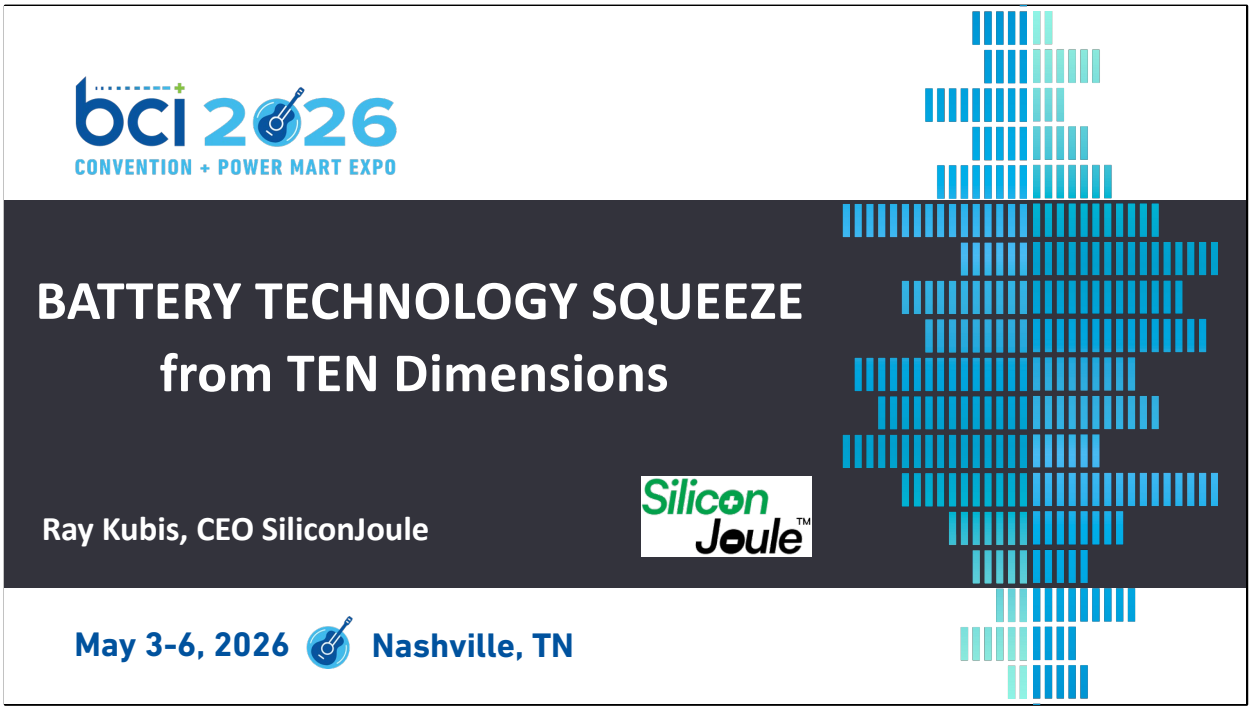


Thank you

Most here will recognize the ten dimensions I will explain squeezing or challenging our industry and leaders today as they plan for the future of their businesses.

And when you consider all of them together, it is easier to understand the billions in recent write-offs, bankruptcies and other changes to battery companies and those depending on our energy storage solutions.

Yet there two positives to highlight :

First the rechargeable energy storage industry at about $200 Billion today is still growing by double digits each year toward $600 Billion by 2035.

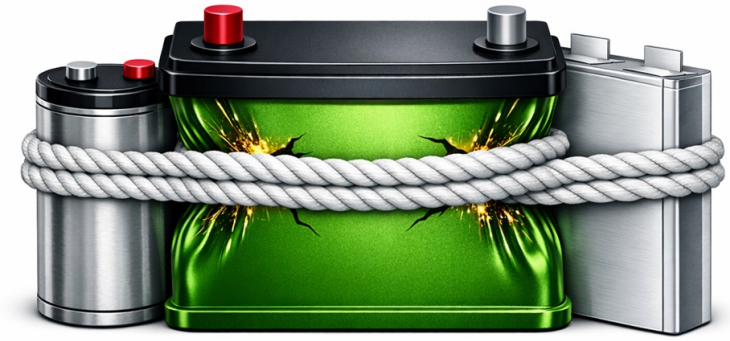
Secondly, in contrast to the many write-offs, some companies in the US, China and India are enjoying the best cash flow in decades – with great product mix,low material costs and supporting gov't policies.

Hence, truly billions of investment options are being assessed and made which will shape the competitive environment for the next decade.

Maybe some of the insight provided here can help you in making the best strategic and investment plans for your business.

Battery Technology Squeeze

… increasing the pressure



The Technology Squeeze is a challenge for ALL companies, even if in different ways, and the pressure is increasing.

This includes large and niche-focused battery companies, start-ups, and to those with multiple chemistries or one's specialized in a single chemistry platform fighting to protect its space or innovate for growth.

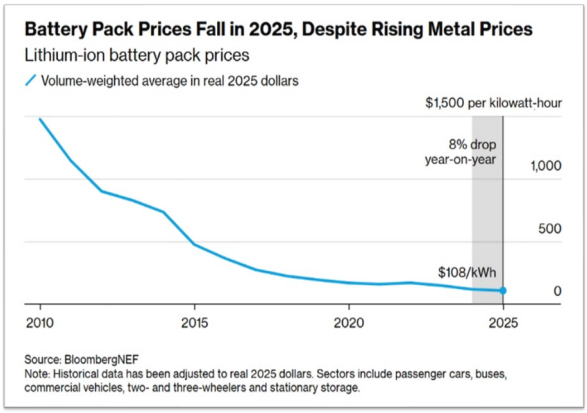
And it is also challenging battery users as they adapt to changing performance metrics, new supply chains, service and safety requirements and periodic recalls.

