



MiningMaven

Armadale Capital: Advancing one of the world's highest-grading, large-flake graphite resources



ARMADALE
CAPITAL PLC

AIM:ACP

Q4 2019

Introduction

Armadale Capital's (LSE:ACP) primary interest is its 100pc-owned Mahenge Liandu project in Tanzania – one of the world's highest-grading, large-flake graphite resources. Throughout summer 2019, the company's share price has soared as work completed as part of an ongoing feasibility study (FS) has continued to demonstrate the asset's market-leading grades and flake size. All the while, Armadale's efforts to secure offtake financing arrangements for its project have continued against a backdrop of improving

demand for graphite - a key element in the production of electric vehicle batteries.

With several of Armadale's peers securing highly attractive terms for the offtake of graphite produced at their projects, the economic fundamentals used to date at Mahenge Liandu are looking increasingly conservative. Here, we have analysed the opportunity for shareholder value creation at the organisation in detail.

Armadale Capital One Year Price Chart



The Mahenge Liandu Project

The East African graphite province in which Mahenge Liandu sits stretches through Mozambique into northern Tanzania and contains numerous high calibre graphite deposits. Armadale's asset, which is made up of two tenements covering 29.9km² near existing infrastructure, is based within a world-class graphite region, known for its premium quality, high purity product. Notably, the area contains the Mahenge project owned by Black Rock Mining (ASX:BKT), which boasts the world's fourth-largest graphite resource at 212Mt's grading 7.8pc total graphitic carbon (TGC).

Mahenge Liandu, which shares many geological characteristics with Black Rock's project, hosts a near-surface, high-grade deposit with an inferred resource of 51.1Mt at 9.4pc TGC, including 38.7Mt indicated at 9.3pc TGC and 12.4Mt inferred at 9.1pc TGC. These figures make it one of the highest-grade large flake resources globally.

Armadale reached a significant milestone when a 2018 scoping study highlighted that the project was potentially commercially viable.

Key findings from the scoping study for the mine plan included:

- JORC-compliant Resource: 13Mt @ 12.5pc TGC
- Average graphite production rate: 49,000tpa over a 32-year life of mine
- NPV: US\$349m
- IRR: 122pc
- Basket graphite price: US\$1,272/t
- Payback period: 1.2 years

Importantly, this mine plan was based around just 25pc of Mahenge Liandu's total resource. Armadale plans to use working capital generated from its initial production to exploit this potential upside through staged future exploration programmes.

Mahenge Liandu's Resource Estimate

	Tonnage (Mt)	% Cut-Off TGC	Average % TGC
Inferred	12.4	3.5	9.1
Indicated	38.7	3.5	9.3
Measured	0	3.5	0
Total	51.1	3.5	9.3

