

Li-ion BESS: Look-back and lessons for the future



Lithium-ion | Two years of volatility in the lithium-ion battery storage industry have seen prices tumble and a host of supply-chain complexities come to the fore. As Swetha Sundaram of RWE Clean Energy writes, the winners in this fast-changing market will be those who are best prepared

The last couple of years have been a strange time for the world, with wild ups and downs impacting several industries differently. The lithium-ion-based battery energy storage industry is no exception – swung by the push and pull of supply chain dynamics and key policy developments in the US. The stationary BESS industry has been reactive in most aspects, reeling to control project economics and schedules. But the industry as a whole has learned several lessons and proactive measures to implement.

Price swings like never before

Lithium mineral prices, specifically lithium carbonate, a key component for lithium-ion batteries, have experienced quite a roller-coaster in the past few years. The prices surged in the second half of 2022 as high as 10x of average historical levels. This trend was rooted in the overall shift and positive sentiment around transportation electrification, especially electric vehicles (EVs) around the world. Lithium supply at the time was not able to scale to meet this demand at such a rapid pace –

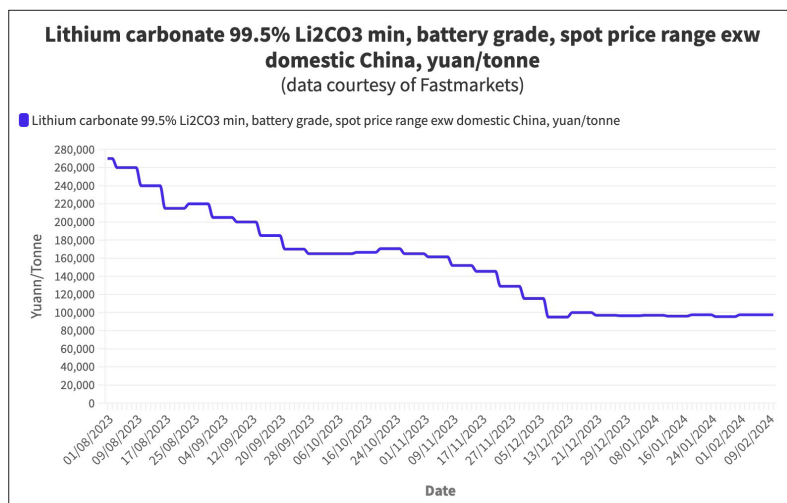
depending on the process of mining and extraction, it can take three to five years to bring new capacity online because of the permitting and capital-intensive nature of extraction.

However, due to a combination of market factors, namely anticipated reduction of EV purchases in China because of the anticipated expiry of government subsidies, the lack of EVs as forecasted

because of COVID-induced limited mobility and a big wave of new factories expected to flood the supply-side, prices came back down in dramatic fashion in 2023 compared to highs in November 2022.

As a result of these market dynamics, two noteworthy things ensued: lithium-ion battery suppliers began indexing the price of batteries to raw materials (RMI)

Figure 1. Lithium carbonate prices Aug 2023 to February 2024



such as lithium carbonate to mitigate their risk exposure; and the system cost of building BESS increased compared to prior years. While time will tell if RMI pricing will be here to stay as standard practice, BESS costs stabilised in H2 2023, and continue on their anticipated downward trend from 2024. (For more insights into BESS pricing, turn to p.90 for Clean Energy Associates' analyses of recent trends.)