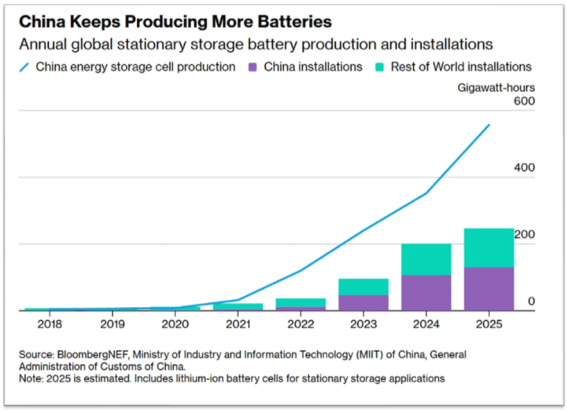
Before I cover the 10 dimensions, let me offer the strategic imperatives I consider in this environment as you are making plans for your business..

I highlight four points: FOCUS, LOW COST, INNOVATION and PACE….And later I will add my view on the relevance of Collaboration and Energy Systems vs. just battery cell or block supply around these four points.

LFP Prices

LFP Prices and Expanding Capacity





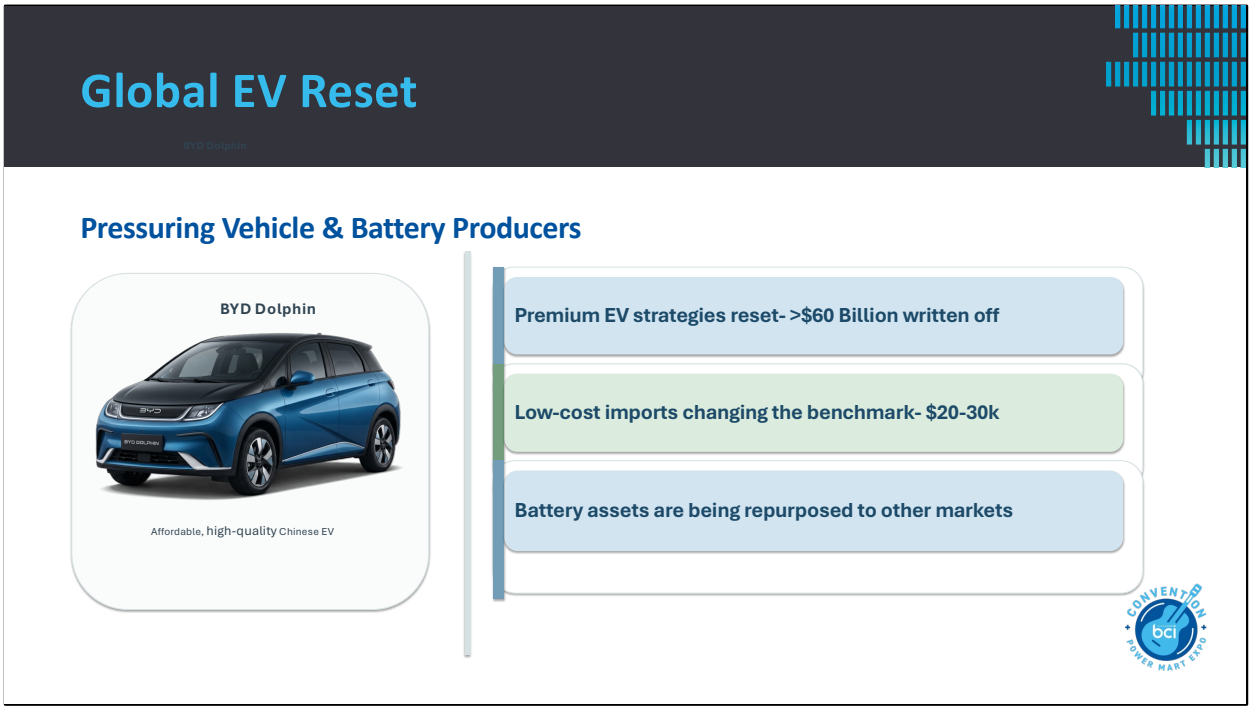
Don't worry about the details in this eye chart, rather focus on the slope of the two graphs.

The greatest squeeze has come from the continued decline in lithium LFP battery prices from China depicted on the left graph, while at the same time capacity in China and elsewhere keeps growing as shown on the right graph..

The 'involution' as they call it across many industries in China will certainly lead to a shake-out and consolidation, yet that may lead to even stronger surviving producers.

Beyond the prices, the continuous improvement in LFP performance by the largest suppliers has disrupted plans in Korea, Japan, Europe and the US at battery and vehicle companies forcing expensive changes.

We all recognize there are still many safety and sustainability issues across the range of lithium battery types, yet the lithium share of the total market is still expanding.