Source: Armadale Capital



Source: Armadale Capital

The Mahenge Liandu Project

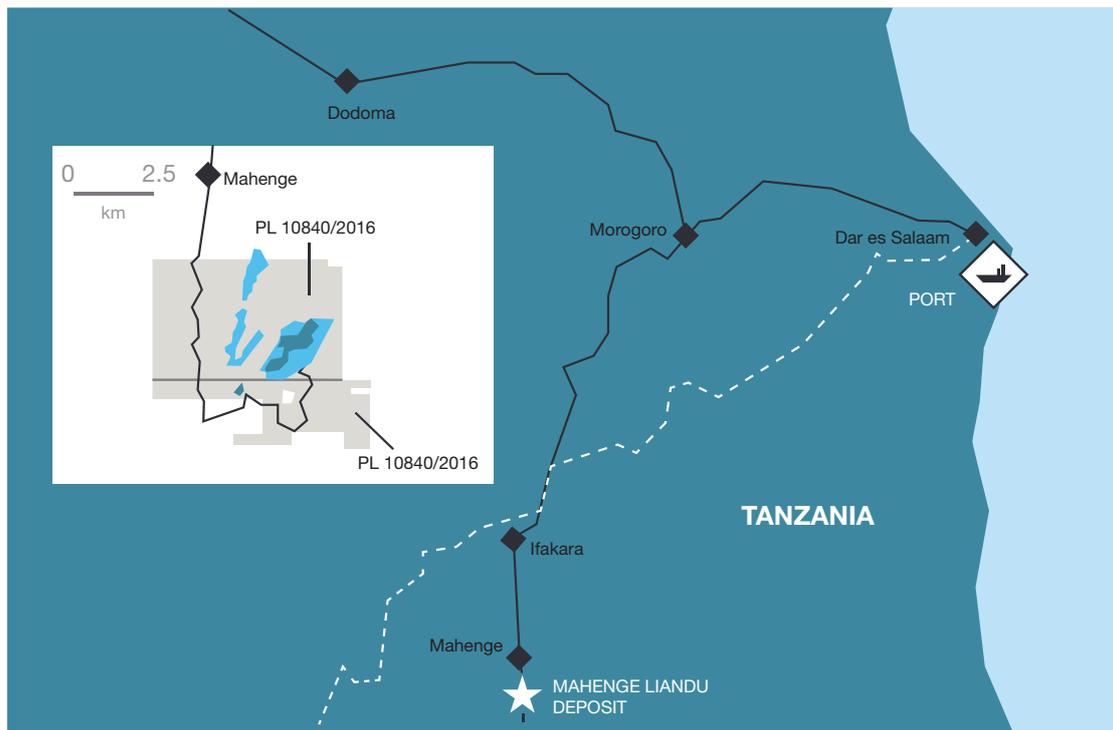
Tanzania as an operating jurisdiction

- ▶ Stable democracy with legal system founded on English common law
- ▶ Long mining history and fourth largest gold producing nation in Africa
- ▶ 30pc corporate tax rate and 3pc royalty levied for industrial minerals
- ▶ Mining Commission established in April 2018 to support grant, renewal, and transfer of mining licences

Tanzania's Location in Africa



Mahenge Liandu's Location in Tanzania



Source: Armadale Capital

Closing in on Graphite Production

This year has seen Armadale carry out a great deal of work to take Mahenge Liandu further towards production. In February, the company launched a feasibility study (FS) based around its scoping study figures to confirm the deposit's commercial viability. Moreover, it has made a great deal of progress in areas such as environmental planning, mine permitting, metallurgical testing, plant and site design, community engagement, and marketing.

Graphite core from Mahenge Liandu



Source: Armadale Capital

Graphite floatation test-work being carried out on diamond core from the Mahenge Liandu drilling program



Source: Armadale Capital

The FS is on track to be completed in Q4 2019, funded by a £500,000 placing carried out in [September 2019](#) at 1.8p a share – a significant premium to both Armadale's market value at the time and its last raise. The work will then be followed immediately by a Front-End Engineering Design (FEED) work programme. The output from this will be a detailed technical project-planning report, which will be used as the basis for sourcing project construction bids. Adding more detail to this, Matt Bull, Armadale's technical adviser, told us:

