Mines & Money

Investment Thesis: Lithium processing technology – the real roadblock to lithium investment opportunities?

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RK Equity

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10 Years Experience with Lithium Battery Materials Developers

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Why is lithium processing technology so important? Li chemical demand is shifting

The future of lithium demand is not spread evenly across the different market segments

Industrial, derivative and consumer electronics demand growth is more GDP related

The real demand growth is for e mobility batteries and in particular EVs

The specifications for lithium required in Western OEM EV batteries (8 year + warranties) are NOT commodity like – specialty chemicals

Over 80% of future demand growth is for "high spec" chemicals, especially hydroxide for EV batteries – specialty chemicals are the future

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What is the "real" lithium supply challenge? Quality of assets

Lithium production has a long history for both brines (Atacama) and hard rock (Greenbushes)

Highest grades (by some margin) and manageable impurities (time & money spent)

Made products of limited technical spec, incl batteries (ceramics, glass, grease, electronics etc)

Even these quality assets have struggled to meet rising EV battery quality specifications

New assets are "best of the rest" - some larger resources - but lower grade and many - higher impurities – ↑ costs and technical difficulty

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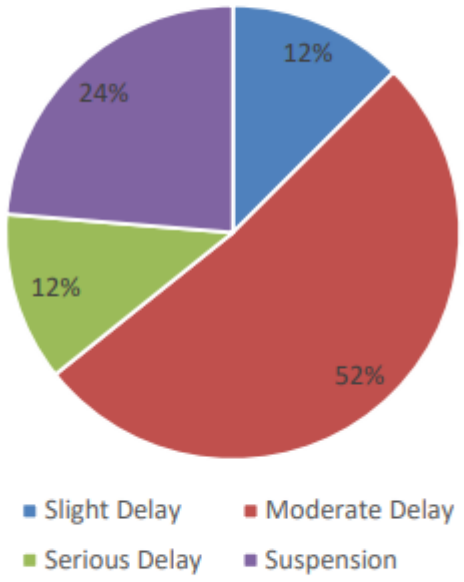
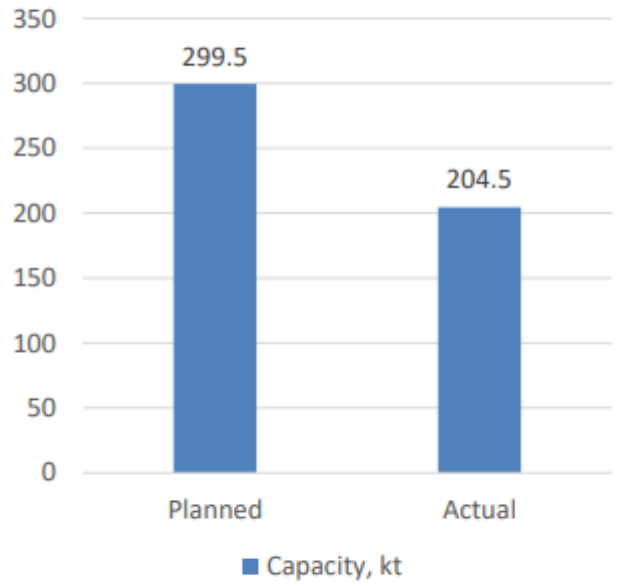
Planned versus completed expansions tells the true story

Why is this?

Challenges to New Conversion Projects





Among 16 projects, existing convertors showed 7 slight-moderate delays, 2 serious delays and 2 suspensions, vs new convertors showing 3 moderate delays and 2 suspensions.

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What is the "real" lithium supply challenge? Technical (Non-integrated producers)

Scale – old plants 3,000-8000tpa

New plants are 20,000tpa +

Limited history of SC6 conversion, only Greenbushes – newcomers lack experience

Quality of SC6 feedstock supply - impurities

Inconsistency of SC6 feedstock - multiple offtake partners, multiple suppliers-batch qualifying

OEM qualification standards rising - high Nickel cathodes and desire for improved energy density

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What is the "real" lithium supply challenge? Economics (Integrated producers)

Capex, operating costs, royalties and taxes are high in Western Australia ("WA")

Lithium is a specialty chemical, construction to full ramp takes at least 5 years (brines longer)

Effective capacity less than nameplate (~85%)

Battery-grade as a % of total production (~75%)

B-grade = 63.75% of nameplate – lower returns

WA projects need >$14k/MT long term price for a 15% after-tax IRR – hence "postponements"

OEM quality standards are rising (warranties) plus pressuring the supply chain to reach $100/kWh or less at the battery pack level

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Is there real demand growth for high spec lithium? Hydroxide or Carbonate?