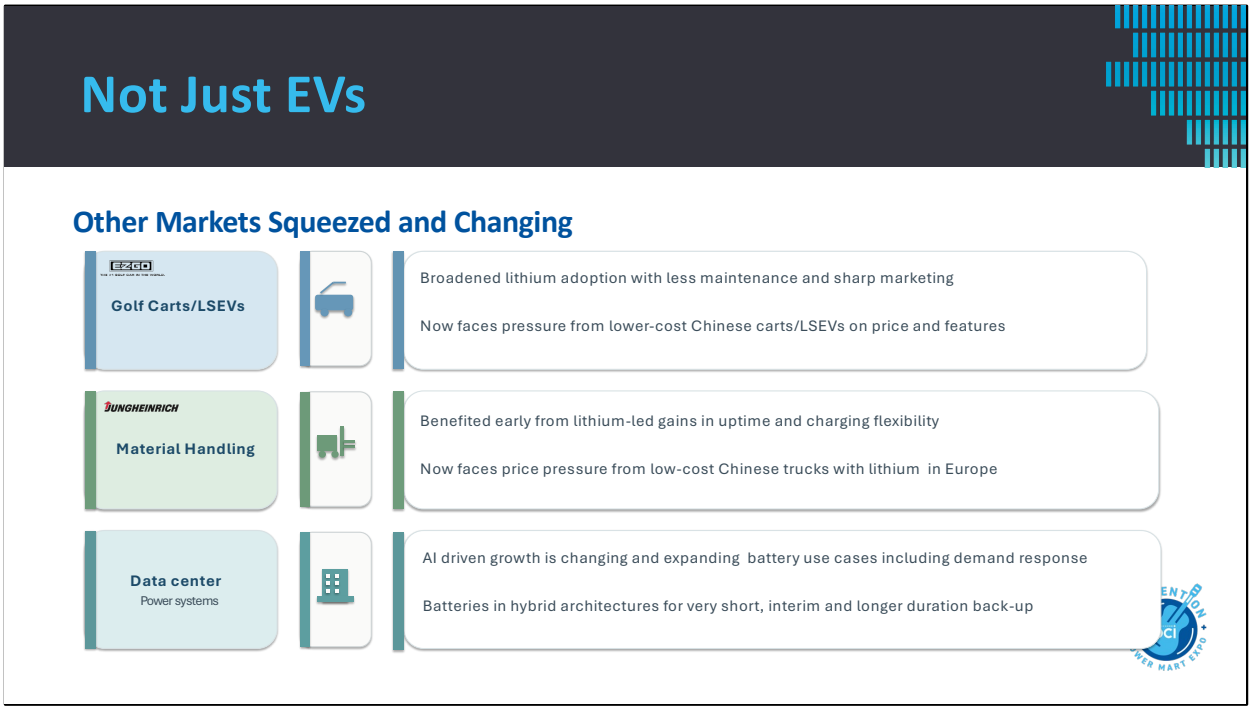
The second squeeze is the Global EV Reset. Two points to highlight are the evolution in US and EU EV policies and secondly the surge in Chinese EV producers to fill the still expanding global EV demand with attractive and affordable options.

Western vehicle makers have reassessed which products their customers will buy at what prices and which battery technologies to use…and still make a profit.

This has led to over $60 Billion in write-downs by vehicle makers for 2025 including an important share for their development plans for battery technologies and capacity.

And many battery makers from large ones like Northvolt to Freyr to LG, or many start-ups have stopped or changed plans, with huge consequences for their investors, creditors, suppliers and employees.

BYD's Dophin EV comes at an attractive price point in Germany or Brazil delivered in BYD's own 3,000 vehicle shipping vessel stopping in the ports Hamburg and Santos.

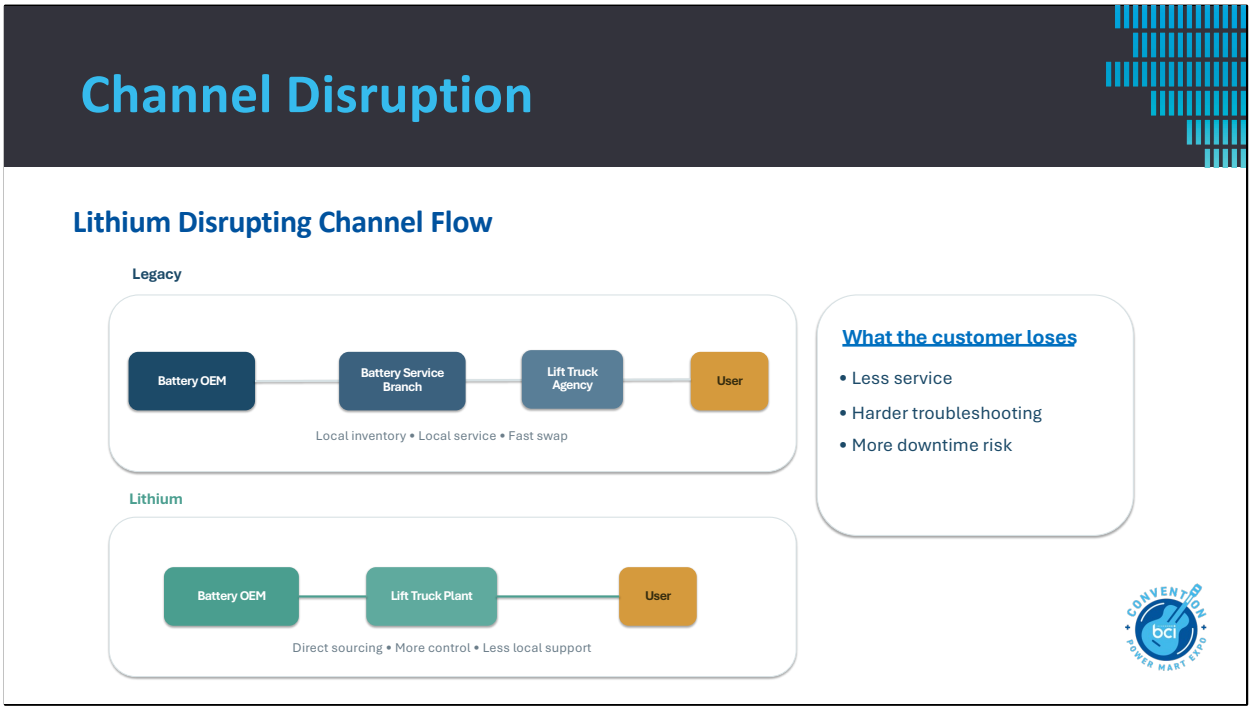


The squeeze is evident beyond EV markets in other large battery applications. Shown here are just three: Golf carts or LSEVs (Low Speed EVs), the Material Handling sector and the booming Data Center market.

