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Lithium ferro phosphate battery market - 500% expansion by 2030 - a prime opportunity for Lithium Australia

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HIGHLIGHTS

- **Lithium ferro phosphate ('LFP') type lithium-ion batteries ('LIBs') reduce battery industry dependency on energy metals such as nickel and cobalt while providing safer power storage.**
- **It is anticipated that LFP will become the fastest growing sector of the LIB market, particularly with respect to electric vehicle ('EV') penetration into the automotive market and the increased use of battery energy storage systems ('BESS') for reliable power distribution from renewable energy sources.**
- **Lithium Australia's battery R&D subsidiary VSPC is well-positioned to service LFP markets outside China.**

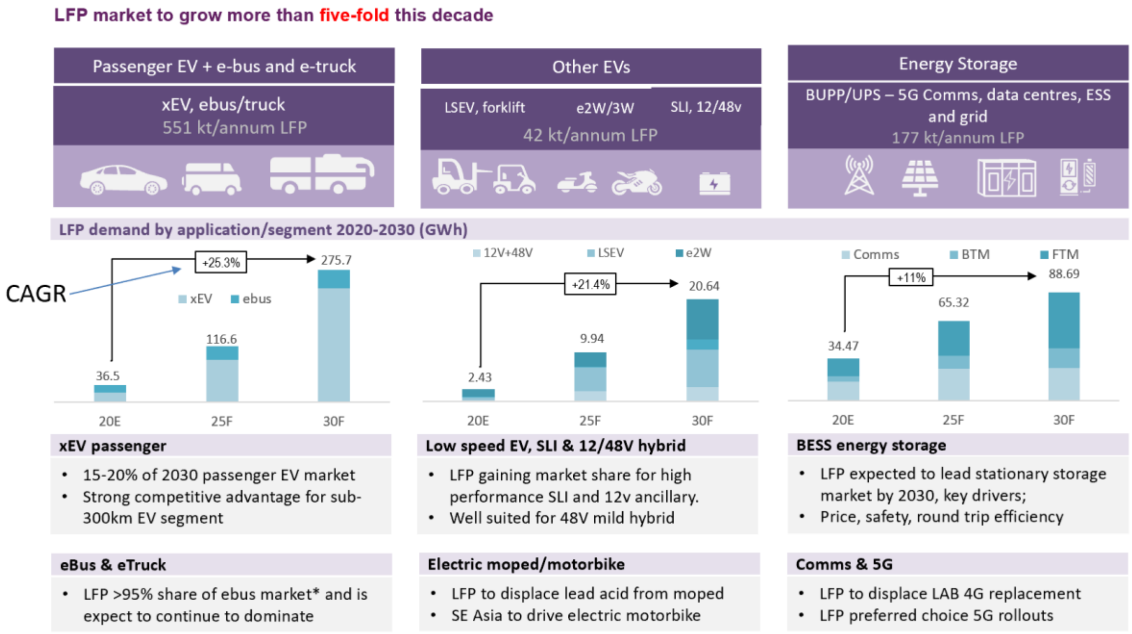
Comment from Adrian Griffin, managing director of Lithium Australia

"Lithium Australia subsidiary VSPC Ltd ('VSPC') has patented processing technology for the production of advanced LFP cathode powders, a market forecast to grow 500% by 2030. Cost, safety and performance advantages are driving manufacturers towards LFP batteries for both EV and energy storage applications. The use of LFP simplifies the supply chain and reduces exposure to critical metals … nickel and cobalt in particular. Only 2% of global LFP cathode powder production occurs outside China, whereas future jurisdictions of high demand are likely to include Europe, India and North America. This creates a real opportunity for the Company."

The VSPC cathode powder pilot plant and research facility.

