Black Rock Mining

BKT.AX

MST Access

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20 March 2023

Graphite demand from LIBs hits turning point – and shortages loom

NEED TO KNOW

- 7–10X more graphite than lithium in an LIB by weight – but prices don't yet reflect likely future shortages
- Graphite demand is now >50% EV-related – a major inflection point

Stable graphite prices do not yet reflect likely future shortages: Although battery demand has caused lithium prices to soar (+800%), graphite prices remain relatively stable. This is unexpected given that lithium-ion batteries (LIBs) contain 7-10X times more graphite, with the role of this mineral in LIBs often overlooked. The causes of this disparity are changing.

EV-related demand as a percentage of total graphite demand has crossed the 50% mark: This is a significant inflection point for graphite prices, with the majority of demand coming from a high-growth, critical sector.

BKT's competitive advantages: BKT is among the few publicly graphite listed companies globally that have been officially qualified by an anode producer, and notably, an anode producer outside of China: POSCO.

Investment Thesis

High-quality, shovel-ready flagship asset: The Mahenge project, majority-owned by Black Rock (BKT), has a large graphite mineral resource of 213Mt at 7.8% TGC and the second-largest Ore Reserves worldwide. It can produce up to 350kt/year of high-quality graphite concentrate with minimal processing due to low impurities and large flake size.

Demand: batteries make up an increasing percentage of total graphite market, have hit a critical milestone: Lithium prices soared in 2020/2021 as battery demand reached ~60% of the total market. In 2023, battery demand is projected to reach a critical turning point, comprising ~60% of the market and growing to 85% by 2030. As the proportion of battery demand relative to the total market demand increases, we anticipate increased upward pressure on natural flake prices.

Supply: optimistic forecasts don't paint full picture; product qualification is key: By 2025, the year we expect BKT to be producing, we forecast the market will face a shortage of almost 500kt of graphite concentrate. While a scenario incorporating the expected ~20% CAGR in graphite demand for LIBs, the need for qualified product, and the preference for ex-China sources could lead to ~580kt natural graphite deficits by 2025.

Valuation

We value BKT at A$0.52, fully diluted, **implying upside of 319% to the current share price**. Our valuation is based on our financial analysis of Mahenge. We applied a conservative 65% risk weighting to account for outstanding project risks (financing, construction, commissioning) and dilution for a A$141m equity raise at A$0.20/share to fund BKT's equity contribution to the project (we assume 50:50 debt and equity).

Risks

Key risks include inability to access funding, project delays, escalation in capital costs, a fall in the graphite price, inability to sell large flake into the high-value markets, and continuity of key persons.

Equities Research Australia

Mining and Energy

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BLACK ROCK MINING LIMITED

Black Rock Mining (ASX:BKT) is a mining company focused on graphite projects in Tanzania. The main project is the Mahenge Graphite Project, a world-class deposit of high-quality graphite ore. The goal is to become a leading producer of high-grade graphite for use in lithium-ion batteries and other high-value applications.

https://blackrockmining.com.au/

See our initiation for more detail:

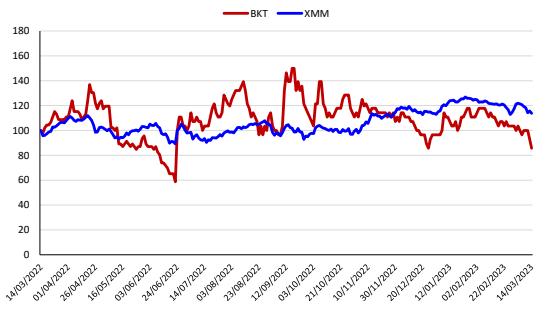
Advanced graphite project with compelling economics to help plug the supply hole

Valuation	**A$0.52** *(unchanged)*
Current price	**A$0.12**
Market cap	**A$118**
Cash on hand	**A$10.9m**

Upcoming Catalysts / Next News

Period	
1H CY23	POSCO to sign the full-form offtake agreement & US$10m prepayment
2Q CY23	Credit-approved term sheets for project debt
CY23	Potential sell-down of a stake in the Project to provide funding

Share Price ($A)



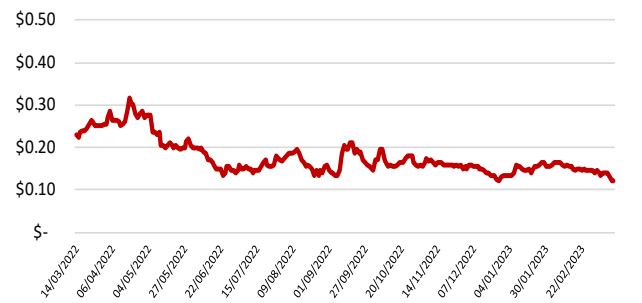
Source: FactSet, MST Access.