EZGO in the US benefitted from an early solid marketing program with its adoption of lithium batteries from Samsung. Yet the industry now faces serious competition in many markets from Chinese carts with with their own lithium batteries to serve commercial, golf and low speed road use applications.

And from Jungheinrich's early lead in adopting lithium batteries in its smaller lift trucks (powered pallet movers), today Chinese trucks with lithium batteries are a growing challenge in many European and other countries.

And for the huge data center growth, the speed of plans and increasing complexity for the centers is challenging all energy system providers trying to deliver solutions to sustain uninterrupted power and help with the implications of such huge increases in electricity demand.



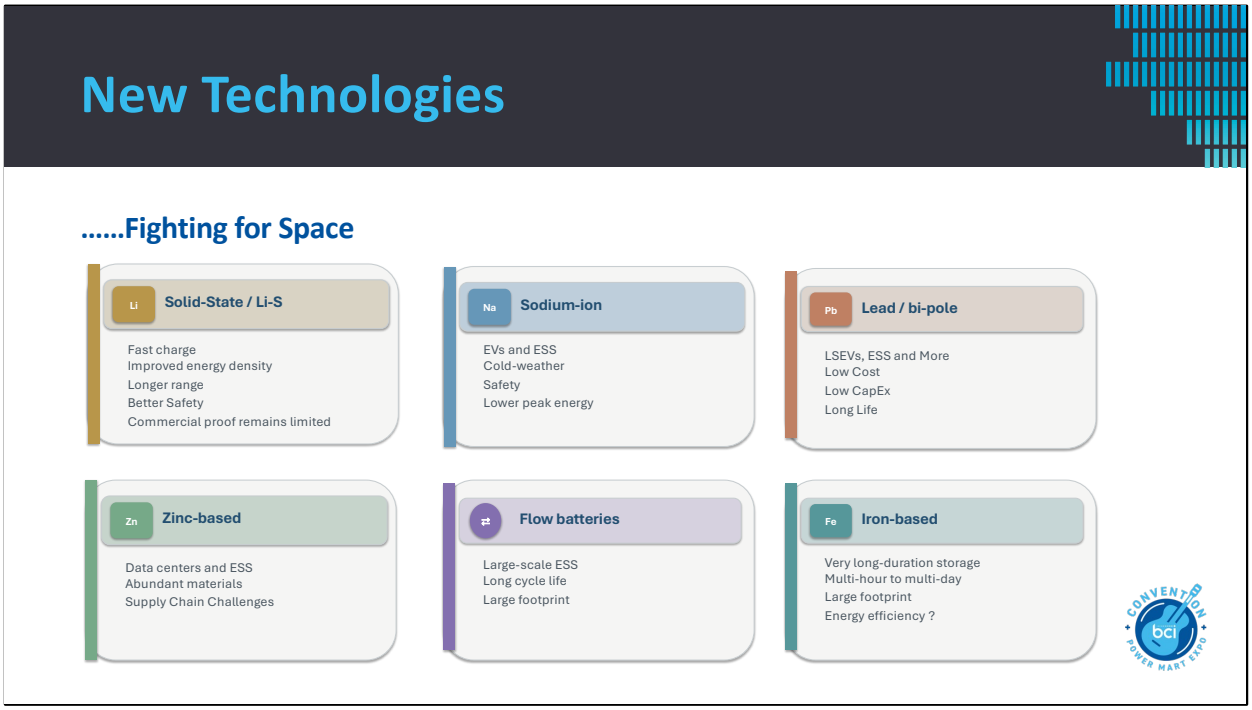
Distribution channel changes is another squeeze partially resulting from lithium battery solutions offered.

One example is the preference of some lift truck makers now to directly control the safety and cost for lithium batteries.

This has included a change in the the supply chain where the lithium batteries are fitted directly in the lift truck producing factory, rather than the batteries, related chargers and trucks being matched either at the user warehouse or the local lift truck servicing branch.

One example, In supporting teams working through the conversion from flooded to AGM batteries and possibly lithium options over a decade ago un Europe my message was the customer did not care whether it was peanut butter inside, what they wanted was an efficient solution. Do not focus on battery A, B or C, but a solution matched to the application or duty cycle and environment.

However, these supply chain changes also add new challenges for users and forklift truck companies, as you cannot trouble-shoot truck and/or lithium battery challenges easily, nor replace a faulty battery cell which can lead to the worst impact for a warehouse, that being unable to pick and move goods efficiently for on time delivery.