EV model growth in Europe increasing from 60 in 2018 to greater than 300 in 2025, globally >500

Battery plant capacity in Europe increasing by more than 10x by 2025, globally >5x

CO_2 emission standards penalties in Europe, China NEV policy, cities banning ICE vehicles = effectively mandating the adoption of EVs

OEM demand is for high Ni cathodes (NMC 811) and even higher Ni in time = hydroxide demand

Hydroxide limited life (6-9 months), harder to produce. Will OEMs stick with NMC 622 carbonate if LiOH in short supply? Performance?

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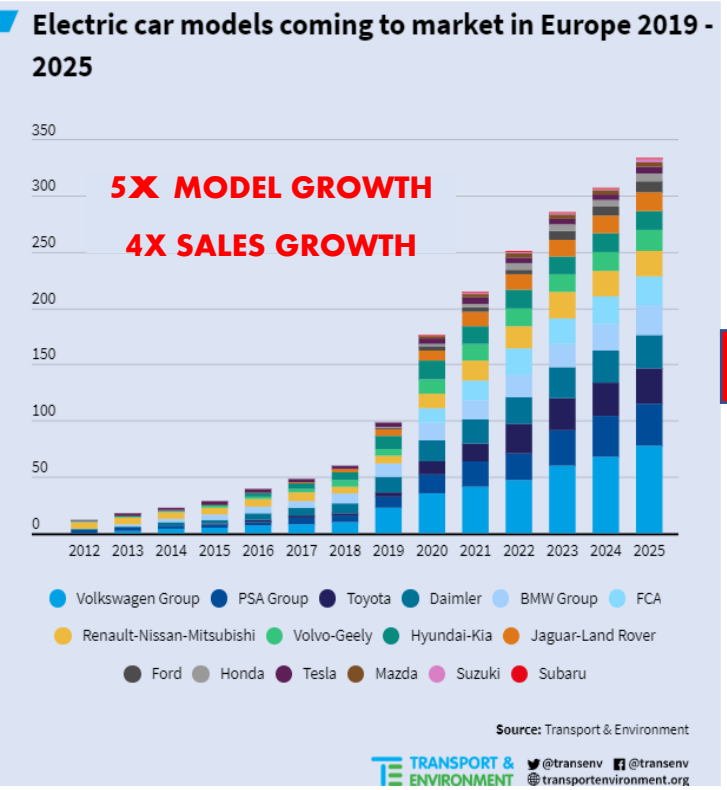
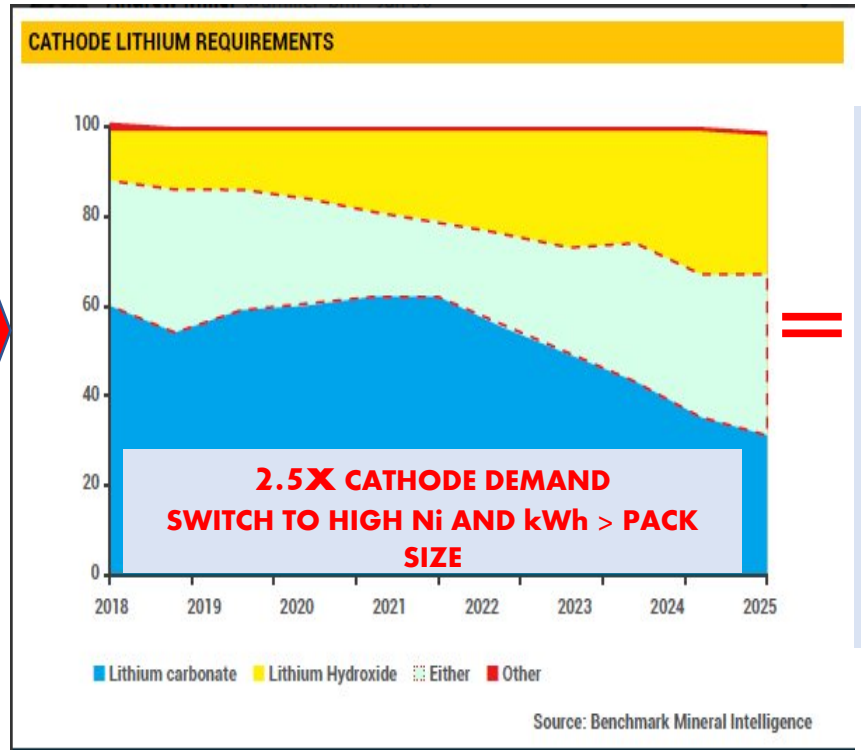
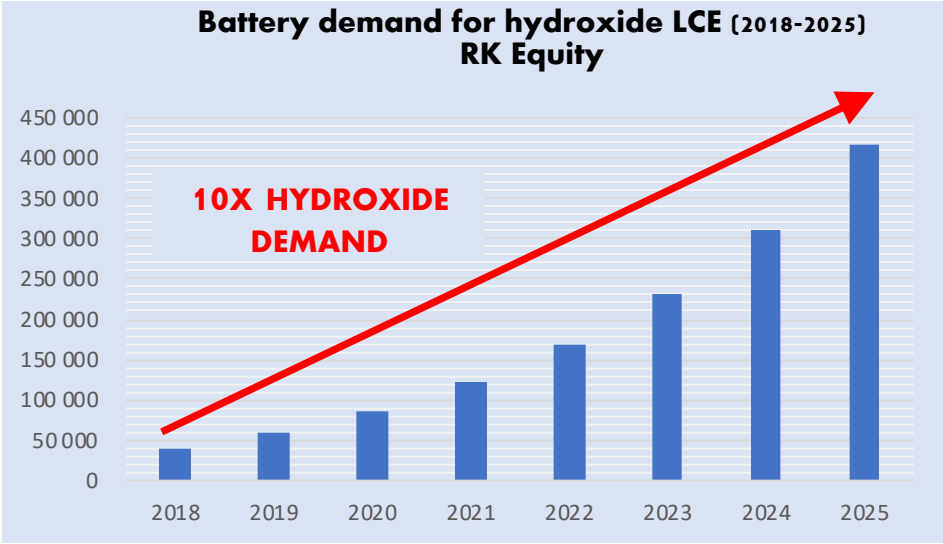
Battery grade hydroxide (10x growth to 2025)