Financial Summary: Black Rock Mining

BLACK ROCK MINING						BKT.AX
Year end FY2023						
MARKET DATA						
Share Price	A$/sh					0.12
52 Week Low	A$/sh					0.12
52 Week High	A$/sh					0.33
Market Cap (A$m)	A$m					118
Net (Debt) / (Casj) (A$m)	A$m					(26)
Enterprise Value (A$m)	A$m					92
Shares on Issue	m					983
Capital Raise	m					704
Potential Diluted Shares on Issue	m					1,687
INVESTMENT FUNDAMENTALS		**Jun-21**	**Jun-22**	**Jun-23e**	**Jun-24e**	**Jun-25e**
Reported NPAT	A$m	(3)	(6)	(3)	(19)	14
Underlying NPAT	A$m	(3)	(6)	(3)	(19)	14
EPS Reported (undiluted)	¢ps	(0.5¢)	(0.5¢)	(0.2¢)	(1.1¢)	1.4¢
EPS Underlying (undiluted)	¢ps	(0.5¢)	(0.5¢)	(0.2¢)	(1.1¢)	1.4¢
P/E Reported (undiluted)	x	N/A	N/A	N/A	N/A	8.8
P/E Underlying (undiluted)	x	N/A	N/A	N/A	N/A	8.8
Operating Cash Flow / Share	A$	(0.00)	(0.00)	(0.00)	(0.01)	0.01
Price / Operating Cash Flow	x	(50.0)	(28.0)	(44.4)	(10.2)	10.8
Free Cash Flow / Share	A$	(0.00)	(0.01)	(0.03)	(0.13)	(0.03)
Price / Free Cash Flow	x	(35.6)	(10.1)	(4.3)	(0.9)	(3.5)
Free Cash Flow Yield	%	-2.8%	-9.9%	-23.1%	-107.0%	-28.2%
Book Value / Share	A$	0.04	0.06	0.11	0.10	0.11
Price / Book	x	3.07	2.13	1.05	1.18	1.10
NTA / Share	A$	0.04	0.06	0.11	0.10	0.11
Price / NTA	x	3.07	2.13	1.05	1.18	1.10
Year End Shares	m	849	977	1,681	1,681	1,681
Market Cap (spot)	A$m	102	117	202	202	202
Net Cash / (Debt)	A$m	11	26	120	(95)	(52)
Enterprise Value	A$m	91	91	81	297	254
EV / EBITDA	x	(32.6)x	(15.3)x	(27.4)x	(27.4)x	1.7x
Net Debt / Enterprise Value		(0.1)	(0.3)	(1.3)	1.0	0.6

PRODUCTION AND PRICING		**Jun-21**	**Jun-22**	**Jun-23e**	**Jun-24e**	**Jun-25e**
Ore Mined	kt		-	-	-	1,107
Graphite Concentrae Produced	kt	-	-	-	-	87
Graphite Basket Price	US$/t	-	1,160.3	1,081.5	1,133.0	1,187.5
AUDUSD	:	0.75	0.70	0.71	0.71	0.71

12-Month Relative Performance vs S&P/ASX Metals & Mining



Profit & Loss (A$m)	**Jun-21**	**Jun-22**	**Jun-23e**	**Jun-24e**	**Jun-25e**
Revenue	-	-	-	-	145
Expenses	(3)	(6)	(3)	(3)	(90)
EBITDA	**(3)**	**(6)**	**(3)**	**(3)**	**54**
D&A	(0)	(0)	(0)	(0)	(12)
EBIT	**(3)**	**(6)**	**(3)**	**(3)**	**42**
Interest	0	0	0	(16)	(22)
Tax	-	-	-	-	(6)
Underlying NPAT	**(3)**	**(6)**	**(3)**	**(19)**	**14**
Exceptionals					
Reported Profit	**(3)**	**(6)**	**(3)**	**(19)**	**14**

Balance Sheet (A$m)	**Jun-21**	**Jun-22**	**Jun-23e**	**Jun-24e**	**Jun-25e**
Cash	11	26	261	45	188
Receivables	0	1	-	-	10
Inventory	-	0	-	-	16
PP&E	0	1	43	238	302
Exploration	22	30	30	30	30
Other	-				
Assets	**34**	**57**	**333**	**314**	**546**
Creditors	0	2	-	-	17
Debt	-	-	141	141	241
Other	0	0.73	1	1	3
Liabilities	**0**	**2**	**142**	**142**	**260**
Shareholder's Equity	**33**	**55**	**191**	**171**	**184**

Cashflow (A$m)	**Jun-21**	**Jun-22**	**Jun-23e**	**Jun-24e**	**Jun-25e**
Net Cash From Operations	**(2)**	**(4)**	**(5)**	**(20)**	**19**
Capex	(0)	(0)	(42)	(196)	(76)
Exploration	(1)	(7)	-	-	-
Other	-				
Net Cash From Investing	**(1)**	**(7)**	**(42)**	**(196)**	**(76)**
Equity	14	26	141	-	-
Borrowings	-	-	141	-	100
Dividend					
Net Cash From Financing	**14**	**26**	**282**	**-**	**200**
Effects of FX	(0)	0	-	-	-
Net Increase / (Decrease) in Cash	**11**	**15**	**235**	**(216)**	**143**

Source: Company data, MST Access.

Prices: Why Natural Graphite Has Not (Yet) Followed the Lithium Trajectory

there is 7–10 times more graphite than lithium in a lithium-ion battery

Despite the fact that demand for lithium-ion batteries has surged over the past few years, leading to a significant increase in the price of lithium carbonate used in batteries, graphite prices have not risen substantially. This may seem surprising, given that there is 7–10 times more graphite than lithium in a lithium-ion battery, and the global demand for graphite is expected to grow sevenfold between now and 2035.

In this section, we explore why natural graphite prices have yet to increase significantly and why we believe that this situation will inevitably change. For a review of the types of graphite and their applications, see the Appendix.