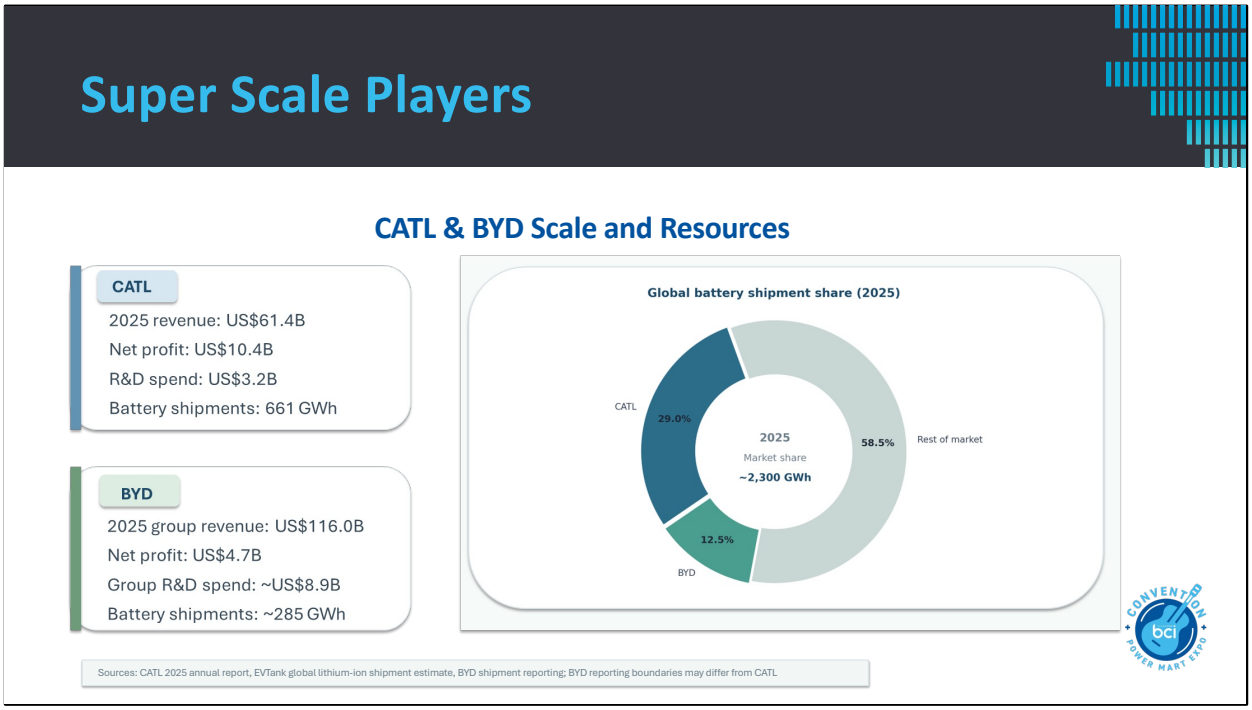
New innovations with alternate chemistries or others with big improvement claims such as for lithium-based chemistries like solid-state or Lithium sulfur need to fight harder for space and investment.

Most new claims arriving each week can be dismissed simply as hype, yet some of the improvements will change the prospects for profits by many.

And as there have been a lot of failures or claims that did not pan the last two years it has made many investors and battery companies more cautious about supporting potential and maturing battery innovation.

Regardless how complex today's battery environment may be, today's decisions where to invest now for innovation and growth are as critical as ever for companies planning for a sustainable future.

Ps It should come as no surprise that I favor a lead-based technology benefitting from bi-pole design architecture like SiliconJoule.



Some companies have achieved such scale in the battery sector that it helps to put some numbers in perspective….starting with CATL who reported > $10 Billion in after tax profits in 2025.

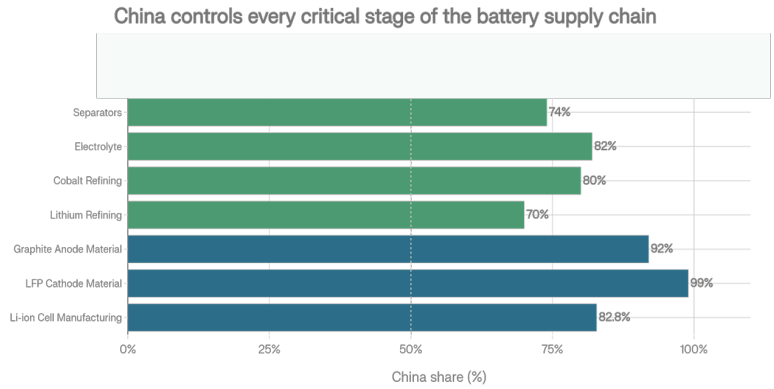
I estimate given the losses reported by so many……that potentially that $10 Billion in profits was larger than the ENTIRE lithium-based battery sector including CATL if you included the rest of the Chinese, EU and US players alone for 2025 from cell producers through to integrators.

And a couple more references – At CATL there are 23,000 people in R&D, and a capacity of nearly 700 GWhs, which exceeds the estimated 600+GWhs of the entire global lead-based battery business in 2025. The implications are many in costs in production, purchasing and development for incumbents and innovators any where in the energy storage space.

BYD is a different story emerging from a small format battery producer to #2 in lithium batteries, and now the largest global EV car company.

How do western makers compete with such integration and cost effectiveness?

Supply Chain Control



82.8%
of global Li-ion cell production

70%
of global lithium chemical refining

99%
of LFP cathode material produced

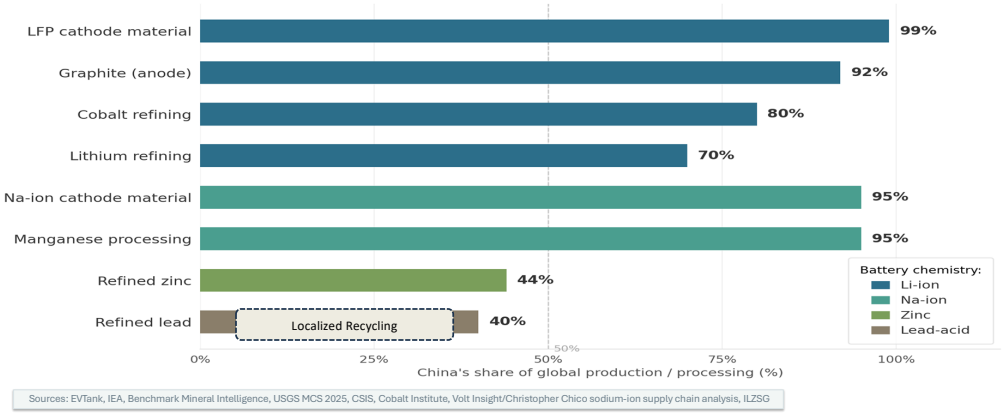
Looking beyond the manufacturing and development scale benefits of the largest producers, regardless the type, the battery business is a materials business. And lithium battery related investments by many in China has led to a dominant position today across the supply chain for components and materials..

Some of these are simpler to replicate than others when you work to localize a supply chain in the US or Europe, but given the head start and scale, the cost targets are very challenging.

