system, which is quite advanced now, and, equally, much older stuff. It is a question of what they like and dislike. Newer projects will generally tick all the boxes."

"If you've got an older facility, you might end up paying more insurance. That is one thing. But for companies sitting on loan agreements, a lack of insurance has serious implications,"

— Tom Harries, partner, NARDAC

Upon closer inspection

There are other nuances to battery storage facilities that insurers will start to take a closer interest in, he believes.

One of these is the UL9540 and UL9540A which set the criteria for a product to be tested and also a method, which is commonly used to characterize the internal thermal runaway and fire propagation performance of a BESS as required in accordance with applicable fire codes. Essentially, the test works by gradually heating a battery up until gasses are released and thermal runaway temperature is reached.

There is no right or wrong in such a test, but it does offer an indication of how quickly a fire might spread. Most of the bigger players use the test.

But insurers will almost certainly

AND NOT JUST THIS RECENT FIRE …

Regulators in California are calling for a major overhaul of safety standards for BESS plants in the wake of a string of incidents over the last three years — including a major fire on January 16 at Vistra's 300MW Moss Landing battery storage facility.

The California Public Utilities Commission (CPUC) said on January 27 it wants to compel energy storage system owners to report safety-related incidents such as injuries, fatalities, thermal runaways, fires, or other system failures — which they are not required to do at present.

And CPUC has launched its own probe into the January 16 fire at the Vistra-owned lithium ion BESS.

Meanwhile, in a related move, local councillors in the city of Morro Bay, which lies around 140 miles to the south of Moss Landing, voted unanimously on January 28 for a temporary ban on 'applications, approvals, establishments, relocations, or expansions' of certain BESS facilities within city limits.

That vote came as California State Assembly member Dawn Addis, who represents Morro Bay, called on Vistra to withdraw a pending application to build a BESS plant in the city.

Addis said on January 24 she had also introduced draft legislation to improve safety and accountability of BESS facilities in California and "restore local oversight".

She said the bill would require critical local engagement in the permitting process for battery or energy storage facilities, "and create environmental setback requirements for sensitive areas, including schools, hospitals, and natural habitats".

Addis was backed by Monterey County authority supervisor, Glenn Church, who said on January 19 the Vistra fire could "best be described as a worst-case scenario", adding: "This is a wake-up call for this industry.

"If we're going to be moving ahead with sustainable energy, we need to have a safe battery system in place."

CPUC's proposal

New standards proposed by CPUC, which regulates services and utilities, protects consumers and safeguards the environment, include ensuring BESS owners have emergency response and action plans and having the power to order technical updates to improve safety, reliability, and effectiveness of operation and maintenance.

Updates could include establishing "technical logbook standards" for battery storage systems, and expanding requirements for emergency plans that relate to all electric generating facilities.

The proposal will be on the CPUC's agenda for a vote on March 13.

CPUC listed a number of what it said were other safety incidents at BESS plants in the state in recent years, including earlier incidents at the Vistra facility. These include:

- Vistra BESS, September 4, 2021;
- Vistra BESS, February 13, 2022;
- Terra-Gen Valley Center Energy Storage Center, April 5, 2022;
- PG&E Elkhorn BESS facility, September 20, 2022;
- Terra-Gen Valley Center Energy Storage Center, September 18, 2023;
- SDG&E Kearny South Energy Storage, April 29, 2024;
- Convergent Orange County Energy Storage 2, July 17, 2024;
- REV Renewables Gateway Energy Storage Facility, May 15, 2024;
- SDG&E Northeast Operations Center, Escondido, September 5, 2024.

Vistra's response

In terms of the January 16 fire, Vistra said in an update on January 22 that conditions at Moss Landing remained stable, although there continued to be a limited amount of smouldering.

The cause of the fire had not yet been determined. However, no injuries had been reported as a result of the fire or subsequent operations by first responders and others.

Priorities moving forward are safely removing the remaining batteries from the building when conditions permit, the utility said.

The company has retained a structural engineering firm to advise with this work and planning is underway.

"We have begun our investigation and retained multiple outside experts to assist, and we are prepared to cooperate with any local or state investigations as well."

Vistra said representatives of the battery manufacturer, LG Chem, were also on site.

Background

The resurgence of devastating wildfires in California presents a dilemma for regulators and lawmakers, because utilities, businesses and homeowners have turned to battery storage to try and avoid the threat of chronic blackouts.

In 2010, the state of California authorized CPUC to evaluate and determine energy storage targets, with the goal of a major expansion of energy storage and a procurement target of 1,325MW by 2020.

The deployment of battery storage systems grew significantly since, increasing from 500MW in 2019 to over 13,300MW state-wide in 2024, CUPC said.

Likewise, battery storage system technologies and standards have also matured over time.

CUPC has said battery storage is a key technology relied on by the state to enhance reliability and reduce dependency on polluting fossil fuel plants.

Last year, California brought more than 7,000MW online — the largest amount in a single year in California's history. This includes over 4,000MW of new battery storage, the regulator said.

California's current installed battery storage capacity is over 20% of California's peak demand. The state's projected need for battery storage capacity is estimated at 52,000MW by 2045.

now take a closer interest in the test — and the results as they may differ between manufacturers. Again, this could influence the insurance premium.

Another worry for insurers will be any knock-on effect from future fires on to any third-party liability policies they might have. In other words, they may implement greater scrutiny of neighbouring properties. Insurers hate being hit with different types of claims from the same incident.

Further linked to this could be any implications as a result of pollution. A plume released from the plant contained hydrogen fluoride, a highly toxic compound. While it seems the Moss Landing Power Plant fire did not cause toxins in their air to exceed legal levels, this would be a concern around future events.

If other premises are damaged or even closed down for a period of time due to such concerns, liability underwriters could also be on the hook for that lost revenue for those shops. Thus, potential claims may not be limited to the physical damage; any financial damage could also trigger big claims.

Emergency plans

Yet another consequence is that all stakeholders in such facilities, including insurers, will start to take a closer interest in what emergency response plans might be in place. Some older facilities are out of sync with correct response procedures for a battery-related fire. Some have sprinkler systems, for example, despite water being unsuitable for extinguishing a thermal runaway.

In the case of this fire, several factors contributed to its rapid spread and made it tricky for firefighters. A fire suppression system at the plant reportedly failed and led to a chain reaction of batteries catching on fire. A broken camera system and superheated gases made it further challenging for firefighters. Equally, firefighters were unable to use water, as this reacts with lithium-ion batteries, causing explosions.

"Insurers may want proof that there is a clear plan that's being communicated to all relevant players, including the fire brigade, for example," Harries says. "Do they know that the facility has a lithium-ion battery project? That will mean they treat it differently. Maybe they understand opening doors could make it worse. Maybe they don't do much except preserve life."

Rebalancing the risks

The most obvious consequence of all this will be higher premiums for some facilities as underwriters re-appraise the types of risk. But there could be more far-reaching implications.

There could come a point where some insurers refuse to cover certain facilities at all. This is where rates really start to rise — or where insurance becomes unavailable completely.

This matters in the obvious sense — if there is a loss. But there is also another scenario that will worry companies. Plenty of manufacturers will rely on finance for such projects.

In all such arrangements, insurance being in place will be non-negotiable. "If you've got an older facility, you might end up paying more insurance. That is one thing. But for companies sitting on loan agreements, a lack of insurance has serious implications," Harries says.

Some of the other consequences, however, could be seen as a good thing. Future projects will, partly led by insurers, face more scrutiny based on lessons learned. "There could be a moratorium on certain types of consent for such projects and things like revised guidance on the spacing of the units," Harries says.

"If you apply for planning to build a big factory of indoor batteries, it's going to be scrutinised much more. For insurability purposes, perhaps the spacing between the cabinets is farther apart. You might have a conversation with the insurers and try and get the layout right."

Finally, the momentum could lead to the retrofitting of some facilities, meaning investment needed from manufacturing companies — but safer plants.

In the background, however, there is good news for battery companies: the insurance market is much more competitive and bullish now, compared with five years ago. Then it could be hard to place certain risks. As more carriers have invested in understanding the risks, competition has increased, bringing down rates and offering more choice.

This means that any retraction or caution from insurers is starting from a better place. "So, the story is positive from that. You now have a lot more options on which insurers to use," says Harries. "Five years ago, you just took what you were given. Prices have also fallen. That won't change overnight because of one loss, but it will lead to greater scrutiny and discussions about the cost of and importance of insurance." ■

DOMESTIC CLAIMS MOUNT UP AND ADD TO COMPENSATION REQUIRED

Already local attorneys are accepting clients who were victims of the Moss Landing Vistra battery plant fire. Typically they are seeking compensation for physical injuries — including from toxic fumes — as well as property damage.

Compensation could also include damages to cover the lost use of your home, any costs incurred with having to evacuate, and reimbursement for the time spent away from work.

"We are particularly concerned about people living near the plant," says Devin Bolton, an attorney in Weitz & Luxenberg. "The fire and explosions that occurred are dangerous. Any exposure to toxic fumes and gas can lead to serious respiratory problems.

"In addition, we're monitoring the site for any hazardous substances that might lead to poisonous water runoff.

The primary hazards beyond the actual fire were the particulates and hazardous chemicals released, but through air quality testing it was determined that favourable wind and atmospheric conditions prevented the smoke from reaching ground level — a lucky break for the foggy Central Coast.

Some residents reported headaches and respiratory problems, although so far these appear to be minor in severity. Unfortunately, elevated levels of nickel, manganese, and cobalt nanoparticles were detected in the soil of the surrounding area, which includes the nearby Elkhorn Slough and Salinas River; further testing is needed to determine the impact on local wildlife.

Last April the EPRI released the first study of utility-scale battery energy storage systems. The charts paint an interesting picture of a huge increase in volumes with a roughly static number of BESS incidents showing that the percentage of rogue fires has fallen spectacularly.

Lessons from a flatlining curve

The global installed capacity of utility-scale battery energy storage systems has dramatically increased over the past five years. While recent fires afflicting some of these BESS have attracted enormous media attention, the overall rate of incidents has sharply decreased, as lessons learned from early failure incidents have been incorporated into new designs and best practices.

Between 2018 and 2023, the global grid-scale BESS failure rate has dropped 97%. The battery industry continues to engage in R&D activities to improve prevention and mitigation measures, including development of a better understanding of the diverse causes of BESS failures.

EPRI's BESS Failure Incident Database is the main source of data for this report. The database was initiated in 2021 following a series of lithium ion BESS fires in South Korea and the Surprise, Arizona, incident in the US. The database gathers information on stationary BESS failure events for commercial and industrial (C&I) and utility-scale BESS.

EPRI defines failure incident as an occurrence which resulted in increased safety risk, caused by a BESS system or component failure rather than an exogenous cause of failure (e.g., wildfire impacting the BESS).

At the time of writing in April 2024, the database contained 81 incidents. Of these, 26 incidents had sufficient information to assign a root cause and to identify the element that experienced failure.

Incidents can result from a variety of causes, such as water intrusion, retrofitting errors, operating conditions, coolant leaks, temperature stress, quality control, component manufacturing defects and other factors. For meaningful analysis, these causes were grouped into classifications.

Each failure incident with sufficient information was classified by root cause and by failed element.

Root cause: design

A failure due to planned architecture, layout, or functioning of the individual components or the energy storage system as a whole. Design failures include those due to a fundamental product flaw or lack of safeguards against reasonably foreseen misuse.

Root cause: manufacturing

A failure due to a defect in an element of an energy storage system introduced in the manufacturing process, including the introduction of foreign material into cells, forming to incorrect physical tolerances, or missing or misassembled parts.

Root cause: integration, assembly & construction

A failure due to poor integration, component incompatibility, incorrect installation of elements of an energy storage system or due to inadequate commissioning procedures.

Root cause: operation

A failure due to the charge, discharge, and rest behaviour of the energy storage system exceeding the design tolerances of an element of an energy storage system or the system as a whole. Operational failures include incorrect sensing of voltage, current, temperature, and other set point values, or operation above designed temperature, C-rate, state of charge, or voltage limits of the energy storage system.

Failed elements: cell/module

A failure originating in the lithium ion cell or battery module, the basic functional unit of the energy storage system. These usually begin with short circuits within the cell leading to eventual thermal runaway. They can originate from poor cell design, manufacturing defects, incorrect installation, or cell abuse.

Failed elements: controls

A failure in the sensing, logic circuits, and communication systems. Control systems coordinate the operation of the ESS, including the battery management system (BMS), energy management system (EMS), plant controllers, and any subsystems. Controls failures include those due to control system incompatibility, incorrect installation of the control system, defects leading to errors in sensors or controls, or inappropriate operation limits.

Failed elements: Balance of System (BOS)

A failure in any of the elements of a BESS excluding the cells, modules, and controls. BOS typically comprises busbars, cabling, enclosures, power conversion systems, transformers, fire suppression systems, HVAC, or liquid cooling systems.

Results overview

Of the nine incidents recorded in the BESS Failure Incident Database between 2011 and 2017, none were able to be classified, while 36% of incidents between 2018 and the present had root causes identified. The availability of root cause information starting in 2018 is an indication of both energy storage industry maturity as well as collective action and scrutiny on lithium ion BESS safety.

The data challenges the widespread assumption that the lithium ion battery cell is the primary cause of failure. The BOS and controls were the leading causes of failure, with the cell having a relatively small number of failures attributed to it.

See figures 2 & 3

Between 2017 and 2018, the lithium ion BESS deployments increased by around 1 GW, more than doubling total global deployment, and signalling the advent of the commercial BESS industry. The period between 2017-2019 also experienced a spike in BESS failure incidents.