Reason 1: Global graphite demand has been less concentrated on batteries – but this is changing

Graphite prices have lagged lithium prices partly because of the difference in demand for each mineral in battery application as a proportion of the total market. As the proportion of battery demand for a mineral relative to the total market size increases, the price of that mineral becomes more sensitive to fluctuations in battery demand.

Consequently, the price of lithium is more sensitive to fluctuations in battery demand at this stage, although the sensitivity of the graphite price to battery demand is set to grow over time.

Figure 1 shows that lithium carbonate prices significantly increased in 2021, when battery demand as a percentage of the total lithium market was ~65%.

The percentage of lithium demand from batteries in the overall lithium market is growing, increasing from 47% in 2019 to an estimated 80% in 2023. Similarly, the percentage of natural graphite demand from batteries in the total market is also increasing, from 26% in 2019 to a projected ~63% in 2023.

Historically, graphite has been more closely tied to global crude steel production. The decline in crude steel production, brought about by COVID-related lockdowns in China, led to reduced demand for graphite in steel-related applications. This, in turn, exerted downward pressure on natural graphite prices.

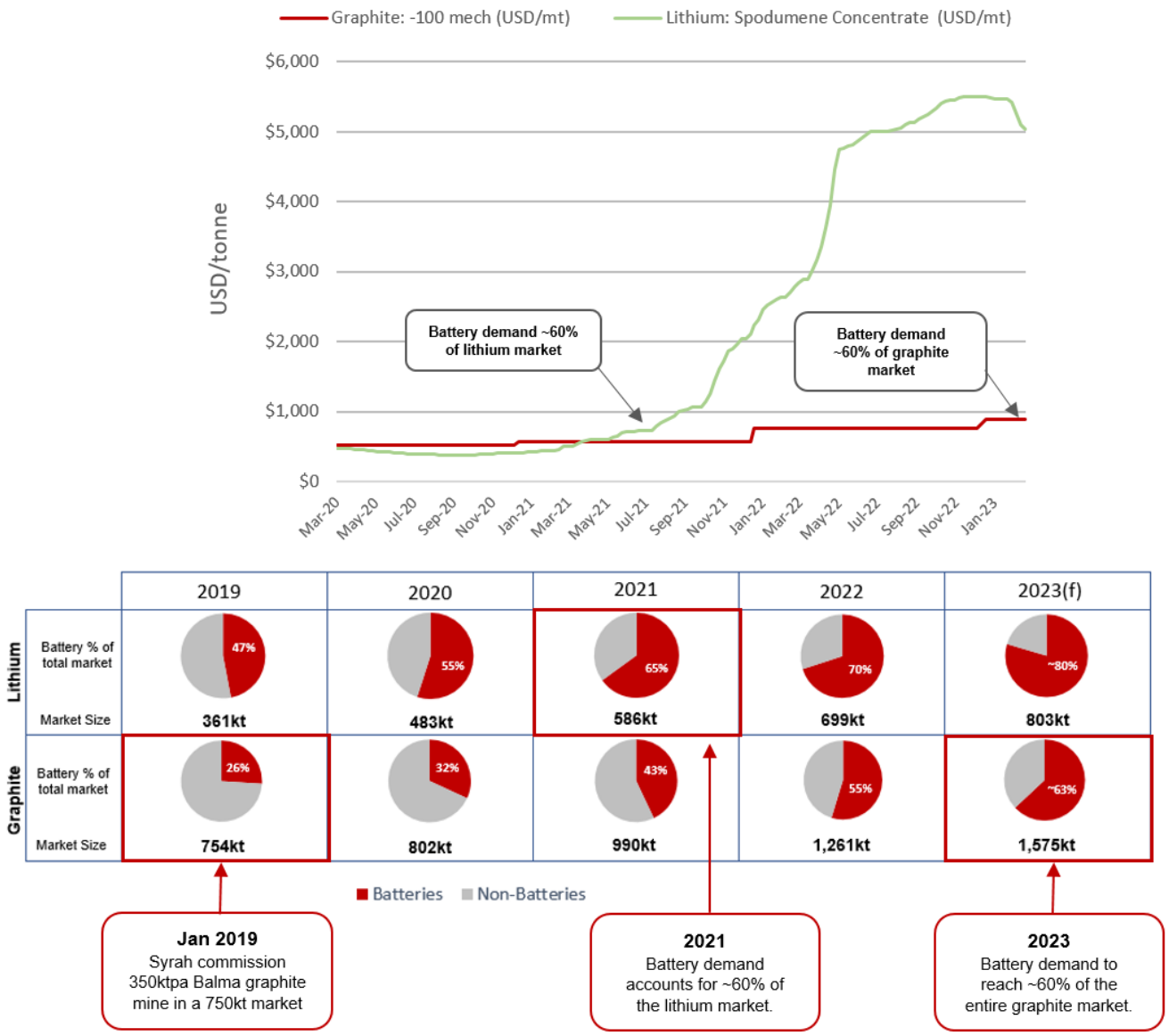
Battery demand anticipated to constitute ~60% of the market by 2023, a comparable proportion to the lithium price surge.

Nonetheless, the situation is evolving, and we believe the global flake graphite market will experience a pivotal moment in 2023, with batteries projected to make up ~63% of the market, similar to when lithium prices surged.