Introduction

EVs offer the potential to reduce the rate of climate change, as do BESS for renewable energy. Together, these technologies are contributing to the shift away from fossil fuels worldwide. That said, the resultant boom in battery production is placing supply-chain stress on the materials required, in particular nickel ('Ni') and cobalt ('Co'), which are integral to the LIB types preferred by EV manufacturers in the western world. Hence the growing popularity of LFP-type LIBs. Indeed, many factors will contribute to the growing demand for LFP, a market that is anticipated to increase five-fold by 2030 (see below).



Critical battery metals

Most EVs and many BESS contain lithium nickel cobalt manganese (‘NCM’) or lithium nickel cobalt aluminium (‘NCA’) LIB cells. However, if these battery chemistries continue to be used in those applications, the amount of lithium required by 2050 is likely to rise 20-fold, cobalt by a similar amount and nickel a staggering 30-fold *(source: Benchmark Mineral Intelligence – Q2 Review 2020)*.

It is inevitable, then, changes in battery chemistries will be required.

Future battery technologies

Of the many LIB types being considered as substitutes for NCM and NCA, most are in the early stages of commercialisation. Only one, LFP is already widely available, and deservedly so, since it exhibits superior safety, longer life and lower cost, which are but a few of its benefits. A comparison of the main performance characteristics of the principal LIB types, as published by the Battery University (*https://batteryuniversity.com/*), is shown in the diagram below.

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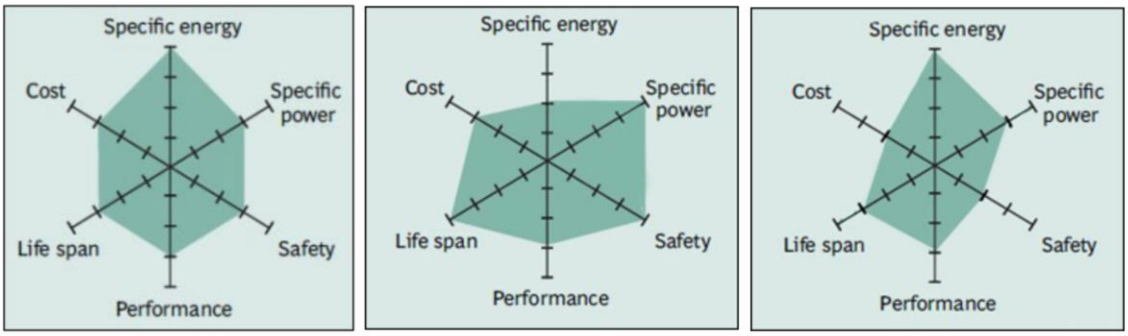


NMC **LFP** **NCA**

Lithium nickel manganese cobalt **Lithium ferro phosphate** **Lithium nickel cobalt aluminium**

In addition to the attributes described above, LFP is a great candidate for future LIB applications since, compared with NCM and NCA, it contains less lithium and no nickel or cobalt whatsoever. Moreover, as battery recycling becomes the norm, use of LFP can ease supply chain pressure, as well as risk, by reducing the complexity of managing three critical components, lithium, nickel and cobalt, to just one – lithium. Similarly, use of LFP can reduce the environmental impact of the battery industry.

Battery trends

LFP has long been used in transport applications such as trucks and buses, where safety is paramount and its lower energy density (in comparison with NCM and NCA) is inconsequential. That said, major EV producers including Tesla, VW and BYD all adopted LFP for EVs built in China for the local market. More recently, Tesla and BYD have made these EVs available outside China too, a trend likely to spread to allow for greater control of commodity prices and supply chain vulnerability.

To date, LFP's one major shortfall has been its lower energy density in comparison to the other LIB chemistries. However, this is now being countered by the use of more efficient cell geometry and modifications to the LFP chemistry itself, mainly through the addition of manganese to produce lithium manganese ferro phosphate ('LMFP').

Over the past several years, as a means of combatting climate change, many governments globally have set higher targets for EV utlisation. But, to achieve EV penetration rates of around 40% by 2030, battery manufacturing capacity has to increase five-fold to around 2000 GWh annually.