See figure 4

This shows the root cause classification for the 26 incidents considered in the analysis. Two incidents were classified with dual root causes (Design as well as Integration, Assembly & Construction), and the discrepancy in total incidents is due to this double-counting. Integration, Assembly & Construction was the most common root cause of failure

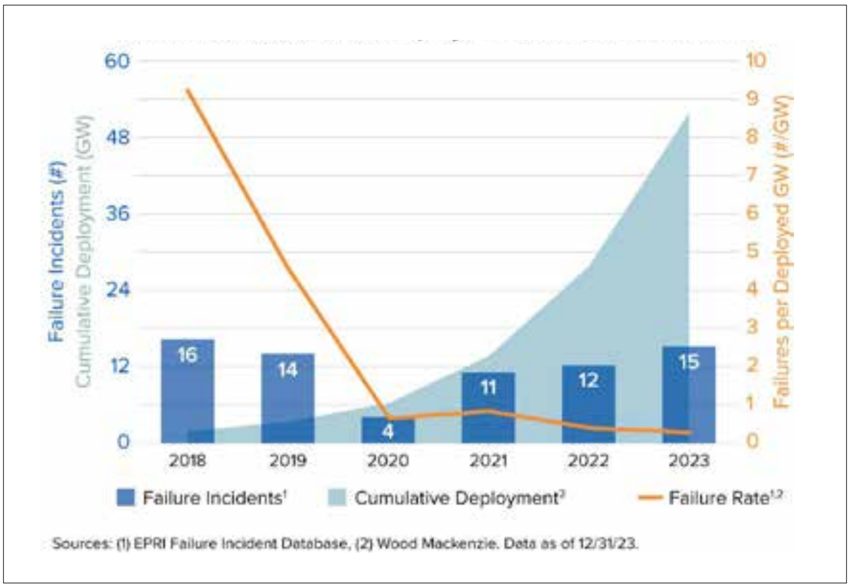
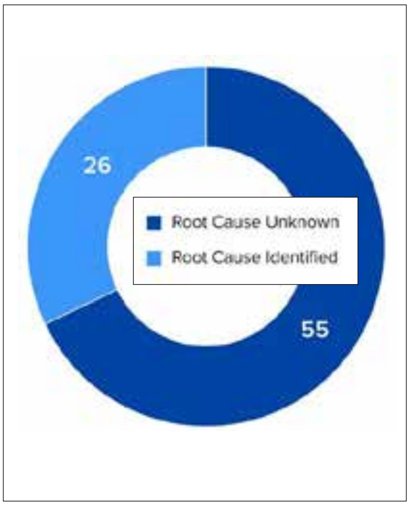


Figure 1. Global grid-scale BESS deployment and failure statistics



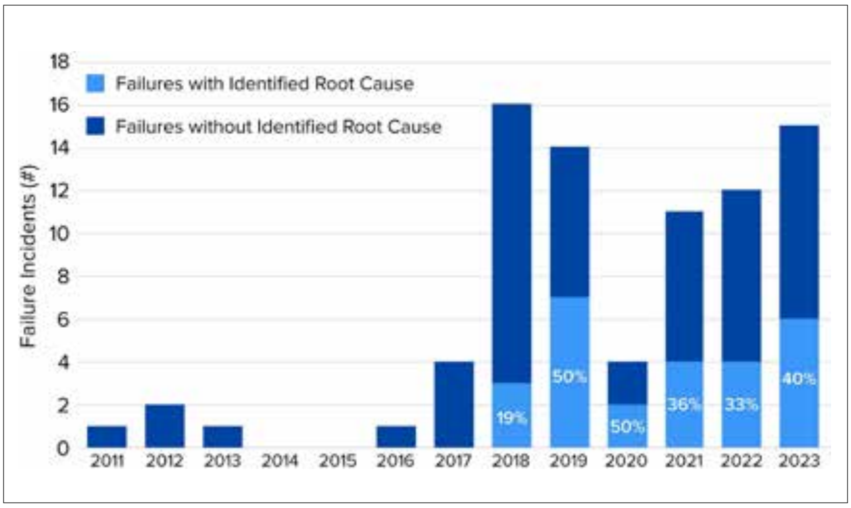
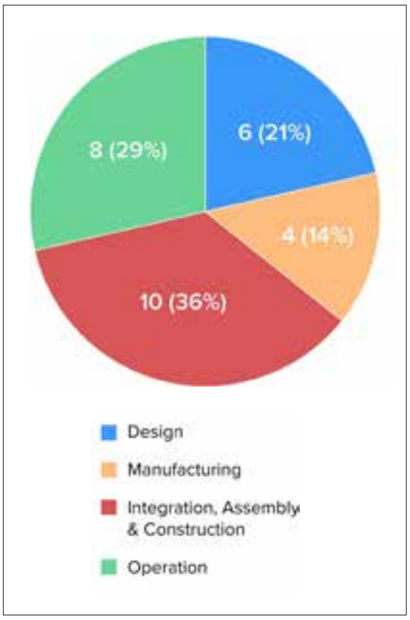


Figure 2. (above left) Fraction of BESS failures with identified cause. **Figure 3.** (above right) BESS failures with Identified root cause over time



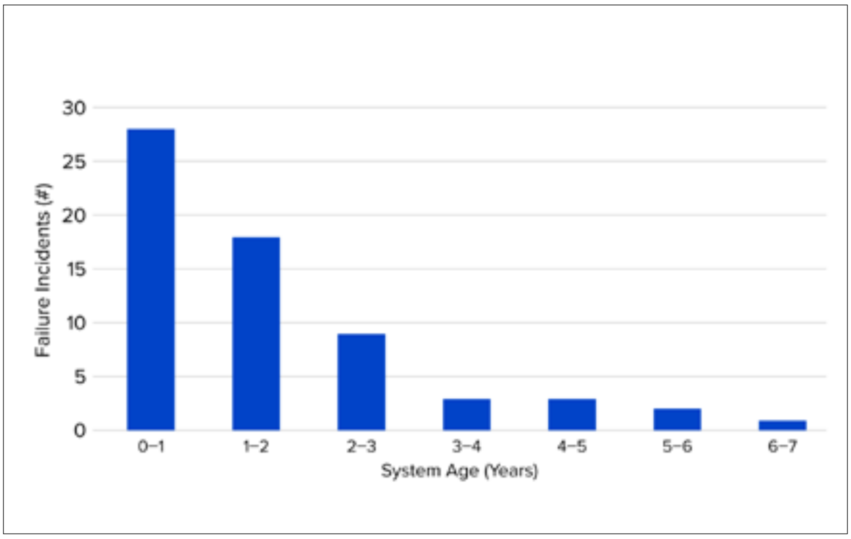


Figure 4. (left) Breakdown of BESS failures by root cause

Figure 5. (above) BESS age at failure, where known

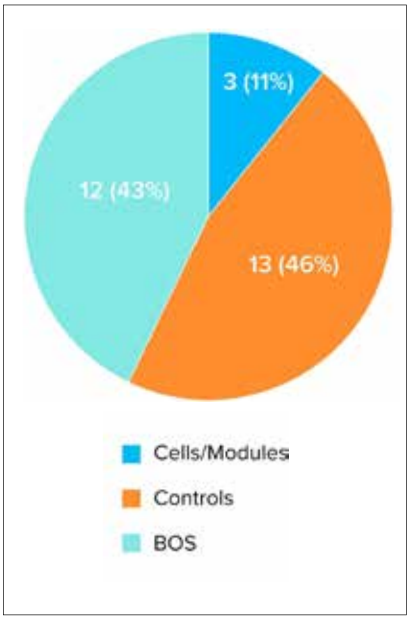


Figure 6. Breakdown of BESS Failures by failed element

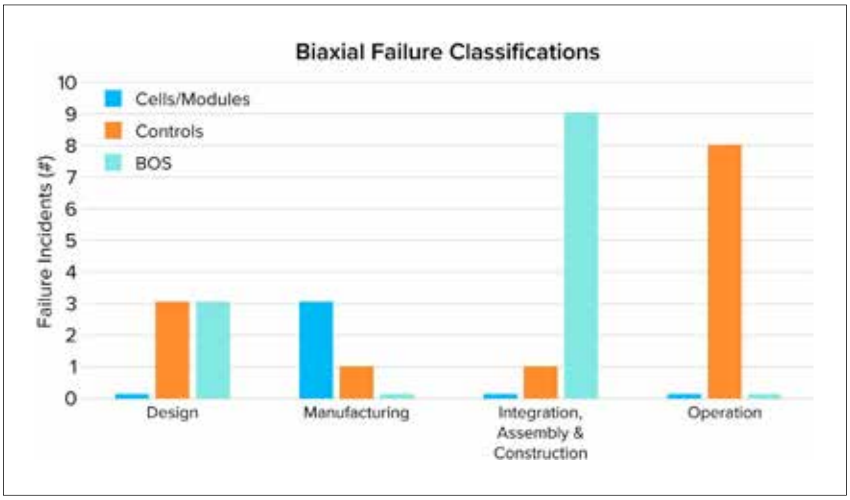


Figure 7. Relationships between root cause and failed element

See figure 5 (previous page)

This highlights the number of failures in the database that happen early in the project lifecycle. Deployment has increased significantly in recent years, and there are relatively few older BESS that are operational. The majority (72%) of failures where the system age is known happen during construction, commissioning, or within the first two years of operation. Integration, Assembly & Construction is a critical phase in BESS risk mitigation.

Manufacturing as a root cause has the fewest failures attributed to it. This is most likely due to the difficulty in definitively identifying a manufacturing defect as a root cause with the loss of physical evidence after a fire or explosion.

Earlier failures from 2018-2020 in particular may have involved cell or module manufacturing defects as a contributing factor. Several product recalls from major EV manufacturers during those years cited manufacturing issues by battery OEMs.

Failed element

The distribution of failure sources across BESS elements (i.e. components) provides an insightful view of the vulnerabilities within the system.

See figure 6

The BOS and controls account for the vast majority of failed components. The prevalence of BOS failures is corroborated by the recent CEA report, which found that nearly 50% of quality assurance items were in the BOS. Only three incidents, or 11% of classified incidents, are attributed directly to the cells. However, many of the failures classified as controls were related to operational issues aimed at restricting cell state of charge (SOC), voltage and current, due to cell limitations. These were classified as controls failure rather than cell/module since the failures could have been prevented if more limited operational windows were maintained.

See figure 7

Integration, assembly & construction and BOS

Integration is the most common root cause of BESS failures, and the vast majority of incidents with

THE NOTORIOUS KOREAN EXPERIENCE

Of the 30 incidents in the database between 2018 and 2019, 27 occurred in South Korea. The Korean government had provided strong economic incentives for BESS, especially paired with solar PV generation.

The number of installed BESS in South Korea rose from 30 in 2013 to 947 in 2018.

The rapid deployment was not accompanied by robust safety standards and regulations, which contributed to the failures. After the first spate of fires, the South Korean government investigated the incidents, and provided summarized findings for the failures in aggregate. Subsequent academic papers provided more detailed root cause analyses for individual incidents.

Integration is the most common root cause of BESS failures, and the vast majority of incidents with this classification involved BOS components. These components included DC and AC wiring, HVAC subsystems, and safety elements such as the fire suppression system.

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this classification involved BOS components. These components included DC and AC wiring, HVAC subsystems, and safety elements such as the fire suppression system.

Lithium ion BESS contain components from multiple suppliers, which are not necessarily designed to work together. Integration is a critical part of the deployment and installation process to ensure all interfaces are compatible and functional.

Operation is the second most common root cause, and in all cases, the operation failure occurred in the controls system. Seven of these incidents occurred in 2018-2019 in South Korea, reflecting the early challenges in determining appropriate BESS operation limits for parameters such as voltage and SOC.

See figure 8

Considering root cause trends over time, the bulk of operational failures occurred in 2018-2019 when a significant number of BESS installed in South Korea experienced fires. Many of these were classified as operational failures since the SOC just before incidents was higher than recommended limits. Investigation of the failures revealed that a significant fraction of those failures occurred when the SOC was above 90%.

Integration-related failures have become more common. The vast majority of these failures are related to poor build quality in the BOS, whether it is AC or DC wiring, coolant systems, or safety systems such as water suppression piping.

While the core battery technology has been in commercial development since the 1990s, fully integrated BESS products arrived much later to market. BOS subsystems like cooling, and especially safety components are not yet mature.