What we highlight in Figure 1 is the following:

- Lithium prices surged in 2021 when battery demand represented ~60% of total lithium market
- Historically, graphite has been closely tied to global crude steel production, but this is changing
- Battery demand is expected to make up ~60% of the market by 2023, similar to the lithium price surge.

Figure 1: Battery demand to start driving graphite pricing from 2023?



Source: MST, using publicly available data

Reason 2: Synthetic graphite has dominated – but natural graphite is expected to become more prevalent

Graphite anodes can be obtained through the extraction of natural graphite or from synthetic graphite, created using crude oil (see Appendix).

We believe graphite prices have been held back by the dominance of synthetic graphite anodes, which account for ~57% of the battery anode market.

Synthetic graphite is produced from petroleum coke, which is a carbon-rich material obtained from oil refining. As a result, fossil fuels are currently supplying a significant portion of the growing anode demand for graphite.

Natural graphite is cheaper and ~55% less carbon intensive

However, experts are predicting that natural graphite is likely to increase in anodes relative to synthetic. Natural graphite is cheaper, has greater range, and is ~55% less carbon intensive, making it more attractive in terms of cost-effectiveness, performance benefits, environmental concerns, and the growing demand for sustainable materials.

Reason 3: The graphite market is still opaque – greater transparency might drive up prices

The graphite pricing market is quite opaque due to supply chain transparency issues, few market players, and concerns about price information reliability.

As demand for graphite continues to grow, there is likely to be greater pressure on market players to provide more reliable and transparent pricing information. This will likely lead to increased demand from ethical suppliers, which may drive up prices. We have seen this in other markets; for example, the implementation of stricter environmental regulations and greater transparency in the cobalt supply chain led to increased scrutiny and higher prices.

Increased demand from ethical suppliers, may drive up prices

Conversely, a more transparent market may facilitate increased funding for new supply. The graphite market's opacity in terms of pricing has made bankers hesitant to finance new projects as forecasting long-term prices is difficult.

Reason 4: OEMs not incentivised (yet) to use ex-China product

Western Governments are placing mounting pressure on EV OEMs to source their anode materials from non-Chinese suppliers. Currently, China produces ~83% of the global supply of anode material, a dependency which exposes OEMs to supply chain risks due to potential disruptions from trade tensions, tariffs, and export restrictions.

China produces >80% of global anode material supply, exposing OEMs to supply chain risks.

Concerns over the environmental and social impact of raw material mining and processing in China have also led to increased scrutiny and pressure from regulators (notably the USA and the EU) and investors for responsible sourcing practices. Additionally, the expected growth of the EV market is driving up the demand for anode material and increasing the urgency for OEMs to secure reliable and sustainable sources of supply.

Policies such as the US *Inflation Reduction Act* (2022) will incentivise OEMs to explore alternative anode material sources outside of China. We expect the shift towards non-Chinese sources to result in upward pressure on natural graphite prices.

A surge in natural graphite prices is not a matter of if, but rather a matter of when.

Sleepwalking into Lithium 2.0: “Expert” Predictions of a Smaller Supply Shortage Appear Flawed

In our Initiation Report - Global Market Section, we discussed how the natural graphite industry is expected to face significant supply shortfalls in the near future. According to Benchmark Mineral Intelligence:

- the market already faced a deficit in 2022
- deficits are projected to increase each year
- by 2029, market deficits are expected to exceed graphite supply by a factor of four
- there will be a shortfall of 8Mt by 2040.

Graphite production must increase nearly eightfold in the next 18 years

To address the shortfall, the mining industry needs to increase graphite production by almost eightfold in the next 18 years. This requires building 97 natural graphite mines by 2035, with an average annual output of 56,000 t/year.

In this section, we examine publicised forecasts and evaluate the likelihood of projected deficits by scrutinising supply and demand data from market analysts, comparing it with our own forecasts, and assessing the accuracy of the predicted shortfalls.

Demand forecasts look reasonable, but optimistic supply forecasts don't paint the full picture

Experts have a clear sense of optimism in supply forecasts

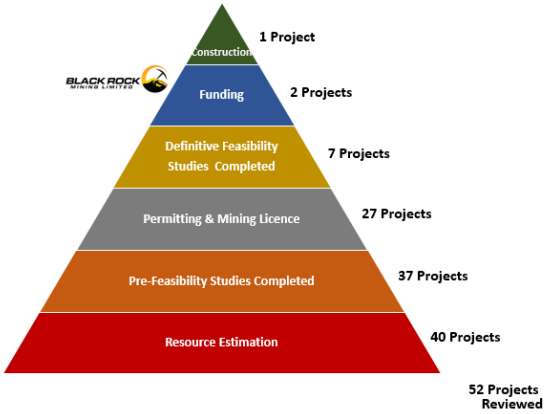
What we discovered was both interesting and somewhat concerning. While the demand forecasts appeared reasonable, we noticed a clear sense of optimism in the supply forecasts.

To evaluate the oncoming supply, we looked at a large proportion (52) of the publicly listed developmental graphite projects and considered multiple factors to determine a feasible start date based on the current stage of development. Specifically, we examined whether a project has:

- estimated resources/reserves
- completed feasibility studies
- obtained mining licences
- received funding (or are close to doing so)
- begun construction.

Figure 2 depicts the position of BKT's Mahege Project within the development construction hierarchy relative to other projects, while Figure 3 provides an overview our assessment of the largest projects under development and their probability of being operational by 2025.