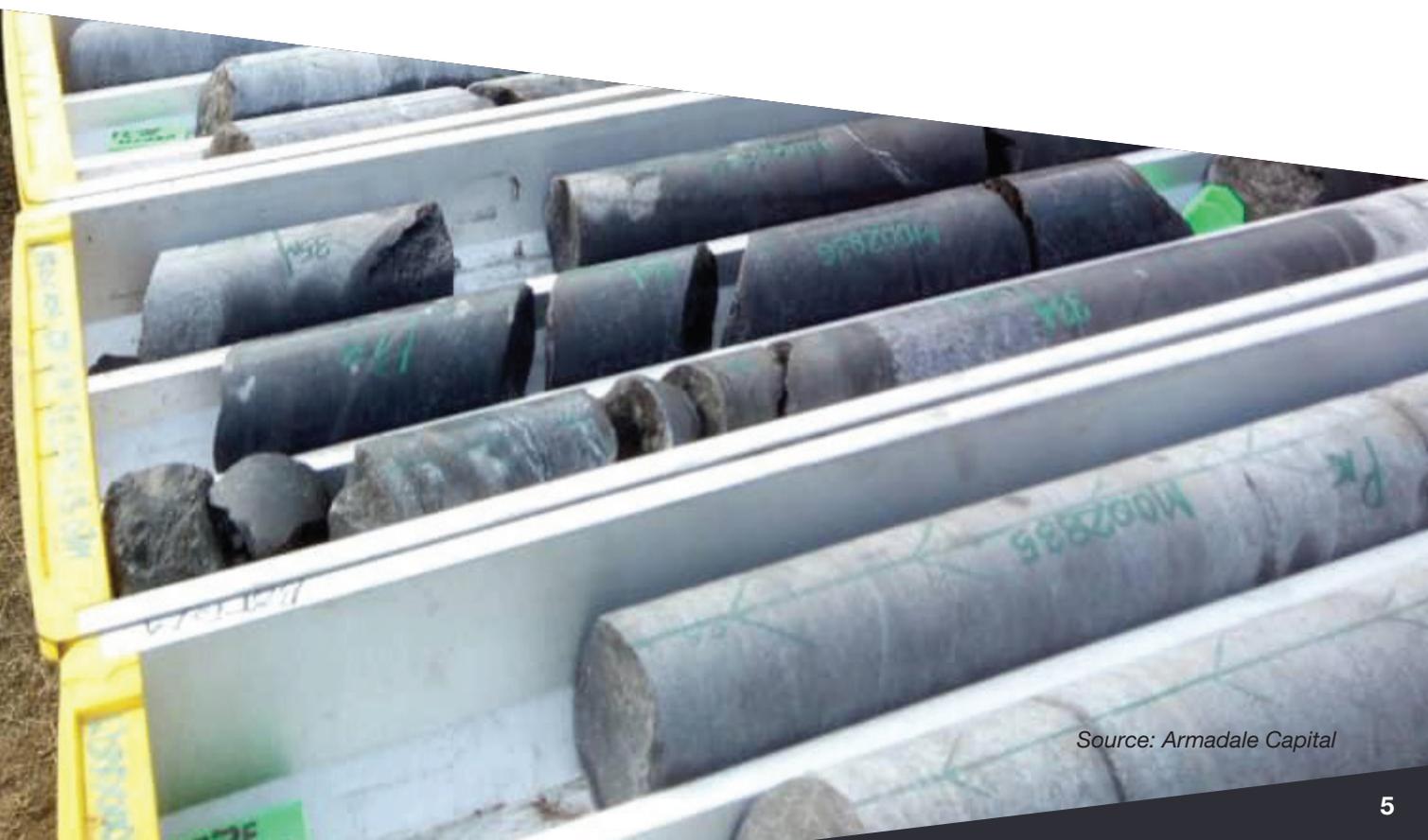
“ We are currently focused on finalising a resource update, advancing permitting to facilitate granting our mining lease, updating our mine plan and determining the final design requirements. The FS is projected to be completed at the end of Q4. We will then move into the final engineering design phase, contingent on project financing. ”

Alongside its FS work, Armadale has been busy working to secure offtake agreements for the graphite it eventually produces at Mahenge Liandu. The business took a considerable step forward here in February 2019, when it signed a memorandum of understanding for a proposed offtake deal with China-based mining and processing organisation Matrass Group. The proposed terms cover the offtake of 30,000tpa of graphite concentrate for an initial five-year term based on Chinese benchmark prices. This represents more than 60pc of Mahenge Liandu's average target annual production. To date, significant test-work has been completed to progress this MoU into a binding agreement.

Armadale took another step forward in the offtake arena in September 2019 when it announced that it had signed a MoU with a second Chinese firm called CoolRU Information Technology. It has proposed that CoolRU will offtake 5,000tpa of graphite concentrate produced at Mahenge Liandu for an initial five-year term again based on Chinese benchmark prices. In combination with the Matrass engagement, the proposed deal takes the total offtake under an MoU to 35,000tpa, or, 71.4pc of Mahenge Liandu's 49,000tpa average annual production target. Armadale added at the time that discussions were advancing with another 'major organisation' to secure a further offtake agreement for the remaining target production.