BESS products have rapidly evolved from walk-in containers assembled on-site to module, pre-integrated systems. There is a diversity of products, architectures, thermal management approaches etc., leading to integration challenges and the potential for incompatible interfaces or unexpected interactions between

New products without long operational histories are entering the market. A lack of experience and training in integration and assembly could have contributed to the assembly and construction-related failures in the recent years. ■

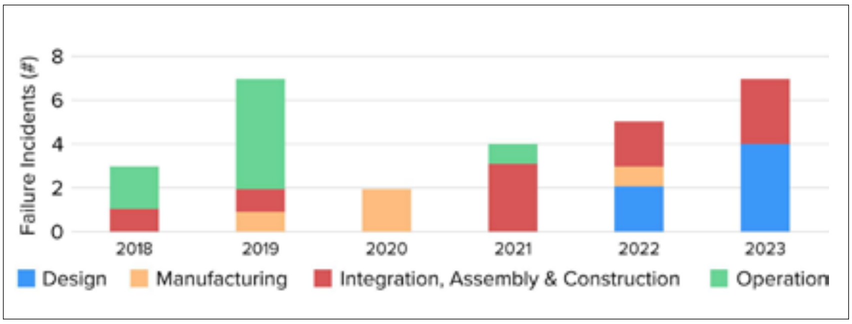


Figure 8. Root Cause

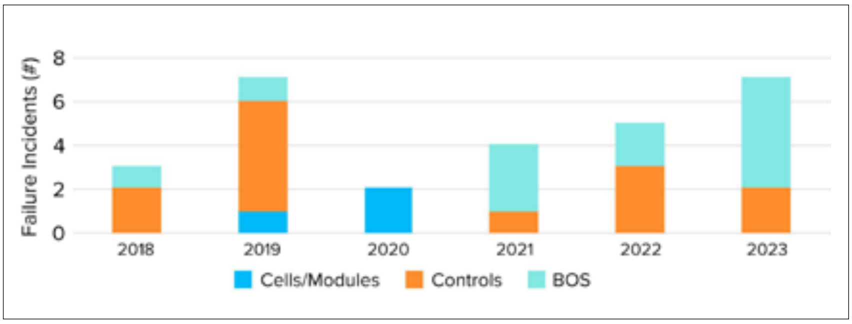
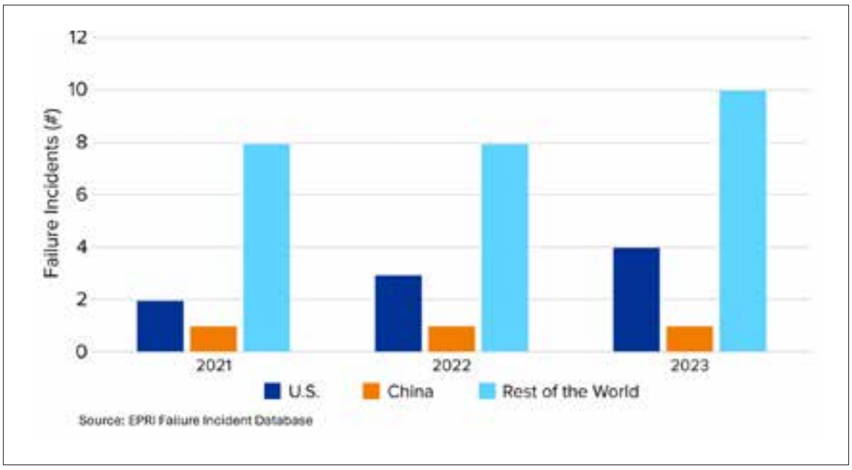
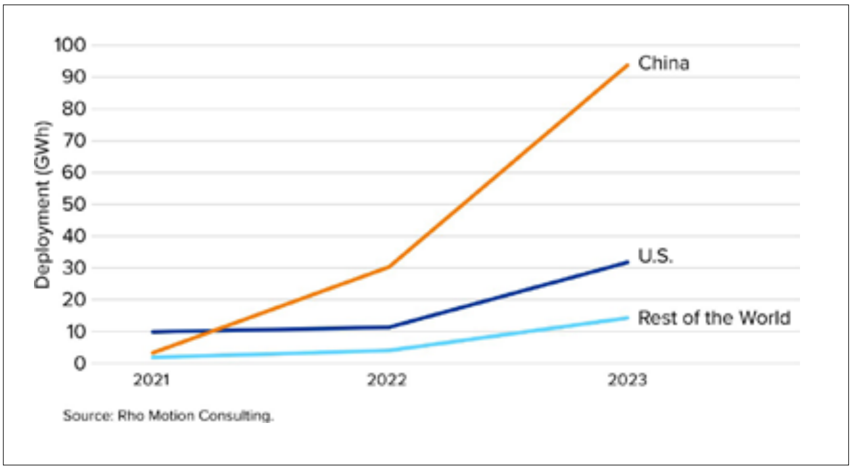


Figure 8. Failed elements



Failures by Country



Cumulative Deployment by Country

The mass market potential of electric cars is concentrating the minds of solid state battery innovators but there is a host of applications requiring cells that pack in more energy. Sara Verbruggen reports.

Taking electrification to the next level

It's the EV dream come true. A battery that can charge from flat to 80% in just over 10 minutes. A capacity that could allow someone to drive from New York to Chicago — or say Hamburg to Barcelona — without having to be recharged. And with extra bonuses of greater safety and a lower carbon footprint to boot.

These are some of the claims being made about a new generation of solid state batteries that is rapidly starting to emerge.

SSBs and their semi-solid state cousins have better performance characteristics than lithium ion. Broadly, if SSB cells are damaged they do not leak a volatile flammable liquid electrolyte, potentially leading to thermal runaway, making them much safer than their regular lithium ion counterpart.

That has ramifications for the design of future EVs, which require a lot of safety engineering to minimize risk of damage to an intrinsically explosive capability in the battery. These include mechanical safety measures, like heavy steel girders around the battery, which takes up space and weight.

Solid state cells can operate at higher temperatures because there is minimal evaporation, so the cooling systems required for lithium ion battery packs can also be minimised.

Graham Purdy, chief executive of Ilika, says the solid state battery field has extended beyond a battery having a solid electrolyte and a lithium metal anode to encompass a huge variety of chemistries and cell architecture.

He compares it to the lithium ion field which spans different cathode chemistries, used for different applications, depending what each application requires.

Like many other battery technologies, progress towards all-solid battery cells is incremental. There is a big leap between a battery cell system based on liquid components to an entirely solid one. All-solid systems throw up manufacturing challenges, requiring modifications of cathodes and anodes to improve conductivity, for instance.

China

From the end of 2024 through to the first half of 2025 first commercial delivery of battery cells using semi-solid state is starting to happen in China. These types of cells, containing an oxide-based electrolyte and a traditional silicon-graphite anode, will achieve some of the benefits of solid state, though there is still room for improvement.

"Scaling semi-solid-state technology is a stepping stone to scaling the manufacturing of oxide-based solid electrolytes at the GWh-scale," says Benchmark Mineral Intelligence product director for new technology, Rory McNulty.

Players outside of China have focused on using high-energy density anode materials in their cells, because of the improvement in cell performance. McNulty says: "These technologies may, as the market gets going, limit initial commercial prospects to premium markets, where cost can be absorbed if performance and safety are sufficient."

As the technology is optimized and supply chains mature, Benchmark sees scope for solid-state batteries to meet the performance, safety and cost requirement for entry into mass market EV applications. "However, this transition is likely to be slow and methodical rather than a 'lithium-ion killer'," according to McNulty.

Revving up in the EV industry

In the past 12 months SSB developers have begun entering into partnerships with EV original equipment manufacturers (OEMs) and automotive brands.

Following a $75 million investment in Factorial in 2021, car maker Stellantis plans to launch a demonstration fleet of Dodge

"Everyone is on an equal standing. Europe and the US have particularly strong history in R&D and innovation, which gives a great platform to develop a game-changing technology, but China and the rest of Asia have much more established expertise in manufacturing of battery cells and components which gives a strong footing to scale the technology once locked in"

— Rory McNulty, Benchmark Mineral Intelligence

Charger Daytona EVs by 2026 equipped with Factorial's Factorial Electrolyte System Technology (FEST) solid-state batteries to valid assess performance of the cells in real driving conditions.

Factorial's FEST cells are targeting an energy density of over 390Wh/kg. Stellantis ultimately sees the technology being applicable in its electric SUVs and performance vehicles, which includes brands like Jeep, Dodge, Chrysler and Alfa — an annual market of about two million vehicles.

In 2024 Factorial also introduced a more advanced solid-state battery technology, compared with FEST. Solstice could be capable of achieving an energy density of up to 450Wh/kg and incorporates a dry cathode design for more efficient and sustainable production.

It complements Factorial's FEST technology for automotive and other electric mobility applications while expanding applications and was developed in collaboration with Mercedes-Benz.

Toyota and Idemitsu are targeting commercialization of SSBs by 2027-2028. A large-scale pilot plant for solid electrolytes in Japan is planned for operation in 2027, with an annual production capacity of several hundred tonnes. The partners will supply batteries to the market with mass production expected from 2030 onwards.

"Regarding these next generation solid state batteries there is everything to play for. These devices use lithium metal or high content silicon anodes, with the goal of achieving a step-increase in cell performance and the playing field is level globally. Demonstration and pilot lines and facilities are anticipated in the coming two to three years, with commercial production to follow from the end of this decade and early next," says McNulty.

The race is a technological one. "Everyone is on an equal standing. Europe and the US have particularly strong history in R&D and innovation, which gives a great platform to develop a game-changing technology, but China and the rest of Asia have much more established expertise in manufacturing of battery cells and components which gives a strong footing to scale the technology once locked in," he says.

The winners and losers in this race between the battery giants will take time to become obvious. Solid Power, which has had a joint development agreement in place with BMW since December 2022, is having to extend its timings for delivering its latest cells. The Colorado-headquartered company is aiming to scale electrolyte production to power 800,000 electrified vehicles using its SSBs annually by 2028.

The company's latest A-2 cells were meant to be delivered by the end of 2024, but CEO John Scoter told investors and analysts in the 2024 third quarter earnings call that these would likely be ready to enter the testing phase in early 2025, with the team working hard on improving the design of the cathode, anode and separator for the A-2 cells.

Collaborations are key

Blue Solutions, which is part of French logistics and electric buses group Bollore, has signed four several joint development agreements, to help it forge a route to adoption of its

SOLID-STATE BATTERIES — THE CHEMISTRIES

Solid-state electrolytes — the basis for SSBs — are broadly broken down into three distinct chemistries.

Polymer-based: These cells have excellent flexibility, very good atmospheric stability and good mechanical strength. But they suffer from poorer ionic conductivity and electrochemical/ thermal stability than oxide and sulphide electrolytes.

Oxide-based: Excellent electrochemical/thermal stability, very good ionic/chemical stability and mechanical strength are characteristics of these cells. They suffer significantly when it comes to atmospheric stability and flexibility.

Sulphide-based: These cells have the best ionic conductivity of these three types of electrolytes, with very good thermal stability and mechanical strength, and reasonable processing cost and electrochemical stability. Issues are around chemical stability, atmospheric stability and flexibility.

These solid electrolyte materials can then either be paired individually or as a combination, for example, oxide/polymer, with the cathode and anode to make a battery cell. The anode is usually high capacity, such as lithium metal or high-content silicon, and the cathode is usually high-nickel nickel, manganese, cobalt (NMC), to balance the capacity of the anode.

THE PLAYERS

Polymer-based companies include Blue Solutions, Factorial Energy (FEST), LG Energy Solution, Basquevolt, Lishen.

Oxide-based companies include WeLion, Talent New Energy, Ion Storage Systems, QuantumScape, Ilika, Qingtao New Energy.

Sulphide-based companies include Solid Power, CATL, SVolt, Toyota and Idemitsu, Samsung, Factorial Energy (Solstice).

Ion Storage Systems pilot line in Beltsville Maryland.jpg

"We're talking about 40%-50% more energy density than today's lithium ion cells, which translates into a similar increased range for an EV"

— Sriram Ramanoudjame, Blue Solutions

cells within the EV industry as well as other mobility applications.

These collaborations all concern the use of its lithium metal polymer solid state cell technology in the fourth generation cell format. The company plans to start production at its first gigafactory, in the east of France, in 2029. Blue Solutions' Gen4 cell is targeting 450Wh/kg.

"We're talking about 40%-50% more energy density than today's lithium ion cells, which translates into a similar increased range for an EV," says Blue Solutions' chief marketing officer Sriram Ramanoudjame.

The company entered into a JDA with BMW in March 2023 which will see the carmaker focus on integrating the Gen4 LMP cells into EV battery packs. An advantage of polymer SSBs is that they require less compression to ensure the cell's internal layers do not detach, compared with other SSB chemistries.

In November 2023, Blue Solutions signed its second JDA with a large battery producer outside of Asia, which has access to the company's IP to develop LMP cells, including manufacturing processes. Another was signed with a global EV maker in July 2024. The latest is with a manufacturer in the mobility space, though not EVs.

One working SSB cell is not much good on its own. These need to be made reliably at scale and then integrated into battery packs before being integrated into a new automotive or product design.

Blue Solution's cell manufacturer partner's end goal is to make SSBs at scale. "They could of course be making JDAs of their own with their OEMs or their current partners to see how they can integrate these cells inside battery packs for their customers. We are in touch with cell makers but they are in touch with own supply chains," says Ramanoudjame.

"The OEMs will check in with them about how they can integrate the cells into packs so if there are questions the cell maker cannot answer, the OEM could come into the JDA framework."

Following joint development, the next step would be for an automaker to design requests for information based on internal criteria from designing and developing their battery packs based on SSB cells.

"The logical next step — as we are now speculating — is to produce a request for quotations that they can send to suppliers to set out the type of cell, format, quantity and timing in time for it to be launched in a new EV model," says Ramanoudjame. "In parallel they might be interested in designing a demonstration car that will integrate sample cells to demonstrate that the battery is charging in a given timeframe and is driving at a given range."

While the long-term aim is to license its IP and generate revenues from royalties either on overall volumes or on each cell produced, Blue Solutions is setting up the gigafactory in France to increase its chances of its solid-state cells hitting the market first.

Meanwhile in the UK, Ilika's technology uses an oxide-based electrolyte with silicon anodes. Its small SSB technology, resulting in batteries that are tinier than medical implants, called Stereax, is now being licensed, including to a company in the US.

Ilika is also making progress with its Goliath SSB cell technology designed for EV applications. One interested company is Agratas, Tata Group's

"The first production run will be before the end of this decade, so we'll probably see the first batteries in EVs by 2028 and then mass-market availability in the years following"

— Graham Purdy, Ilika

global battery business, which is building a lithium ion battery factory in Somerset, in the UK, with production set to begin after 2025.

In April 2024, Ilika entered into a year-long technology collaboration agreement with Agratas, which encompasses mutual development and testing of SSBs.

Over time Agratas' UK gigafactory could incorporate lines to make SSB batteries.

Ilika has shared a first set of prototypes with Agratas for evaluation and testing and will also share a second set of prototypes for evaluation before the agreement ends. The first set were 2Ahr batteries and the second set will be 10Ahr, which will be more akin to what is built into current batteries.