Figure 2: Projects assessed on six criteria



Source: MST, assessment using publicly available information

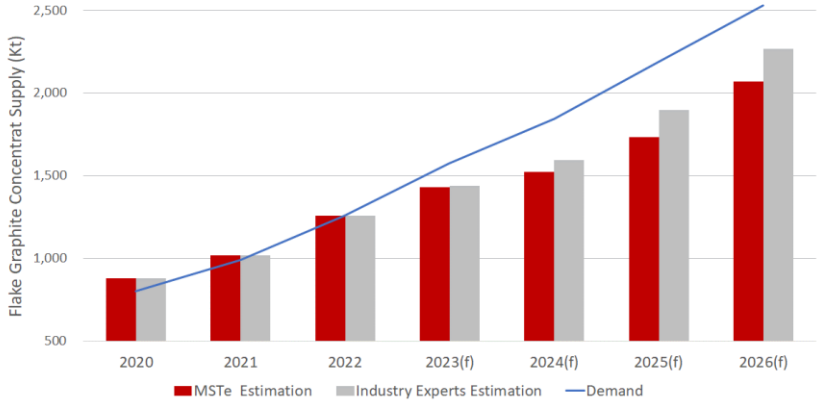
Figure 3: The six largest developmental projects vs Mahenge

Pre-Production Graphite Projects	Resource Estimation	Reserve Estimation	PFS Complete	Mining Licence	DFS Complete	Product Qualification	Funding	Producing by 2025
Mahenge Project (BKT)	✓	✓	✓	✓	✓	✓	×	Likely
Project #1	✓	✓	✓	✓	✓	✓	×	Likely
Project #2	✓	✓	✓	✓	✓	×	×	Possible
Project #3	✓	✓	✓	✓	✓	×	×	Unlikely
Project #4	✓	✓	✓	×	×	×	×	Unlikely
Project #5	✓	×	×	×	×	×	×	Unlikely
Project #6	✓	×	×	×	×	×	×	Unlikely

Source: MST, assessment using publicly available information

Figure 4 displays the current and projected supply and demand of natural graphite, with a comparison between our supply forecasts and those of industry experts.

Figure 4: Natural graphite supply and demand forecast: MST estimates vs consensus



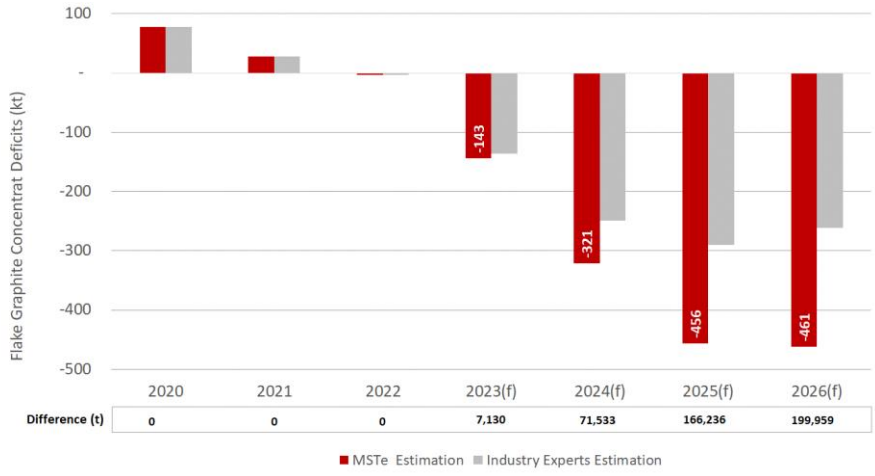
Source: MST estimates.

By 2025, we estimate a shortage of almost 500kt of graphite concentrate

Although the above chart highlights that our supply projections are notably lower than current forecasts, Figure 5 emphasises the significant magnitude of the deficit gap.

By 2025, the year we anticipate BKT to be in production, we estimate the market will face a shortage of almost 500kt of graphite concentrate, while others are forecasting deficits of ~300kt.

Figure 5: The gap between hope and reality: natural graphite deficit forecasts (MST vs. consensus)



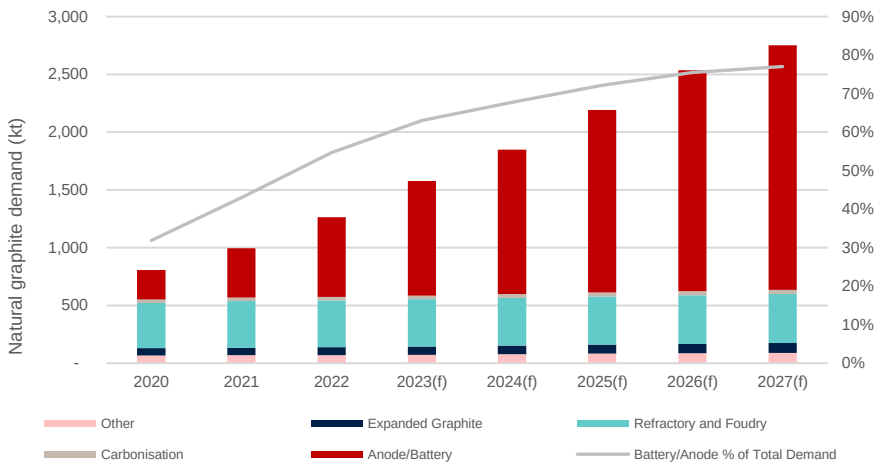
Source: MST estimates.