As so many companies in this room know the same localization goals for cost and supply for lead and plastics has proven to be essential for a more secure and profitable business.

Precursor Materials

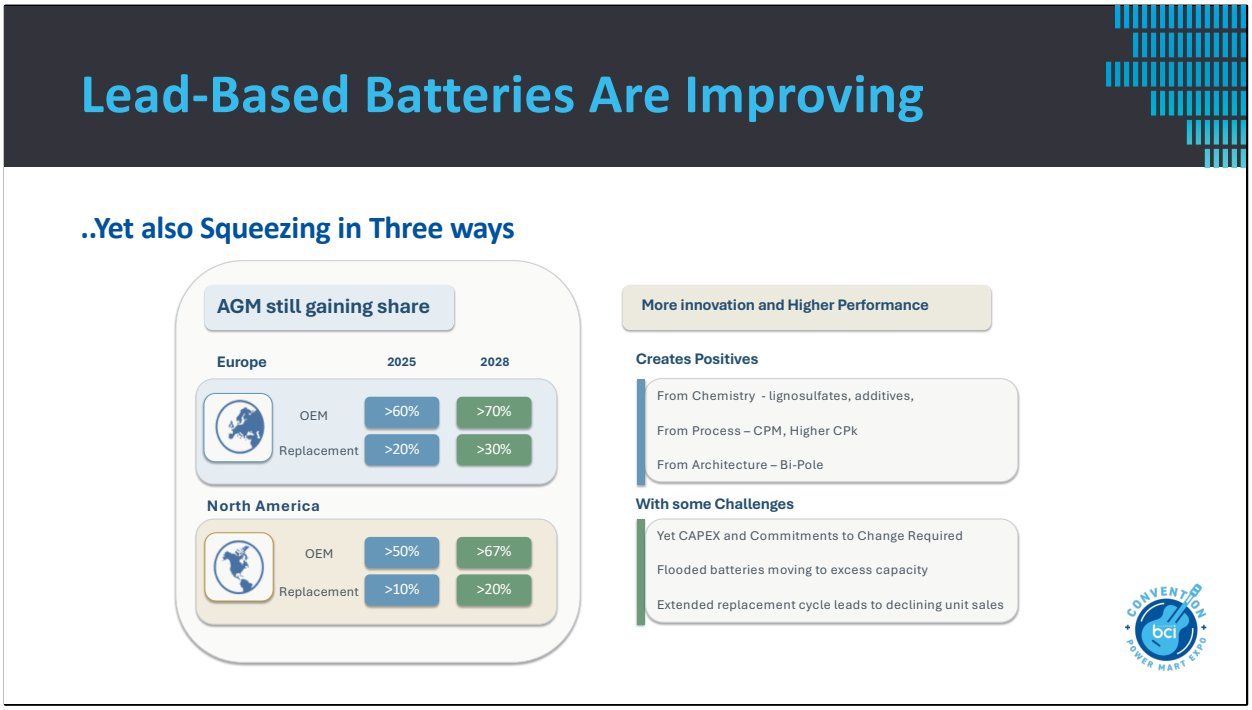
China Precursor Control in Li, Na, Zn



Sources: EVTank, IEA, Benchmark Mineral Intelligence, USGS MCS 2025, CSIS, Cobalt Institute, Volt Insight/Christopher Chico sodium-ion supply chain analysis, ILZSG

One more look here at the metals and materials needed for the active mass for batteries. These precursor materials for lithium, sodium and zinc-based are again dominated by Chinese producers, where for lead batteries their share is more proportionate to their localized use.

Fortunately for lead batteries the comprehensive recycling platforms in the US, Europe and elsewhere provide a substantial steady supply of recycled materials that can be refined to the standards for the highest quality batteries.



Vehicle makers and other battery users clearly recognize the continued improvement in lead-based batteries with the wider adoption of AGM (maintenance-free) batteries to support added functions such as start/start to the continuing growth in accessory support for infotainment and new functions for safer and autonomous driving.

AGM batteries now represent over half the OE batteries used by vehicle producers in North America and Europe, and the replacement cycle impact is growing for these better and higher value batteries.

I would highlight three consequences of the shift to AGM batteries

1. The CAPEX to make today's AGM batteries is significant, for rolling and punch lines, cast-on strap machines and the required formation capacity, and not all companies are willing and or can afford to make these investments including the people and focus to assure production to the tighter manufacturing tolerances required.

2. For companies not willing to adapt to the shift from flooded to AGM batteries, they may find themselves being pressured due to excess capacity for flooded batteries.

3. Lastly, some companies are reporting the better AGM batteries are lasting longer, which may slow the unit growth the large replacement market has typically shown from the expanding global vehicle fleet.

Volatile material costs have challenged the lithium battery industry whether we focus on lithium carbonate for LFP batteries or the copper, aluminum, nickel and cobalt.

So, whether planning a 70 kWh vehicle battery pack or a 10 MWh utility BESS system it has been difficult to forecast costs. This volatility has also pressured the makers of precursor materials, cell manufacturers, or the many companies packaging cells to provide systems on typically tight margins.