All-solid-state battery prototypes typically start at 1Ah capacity and work their way up. At the 1Ah sample stage, manufacturers are tasked with testing battery material performance.

At 10Ah capacity, the samples are primarily used to test the performance of individual cells of the battery. At a sample capacity of 20Ah, the battery solution is initially finalized and enters the production technology exploration phase: 20Ah is the capacity of a single cell of the soft-pack batteries currently used in EVs.

The company has 17 agreements globally with automative OEMs so they can evaluate its technology.

There is a long timeline in terms of integrating new battery technologies into electric cars, due in part to the development cycles of new vehicles, which can take years to get from the design phase to the production line.

Purdy says: "We expect a minimum viable product for assessment by mid-2025. Then there will be a manufacturing scale up process of a couple of years before these batteries are built into pre-production vehicles. The first production run will be before the end of this decade, so we'll probably see the first batteries in EVs by 2028 and then mass-market availability in the years following."

Ilika's strategy is to commercialize its Stereax SSBs sooner to generate revenues. It is now in the middle of manufacturing scale-up with first commercial samples coming off production in 2025.

"With Goliath there will be engineering fees associated with taking our technology and optimizing it for customers then license issue fees as it is scaled up and implemented on a mass market scale," Purdy says.

The Stereax cells are made using similar techniques in electronics manufacturing, with vacuum deposition while the Goliath ones use battery making processes, based on roll-to-roll, so many of the steps are compatible with lithium ion cell production.

SSBs are attractive to the EV industry because they allow for more design flexibility than lithium ion, are more durable and can be produced more sustainably than lithium ion.

The increased energy density of SSBs — potentially up to half as much again compared to what lithium ion is capable of — allow for a car to be designed for higher mileage. Doing away with much of the mechanical safety protection could yield even more space for batteries and create a lighter format.

For smaller cars designed to be city runarounds, a carmaker can potentially downsize the battery pack, creating a lighter car, which helps to increase range, with more room inside.

Purdy says: "Think more streamlined

CATL PUTS PEDAL TO THE METAL

Chinese battery giant CATL has increased its R&D investment in all-solid-state batteries in 2024, having expanded its R&D team for the program to over 1,000 people, according to Chinese media reports in November.

CATL has recently entered the trial production stage of 20Ah samples and CATL's current solution can achieve an energy density of 500 Wh/kg for lithium ternary batteries, an improvement of more than 40% over existing batteries, but charging speed and cycle life have yet to meet expectations,

In April 2024, CATL chief scientist Wu Kai said the company had built a performance verification platform for 10Ah all-solid-state batteries and had made technological progress in cathode materials, anode materials, processes and manufacturing equipment.

Wu said CATL was targeting small-volume production of all-solid-state batteries in 2027, marking the first time the battery maker has announced a mass-production timeline for the new type of battery.

Using technology and manufacturing process maturity as a rating system on a scale of 1-9, CATL's all-solid-state battery development was at a 4, Wu said at the time.

CATL's goal was to reach a score of 7-8 by 2027, meaning that it can produce all-solid-state batteries in small batches at that time, but mass production will still face problems including costs, Wu said.

At a power battery conference in September, CATL chairman Robin Zeng said the company's research in the field of all-solid-state batteries is "second to none" compared with its competitors.

CATL's all-solid-state battery team is 1,000-strong, the first time in the industry that a company has invested huge amounts of resources into researching and developing such batteries a local media report claimed.

Using technology and manufacturing process maturity as a rating system on a scale of 1-9, CATL's all-solid-state battery development was at a 4. CATL's goal was to reach a score of 7-8 by 2027

— Wu Kai, CATL's chief scientist

lighter weight vehicles with a longer range thanks to lighter battery packs and at a lower price point. The design will tend towards those we are used to with traditional vehicles.

"A lot of EVs almost look like SUVs because of their bulkiness. But because the size of the battery packs will become smaller, EVs could tend towards some of the optimized designs of traditional cars."

SSBs are a more durable battery capable of a longer operational lifetime in. Fast-charging and high mileage take their toll on lithium ion batteries, leading to a drop in capacity after seven or eight years.

"Even with heavy usage and lots of fast charging, our SSBs are targeting a lifetime of 10-12 years which is similar to the average lifetime of a combustion engine car before scrapping in Europe. There is no point, in our view, of EVs not at least achieving the same lifetime as their petrol or diesel equivalents," says Ramanoudjame.

Solid state batteries are interesting to OEMs from a sustainability perspective. "End of life is important so we have a prototype line in France able to recover 90% of the lithium metal anode in the cell. We have cells in use in the market (in buses) since 2011 but soon they will need to be recycled," says Ramanoudjame.

The ultimate goal, which Blue Solutions continues to work towards, is to be able to re-inject the lithium metal that has been recovered into the production of new cells in a completely closed loop process.

The solid state battery field today is the accumulation of years of R&D and cash-burn as companies seek to break this technology out of the lab. But the rest of this decade is arguably going to be the toughest last leg for the industry.

One of the biggest challenges, according to McNulty, is proving manufacturing on a multiple GWh-scale at high throughput. "This is a key milestone innovators need to overcome to prove mass market commercial viability and cost with the economies of scale."

The first semi-SSB powered EVs are set to enter the Chinese domestic market by mid-2025. For the rest of the world, many innovators are just entering the formal automotive qualification procedure, which can span four to six years, requiring qualification of subsequent samples before commercial production.

Most innovators with pilot lines are still pre-A Sample, according to McNulty, meaning in the best-case scenario commercial EVs would be available around 2030, in premium models, with mass market entry expected around a decade from now.

What will be more interesting is where solid state batteries make their debut in the interim. Their energy density and enhanced performance have the potential to benefit drones, unmanned aviation craft, seagoing vessels, microelectronics, wearable electronics, medical devices, defence equipment and much, much more. ■

FARASIS ENERGY LOOKS TOWARDS 500WH/KG

Chinese power battery maker Farasis Energy announced in December that its all-solid-state battery with an energy density of more than 400Wh/kg had entered the real-world testing phase with stable cell cycling.

The product is built on a sulfide-based system with a high-nickel ternary anode and a high-silicon anode, according to the company.

The safety of the cells with all-solid-state electrolytes has been enhanced, passing pinprick, shear, and hot box tests, with thermal runaway self-shutdown capability at the cell level, Farasis Energy said.

There are three mainstream technology routes in the solid-state battery field -- oxide, polymer and sulfide routes.

In addition to products based on the sulfide route, Farasis Energy also announced its progress in building solid-state batteries based on oxide and polymer systems.

The company's prototype solid-state battery using lithium metal anode and high nickel cathode has an energy density of up to 500Wh/kg, according to the firm..

They also confirmed that omposite electrolyte materials compatible with lithium metal anodes and high nickel cathodes have now been developed, Farasis Energy said.

Farasis Energy, founded in 2002 has built three generations of semi-solid-state batteries before launching all-solid-state batteries.

The company's first-generation semi-solid-state batteries, with energy densities of up to 280-300Wh/kg, began mass production in 2022 and have been accepted by customers including Dongfeng Motor, GAC Group, Geely, and a number of overseas customers, Farasis said.

The second-generation semi-solid-state battery has an energy density of 330Wh/kg, with more than 3C fast-charging capability and a cycle life of more than 4,000, it said.

The company's third-generation semi-solid-state battery has an energy density of up to 400Wh/kg and is undergoing automotive-grade certification and development.

The development of SSBs

Maryland-headquartered Ion Storage Systems has developed a three-layer solid-state lithium-oxide ceramic electrolyte. Its SSBs could find deployment in applications that still rely on lead acid because safety concerns rule out lithium ion. These may be more niche than EVs but they will allow the company to supply smaller volumes sooner and then grow its market over time.

Company founder and chief technology officer Greg Hitz says: "From the outside you wouldn't know the cell is not lithium ion. To the customer, all they need to know is that it has more energy, it is lighter and smaller and it won't burn. By design, all the customer sees is an improvement."

This has been critical to opening up a multitude of markets that traditionally haven't been applicable to SSBs, according to Hitz.

"Our cell doesn't require any compression. When you need all that compression it requires an advanced battery pack to pull it all together. All our competitors are going to EVs, partly because it is a very big market but also because OEMs already have complex battery packs. We can deliver smaller niche products, higher value, higher margin and grow the company more organically," he says.

The company is qualifying its pilot line internally but has what Hitz describes as trillion dollar companies in consumer electronics, in EVs, in defence and in aerospace, keen to qualify its cells.

"Lithium ion isn't safe enough to be on submarines or on naval ships. We're looking into those applications which means competing with lead acid, which is used because it is safe. Our batteries give advanced performance and same safety."

The pouch cell format also simplifies integration, while the battery management system and fire management are minimized.

"Simplified integration and reduced costs and access to US manufactured batteries as well as ability to deliver higher energy densities than for lithium ion are what are attracting potential customers," Hitz says.

Discussing the first customer in the US defence industry, Hitz says it came to Ion wanting a battery that had to be safe, performed better than lithium ion but, crucially, wouldn't be years off to produce. "We're delivering them at a 40% increase over what they have today in terms of energy and format. And it is safe. As we move towards cells for EVs they will have two to three times the density of lithium ion."

"From the outside you wouldn't know the cell is not lithium ion. To the customer, all they need to know is that it has more energy, it is lighter and smaller and it won't burn. By design, all the customer sees is an improvement."

Greg Hitz, company founder and chief technology officer, Ion Storage Systems

Hitz says the defence market is a microcosm of the consumer market in general with mobile applications, vehicle applications and stationary applications. Robustness is key.

Meanwhile electrification needs on the battlefield have been skyrocketing. Advantages include safety and security because there is no fuel to blow up or to steal. "By dedicating itself to electrification the military is reducing its supply chain and simplifying logistics, which makes soldiers safer. Lead acid is used on forward operating bases because lithium ion isn't safe," says Hitz. The company is also in talks about using its batteries in small wearable consumer electronics.

In June 2024 the company started a $40 million collaborative project, overseen by the US Department of Energy's Advanced Research Projects Agency — Energy (ARPA-E) SCALEUP programme.

In the three-year project, Ion Storage Systems will work with ceramics and glass producer Saint-Gobain and KLA, a specialist in semiconductor process and quality control, to accelerate the commercialisation of its anodeless cell.

"Accelerating the widespread adoption of electric vehicles requires increasing driving range, reducing costs, and improving safety. Ion Storage Systems — through an earlier ARPA-E program —focused on working toward these goals, and now, through SCALEUP, the company will accelerate domestic manufacturing of next generation solid-state, high-power-density lithium-metal batteries, based on ION's proprietary ceramic electrolyte manufacturing technology," said Evelyn N Wang, ARPA-E director, when the project was announced.

Hitz says: "ARPA-E wants a hard technical achievement paired with business development that makes it meaningful. Because the anode and cathode can be separated, we can develop stable supply chains. Initially we'll supply battery cells that goes into customer packs in the military. Longer term we focus on where we deliver maximum value and where others deliver maximum value."

For instance, the company has considered delivering the anode/ceramic as a component that can be used by others in cell manufacturing as a way to deliver to a much larger market.

At the end of the ARPA-E project Ion Storage Systems will be at pilot phase and then will build out a factory afterwards. "In military we are imminently qualifying our cells. In consumer electronics we are building relationships with manufacturers in Asia," says Hitz.

"We expect to use a lot of manufacturing centres globally to produce our electrolyte and our anodes. The simplicity of using lithium ion means we expect to scale quickly with customers in their locations on the ground." ■

Blowing hot and cold

The cost of energy is a major expense for battery manufacturers. A fast response time by dew point sensors is an important control mechanism in this respect writes Vaisala's Antti Viitanen.

Humidity control is critical to ensuring battery quality and preventing defects. Battery manufacturers use dehumidifier units to ensure that the air circulating in the process meets strict specifications. In battery production, humidity levels need to be kept extremely low, which means that a lot of dry air is needed, and drying requires heat and, therefore, energy.

One of the most important ways to optimize energy usage is to measure dew point and temperature and use these parameters to control the dehumidifier unit.

The amount of heating required changes as the outside humidity changes. On wet days more heat is needed and on dry days less, but the air fed into the manufacturing spaces must be consistently dry. So how can the dryness of the air blown in by the dehumidifier units be kept at exactly the right level without wasting energy?

In battery manufacturing the sensors used to measure humidity must be extremely accurate: At a dew point of around -70°C, there will only be 2.6 molecules of water in a million particles of air.

Speed is also of the essence. The rotating drums dehumidifier units consist of two main parts:

- the drying section made of desiccant material that draws the moisture out of the air
- the regeneration section that drives heated air in the opposite direction to take moisture away from the desiccant material

The segments typically rotate once every 10 minutes or so. If the moisture level of the incoming air is above the set limit, more heat is needed to remove the water molecules; if the moisture level is below the set limit, less heat is needed.

The sensor technology must be able to measure the changes in humidity within the 10-minute window or the opportunity to adjust the heating for that rotation will have been missed. To get around this challenge, sensors that are too slow to detect such changes in time typically average out results across multiple readings.

The problem with this approach is that drying cannot be controlled in real time. Lack of control over drying leads to unstable humidity conditions, increased safety risks, and potential negative impacts on product quality.

The ability to measure in real-time over a single rotation enables better control of humidity and costs.

The ability to measure humidity variations within one drum rotation, and not just between rotations, is a vitally important feature of dew point sensors in battery manufacture. With this capability it is possible to control the process in real-time to maintain optimal dryness levels in each stage of production and to prevent product defects.

Sensor response times are slower when air is dryer, and faster at higher humidity levels. The extreme dryness required in the dehumidifier units of battery plants makes it challenging to measure fast enough, which means that operators risk relying on falsely high humidity readings. In turn, this could lead to over-drying of the air and wasting a lot of energy.