Qualified graphite products: the missing piece in understanding graphite supply shortages

While the above analysis highlights structural supply shortages across the entire natural graphite market, it fails to address the specific deficit in battery-grade flake graphite.

We project graphite demand in the battery market to grow at a CAGR of 24% ex-China over the next 10 years, driving graphite demand significantly. We project that by 2030, the battery industry will comprise ~85% of total graphite demand. Therefore, those projects producing qualified products stand to benefit substantially from this surge in demand.

Figure 6: Where is demand coming from?



Source: MST estimates.

To obtain debt financing, developers likely to require offtake agreement with one of three companies.

The qualification dilemma

Graphite qualification is essential for OEMs to ensure their products meet specific performance standards. However, the qualification process poses a significant hurdle for many projects due to the large scale of the testwork requirements (typically 20-100t of product), high cost (typically ~A$20-25m) and lengthy timeframes (~3-4 years).

Making matters more difficult, to secure debt financing, graphite developers may need an offtake agreement with a non-Chinese anode producer. Interestingly, three companies (with POSCO being the largest) control 85% of the ex-China anode market. As a result, developers will need to secure an offtake agreement with one of these companies if they intend to obtain debt financing.

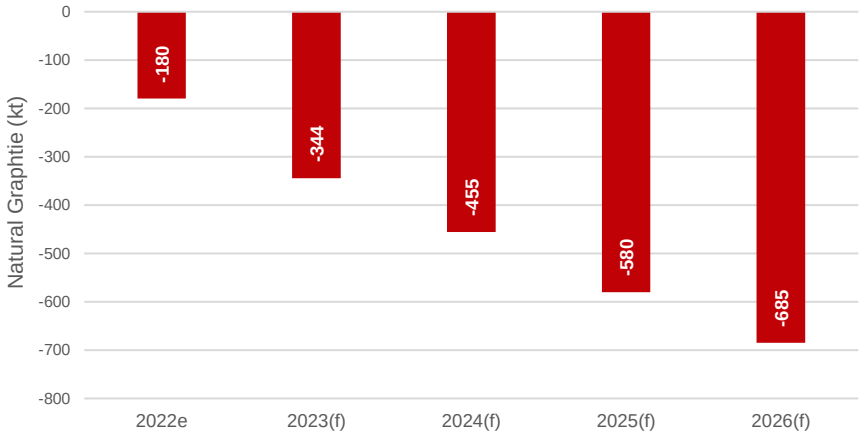
Escalating deficits

Determining the qualification status of Chinese graphite producers is challenging due to the opaque nature of the market. As a result, we have focused our analysis on non-Chinese graphite producers, believing they will be crucial suppliers in western economies' efforts to diversify away from China.

As previously mentioned, our audit of ~52 graphite projects revealed that only a few projects have gone through the qualification process or started testing. We analysed ex-China demand against a probable qualified supply market and demand situation that and built a supply deficit chart (Figure 7). This chart suggests natural graphite supply deficits will reach ~580kt of in 2025, painting a concerning picture for western economies who are desperately trying to diversify supply away from China.

Figure 7: Battery-grade graphite market balance – ex-China

There could be a shortage of nearly 600kt of natural graphite supply by 2025



Source: MSTe.

BKT's competitive advantages as supply tightens: ex-China qualification, underestimation of supply shortages

BKT is one of the few publicly listed graphite companies worldwide officially qualified by a non-Chinese anode producer

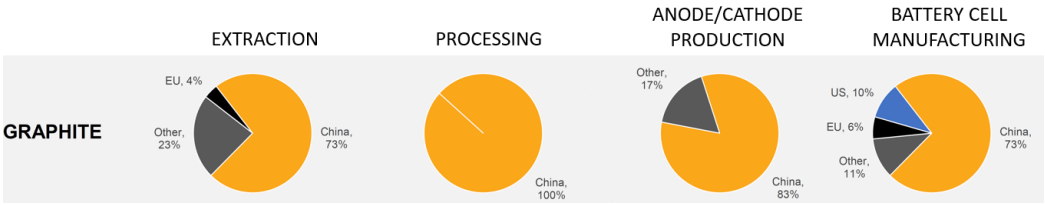
BKT is among the few publicly graphite listed companies globally that have been officially qualified by an anode producer, and notably, an anode producer outside of China: POSCO.

Of the ~52 graphite projects we evaluated, only two besides BKT had a qualified product, while several others are in the early testing phase. This suggests that a considerable majority of upcoming projects will be unable to satisfy the battery market's supply needs.

Considering the qualification dilemma, the market imbalance is likely to be far more significant than initially estimated. Consequently, projects producing qualified products stand to benefit substantially from the surge in demand.

The market's limited research and understanding relating to the anode component of LIBs, stemming from its relatively low contribution to total battery cost, leads to underestimation of supply shortages and undervaluation of BKT, in our view. We believe BKT is poised to play a vital role in helping western economies diversify their supply chains away from China's monopolised EV value chain (Figure 8Figure 8).

Figure 8: China dominates every stage of the battery value chain



Source: BKT, Publicly Released by Benchmark Mineral Intelligence

Investment Thesis: Geology and Geography Make Mahenge a Compelling Graphite Project

Company profile: shovel-ready project at world-class deposit

Tier-1, shovel-ready graphite project

The Mahenge Project (Mahenge or the Project) is a Tier-1, shovel-ready graphite project located 450km by road from Tanzania's largest port, Dar es Salaam. BKT holds an 84% stake in the Project through a joint venture company, Faru Graphite Corporation (Faru), while the Tanzanian Government owns the remaining 16% (free carry).