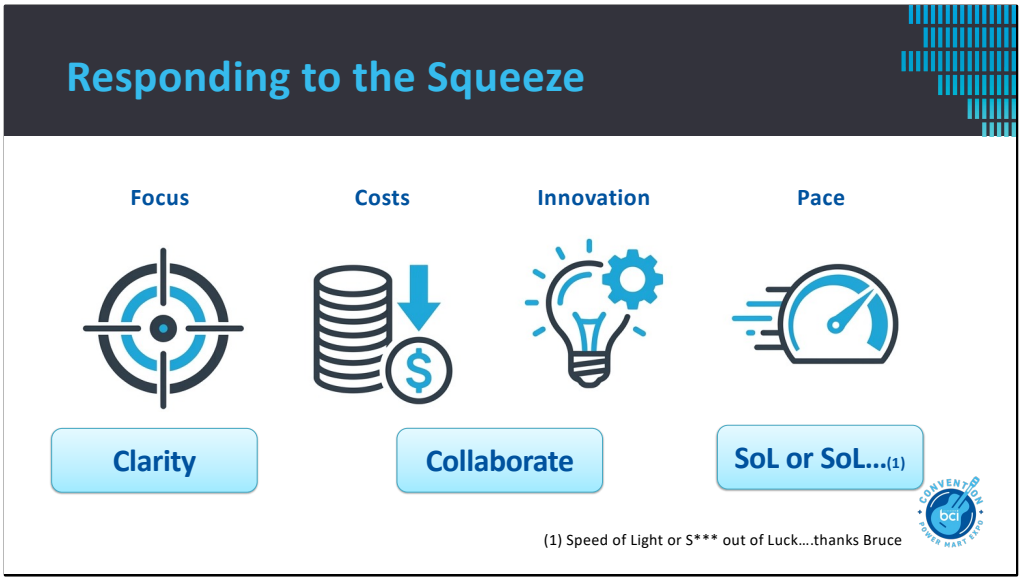
By contrast lead prices remain low and stable as an exception to other battery materials owing in part to the huge recycling infrastructure where the industry is not dependent on mining developments.

It is my opinion that lead prices will continue low, and possibly go lower in the mid term based on two factors beyond the recycling flow; 1) The substitution shift to lithium in many large lead content applications like golf/LSEVs, material handling, et al. may flatten global demand for lead, and 2) Miners striving for higher silver and zinc output will continue to deliver lead as a mining by-product regardless the value offered for lead concentrate.

Also, SiliconJoule battery designs with its bi-pole architecture substitutes treated silicon wafers for lead grids reducing lead usage and weight.

Stable and Lower materials costs are a big positive for makers of advanced lead batteries innovating to compete with lithium and other battery alternatives.

One caveat however for the US is that we need the advocacy to achieve government support to stop the increased export of used batteries. This would better assure protection of the designated critical materials and protect against environmental risks in other countries with less controlled recycling practices.



Let's agree the technology squeeze is applying a lot of pressure across transportation and nearly all energy storage applications and markets. For the many companies with solid cash flow from from the lead battery business today a key question is what is the best use of the cash for their owners, employees and business future. As I said at the beginning I would assess any business plan through the prism of these four points:

Focus for me is which markets and applications where your company can deliver a sustainable difference and value to the customer. Critical strategic and business leadership starts there. And then the three other elements:

Costs – I think about three costs to underpin a successful plan 1) Out of box costs, largely the material costs, 2) The real lifetime costs, considering the true deep cycle or service life along with the solution's energy efficiency, and 3) The capital costs for factory capacity and tooling of the sizes to support the target market.

Innovation – Today's solutions will not be good enough for long. There is too much effort by many companies large and small delivering turnkey energy storage solutions. And that is before AI further accelerates innovation in materials and applications.

Pace – As an industry, we need to move faster to compete with the advances coming from other technologies and China specifically. I will borrow a quote passed along to Bruce Cole at East Penn – that some sectors are pulling us to move at the Speed of Light or be S*** out of Luck. Material science does not follow Moore's Law, yet we need to drive faster, and I believe broader collaboration on technology and scaling for lower costs will be keys to better assure a future for some great businesses.

Whether we compare to CATL, China or new technologies the squeeze here now I

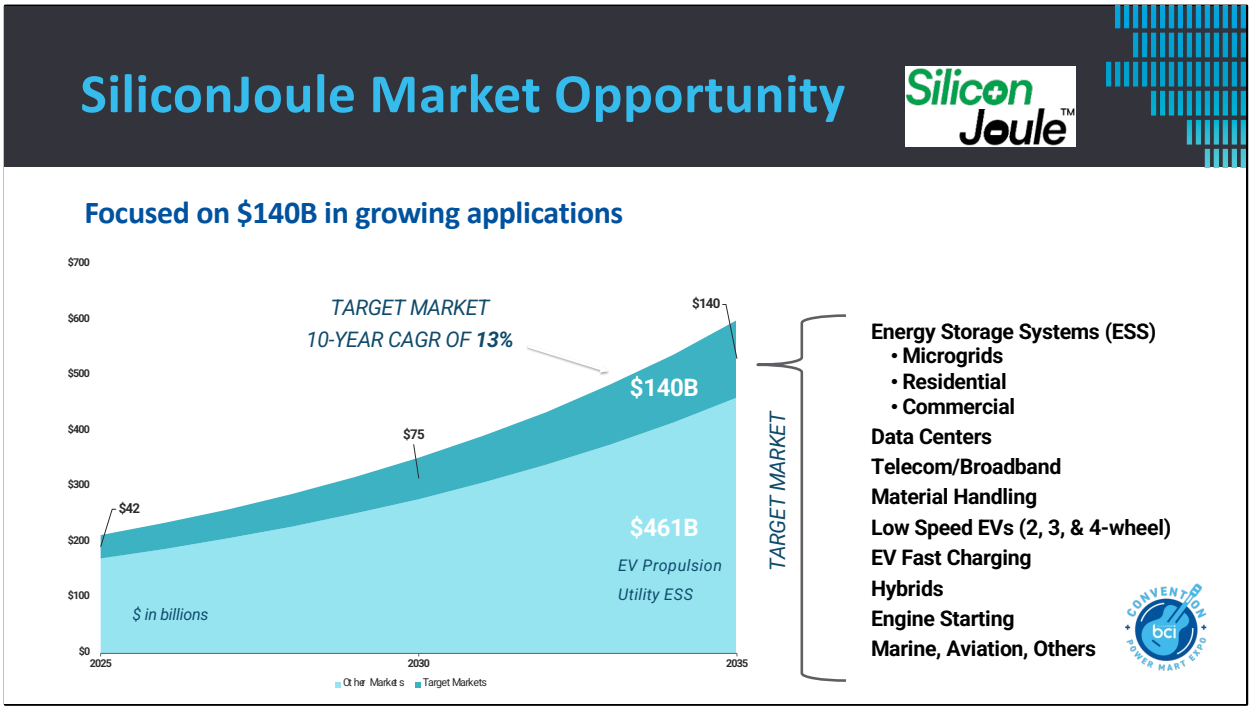
believe will leave an industry looking quite different 4-5 years from now.