Over the last 12 months, global demand for LFP has increased over 25%, bringing Chinese LFP cathode powder manufacturing up to over 100 thousand tonnes per annum ('ktpa') – only 2% of global LFP cathode powder production originates elsewhere.

So, with many EV producers already manufacturing LFP-powered vehicles inside China, and making them available in other jurisdictions, North America and Europe are likely to be areas of high demand, with BESS and marine applications further increasing that demand. This creates a great opportunity to supply LFP into a market with little in the way of competition.

Global trends in LFP production are likely to follow that in China, where rising LFP demand, as forecast by Roskill (below), is likely to see LFP become the dominant LIB chemistry in the next few years.

Roskill Base Case

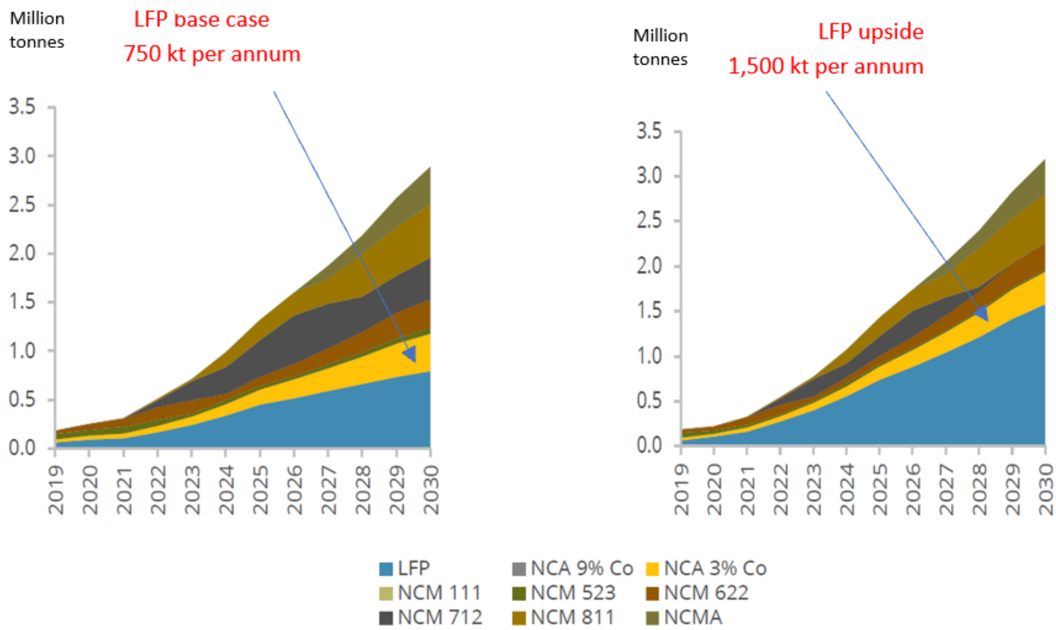
2030 750 kt LFP
requiring 184 kt LCE or LP
market value ~ USD 1.8b