Vaisala claims that its dew point sensors have a response speed up to many times faster than competing products. Accurate, fast-response sensors therefore help to optimize the efficiency of dehumidifier units so that they only dry air as much as is necessary. This lowers both energy consumption and operational costs.

The ability to measure in real-time over a single rotation enables better control of humidity and costs. However, a further benefit can be achieved by comparing accurate data from each cycle, to identify small anomalies before they escalate into bigger problems.

This supports predictive maintenance and condition-based maintenance, both of which further reduce operating costs – as well as the headaches caused by potential product quality issues.

In addition to the accuracy and fast response of a dew point sensor, low drift and long-term reliability are also essential features of sensors. For example, in environments like battery manufacturing where sensor failure could compromise production quality and safety, this would affect issues such as charging speed and range in EVs for example.

In summary, an investment in accurate, reliable, fast-response sensors would be negligible in comparison with the cost savings and other benefits that it would deliver. In addition, at Vaisala we believe that a compromise on sensor quality would not be worth the risks associated with the potential effects on battery yield and quality. ■

Antti Viitanen is a product manager at Vaisala for industrial instruments and mainly focuses on OEM products/dew point and CO2 products.

Known best for its groundbreaking work in developing electric aircraft motors, magniX has made its first foray into batteries with the help of NASA writes Corporate Jet Investor's Yves Le Marquand.

Next generation powered flight — battery hybrids phase out aviation fuel

In Norse mythology, Magni is the son of Thor and Járnsaxa. His name means 'mighty' in Old Norse. There have been many references in popular culture to Magni, from the Marvel comic series to hugely popular online video game World of Warcraft. But his name has never been adopted quite as aptly as by electric aircraft motor (and from 2024 battery) manufacturer magniX.

The electrification pioneer has been making headlines for its work developing and flying electric motors for aircraft. Highlights include in 2019 the first flight of a De Havilland Beaver seaplane retrofitted with an electric power unit (EPU) in partnership with Vancouver-based seaplane operator Harbour Air. And in September 2022, the first all-electric flight for Eviation's Alice aircraft. Electric motor manufacturer magniX has been flying electric aircraft since 2019 and in that time has flown five platforms.

Leveraging its experience in developing and delivering EPU solutions for the burgeoning electric aviation industry, magniX is expanding its attention to battery development.

The firm recently unveiled its first battery product line, called Samson, focused on delivering high energy density and "unmatched" cycle life. The Samson300 is the first in the line offering energy density of 300Wh/kg) and cycle life of more than 1,000 full-depth discharge cycles to reduce operating costs.

Combined with the firm's magni350/650 electric engines, the Samson battery allows magniX to offer a complete electric powertrain.

"We realised we had been playing with batteries for many years. You can have the best electric motor to power an aircraft in the world, but without an energy source you are not going to realise the dream of electric flight," says Ben Loxton, vice president of Energy Storage Systems and the NASA Electric Powertrain Flight Demonstration (EPFD) programme at magniX.

Samson's development is being advanced under NASA's EPFD programme, which has seen magniX undertake conversion of a De Havilland Canada Dash 7 aircraft into a hybrid-electric propulsion demonstrator.

"We want energy density, but not at the expense of cycle life. If you have a fantastic cell that is, let's say, 500Wh/kg, but it can only do 100-200 cycles, economically that does not work"

— Riona Armesmith, CTO at magniX

"We've always kept a close eye on batteries and we have worked with a number of battery manufacturers and have used a variety of batteries in our demonstrators.

"What we learned, particularly from our work in the EPFD programme where we intended to go out and use a third-party battery, is that there aren't any products that meet the requirements we have, and believe the industry needs, to have a certified, in-service aircraft in the next few years," says Loxton.

Last August magniX unveiled the Dash 7 airframe that will be retrofitted as part of the EPFD programme with NASA. In the next phase, the aircraft, provided by Air Tindi, will have one of its four turbine engines replaced with a magniX electric powertrain, with test flights planned for 2026.

Then, a second electric powertrain will be retrofitted to the aircraft — a configuration that will reduce fuel burn an estimated 40%, Magnix says.

Riona Armesmith, chief technology officer at magniX says: "We have learned so much through integrating these things into aircraft. We're not building a battery from a sole manufacturer's perspective, we are not taking a battery chemistry and trying to turn it into an aerospace battery. We are asking what, from the view of an aircraft operator, are the needs of the industry? This is a fundamentally different approach."

The Samson 300 boasts a number of key features, according to Loxton. Among patented safety technologies such as cell level protections from thermal runaway and ability to store batteries for long periods at zero

"We are asking what, from the view of an aircraft operator, are the needs of the industry? This is a fundamentally different approach."

charge, active on ground cooling during charging and modular architecture to allow for simple replacement, the most impressive capability is its 1,000 full-depth discharge cycles.

Discharge cycles determine the usable life of the battery, the cost of which will be among the primary operating expenses for electric aircraft operators.

The end of usable life for an aircraft battery — similar to an EV — typically arrives when the full charging capacity of the battery reaches about 80% of the original. This means regulations will stipulate operators need to replace the battery at this point, and that could become a costly process especially for those operating high-volume services like air taxi flights, or those flying missions which require most of the battery's state of charge to operate.

"A lot of what we do is to look at what this means for the end user," Armesmith says. "In developing this cell, we have been very strict on cycle life. Yes, we want energy density, but not at the expense of cycle life. We needed to achieve a reasonable balance. If you have a fantastic cell that is, let's say, 500Wh/kg, but it can only do 100-200 cycles, economically that does not work.

"As we go forward beyond our 300Wh/kg module, there is going to be a real focus on keeping that cycle life up. That is the only way we can make this economically viable."

The Samson300 battery offers a cycle life of more than 1,000 full-depth discharge cycles. When combined with magniX's electric engines, the battery allows the firm to offer a complete electric powertrain.

Usable life also brings with it a new challenge: what do you do with batteries once they lack the charging capacity for aircraft operations? It is an area magniX is keeping a close eye on as it develops the Samson product line. Although detailed plans for recycling batteries are

WHAT BATTERY TECH MEANS FOR BUSINESS AVIATION

The aviation industry has long been an incubator for new, disruptive technologies. Advancements in aerospace technology such as winglets, composite airframes and fly-by-wire systems were all tried and tested in business aviation first.

Logic suggests that at least a portion of the latest incumbent of disruptive technologies will also find their feet in business aviation and battery-electric aircraft are certainly no different.

German eVTOL developer Lilium is targeting the luxury end of air travel as an entry market. The startup, currently working on its six-passenger Lilium Jet powered by 36 electric motors, has announced deals with industry operators including Luxaviation, Philjets and GlobeAir. It also has an exclusive dealership deal in the UAE, Cyprus and Israel with brokerage ArcosJet.

Fellow German startup VÆRIDION has also singled out business aviation as a key target entry market for its battery-electric aircraft – the nine-passenger Microliner. The company has cooperation agreements with Danish charter operators Copenhagen AirTaxi and Copenhagen Helicopter.

Co-founder and CEO Ivor van Dartel says VÆRIDION decided on the business aviation-first pathway partly due to regulations. If an aircraft holds nine seats or below, it still qualifies for level three of CS23 — EASA's regulation for normal, utility, aerobatic and commuter aeroplanes.

The same is true in the US. The regulatory framework that enables initial operations of electric aircraft will see them flown as Part 135 services. Those are conducted under the set of Federal Aviation Regulation (FAR) guidelines relevant to non-scheduled, commercial aircraft operations — in other words, business aviation.

Logic suggests that at least a portion of the latest incumbent of disruptive technologies will also find their feet in business aviation and battery-electric aircraft are certainly no different.

"There are exotic chemistries in the lab with small coin cells where people are demonstrating 400-500Wh/kg, but that is almost impossible to produce at scale. We are probably the best part of five years away from having the specialized production techniques required to produce large numbers of those cells at a reasonable cost and reliability rate"

— Ben Loxton, VP Energy Storage Systems

yet to be defined, the firm plans to keep production "as domestic as possible" including everything from mineral extraction right through to cell production to minimise climate impact.

"These are factors we are looking at right out into the future," says Loxton. "We are thinking about what you might do with the battery packs through second and third lives once they are no longer fit for the aircraft. And then how you reclaim and recycle those materials back out of it. It is an important aspect we will be looking at over the next five or so years as our batteries go into service planning."

While magniX is not revealing the specific battery chemistry — though it can only be a variation of a lithium one —it has selected for the Samson product line, Loxton says it is "nothing super exotic". The team decided on a "reasonably static" chemistry that can be produced using equipment today.

"There are exotic chemistries in the lab with small coin cells where people are demonstrating 400-500Wh/kg, but that is almost impossible to produce at scale. We are probably the best part of five years away from having the specialized production techniques required to produce large numbers of those cells at a reasonable cost and reliability rate," says Loxton. "That was one of the key drivers behind our chemistry decision." ■

The companies plan first to replace one of the Dash 7's PT6As with a Magnix electric powertrain, with flight tests to begin in 2026. Then, a second electric powertrain will be retrofitted to the aircraft — a configuration that will reduce fuel burn an estimated 40%, Magnix says.

Study charts rise in patents for Li battery materials

Patent filings for battery recycling have increased 45% year-on-year, with a greater focus on extracting lithium, according to latest analysis.

The number of patent filings in 2022 for battery recycling focused on lithium was almost 200% higher than for nickel, cobalt or copper, intellectual property law firm Appleyard Lees revealed in the fourth annual edition of its *Inside Green Innovation: Progress Report*.

This innovation focus reflects the relative complexity involved in recycling lithium ion batteries and comparative scarcity of the element, which affects energy security, said the report — which looks at the latest complete filing data available from public sources (through to December 31, 2022).

According to the report, patent filings for battery recycling in 2022 (219) increased by 45% on 2021 (151) and more than 250% on 2019 (58) — with innovation focused on so-called black mass.

The marked rise in patent activity is through new market entrants such as BASF, Guangdong Brunp Recycling Technology and Volkswagen, adding to the existing companies active in this area including Toyota and Duesenfeld.

And while previous research showed that battery innovation was driven by electrical engineering, the report said latest evidence shows comparable advances in both chemical and electrical engineering fields.

Newly-protected innovation for lithium extraction using pyrometallurgy includes a process involving a partial-oxygen environment to react lithium with carbon in the black mass to produce extractable lithium carbonate.

Meanwhile, a BASF patent application using hydrometallurgy offers a potentially more economical and commercially-desirable method to extract lithium via lithium chloride and lithium hydroxide extraction, the report said.

Appleyard Lees trainee patent attorney Kealan Fallon said: "There is an urgent need for new technologies and methodologies to efficiently extract valuable materials from lithium ion battery waste, especially with the rapidly increasing EV market, in which about 1,400 EVs per day are estimated to be available for recycling by 2040."

Fallon said this is reflected in projections of market size for battery recycling globally, estimated to more than double between 2023 to 2030 to $54 billion. ■

IBMA alert over India's latest national guidelines

Battery makers in India say proposed new national recycling guidelines can boost sustainability, but have cautioned the move risks ramping up costs.

The Indian Battery Manufacturers Association (IBMA) said on December 10 that environmental compensation guidelines unveiled by the Central Pollution Control Board propose a minimum pricing for extended producer responsibility (EPR) credits at 30% of the environmental compensation.

But this risks potentially raising compliance costs to unsustainable levels and could lead to battery price increases, the IBMA warned.

The IBMA is instead calling for free EPR credits for manufacturers that already cover waste management costs.

In addition, the association said the proposed minimum EPR credit price should be replaced with a market-driven pricing model for EPR certificates without a fixed minimum.

"IBMA members have significantly invested in reverse logistics to ensure proper collection, handling, and transportation of used waste batteries to authorized recyclers," the association said.

"Including the cost of recycling in the environmental compensation and the requirement to buy EPR credits indexed at this inflated price could lead to double reimbursement to recyclers."

India's existing EPR system favours integrated recycling facilities that produce refined lead directly from waste batteries. But doing so excludes the majority of recyclers who deploy a two-step process — producing remelted lead before refining it to the required purity.

The IBMA is instead calling for all approved recycling processes linked to waste batteries under the EPR certificate system, irrespective of processing method.

IBMA president and CEO of Luminous Power Technologies, Preeti Bajaj, said: "Engaging deeply with industry stakeholders isn't just important — it's essential for crafting rules that truly work." ■

Hyundai, Lithion partner for EV battery recycling

For the record, Montreal-based strategic minerals supplier and battery recycler Lithion Technologies have entered a multi-year agreement with Hyundai Auto, Canada, furthering an initial 2021 agreement between the two companies.

The announcement was made earlier this month at The Battery Show, North America and makes Lithion a partner for over 250 Hyundai and Genesis dealers across Canada.

The recycling company attracted General Motors as an investor two years ago and aims to be able to recover 98% of the minerals contained in EV batteries and 95% of battery components.

It says it will encompass logistics, collection, dismantling, and recycling, ensuring batteries are processed in the safest and most efficient manner at its recycling plant in Saint-Bruno, Montreal, the construction of which was announced last year. The plant will process over 15,000 tonnes of lithium-ion batteries per year, which come from electric and hybrid vehicles, as well as production rejects.

Since the completion of its first commercial plant in June 2024, Lithion has rapidly expanded its activities, signing multiple multi-year battery feedstock agreements with key industry players.

"For many years, Lithion has been privileged and fortunate to partner globally and locally with Hyundai, a visionary company dedicated to finding sustainable circular economy solutions for its lithium-ion batteries," said Yves Noël, Lithion's vice president and chief business development officer. ■

Li-Cycle announce prelim 2024 highlights

Li-Cycle, the Canadian lithium recycling firm, is continuing to prioritize securing a full financing package to support the construction restart of the Rochester Hub project and to satisfy requirements for the first advance under the $475 million loan from the US Department of Energy according to Ajay Kochhar, Li-Cycle president and CEO in January.