In the innovation awards, you already heard about the new SiliconJoule 24volt GC2 commercial product optimized with the help of East Penn. It has been a long road, yet worth the patience of our collaborators and investors.

Our priority now is scaling production for broad field testing and cost reduction, yet future high-power and hybrid power/energy products will follow with other partners with moderate capex to adapt existing lead battery factory capacity.

In the best spirit of the objectives for the innovation support from the US government our SiliconJoule technology offers a real chance to compete with lithium batteries in many applications from US factories.

And referencing my earlier insight, we are FOCUSED, driving to deliver real low-cost solutions with step-change performance as quickly as we can through terrific companies like those here. Our design architecture significantly improves the performance of your proven chemistry, designs and the further improvements many of you are driving for with better active materials, additives, separators and processes. And to aid the delivery of efficient systems, not just big 12volt blocks, our platform allows the optionality of 12 to 48volt blocks and anything in between off the same assembly line to directly match system voltages.
My preference for collaboration contrasts to the question I often get asked, which is why doesn't SiliconJoule just build its own factory. My answer is simple, markets are moving too fast, and companies like those here have the application engineers, permits, customer relationships, balance sheets and related capacity to adapt or expand far more quickly to scale the technology.



A couple more thoughts to share on focus within the large and fast-growing global energy storage business.

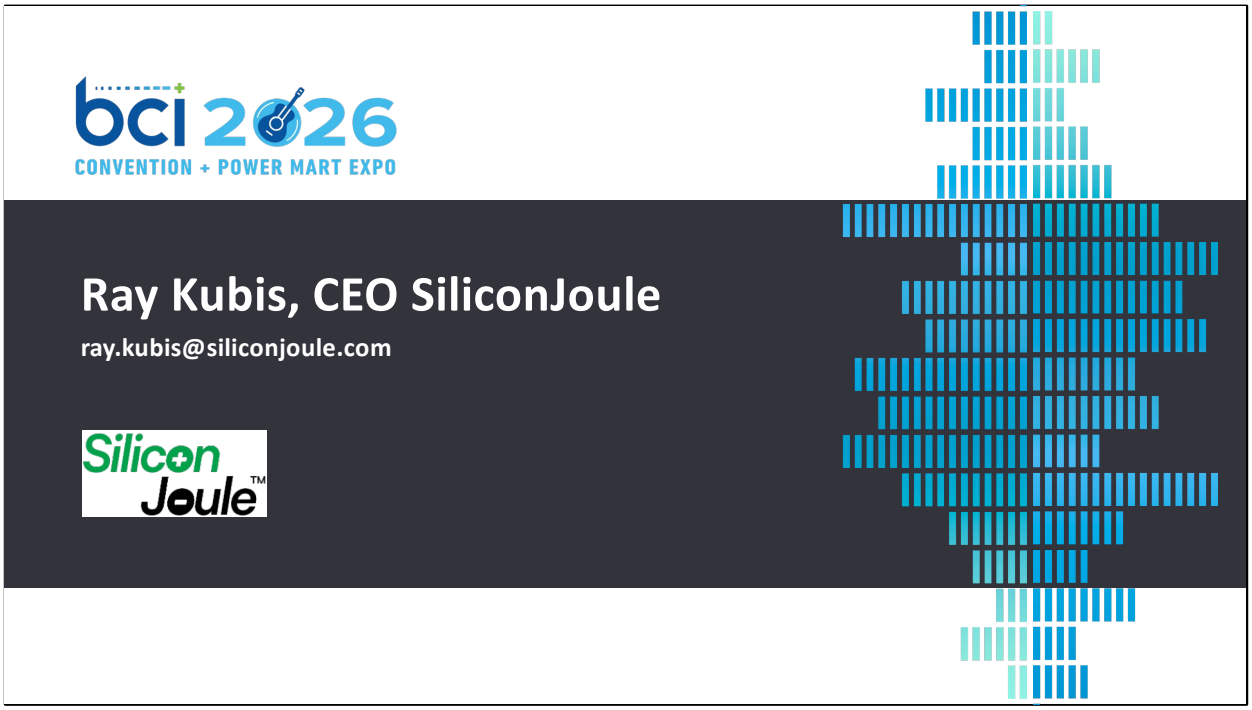
Of the $200 Billion market today, a big share is for light vehicle EV propulsion and huge utility or multi-MWh BESS systems, and most of us here are not focused on these intensely competitive commodity-like markets.

The broad global electrification trend already supports high growth in many other markets for distributed energy storage deployment in micro-grids, businesses and homes. And growth continues in material handling, robotics and in communications back-up power to support uninterrupted service for businesses, vehicles and new applications.

And the dramatic buildout in data centers has tripled the rate of growth in electricity demand in some countries further fueling options for diverse distributed power solutions as base load generation cannot grow fast enough..

Even this week an exec explained food companies driving to offset inflation were integrating back-up power to assure higher yields for their continuous processing of avocados and egg plant.

So many markets we know well, and many emerging are growing to over $100 Billion and that is a lot of opportunity for us to work together on.
Thank you.


bci 2026
CONVENTION + POWER MART EXPO
Ray Kubis, CEO SiliconJoule
ray.kubis@siliconjoule.com
Silicon Joule™