Roskill Scenario 2 - increased LFP adoption in global EV market

2030 ~1,500 kt LFP
requiring 367 kt LCE or LP
market value ~ USD 3.7b

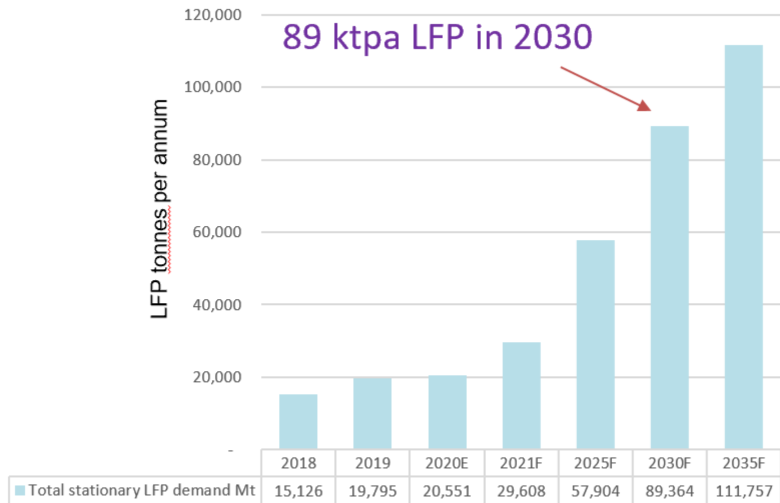
LCE = lithium carbonate equivalent

LP = lithium phosphate



The expanding market for energy storage

Stationary energy storage driven by renewable energy and the transition to 5G communications is forecast to grow four-fold to 35 GWh by the end of the decade, potentially creating a market for nearly 90 ktpa of LFP cathode powder by 2030. (It's worth noting that LFP is already the favoured battery technology for replacing lead-acid batteries in the communications industry.)



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Legislation encourages LFP use

Fire protection on NCM and NCA battery packs in EVs is likely to become mandatory in Europe, North America and China in the near future. This will reduce energy density at battery-pack level, making LFP a more competitive option as there is no fire risk.

The VSPC advantage

VSPC – a wholly owned subsidiary of Lithium Australia NL (ASX: LIT, 'the Company') – is a developer and producer of LFP-based cathode powders, plus derivatives that enhance the quality and performance to many other LFP cathode powders currently available. VSPC also produces LMFP at its R&D facility in Brisbane, Queensland, Australia.

Advancing cathode powder technology

To date VSPC has achieved the following.

- Manufacture of high-quality LFP cathode powders (27 Nov 2019).
- Improving the energy density of LFP via the addition of manganese (3 Dec 2020).
- Reducing the cost of LFP and LMFP cathode powders (16 Dec 2020).

The recent change in direction of the LIB market, resulting in LFP demand rising at a greater rate than competing LIB chemistries, and the lack of installed LFP production capacity outside China, provides an outstanding opportunity for VSPC.

This quarter, VSPC will complete a preliminary feasibility study for LFP cathode production that includes these emerging market dynamics and compares its production and use in a number of jurisdictions outside of China.

Conclusion

LFP battery chemistry is poised to dominate the LIB market and Company subsidiary VSPC is well-positioned for expansion as demand for LFP continues to grow.

Authorised for release by the Board.

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About Lithium Australia NL

Lithium Australia aims to ensure an ethical and sustainable supply of energy metals to the battery industry (enhancing energy security in the process) by creating a circular battery economy. The recycling of old lithium-ion batteries to new is intrinsic to this plan. While rationalising its portfolio of lithium projects/alliances, the Company continues with R&D on its proprietary extraction processes for the conversion of *all* lithium silicates (including mine waste), and of unused fines from spodumene processing, to lithium chemicals. From those chemicals, Lithium Australia plans to produce advanced

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components for the battery industry globally, and for stationary energy storage systems within Australia. By uniting resources and innovation, the Company seeks to vertically integrate lithium extraction, processing and recycling.

About VSPC

VSPC operates a battery material R&D facility and pilot plant in Brisbane, Queensland, Australia. It has developed advanced processes for the manufacture of cathode powders applicable to all lithium-ion battery chemistries, as well as anode materials like lithium titanate (LTO).

VSPC's processes are simple and scalable for nano-structured battery cathodes, provide for precise control of chemical composition, particle size and surface characteristics, are flexible and cost-competitive (given their ability to use low-cost raw materials and recycled lithium as feed), and are adaptable to a range of nanostructured materials.

Currently, VSPC is commercialising its process technology for the manufacture of cathode material for lithium-ferro-phosphate (LFP) and lithium-manganese-ferro-phosphate (LMFP) batteries.

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