"We are focused on securing a full financing package to underpin the restart of construction of the Rochester Hub and starting to draw on the DOE loan alongside implementing initiatives to enhance Spoke performance and improve cash flow to establish a self-sufficient Spoke business," he said

Li-Cycle had earlier revealed that it has resumed planning for a battery recycling partnership in Italy with Glencore and that the firms had restarted assessing the technical and economic viability of developing a facility in Portovesme, Sardinia, including a concept and pre-feasibility study.

The move comes just weeks after troubled Li-Cycle was awarded a conditional $475 million loan from the US Department of Energy — $100 million more than discussed earlier in the year.

The Portovesme study is expected to be led and funded by Glencore, with Li-Cycle providing technical expertise and support. The project will utilize infrastructure and equipment at Glencore's existing Portovesme metallurgical complex and deploy Li-Cycle's spoke and hub technologies to produce critical battery materials such as lithium, nickel and cobalt from recycled battery content.

Spoke facilities are where all types of lithium ion batteries are transformed from a charged state to what Li-Cycle describes as an inert product. The resulting black mass is then transferred to a hub, where cathode and anode materials are processed into battery grade end-products for reuse in battery production or other applications.

It is the first DoE loan for a battery resource facility. Li-Cycle reckons the project will create 855 construction jobs and over 200 permanent jobs.

Li-Cycle had sought the loan for nearly three years. ■

Environmental best practice in focus for US lead recyclers

US lead battery recyclers' total lead emissions to air account for less than 1% of total air lead emissions nationally, industry leaders have been told.

Updates on stringent practices involved in the sector were included in the latest semi-annual meeting of the Association of Battery Recyclers (ABR) — which featured an environmental panel on best practices for emissions control, the ABR said on January 16.

Industry experts taking part in the panel included Mark Hoffman, environmental director at Ecobat Resources, Eric Peffel, East Penn's director of environmental affairs and Mike Casper, director of environmental engineering at Motrex.

Key topics included testing by third parties and the use of cutting-edge filtration systems to reduce emissions, dust mitigation measures such as facility washdowns and rooftop sprinklers and temporary enclosures with negative pressure during maintenance to prevent the release of fugitive (leaks and irregular) emissions. ■

Gravita's Mundra set for lead recycling boost in India

Lead battery recycling capacity at Gravita India's Mundra facility is on course to increase to 100,000 tonnes a year, the company confirmed on January 27.

The announcement came less than two years after Batteries International reported an increase in lead recycling at Mundra, in Gujurat, by 40,500 tpa to 60,000 tpa.

Gravita said the latest capacity increase, to be achieved within the next year, was announced by CEO Yogesh Malhotra in an earnings call on January 23.

Mundra is also set to start a pilot lithium ion battery recycling scheme, Malhotra said.

"It's only a pilot project because, currently, we are not considering any revenues coming from lithium ion in the next three to four years."

However, Malhotra said the move was needed to better understand the recycling tech for lithium, although the company has its own R&D team looking into the technology.

In future, Malhotra said Gravita envisaged a partnership with another company that already deals with lithium battery scrap and could involve a technology transfer agreement for recycling.

Gravita is also looking at opportunities to import (lithium) scrap into India for recycling. Malhotra said waste batteries could come from EVs and energy storage systems. ■

Ace Green deal to build India LFP recycling plant

Ace Green Recycling said on January 8 it had finalized a lease agreement to build what will be India's biggest LFP battery recycling plant.

The company plans to establish 10,000 tonnes of LFP battery recycling capacity annually in India by 2026.

Ace's new facility, in Mundra, will follow on from the company's existing commercial lithium and LFP battery recycling dating back to 2023, the company said.

The firm's deployment of its so-called Lithium-First LFP recycling tech will be phased in, along with the planned use of the technology in Texas — for which plans were originally announced in 2022.

Ace claims the proprietary technology is based on room temperature operations in a fully electrified hydrometallurgical process producing no Scope 1 carbon emissions, and with zero liquid and solid waste.

The firm claims the process recovers lithium at levels of around 75%, producing lithium carbonate of purities exceeding 99%, which is fed back into the battery materials value chain.

In January 2024, *Batteries International* reported that Taiwanese lead refiner ACME Metal Enterprise had installed its first modular lead battery recycling equipment supplied by Ace. ■

Umicore to pause construction of battery materials plant in Canada

Metals recycler and battery materials producer, Umicore, announced mid-November it had paused construction of a battery plant in Ontario as the company rethinks its plans. The decision, it said, was part of a broader response to slowing demand for electric vehicles.

The Belgian-based group had only broken ground for the facility near Kingston, Ontario last year. It was expected to support 600 new jobs and provide battery materials for as many as 800,000 electric vehicles annually after starting operations in 2026.

"Umicore is navigating a challenging environment where we feel the impact of the complex transitioning of the automotive industry towards electric mobility. Serving our North American customers out of Korea is now clearly the most effective use of our assets," CEO Bart Sap said on November 6.

Umicore launched a review of its business earlier in 2024 saying then it had postponed "large scale" investments in an unspecified battery recycling plant in Europe, as well as the one in, Canada.

Sap said factors that had driven Umicore's decision were: the need to scale back its battery materials business; several of the company's legacy contracts were ending faster than anticipated; and a ramp-up of new contracts in Europe was delayed, as has anticipated production for a battery manufacturing operation in China.

The company also gave detail on the cost-cutting measures it announced in July, saying they would contribute €40 million ($43 million) of savings in 2025. They would also affect around 260 positions, 100 of which were in Belgium. The company has 12,000 employees in all.

Umicore said it had begun consultations with trade unions, and intended to resize the workforce of its battery materials division predominantly in its Jiangmen, China production plant, while also cutting R&D activities in Hørsholm in Denmark. ■

Altilium achieves milestone in EV battery recycling

UK clean technology group Altilium has announced a breakthrough in the development of the UK's only domestic supply of sustainable low-carbon battery materials with a test confirming that the company's recycled cathode active materials (CAM) are comparable to commercial materials.

Recycling old EV batteries and production scrap looks set to play a significant role in alleviating the shortage of raw materials needed for the energy transition and reducing the environmental impact of battery production. However, little work has been done to date to show if the performance of recycled materials can match commercial materials.

Now, results from electrochemical testing of cells produced from Altilium's recycled CAM at its facility in Devon in southern England have shown comparable rate and cycle performance with commercially available CAM used in today's high-nickel NMC 811 batteries. The cycle cell capacity of Altilium's recycled CAM reached 193 $mAh.g^1$ in testing, aligning closely with the 190-194 $mAh.g^1$ range typical for commercial CAM, showing its equivalency.

Battery cycle testing, a vital step in the design and validation phases, involves repeated charge and discharge cycles to confirm a material's reliability and lifespan.

"With these results, Altilium has shown recycled battery metals can perform as well as virgin metals and that critical minerals are essentially the same whether they come from a mine or an old EV battery" said Christian Marston, Altilium co-founder and COO.

The CAM was produced as part of a collaborative research project backed by the Advanced Propulsion Centre in the UK. Atlilium produces CAM from recycled materials for production and qualification of new EV batteries.

The company's EcoCathode process is able to recover over 95% of the critical metals, including lithium, from spent batteries, before upcycling and re-engineering them to produce modern battery chemistry materials.

Currently almost all the world's CAM is produced in Asia. ■

Mercedes opens EV battery recycling plant

German carmaker, Mercedes, opened in November Europe's first battery recycling plant featuring an integrated mechanical-hydrometallurgical process, which the company has hailed as a 'key milestone' in boosting the sector's sustainability.

The new facility, based in Kuppenheim, southern Germany, was inaugurated on October 21, and will have an annual capacity to recycle 2,500 tonnes of material which will feed into producing some 50,000 batteries for the group's electric models.

Unlike existing established recycling processes, the mechanical-hydrometallurgical technology at the plant will allow for the recovery of more than 96% of valuable materials from used EV batteries. Raw materials including lithium, nickel and cobalt will be recovered.

The recycled materials will be used to produce over 50,000 new battery modules annually, the company said, helping to meet the growing demand for EVs while cutting down on the need for new raw materials.

With the clock ticking on an EU deadline to phase out the sale of fossil fuel-burning cars by 2035, there is a growing focus on producing and recycling EV batteries, as well as reducing waste.

Mercedes says it has invested tens of millions of euros in the new plant, and that it will operate in a net carbon-neutral manner, powered entirely by renewable energy.

Germany's chancellor, Olaf Scholz, visited the plant for the opening ceremony saying: "The future of the automobile is electric, and batteries are an essential component of this.

"To produce batteries in a esource-conserving and sustainable way, recycling is also key." ■

12th edition Solar Finance & Investment Europe

February 4 - 5
London, England

Returning in 2025 for its 12th edition, Solar Finance & Investment Europe Summit will bring together the brightest minds representing funds, banks, developers, utilities, government and industry across Europe and the UK on a programme that is solutions-focused from top to tail. The event is designed to enable leaders at the forefront of solar investment and deployment in Europe to scale, learn and land themselves industry-defining partnerships.

Contact
www.financeeurope.solarenergyevents.com
E-mail: ssf@solarmedia.co.uk
Phone: +44 207 871 0122

RE + Northeast 2025

February 12 - 13
Boston, MA, USA

Learn more about RE+ Northeast, powered by the Solar Energy Industries Association (SEIA) and Smart Electric Power Alliance (SEPA). largest forum for professionals dedicated to the integration of solar, storage, and additional renewable energy assets like wind energy and electric vehicle infrastructure in the northeastern United States. This event provides the tools, experience, and expertise to enhance innovation, policy, regulation, and business opportunities in the region. Unlike other industry events, all proceeds from RE+ Northeast support the expansion of the clean energy industry through SEIA and SEPA's year-round research and education activities, and SEIA's extensive advocacy efforts.

Contact
www.re-plus.events/northeast/about/
E-mail: kcroy@re-plus.com

The Smarter E India 2025

February 12 - 14
Gandhinagar, India

The smarter E India Conference provides strategic inputs in all the key aspects of the fast growing Indian solar, energy storage and EV ecosystem. It is very welcoming allowing people to become speakers for the smarter E India Conference and share your insights and expertise with key stakeholders. This conference addresses all the key areas along the value chain and brings together local experts and international stakeholders in the energy future.

Contact
www.thesmartere.in
E-mail: souvik.sanyal@mm-india.in
Phone: +91 22 4255 4711

Energy Storage Summit

February 17 - 19
London, England

2025 is set to be a pivotal year for the global energy transition, as we reach the halfway point in a significant decade for the planet on its path to net zero. Our Summit aims to highlight the fundamental role that energy storage will play in this journey, and will strive to recognise, explore and analyse key challenges that may present themselves on the trajectory ahead. Join us in February for the networking event of the year, bringing together over 2000 delegates from across Europe's energy storage value chain, spanning investors, developers, IPPs, banks, government and policymakers, TSOs and DSOs, EPCs, optimisers, manufacturers, data and analytics providers, consultancies, system integrators and more.

Contact
www.storagesummit.solarenergyevents.com
E-mail: lucy@solarmedia.co.uk
Phone: +44 207 871 0122

NAATBatt 2025

February 17 - 20
Orlando, FL, USA

NAATBatt International, the trade association for advanced battery technology in North America, is holding its 16th annual meeting & conference at the Omni Orlando Resort at Champions Gate in Champions gate (Orlando), Florida in February.

This year's program will focus on the challenges of growing businesses to scale in a world where volatility, uncertainty, complexity and ambiguity have become the norm.

Contact
www.nac.naatbatt.org
E-mail: info@naatbatt.org
Phone: +1 312 588 0477

Battery Japan

February 19 - 21
Tokyo, Japan

Renewable energies are expected to play a greater role in achieving carbon neutrality by 2050.Smart energy week gathers a full range of renewable energy technologies such as hydrogen and fuel cells, solar power, rechargeable batteries, smart grids, wind power, biomass, zero-emission thermal power generation, etc.

Smart Energy Week is an exhibition where the latest technologies, information and people gather to accelerate the business in the energy industry.

Contact
www.wsew.jp
E-mail: wsew.jp@rxglobal.com
Phone: +81 3 6739 4119

Intersolar North America

February 25 - 27
San Diego, CA, USA

Intersolar North America and Energy Storage North America highlights the latest energy technologies, services, companies, and organizations striving to create a positive impact on climate change and support our planet's transition into a more sustainable energy future.

Contact
www.intersolar.us
E-mail: SolarGames@divcom.com
Phone: +1 603 547 7057

ERCOT Market Summit

February 25 - 27
Austin, TX, USA

Faced with an unprecedented expansion of energy demand across Texas, the ERCOT market must generate, transmit and distribute 152 GW of reliable power by 2030, up from 89 GW of today. Rapidly building up system capacity to meet the needs of new data centers, electrification of Permian Basin oil production, and population growth is driving massive investment in an avalanche of new generation, storage, transmission and distribution infrastructure. Simultaneously, the many market and rule reforms, including the $5B Texas Energy Fund mandated in 2023 legislation, implementing real-time co-optimization, and a new dispatchable reliability reserve service are simultaneously changing the risk and reward profiles for all market participants while creating new opportunities for many.

Contact
www.infocastinc.com
E-mail: registration@infocastevents.com
Phone: +1 818 888 4444

2nd Annual Electric Vehicle Battery & Recycling Forum

February 26 - 27
Amsterdam, Netherlands

Electric Vehicle Battery Recycling Forum brings together the key European industry leaders from the Electric Vehicle community to discuss the newest innovations in EV battery recycling. This is the right place to discuss the biggest challenges that the industry is facing and of course, thanks to the expertise of the Speakers, we will get a deep insight into the strategies and best practices that help them overcome the difficulties. Join us to explore more about the innovative technologies and EV battery recycling processes, as well as about the incoming European battery regulations.