Armadale is also in talks to secure a project-level funding mandate as part of more extensive efforts to fast-track Mahenge Liandu towards commercialisation. Matt Bull says offtake and financing arrangements represent significant milestones in Armadale's transition from a graphite explorer to an emerging miner. He adds that the firm is continuing to make steady progress:

“ We are discussing offtakes with potential buyers/customers and are confident that agreements will be reached with more offtake partners to cover the balance of anticipated production. Once we have progressed a little further with permitting, and are closer to finishing the FS, we aim to pursue and finalise project finance. ”



Source: Armadale Capital

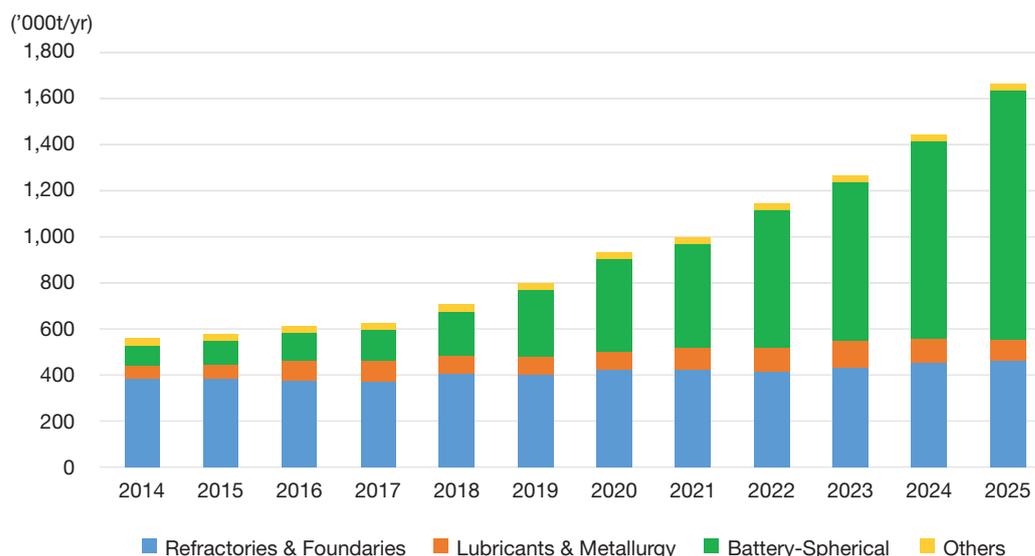
The Electric Vehicle Opportunity

With Armadale's market cap sitting close to £7m as of the middle of September 2019, Matt Bull believes that the market is undervaluing the opportunity offered by Mahenge Liandu materially for several reasons. The first overlooked area he highlights is the potential on offer in the graphite market.

Graphite boasts many useful properties and, while it has been used in industry such as steel making for decades, its physical and electrical properties have recently led to increased demand in higher-value applications like graphite foil, which is used in electronic devices including mobile phones and computers.

Graphite is arguably a lesser-known beneficiary of EV's rise despite Li-ion batteries actually containing around ten times more of the material than they do lithium. As Armadale has noted, numerous 'gigafactories' have arisen around the world to rush out unprecedented amounts of Li-ion batteries ahead of the EV boom. Notably, Tesla has built a new \$5bn battery factory that could drive a 37pc increase in demand for natural graphite by 2020. With this marking just one of many gigafactories being constructed or planned globally, battery demand as a percentage of total graphite demand is expected to rise by 15pc annually over the coming years.

Global Graphite Demand Drivers



Source: Armadale Capital

Critically, in recent years, graphite has become widely used in the production of lithium-ion (Li-ion) batteries - applied in emerging renewable energy technologies and, most importantly, electric vehicles (EVs). This final market is of most interest to Armadale, with the firm expecting EV usage to result in a paradigm shift in graphite demand. Based on industry forecasts, this looks within reach. Indeed, according to the International Energy Agency (IEA), the number of EVs on roads globally will hit 125m by 2030 - this compares to just 3.1m in 2017. Should this growth explosion play out, then demand for all of the commodities required in the creation of EVs - most notably their batteries - will rise. Indeed, forecasts such as the IEA's have already seen the prices of popular 'battery metals' like nickel, cobalt, lithium, and even copper, fly at various points in recent years.

At the same time, the material is experiencing disruption on the supply side. Nearly all of the world's natural spherical graphite has historically been sourced and processed in China. However, many think the global superpower will struggle to keep up with demand as the EV boom plays out. Alongside increasingly strict environmental regulations, an absence of the 'high-quality' graphite required by these new customers is likely to place pressure on the country.