Supply-chain plagues other components

Key balance-of-plant (BOP) equipment needed for BESS systems – such as transformers, MV switchgears, enclosures and steel – have been plagued by supply-chain issues leading to unprecedented lead times. As of December 2023, owners and EPCs are facing up to two to three-year lead times for main power transformers when the historical norm has been about one year. Orders for auxiliary transformers needed to supply auxiliary power to BESS containers need to be placed at least six months to one year in advance. High-voltage breakers are worse, with some suppliers asking for up to a five-year lead time for production slots. This change is mainly attributed to labour shortages and supply-chain issues stemming from the COVID period. Volatile commodity markets for copper, aluminium and steel, coupled with workforce gaps and retention issues, impede the expansion of production. Further, the demand for such equipment is growing fast from developers with plans to build huge renewable projects in great volume, as well as from utilities to perform network upgrades to integrate more renewables. Utility off-takers are often valuing BESS projects that can come online earlier higher than later ones, creating a race to achieve aggressive commercial operation dates (CODs) and further fuelling the demand for equipment with expedited delivery.

Temporary wrinkle in BESS market

These factors have collectively caused a wrinkle in planning metrics for developers of utility-scale BESS projects and rolling delays in CODs of projects under execution. CODs sometimes need to be dictated by equipment that has much longer lead times than planned. EPC firms need to be engaged at least 18 months before the start of construction so that design can be progressed

and appropriate equipment orders placed in time. Finally, interconnection-related delays are also being experienced because of long lead times for equipment required for upgrades when connecting into a utility's substation – at a time when interconnection queues are extremely backlogged with projects in most regions. As a result of these hurdles, utility-scale BESS project deployments slowed in the beginning of 2023 compared to prior years.

Market correction

Entering 2024, the BESS industry has already bounced back on track with bullish projections. 2023 deployment volume is expected to dwarf that seen in 2022, absorbing delays from the first half. On a short-term scale, this is

manufacturing will take shape in time to feed the enormous North American battery market. Interconnection fees have increased significantly as part of the queue reform and process times are expected to get shorter, so it is all the more critical to have 'firm' projects in the queue and certainty in the equipment planned to be used (specifically the power conversion system). It is also equally important to plan for BOP equipment in the form of tactical bulk ordering for medium-term projects in the pipeline as lead times stabilise to be the 'new normal'. EPC resources are an often-overlooked critical aspect as well – the bulk of the major EPC companies are spread thin between a growing list of developers and massive projects. The preconstruction and construction phases of projects are being

"With the 'world's biggest BESS' crown seemingly changing hands every other month, it is an exciting time in the BESS arena, and the winners are the best prepared"

attributed to battery pricing falling back to expected trajectories. At a macro level, the major contributing factor has been the IRA and a growing understanding of its provisions. Interconnection process updates, spurred by FERC Order 23, aim to streamline inefficient interconnection processes for BESS and other generation resources and provide more certainty to project schedules. The set measures to intake projects as clusters for faster processing, requiring study timelines to be established and requiring larger deposits from developers for projects to be in the queue, are all expected to streamline queues and make projects more guaranteed and economical. These are much-needed reforms for the BESS industry to grow to the volumes that are being projected as forecasts.

Planning is the not-so-secret sauce

The BESS market landscape is more competitive than ever. To build projects economically and achieve the target COD, developers need to plan to procure equipment smartly, forge strategic partnerships to secure production volumes for battery systems and take into consideration domestic manufacturing, although it remains to be seen how much of the touted domestic

pulled left and stretched. Hence there is emphasis on forming strategic partnerships and getting them onboarded as early as two years before the planned COD.

With the 'world's biggest BESS' crown seemingly changing hands every other month, it is an exciting time in the BESS arena, and the winners are the best prepared. ■

Author

Swetha Sundaram is the director of BESS project design at RWE Clean Energy, the fourth largest developer and owner of PV and storage projects in North America. She is responsible for development engineering and product management for energy storage projects. Before RWECE, she worked for DNV as a senior consultant in the energy storage independent engineering and advisory group, overseeing IE due diligence for the financing of several BESS and PV+BESS projects across multiple developers. Before that, she worked in the nascent BESS group of RWE Renewables, focusing on design tool development and operational modelling. She has also worked for Pacific Gas & Electric and AES Indiana in the energy storage planning and integrated resource planning groups.