Contact
www.leadventgrp.com/events
E-mail: info@leadventgrp.com

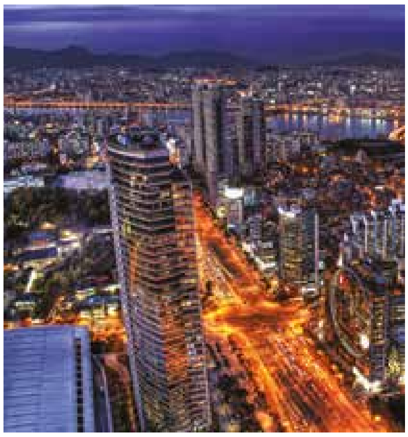
ACI Battery Recycling Europe 2025

March 5 - 6
London, United Kingdom

At Battery Recycling Europe, industry leaders, experts, and innovators will converge to tackle the pressing challenges and seize the many opportunities within the battery recycling landscape. Through thought-provoking discussions, valuable insights from esteemed speakers, and engaging networking opportunities, attendees will gain a comprehensive understanding of the latest advancements and emerging trends driving sustainability in battery management. Battery Recycling Europe serves as a pivotal platform for industry stakeholders to exchange knowledge, form partnerships, and drive collective action towards a more sustainable future. Whether you're a regulatory compliance director, environmental specialist, sustainability manager, or industry advocate, this conference offers invaluable insights and networking opportunities tailored to your professional needs.

Contact
www.wplgroup.com/aci/event/battery-recycling-europe/
E-mail: operations@acieu.net
Phone: +44 20 7981 9800

Amsterdam, Netherlands



InterBattery

March 5 - 7
Seoul, South Korea

The fair showcases a wide array of new products and technologies related to the manufacturing and development of rechargeable batteries. It attracts professional visitors from around the world, including manufacturers, developers, researchers, and end users interested in the latest materials, production techniques, testing and analysis equipment, and battery systems. The InterBattery serves as a central communication and information platform for the industry, offering exhibitors an excellent opportunity to present their innovations to an informed audience.

Contact
www.tradefairdates.com
E-mail: interbattery@coex.co.kr
Phone: +82 2 6000 1061

The Distributed Energy Show

March 12 - 13
Birmingham, United Kingdom

The future of energy generation is flexible, decentralised and renewable. Energy users, network operators and the entire energy supply-chain come to The Distributed Energy Show to see technology in action. The show features the UK's widest array of technologies for onsite and localised heat & power generation along with the infrastructure, software and components necessary to connect to the energy network and implement a low-cost, low-carbon energy strategy.

Contact
www.distributedenergyshow.com
E-mail: marina.rodousaki@event-partners.com
Phone: +44 01273 957116

International Battery Seminar & Exhibit 2025

March 17 - 19
Orlando, FL, USA

The International Battery Seminar & Exhibit has established itself as the premier event showcasing the state of the art of worldwide energy storage technology developments for consumer, automotive, military, grid, and industrial applications.

As the longest-running annual battery industry event in the world, this meeting has always been the preferred venue to announce significant developments, new products, and showcase the most advanced battery technology.

Contact
www.internationalbatteryseminar.com
E-mail: ce@cambridgeenertech.com
Phone: +1 781 972 5400

Giga Europe 2025

March 18 - 19
Autoworld, Brussels, Belgium

Benchmark is delighted to announce the return of the Giga Europe event series, established as the world's premiere platform for the electric vehicle to lithium ion battery supply chain.

We are excited to announce that Brussels has been selected as host city: home to the European Parliament, Brussels is the perfect place for the region's government, industry and finance to meet to chart a course for the region's lithium ion economy, from mine to electric vehicle.

Contact
www.benchmarkevents.
benchmarkminerals.com
Phone: +32 2 743 29 80

IARC 2025 International Automotive Recycling Congress

March 19 - 21
Antwerp, Belgium

The European End-of-Life Vehicle (ELV) Regulation is not just a routine legislative framework — it is a global story of transformation, driven by innovative technologies and digital solutions that will shape the entire lifecycle of vehicles, from design to disposal.

Car, motorbike, truck, and bus manufacturers need to take an active role in preparing for the significant responsibilities and financial implications that new European regulations and policies on critical raw materials and decarbonization will bring.

The European ELV Regulation introduces new rules for vehicle design and end-of-life management, requiring lorries, buses, and motorcycles to be treated at authorized treatment facilities, and restricting the export of non-roadworthy vehicles.

Contact
www.events.icm.ch
E-mail: info@icm.ch
Phone: +41 62 785 10 00

Battery Tech Expo

March 26 - 27
Silverstone, United Kingdom

Battery Tech Expo UK 2025 runs 25th April 2024 at The Wing, Silverstone, a major hub of the UK's high-tech engineering sector.

The event brings together professionals from across the advanced battery technology and energy storage sector to connect, innovate and do business.

The event will provide a unique opportunity to showcase the latest products, technologies and services covering the Battery Management Systems, EV Battery, Battery Storage, Battery Development/ Discovery, Commercial and Mobile Power Device sectors.

Contact
www.batterytechexpo.co.uk
Email: david.reeks@104-media.com
Phone: +44 1283 381719

Batteries Event 2025

April 1 - 3
Dunkerque, France

In 2025, Ecosystemée and Avicenne Energy, in partnership with Grand Port Maritime de Dunkerque, are joining forces to launch a new event. The aim is ambitious: to gather international, national and local players at the heart of one of Europe's leading regions for the battery industry. From 1st to 3rd April 2025, the conference program, exhibition space, site visits and social events will be as many opportunities to understand, meet and discuss all the issues involved in the emergence of this new industry.

Contact
www.dunkerque.batteriesevent.com
E-mail: invoicing@batteriesevent.com

International Advanced Battery Power Conference 2025

April 1 - 3
Aachen, Germany

Advanced Battery Power is one of the largest international scientific battery conferences in Germany. The established symposium offers a broad professional audience an excellent platform for the presentation of research work and results in the field of battery technology. Representatives from industry and academia discuss the latest findings along the entire value chain of batteries: the current state of research on lithium-ion batteries, new types of systems and innovative materials, battery cell production and fields of application as well as second life and recycling.

Contact
www.battery-power.eu/en
E-mail: hdt@hdt.de
Phone: + 49 201 18 03 1

Battcon

April 4 - 6
Orlando, FL, USA

The Battcon technical committee is seeking abstracts (to eventually become papers if accepted) for peer-review, by Battcon. The published papers will be available on the Battcon website archive. The papers focus on stationary batteries, geared mostly towards an end-user audience.

Contact
www.battcon.com
E-mail: events@battcon.com

Intersolar & EES Middle East

April 7 - 9
Dubai, United Arab Emirates

The three-day conference guides the region through the energy transition by providing concentrated insights into the transformative dynamics of renewable energies. The conference is a must-visit for those who can sense the sea change in the energy industry and want to get the inside track. It's specifically for visitors who want to explore the latest advancements in renewable energy, energy storage and green hydrogen. Join the energy industry as it gathers to engage in meaningful dialogue, identify industry pain points, and showcase the latest in energy trends. What's more, it's the perfect place to meet the fresh faces, major players and key influencers in this emerging industry. Get a first glimpse at the topics from the conference program 2024.

Contact
www.intersolar.ae/home
E-mail: maass@solarpromotion.com
Phone: +49 7231 58598-205

Re-Battery 2025

April 15 - 16
Bologna Fiere, Italy

RE-BATTERY 2025 is Southern Europe's largest international trade fair, within E-TECH EUROPE 2025, for battery producers, recycling companies, raw material suppliers and the entire battery supply chain: on collecting, sorting, processing and reusing batteries, e-mobility systems and e-waste. Main topics discussed will include battery recycling technologies, materials recovery solutions, green electronics, sustainable materials, non-toxic substitutes and end-of-life / reuse strategies, as well as regulatory and business models to help reduce the environmental impact. RE-BATTERY 2025 will focus on lithium-ion batteries from e-mobility transportation, stationary applications, mobile and charging products, but also lead-acid batteries and e-waste from electronics.

Contact
www.e-tech.show/re-battery
E-mail: events@e-tech.show
Phone: +39 02 6630 6866

The Battery Show South

April 16 - 17
Atlanta, GA, USA

The Battery Show and Electric & Hybrid Vehicle Technology Expo launches in the next hub of EV, battery, and clean energy growth—the U.S. Southeast. The Battery Show South will bring together the new regional value chain in the Battery Belt to discover the latest technologies across commercial and industrial transportation, advanced battery, H/EV, materials, stationary energy storage, recycling, components, mining, medical, aerospace, and more. Meet engineers, business leaders, top-industry companies, and innovative thinkers creating powerful solutions and shaping the future of Battery and EV technology.

Contact
www.thebatteryshowsouth.com
E-mail: pr.ime@informa.com.

Advanced Clean Transportation Expo

April 28 - May 1
Anaheim, CA, USA

Gain in-depth insight into the trends, technologies, and policies transforming clean commercial transportation. In this expo you will Hear low- and zero-emission vehicle case studies from early adopter fleets, Learn how to take advantage of vehicle and infrastructure funding opportunities. Stay ahead of the

SAVE THE DATE

2025 BCI Convention + Power Mart Exp

May 4-7, 2025
San Antonio, Texas, USA

Get ready to power up for the 2025 BCI Convention + Power Mart Expo in the vibrant city of San Antonio, TX! As we look forward to the next century of innovation, this year's convention promises to be a dynamic gathering of industry experts and leaders. Mark your calendars and join us as we explore the future of battery technology, network with top professionals, and discover innovative solutions that will drive our industry forward.

Contact
https://convention.batterycouncil.org/
E-mail: info@batterycouncil.org

rapidly evolving regulatory landscape and learn how to stay compliant with current and upcoming mandates Discover the latest technologies, solutions, and services to support fleet sustainability

Contact
www.actexpo.com/
E-mail: Registration@trccompanies.com
Phone: +1 888 993 0302

InterBattery Europe

May 7 - 9
Munich, Germany

InterBattery is Korea's leading battery exhibition that offers the most effective business platform for entering the Asian battery market.

It has been growing by 30% each year since it was held for the first time in 2013 in line with the growth of world rechargeable battery industry.

InterBattery, during which major global battery companies such as Samsung SDI, LG Energy Solution and SK On etc. participate, is the largest battery exhibition in Korea with 300 exhibitors and over 85,000 visitors from around the world.

Contact
www.interbartteryeurope.com
E-mail: interbattery.europe@gmail.com

All-Energy

May 14 - 15
Glasgow, Scotland

All-Energy takes pride in being the UK's largest low carbon energy and full supply chain renewables event; while the co-located Decarbonise is aimed at private and public sector energy end users. All-Energy offers an opportunity to meet, network and make connections with the renewable energy community with two days of uninterrupted business.

Contact
www.all-energy.co.uk
Phone: +44 20 8271 2179

Fenibat

May 25 - 27
Londrina, Brazil

Their objective is to disseminate new products, services and technologies from all over the world to the South American market, as well as the exchange of information and knowledge.

Besides the networking events, the Fenikart Tournament and the Welcome Cocktail, we´ll have two days of the Equipment and Materials and Services Exhibition and the Technical and Commercial Conference.

The theme of this edition will be lithium and the future of the lead battery industry, being this, so, the focus of our Conference presentations.

The Feibat will bring information of interest to entrepreneurs, administrators and investors; managers, supervisors and technicians of Administration, Purchasing, Production, Maintenance, Projects and Product Development, Quality Control, Laboratories, Metrology, Work Health and Safety, Environment.

Contact
www.fenibat.com
E-mail: camila@fenibat.com
Phone: +55 43 99937 4911

11th International BCI Meeting

June 2 - 5
Banff, Canada

The BCI Meeting brings together scientists, engineers, and clinicians involved in BCI research and clinical use, to review the present state of the field, address key issues critical to further progress, and promote the education and participation of young researchers. This meeting should, like its predecessors, contribute greatly to BCI research and development. BCI Society members in good standing are invited to submit workshop proposals, abstracts for oral and poster presentations, and applications for the BCI Global Plenary Session for the 2025 BCI Meeting, taking place June 2-5, at the Banff Centre for Arts and Creativity.

Contact
www.bcisociety.org/bci-meeting
Phone: +1 250 472 7644

The Battery Show Europe

June 3 - 5
Stuttgart, Germany

Meet battery manufacturers, suppliers, engineers, thought leaders and decision-makers for a conference and battery tech expo focused on the latest developments in the advanced battery and automotive industries.

Contact
www.thebatteryshow.eu/en
E-mail: thebatteryshowcs@informa.com
Phone: +44 20 8052 0660

Battery Recycling Conference & Expo

June 11 - 12
Mess Frankfurt, Germany

Battery Recycling Conference & Expo 2025 is the must-attend event for battery producers, recycling companies, critical raw material suppliers, and the entire battery supply chain to come together to discover the latest innovations and solutions to create a circular economy for used batteries and help create sustainable supply chains for the future.

Contact
www.batteryrecycling-expo.com
E-mail: peter@trans-worldevents.com
Phone: +44 1483 330018

Advanced Automotive Battery Conference Europe

June 23 - 26
Mainz, Germany

Each year, AABC Europe brings together a global audience of battery technologists and their key suppliers for a must-attend week of development trends, breakthrough technologies and predictions of the market for years to come. As European nations and international automotive OEMs invest in their commitment to vehicle electrification and eMobility, the 2025 event in Mainz will help propel that momentum forward, presenting unparalleled coverage of the research and development that helps drive outcomes and supports the next generation of electric vehicle batteries. The 2024 event was the largest AABC Europe ever!