In China's stead, Bull says the graphite industry is turning increasingly towards the growing number of opportunities in East Africa arising to fill the growing void. This was evidenced in May when Black Rock Mining was able to secure an additional two new Chinese offtake customers for its Mahenge project, taking total committed volumes to 255,000t a year.

Top Quality Product

Another overlooked area highlighted by Bull is the premium price that can be commanded by graphite producers selling a high-quality product. Quality here is determined by purity, with rates typically rising as graphite purity increases above 95pc. One only has to look at Black Rock Mining's offtake to see this dynamic in action. The Australian miner agreed to supply 'regular' graphite with a purity of between 94.5pc and 95.5pc for \$1,117/t. Meanwhile, it will provide 'premium' graphite with a nominal grade of between 97.5-98.5pc for \$1,490/t and 'ultra' graphite grading more than 99pc for \$2,161/t.

The reference pricing framework agreed between Black Rock Mining and its offtake partners in May 2019

	Regular	Premium	Ultra
Nominal Graphite Grade (TGC)	94.5% - 95.5%	97.5% - 98.25%	>99%
CIF China (ex-duty) (US\$/tonne)	\$1,117	\$1,490	\$2,161
Reference exchange rate	RMB:US 6.71		
Rise & fall pricing reference (US\$/tonne)	95% TGC = #100 mesh Benchmark Minerals US\$950/t as at Nov 2018		

Source: Black Rock Mining

Mahenge Liandu boasts purities at the higher end of graphite projects globally, opening up the possibility for premium pricing in future offtake agreements. In August, [Armada announced](#) that its metallurgical test work had shown that the project could consistently produce a high-quality graphite flake of up to 97.1pc purity. To build on this, the business [expanded the scope](#) of its FS in September 2019 to include downstream analysis on the concentrate produced during its test-work programme. It hopes that this can highlight the extent to which the project's graphite can be used to produce battery cells, which typically require high-purity product.

Bull tells us that the region in which Mahenge Liandu is based, as a whole, compares favourably to other graphite-producing areas globally. Indeed, nearby precedent even suggests the potential for consistent purities of higher than 97pc at Mahenge Liandu as the project continues to develop. He adds:

“ In terms of purity, 95pc is the standard. Several key mines have not even reached that level yet. We have reached 97pc. This puts us in a much stronger position than many similar projects around the world in terms of making the most of this opportunity in the graphite market. Black Rock has even managed to achieve a purity of 99pc from its deposit. So, there is scope for an even higher percentage purity than what we have currently achieved at Mahenge Liandu. ”

Fundamentally Conservative Economics

The high quality of Mahenge Liandu’s graphite leads Bull into his final point – that the economic assumptions used in the project’s scoping study were fundamentally conservative.

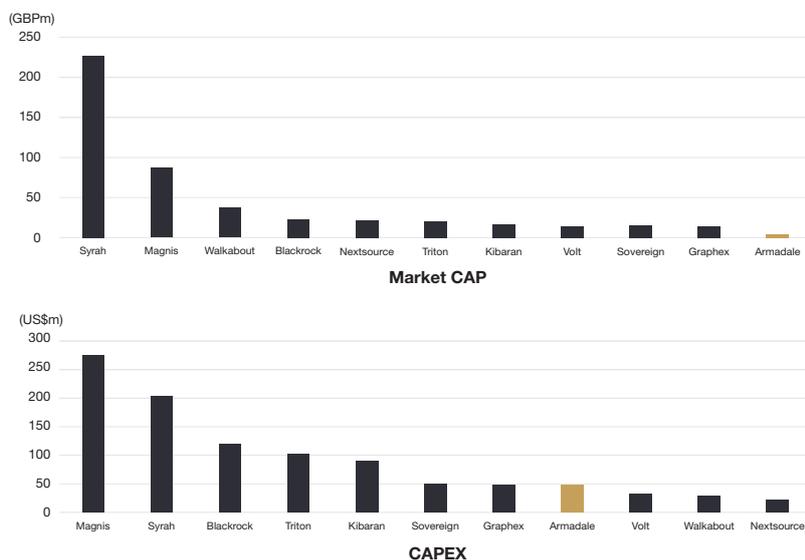
Firstly, given that Mahenge Liandu is Armadale’s critical project, the asset likely underpins much of the company’s value. Putting aside issues like project financing and reaching production, then, the asset’s \$349m (£283.16m) NPV already sits well in advance of Armadale’s current market cap. However, that study was based around a conservative graphite price of US\$1,272/t, far below the rate at which Black Rock was able to secure an offtake agreement. If Armadale can replicate Black Rock’s success, then there exists scope for this NPV to increase much further on this basis alone. For example, if it can agree on a graphite sale price of \$2,161/t, then the project’s NPV significantly increase.