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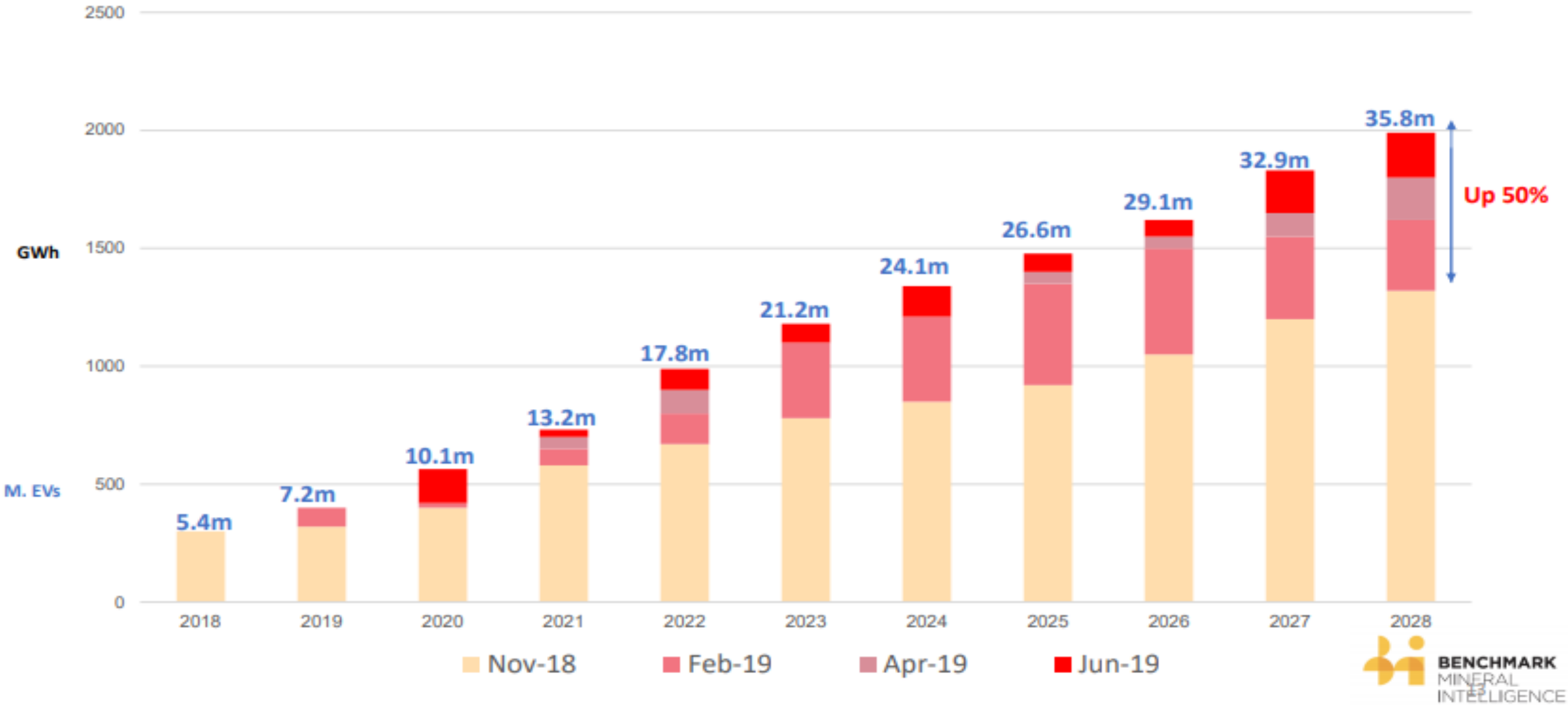
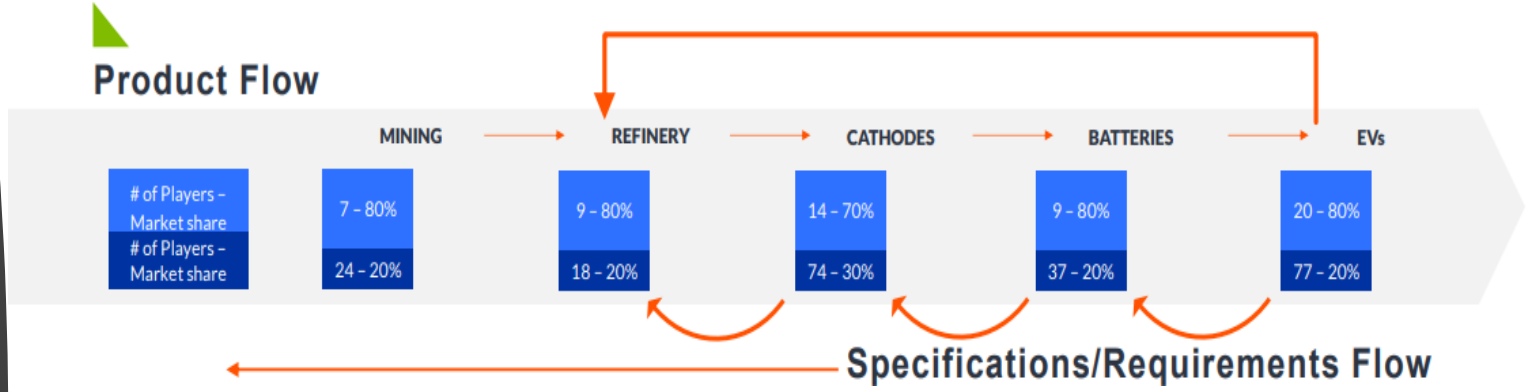
Planned battery capacity expansions to 2028 (GWh)
Confirmation of demand