Contact
www.advancedautobat.com/Europe
E-mail: ce@cambridgeenertech.com
Phone: +781 972 5400

PB2025

June 25 - 27
Amsterdam, The Netherlands

Pb2025 is organised by ILA, the only global trade association dedicated exclusively to representing lead producers and supporting a sustainable future for lead. Many ILA members are recycling lead from end-of-life products, contributing to a circular economy by creating economic value from waste. ILA members also produce lead from mining, smelting and refining of lead from ores and concentrates. Associate members include companies with a direct interest in lead and its many important uses.

Contact
www.pb-conference.com
E-mail : Pb2023@ila-lead.org
Phone: +44 20 7833 8090

Battery Cells & Systems Expo

July 9 - 10
Birmingham, United Kingdom

Battery Cells & Systems Expo will bring together automotive manufacturers, electric utilities, battery system integrators, cell manufacturers and the entire manufacturing supply chain. A truly unique showcase, companies from around the world will use the show to launch products and demonstrate their technology to an audience of professionals.

Contact
www.batterysystemsexpo.com
E-mail: lana.fowler@event-partners.com
Phone: +44 1273 286362

The Battery Show Asia

15 - 17 July
Hong Kong, China

Don't miss The Battery Show Asia that is happening 15-17 July 2025 in Hong Kong, bringing together the leading innovators & engineers in the battery industry.

Positioned as the premier event for energy storage solutions, electric vehicles, and advanced battery technologies, this is your opportunity to connect with Asia's growing market.

Contact
www.thebatteryshow.asia
E-mail: info@thebatteryshow.asia

August 3-6, 2025
Orlando, Florida, USA

The Battcon technical committee is seeking abstracts (to eventually become papers if accepted) for peer-review, by Battcon. The published papers will be available on the Battcon website archive. The papers focus on stationary batteries, geared mostly towards an end-user audience. Feel free to submit a non-commercial (focus on the technology, method, or standardized practice, not the product or company) abstract on whatever subject related to stationary batteries you think might have an interest to an end-user audience consisting primarily of electric utility, data center, telecom, firefighting professionals, and stationary battery service companies.

Contact
https://www.battcon.com/
E-mail: events@battcon.com
www.elbcexpo.org

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For the industrialized world the history of most of the 20th century is a chaotic one, characterized by battles of ideologies that resulted in decades of war and suffering. It was against this backdrop that Berlin-born Otto Jache, perhaps the most unsung of the battery heroes in our feature series, was to create the first gel based system — the VRLA battery. Kevin Desmond tells the story.

Otto Jache and the maintenance free battery

Theodor Sonnenschein didn't realise it at the time but when in 1910 he set up his factory Akkumulatoren Fabrik — its speciality, starter batteries — he was providing the breeding ground for a generation of gel-based batteries that were to transform the energy storage industry a couple of generations later.

Sonnenschein's unknown protégé was to be Otto Jache who was born in the south-east Berlin suburb of Treptow in 1915. He never knew his father who had died early on in the first world war. He was brought up by his mother Gertrud.

Thanks to good teaching and a particular enthusiastic science teacher, chemistry became his first love. After school, he went straight to work as a chemical engineering technician, first working for engineering firm C Lorenz, AG. and then at the Edeleanu petroleum refinery in Berlin.

Oddly enough, his early reputation was that of a prankster — his friends later recalled Jache's love of improvising fireworks such as the night he spectacularly threw some NI3, nitrogen tri-iodide, into Berlin's Landwehrkanal then stood back to watched the multi-coloured Bengal Fire display. Another favourite was an innocuous looking lotion he developed which, when stepped on, went off like a gun.

But the clouds of war were already descending over Europe and Jache like millions of others became a soldier, fighting for Germany in France and later in Finland. As the war started to unravel and the Germans started to retreat he was forced to make a dash from Finland, when it signed the armistice in September 1944, to his homeland.

The alternative was to be taken prisoner by the Soviets and almost certain death. In a marathon journey more suited to a movie he escaped via Norway, accompanied by a Norwegian, Reidum Ingrid Karlsen who had collaborated with the Germans and was also fleeing for her life. Reidum was later to become his wife.

Oddly enough, his early reputation was that of a prankster — his friends later recalled Jache's love of improvising fireworks such as the night he spectacularly threw some NI3, nitrogen tri-iodide, into Berlin's Landwehrkanal then stood back to watched the multi-coloured Bengal Fire display.

Immediate post-war Germany faced the seemingly impossible task of regaining its place in the industrial world. And in the eastern sector it was made more difficult by the occupying powers.

One could no longer select places to work and live in. With the Soviets occupying the Berlin-Marienfelde suburb where the Sonnenschein factory had been based, they decided to confiscate some of the equipment as reparation payment.

But not all of it. Clemens Jonen, brother-in-law of founder the late Theodor Sonnenschein managed to save some material. After a considerable search, he came across the possibility of setting up a new factory at Büdingen in Hessen and moving his staff there, including "Chemoteckniker" Otto Jache.

Büdingen had been a garrison town for the Third Reich, with the local Thiergarten area used as a training field. In 1946 the occupying US Armored Divisions continued to use the training area. But it was in what was later to become Western Germany and Sonnenschein acquired a number of buildings to reset up the factory (which the firm was to occupy until 2008).

Jache's first job at Büdingen was to cast lead grids for pasting together into positive and negative plates. For small batteries, these could be as much as 12 plates. To transport quantities of these around, with his fellow workers, Jache designed and built electric trolleys to replace the horse-drawn ones.

In terms of living quarters, everyone at Sonneschein had to make do with what was available. Some staff took up residence in the former hunting lodge of the Ysenburg princes.

For the next 30 years, Otto Jache's home was to be a converted former ammunition depot, just 200 metres from the factory. It was here that his three children grew up. This proximity to his laboratory would mean that Otto could — and did — work into the night as he did not have far to get home.

Social contacts were rare and, although invited, he did not join the skittles club formed by his colleagues. Instead he became an enthusiastic gardener. Perhaps this quiet life was part of the reason for his marriage ending with Reidum who left to move to the US.

After the death of Clemens Jonen in 1957, Christian Schwarz-Schilling, the husband of Sonnenschein's daughter Marie-Luise, joined the company. There were about 250 employees and he was looking for an outlet to expand. Until then the company had been making wet lead acid batteries for radios, and also for photo-flash devices with charge-indicators using balls of different specific weights. Such batteries were tilt-proof but only operated when upright.

Encouraged by Schwarz-Schilling — although the idea had long been an avenue he wished to explore — Otto Jache formed a team to research dry fit batteries which could be used in transistor radios, photoflash and the like. His team found that lead-calcium (PbCa) gave a cleaner step from charging to H2-emission and avoided the formation of poisonous SbH3. Silica immobilized the electrolyte. Oxidation of the negative plates by air was hampered by a valve, integrated in the cover.

The first dryfit gel batteries were two cell 1Ah, Type 2Ax2, delivered in October 1958, although Jache's patent was filed the year before. As they came to be accepted, these dryfits were used in telecommunications for gliders and even "environmentally important applications like toilets for cats and golf carts".

Post-war Germany for Jache was a desperate place to live — even in the non-Russian occupied zone. Here, the ruins of Potsdamer Platz in central Berlin. Below tranquil views of the Sonnenschein factory in Büdingen where Jache was to work.

Jache's invention, the valve regulated lead acid battery — the first truly maintenance free battery — had been born. Within a decade it was to become the international standard for batteries. In 1965 the first dryfit licence contract was established with Globe Union.

Dryfit technology consists of closed-system batteries in which the electrolyte is fixed in a gel. This means that no maintenance is required throughout the entire service life of the battery. The special advantage of the Sonnenschein dryfit battery lies in the batteries' suitability for extreme operating conditions and the highest demands on reliability.

But the development of the VRLA battery had still some way to go. One of Jache's close colleagues, Günter Piske, has recalled "When I finally joined Sonnenschein in February 1959, I found many of these batteries inadequate. So we had to tackle a sequence of technical problems such as the filling method, charging, and a reliable regulating valve."

In 1968, Jache married again and his new wife Sigrid bore him two sons.

In 1978 larger gel-filled cells for industrial batteries from 24 up to 120 volts were developed. These were to remain in production until 1984.

Jache was to remain an innovator and battery pioneer for the rest of his life.

Later in the 1970s, he filed another patent application making his battery more sturdy, the patent read: "The present invention relates to the leakproof bonding of components of an electrical storage battery, and particularly to the leakproof bonding of storage battery components made of thermoplastic material either to other components made of substantially the same material of to current-carrying components made of metal such as lead."

Four years later, he was applying for a patent for "a precursor for an electrical storage lead battery which can be converted into an operative storage battery by the mere addition of a sulphuric acid electrolyte."

In 1989, aged 74, he filed for a "Method for the production of a lead accumulator with a thixotrophic gel as an electrolyte that consists essentially of sulphuric acid and a gel former, comprising the steps of impregnating the pores of active material in the electrodes and the pores of the separators."

Dryfit technology consists of closed-system batteries in which the electrolyte is fixed in a gel. This means that no maintenance is required throughout the entire service life of the battery. Above a modern Exide maintenance free battery

For many years he was a consultant for lead-acid separator firm Grace GmbH in Hamburg.

Otto Jache died on January 10, 1993, aged 78. Unlike other battery pioneers such as his contemporary Sam Ruben he never received any awards for his contribution to the world's technology and, until this article, he has remained an unsung hero.

Even 50 years on, gel technology is still vital for valve-regulated lead acid batteries.

Without the gel technology that was developed by Otto Jache the company Sonnenschein would have stayed a medium-sized battery producer like many others. Because of its gel technology and the export and worldwide service of its gel batteries since the 1960s Sonnenschein became well known as a technology and quality leader throughout the world.

In 1991, this good reputation was transferred to CEAC which in 1995 was bought by Exide Technologies in the US. ■

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WITH THANKS

I am grateful to Helmut Schnierle, Günter Piske, Frank Jache and also to Kristin M Wohlleben of J Addams & Partners, Inc for their help in preparing this article.

HAPPY BIRTHDAY TO US!

Here's to 10 years being the battery industry's leading, unmissable, weekly news bulletin.

Many of you will no doubt remember that momentous day — back in 2015 — when *Batteries International* launched its weekly electronic newsletter to a fanfare of trumpets and collective global jubilation… (okay, maybe that last bit isn't strictly true!)

What can't be disputed though, is the fact that ever since — week in, week out — we've been powering through to bring all the latest industry news, analysis and insight to your inboxes every Thursday.

And what a heck of a 10 years it's been!

The EV revolution that was set to change the planet was being widely touted by the rise of a new class of engineer — the prophet-cum-conference-visionary speaker.

These seers of the future could sometimes be pinpointedly accurate. A survey by the Technical University of Munich gleefully concluded that fears about the safety of lithium ion batteries were now over.

Sorted. Thank heavens.

Another stunning prediction was that Asian firms could eventually take over Europe and US companies at the cutting edge of battery technology. Since almost every lithium battery in the planet at that time came from Korea or China… well perhaps that wasn't the most profound of market reports.

Especially given the fact that Panasonic, BYD, and LG Chem sold 4,552MWh worth of lithium- batteries that year.

It was a year of tumbling lithium battery prices — from around $800/kWh to bouncing just over $100kWh nowadays. Looking back on the stories we covered we all found ourselves surprised by the now-trivial size of the BESS stories covered — huge headlines for a 30MW deal.

It was a year of restructuring and controversy too as the International Lead Association finally brought its subsidiary the ALABC in-house. Parts of the industry were outraged at the move — others saw the need for it do much, much better things. The creation of the CBI from its ashes had entered the planning stage.

2015 was also a year of farewells. John Craig — a giant figure in the markets for 40 years — announced he was to step down at EnerSys and David Shaffer would take over. And a decade later it is David that has just announced his successor.

It was also one tinged with great sadness when the news that DeLight Breidegam Jr, the charismatic founder of East Penn, passed away aged 88 in the September.

So, with 2025 ahead of us let's raise a glass to the changing landscape of the battery world and what fun we've had sharing the highs and lows with you. Here's to another decade, and hopefully more!

Lastly, it would be selfish of us to hog ALL the cake without acknowledging friends in the industry who are also celebrating anniversaries. So here's to…

ENTEK, 40 years at the forefront of battery separators • MAC Engineering, 60 years in the industry. Almost time to dust off that zimmer frame! • Jimmy Stewart, MAC'S VP, sales. Half a century and still going strong (see his story in our BCI Yearbook) • Eternity's Mark Stevenson. Also celebrating a big 5-0 in the battery world • Hadi. Hats off to these guys. A full 100 years in the industry. But did they get a card or telegram from King Charles?

10 reasons why the number 10 is so important

- **Decadactylous** means 'having 10 fingers', **decemdentate** is 'having 10 teeth'; a **decapod** has 10 feet; a 10-person ruling council is a **decarchy.**
- **Decimate.** This literally meant, in Roman times, killing one in 10 people as punishment of any rebellious mob of soldiers.
- There are **10 vowels** in the Korean alphabet.
- It's Biblical too. There were **10 plagues** in ancient Egypt, **10 Commandments** and **10 generations** between Adam and Noah and **10 generations** between Noah and Abraham.

* **Ten is the base** of the decimal numeral system, logical we have **ten fingers** (digits).

- Pythagoras and his followers considered **10 the most sacred number**, as 10 = 1+2+3+4, which represented existence (1), creation (2), life (3) and the four elements, earth, air, fire and water (4).
- A basketball hoop should be hung **10 feet above the ground.**
- A woman's total height is approximately **10 times the length of her hand**.
- The most common paper sizing system uses the A-series, which has **10 sizes.**
- Crabs have **10 legs.**