Mahenge: a very substantial graphite resource – geologically and geographically blessed

World's largest graphite resources at 213Mt and 7.8% TGC.

The Mahenge project boasts one of the world's largest graphite mineral resources, measuring 213Mt at 7.8% total graphitic carbon (TGC). It holds the **second-largest Ore Reserves worldwide, with 70mt at 8.5%** TGC. These Ore Reserves support a mining operation that can produce up to 350kt/year of graphite.

Mahenge deposit's high-quality graphite ore has low impurities, large flake size, and requires minimal processing in order to produce a very high-grade concentrate, distinguishing it from other graphite deposits. Of the total graphite to be produced at Mahenge, ~60% will be well-suited for high-value end-value products that require large natural flake size, and 40% will be highly suitable for the rapidly growing battery anode market. It is worth noting that all of the product can be directed towards the battery anode market if deemed value accretive.

Produce up to 350kt/year of graphite

Benefitting from experienced management

BKT's management team is made up of individuals with extensive experience in these areas, including Daniel Pantany (GM Engineering & Technical), who worked on Syrah's Balama project from the early stages to commissioning and whose insights have been incorporated into the design of Mahenge.

Financing is moving quickly with discussions underway

BKT is seeking ~US$200m to fund the Mahenge Project, aiming for a 50% debt and 50% equity financing structure. The company is exploring various financing options and discussing with potential lenders, who conducted site visits to the project in February 2023. BKT expects to receive credit-approved term sheets soon.

We believe the recent approval of the 26-year Special Mining License (September 2022) and updated capital expenditure estimates put BKT in a solid position to advance financing discussions.

Macro outlook: graphite poised to be lithium 2.0 – a critical role in batteries

>90% of Module 1 (89kt/yr) under binding offtake or option agreement

While the importance of lithium-ion batteries (LIBs) is widely understood, the crucial role that graphite plays in the anode for all types of LIBs is often overlooked, with LIBs requiring 7–10x more graphite than lithium.

Due to supply shortages and rapid acceleration of EV demand, lithium prices have risen significantly (+800%) in recent years. Ongoing deficits are predicted in the graphite market in the near future; as an example, Benchmark Mineral Intelligence forecasts deficits to exceed the entire natural graphite market (1.2mt in 2022) in 7 years.

Customer offtake: indication of quality deposit with largest non-Chinese anode producer as key customer

BKT is well advanced compared to peers, having received critical battery qualification for the Mahenge ore. This investment has greatly de-risked end markets for the project by demonstrating its ability to produce high-purity graphite concentrates, which, in turn, has opened doors for potential offtake partners.

POSCO, the largest ex-China anode producer, holds a 12.8% shareholding in BKT

Over 90% of Mahenge's Module 1 (89kt/year) large and fine flake production is already under binding offtake or option agreement. This includes a binding agreement with South Korean company POSCO for 100% supply of LOM fines (<150 microns) from Module 1. POSCO is the largest ex-China anode manufacturer. We also note that POSCO holds a 12.8% shareholding in BKT, which we believe to be a strong indication of POSCO's confidence in the quality of the product and its commitment to the Project's success.

POSCO has an ambitious plan to expand its anode production from 40ktpa of natural graphite in 2022 to an estimated 150ktpa by 2030. To support this effort, POSCO has entered into an offtake agreement with BKT, providing 30ktpa of -100 mesh material. To our knowledge, POSCO has no other graphite

concentrate offtake agreements, and no other graphite developer has passed its rigorous qualification process.

BKT has comparable volumes of uncommitted graphite concentrate offtake (~30ktpa) for its Modules 2, 3 and 4. In our view, it is likely that POSCO, a company with ambitious growth plans, would be interested in securing additional offtake from BKT to ensure a stable and secure supply chain.

Valuation: risked NPV of A$0.52/share (fully diluted)

We value BKT at A$0.52, fully diluted, implying an upside of 355%

We value BKT at A$0.52, fully diluted, implying an upside of 355% to the current share price. Our valuation assumes A$141m (US$100m) in equity is raised at A$0.20/share, increasing the share count by 72%. The analysis is based on a discount rate of 12% and a risk weighting of 65%.

In our view, the current share price undervalues the high-quality, shovel-ready Mahenge deposit which has secured offtake agreements. Graphite's strong structural tailwinds are currently underappreciated, and we anticipate tight medium-term fundamentals in the market, with potential for growth similar to lithium.

Potential near-term catalysts

- 1QCY23: Credit-approved term sheets for project debt. Mandating (and naming) lead arrangers expected to follow shortly thereafter
- 1HCY23: Confirmation of POSCO signing the full-form offtake agreement and US$10m prepayment
- CY23: Potential sell-down of a stake in the project to fund development and reduce dilution (subject to attractive pricing)

We note that POSCO may exercise its right to a seat on BKT's Board, which it holds as long as it maintains a stake of at least 10% in the company. This demonstrates a long-term commitment to the success of the Project and we would expect this to be well-received by the market.

Risks

Key risks include inability to access funding, project delays, escalation in capital costs, a fall in the graphite price, inability to sell large flake into the high-value markets, and continuity of key persons.