Beyond this, there now exists a chance for Armadale to improve the grades and capex assumptions associated with its FS. This year has seen the firm complete a drilling programme on Mahenge Liandu’s deposit that delivered highgrade, near-surface intercepts including 8m at 21pc TGC from 13m, 4m at 22.8pc TGC from 36m, and 8m at 21.6pc TGC from 6m. As the business has previously highlighted, these assays are materially above the 12.5pc TGC used for the entire average life of mine in 2018’s scoping study. As mineralisation is near the surface, extraction costs could also be reduced. As such, Armadale expects the results to offer the opportunity for higher average grade near-surface mining in Mahenge Liandu’s early years, potentially enhancing the project’s EBITDA margins in the process.

Bull elaborates:

“ The RC results from the infill drilling showed over 20pc grades from some parts of the deposit. So, if we mine the 20pc grade, we would be able to recover more graphite per tonne of ore. Consequently, we could adjust the mine plan to focus on mining the higher-grade areas earlier. Overall, the amount of graphite will not change, but if we mine the higher-grade areas earlier, we will get a quicker payback period from our mine. ”

Armadale’s market cap and capex requirements in comparison to peers in the graphite market



Source: Armadale Capital

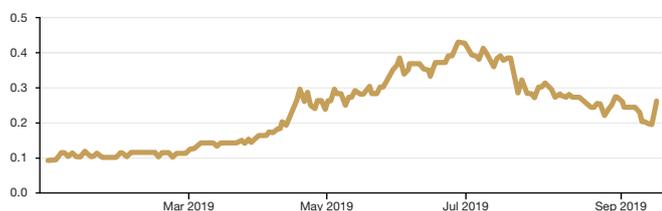
Drawing Comparisons

In terms of the potential impact that these enhanced financials could have on Armadale's share price, Bull says one only has to look at its Australia-listed peer Walkabout Resources (ASX:WKT). Walkabout's flagship asset is the Lindi Jumbo Graphite Project located in southeast Tanzania, which contains an 8Mts resource at an estimated grade of 10.8pc TGC. Like Armadale, the organisation is focusing on delivering high-grade graphite from the project at a relatively low initial throughput rate. Indeed, it has completed a FS for the asset based on annual production of 40,000ts graphite concentrate at an average rate of 230,000tpa over 24-year mine life.

This year has seen Walkabout take several key steps forward at the project post-FS completion, securing two binding offtake agreements and signing off on a global sales deal and a \$1m 'early-start' EPC contract. In line with this, the company's share price has nearly tripled from c.AUD0.09 in January to its current c.AUD0.24 (as at September 2019), hitting highs of c.AUD0.44 along the way. Walkabout's market cap now sits at AUD\$74m, a significant premium to Armadale's. Bull says that if his business can follow in its peer's footsteps, then the upside opportunity could be very considerable:

“ Walkabout's flagship project is near Mahenge Liandu, and the firm has a similar strategy to Armadale- focusing on higher grades than peers at a lower throughput. Walkabout is about 12-18 months more advanced than Armadale, having completed permitting, updating its FS and now securing binding offtakes. We are now trying to emulate what Walkabout is doing, and think we can benefit shortly from the high-quality results we have been getting from our test work programmes. ”

Walkabout Resources Share Price Chart



Source: Google Finance

Armadale - The Next Big Graphite Player?

The comparison between Armadale and Walkabout is certainly encouraging. The Australian firm has been something of a trailblazer in this space and could well prove to act as a pathfinder for its British compatriot. The wide discrepancy in the two companies' relative market capitalisations is notable, but likely reflects their relative development. However, with Armadale on course to deliver its FS in Q4 and plans in place to begin work immediately on the FEED work programme, this gap could close. With the company targeting such a high-grade graphite resource, if the economic numbers confirm current estimates then the path to value is clear.

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