How the EV battery supply chain works **Volume driven**

New challenge for lithium producers

The interconnected value chain means more complexity for lithium producers



- OEM gives battery cell maker a future volume and price profile down to $100kWh (pack) (depending on volumes)
- If battery cell maker can meet the profile (1st hurdle) then they discuss quality (cycle testing – 18-24 months)
- The cell producer then has a volume and price profile for the cathode producer (1st hurdle)
- If cathode accepts, then discuss quality (cycle testing)
- Cathode producer then outlines specifications to the lithium chemical producer (price is negotiated)

Will OEMs sign long dated offtake contracts with Chinese non integrated producers?

Chinese non-integrated producers have limited SC6 offtake contracts with WA (less 5 years) other than Ganfeng/General Lithium

Poor credit quality (unbankable) and low market caps (<US$500m) - no or limited legal recourse

High carbon/GHG footprint, conversion is energy intensive, precursor material is shipped from WA and chemicals to cathode plants offshore

Chinese non integrated companies are the marginal cost producers, first to go offline

Battery represents 25%-30% of EV cost

Ability to consistently meet specifications? Risk of a rise in export taxes or ban during mkt shortage?

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Summary of the challenges facing the lithium chemicals industry

EV buyer subsidies aren't forever (2025), China is a good example of demand impact ($EV>$ICE)

"Mandated" demand supports EV sales
OEM supply chain pressure - packs to <$100/kWh – no futures market or transparency-pvt contracts

Cathode demand moving to high Nickel = hydroxide. Technical and economic challenges to produce high spec

WA projects have high costs, royalties and taxes – will battery/OEM customers pay up for sustainable, secure ex-China contract supply?

RK Equity sees value in integrated projects outside WA and direct lithium extraction ("DLE") technologies have potential

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