Appendix: Graphite Explained

Graphite is a naturally occurring form of carbon with unique properties that make it useful for many applications. It has a hexagonal crystal structure and is known for its thermal and electrical conductivity, chemical stability, lubricating properties, and strength. It is used in applications including pencils, refractory bricks, and batteries.

Classification of graphite: natural vs synthetic graphite

The graphite market consists of two types of graphite: **natural** and **synthetic**. Although both are called graphite, they are two different commodities with unique properties.

Natural graphite

Natural graphite occurs in mineral deposits of three types: microcrystalline (amorphous), macrocrystalline (flake) and vein (crystalline vein or lump).

Natural flake graphite is mined; crushed, ground, milled and screened; and then separated from non-graphitic material in a froth flotation process. The resulting graphite concentrate, depending on its source, is about 95% graphitic carbon and exhibits a distinctive particle size distribution. The concentrate is used as is in many traditional applications (refractories, etc.), or further purified and processed into higher-value products for use in advanced applications (fire retardants, battery anode materials, etc.).

Synthetic graphite

Synthetic graphite is produced by heat treatment (graphitisation) of hydrocarbon materials above 3,000°C for up to several days. High-temperature processing transforms the precursor carbon forms into a graphite structure and vaporises impurities. As a result, synthetic graphite is more than 99.9% graphite. Synthetic graphite is significantly more expensive and has a much larger CO_2 footprint.

Uses of natural graphite: lithium-ion batteries are key application

The breakdown of global consumption of natural graphite by application is shown in Figure 9.

Figure 9: Main uses of graphite

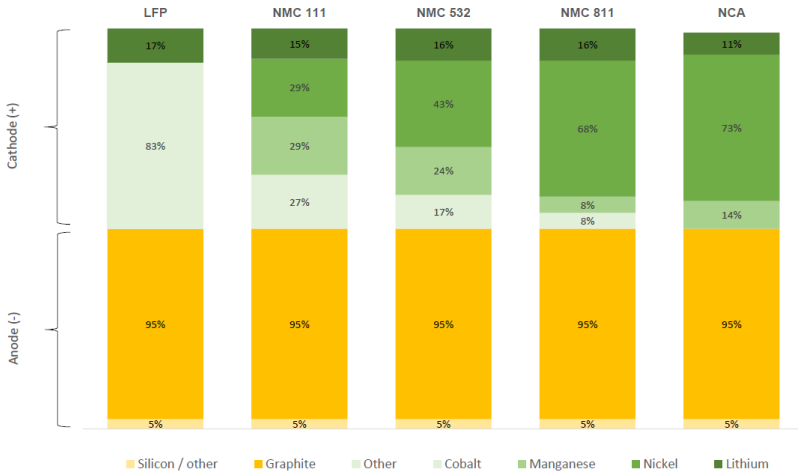
Application	Description
Lithium-ion batteries	Used as an anode material in lithium-ion batteries (LIB)
Refractories	Used in the production of refractory materials, which are used to line high-temperature furnaces and reactors
Lubricants	Used as a lubricant in various industrial processes, including in the production of machine parts and in the mining and drilling industries
Nuclear power	Used in the production of nuclear power, specifically as a moderator to slow down neutrons in the reactor core and control the fission process
Fuel cells	Used in the production of fuel cells, which convert chemical energy into electricity.
Graphite composites	Used to produce graphite composites, which are used in various industrial applications such as aerospace, automotive, and defence industries
Pencils	The main component of pencil leads
Other uses	Used in the production of coatings, inks, ceramics, and other industrial products

Source: MST

Use of flake graphite in battery anodes has grown in recent years

In the past decade, flake graphite has become increasingly important in Li-ion battery anodes as a substitute or additive to synthetic graphite. Anode producers blend materials to optimise cost and battery performance. To make the flake suitable for a Li-ion battery anode, it is spheronised, purified to at least 99.95% graphitic carbon, coated with carbon, and carbonised. The resulting coated spherical graphite (CSPG) is an ingredient in a battery anode. Cell producers combine the anode material with other battery components to produce cylindrical, prismatic, or pouch-shaped cells. Original Equipment Manufacturers (OEMs) purchase these cells from battery producers for various powered applications.

Figure 10: Graphite is the dominant anode material, regardless of battery chemistry



Source: BKT.

Not all graphite is created equal: quality required for battery use

The quality of the graphite used to make anodes is directly linked to their performance. Any impurities in the graphite can significantly impact the battery's functionality. If any deleterious elements are present in the product after processing, it can negatively impact its quality and performance. Impurities such as vanadium, uranium, and tungsten can reduce or even eliminate suitability for these high-value applications.

Therefore, graphite qualification is essential for OEMs to ensure their products meet specific performance standards. Samples with high impurities are likely to be deemed unsuitable.

The process of qualifying graphite for batteries involves four stages, as shown in Figure 11.

Figure 11: Qualification process for the battery market

Testing Stage	Description
First	Testing a small sample of up to 5kg to determine if the graphite has the desired properties like low levels of deleterious elements, and suitable physical properties like Tap Density.
Second	Constructing batteries using samples of up to several hundred kilograms of the graphite.
Third	Testing up to 20t of the material by using the batteries constructed in the second stage with end users.
Fourth (Optional)	a final stage of testing may be required, involving up to 100t of graphite per product grade.

Source: MST.

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