



HALLGARTEN & COMPANY

Coverage Update

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Ceylon Graphite

(TSX-V:CYL, OTCQB:CYLYF, FSE:CCY)

Strategy: LONG

Key Metrics					
Price (CAD)			\$0.25		
12-Month Target Price (CAD)			\$0.76		
Upside to Target			210%		
12mth hi-low			\$0.055-\$0.315		
Market Cap (CAD mn)			\$29.96		
Shares Outstanding (millions)			122.27		
(Fully Diluted)			205.65		
Insiders			16%		
		2020	2021e	2022e	2023e
Consensus EPS			n/a	n/a	n/a
Hallgarten EPS (est.)			\$0.001	\$0.009	\$0.019
Actual EPS		(\$0.040)			
P/E		n/a	202.3	26.7	13.0

Ceylon Graphite

Powering On to Production

- + Production is up and running at the company's K1 mine in Sri Lanka, putting it amongst the select group of graphite producers
- + Environmental approval and mining licenses for K1 project were gained in late 2019
- + M1 mine is now the focus to bring on extra production, while K1 continues to ramp up
- + Ceylon Graphite has a large land package with significant evidence of past production from the glory days of Sri Lanka as the world's prime producer of graphite
- + The travails of Syrah (necessitating firstly production cuts, and now mothballing) have been, curiously, positive for the rest of graphite developers
- + The US has recently declared Graphite to be a metal critical to its interests
- + China has now switched over to being a graphite importer
- ✘ Graphite price movements and stockpiled quantities remain essentially at the discretion of the Chinese
- ✘ The financing scene remains tough for graphite developers
- ✘ The Syrah Syndrome (built it and no-one comes) has put a chill on other graphite projects until its future becomes clear

A Hare amongst the Tortoises

The company is engaged in the development of graphite mines in Sri Lanka. It received the mining (IMLA) and environmental licenses for its K1 mine in late 2019 with first production in early 2020. The mining license was a notable triumph as it was only the fourth one issued since the country's independence in the 1960s.

The company holds exploration rights over a land package of around 121km². These rights cover areas of historic graphite production from the early twentieth century and represent a majority of the known graphite occurrences in Sri Lanka. The company's K1 mine is now on the fast track and then M1 should be following on with production rising incrementally in a non-market-disruptive manner.

Battery metals have gone off the boil since 2017's frenzy, but graphite has held up well, largely because it is not (yet) dominated by the potential for electric vehicle (EV) usage. With a plethora of other usages in a wide range of industries, its dynamic is not driven solely by EV sentiments but rather by supply considerations.

Chinese cutbacks in production (for environmental reasons) and limitations on needle-coke supply (for artificial graphite) have underpinned prices when otherwise they might have trended lower with Lithium

and Cobalt.

However, all has not been rosy on the supply front with the over-dimensioned Balama mine of Syrah looming over the marketplace and suppressing prices.

Despite all this, the EV revolution rolls on in the background and graphite is the key component in the Lithium-ion battery configuration that had been pushed to the side during the hype over other battery minerals.

The Waiting Game

Most of the graphite space is playing a waiting game. Developers are in a holding pattern and exploration has gone on hold (though the discovery of new resources is not necessary). The problem for the space is the oversupply created by Syrah having built its mine at a size that far exceeds current market needs. This has not only put a lid on prices it has also imposed a dampener.

Curiously, a few small players have been able to keep moving despite this stasis amongst the mid- and large-size players because they have projects that can move through the specialized niches in the space and have capital expenditures that are not dependent upon massive funding.

In the current market for all mining projects, nothing succeeds like production (except if you are Syrah) and so small graphite players perversely have more chance of navigating the tough markets with their shallow funding pools than those trying to tap more significant funds.

Ceylon Graphite is one of those still with forward momentum. In late 2019 it secured mining licenses for its K1 project and was already well advanced with shaft construction; all of this has been achieved on a very tight budget.

Ceylon Graphite aims to be the "silent achiever" in the graphite space. In this review we look at the K1 mine and its recent commencement of production.

Graphite in Sri Lanka – A Long Trajectory

To most mining mavens, Sri Lanka was a land of mystery, onerous state intervention and certainly not one of mining; however, Ceylon (as it was then known) and graphite were synonymous for hundreds of years.

Graphite mined in Sri Lanka is known to be some of the purest in the world but currently accounts for less than 1% of the world graphite production. The existence of graphite in Sri Lanka has been known since 1675 when the Dutch governor at the time, recorded its existence. Serious mining and export of Ceylon graphite began about 1824 with graphite exports peaking in 1899. when export tonnage was recorded as 33,411 metric tonnes or 35% of the world 's consumption. Export of graphite at the time counted for 22% of Sri Lanka's trade.

Below one can see the labour intensive "preparation" of graphite in 1910 at a Ceylonese factory.



Most of the graphite mines closed down after WWI and the 1929 Great Depression. It is estimated that prior to 1940, there were over 2,500 graphite pits and mines located in the Southwest and Central Highlands of Ceylon.

Independence came in 1948 and from the 1950s there was a distinct socialistic trend in governments in the following decades culminating in the nationalisation of the graphite sector in 1971. The private sector was allowed back into Sri Lanka's graphite industry in the early 1990s, but by that time problems with the civil war were preventing development on a large scale. Additionally, many of the state-owned mines had been overexploited, allowed to deteriorate and had not been subject to meaningful exploration to find new reserves. The opening of the mining sector in recent years has presented an opportunity for foreign companies to pursue Sri Lankan graphite on a significant scale.

Geology

Sri Lanka is known to be underlain up to 90% by Proterozoic high-grade metamorphic rocks with Proterozoic sediments, particularly along the coastal regions. Vein graphite is known under various names including crystalline vein, Plumbago, Sri Lankan graphite, and Ceylon graphite. The name "Sri Lankan" and "Ceylon" are commonly used for vein graphite since the island is the only area to produce this material in commercial quantities.

Of all the natural graphite materials vein graphite is probably the most difficult to describe geologically

and various theories of its origin have been presented. As the name suggests, vein graphite is a true vein mineral as opposed to a seam mineral (amorphous graphite) or a mineral that is disseminated throughout the ore rock (as in flake graphite). Seam minerals have some unique properties including their being non-contemporaneous with the country rock, steeply inclined (vein orientation), and subjected to filling by a host of minerals, especially those of hydrothermal origin.

The graphite veins in Sri Lanka are unique because of the large scale of their occurrence and their high crystallinity. Similar graphite veins are found in high grade metamorphic terranes of southern India but at a smaller scale though.

Vein graphite deposits of Sri Lanka have received more attention due to their high purity (about 95- 99% of pure carbon), extensive mineralization with large reserves, high crystallinity and mode of occurrence.

According to the US Geological Survey Sri Lanka currently produces a very small amount of graphite, about 4,000 metric tonnes per annum. Sri Lanka's graphite is a unique product. The country produces lump and vein graphite and is the world's only source of these particular materials. Lump and chippy dust graphite are the highest-value graphite products found globally. These unique and comparatively higher margin vein (lump) deposits currently make-up less than 1% of the world graphite production.

In 2019, prices for Sri Lankan vein graphite averaged \$2,300 per metric tonne - significantly higher than prices reported for other products, such as flake or amorphous graphite.

Reactivation

This is not the first time that the Sri Lankan mining sector has opened up. The Sri Lankan mining scene had an outburst of activity during the late 1990s, during which time companies like mineral sands producer Iluka Resources (ASX:ILU) actively explored the country; however, as is well-known, the country was long wracked by civil war with a Tamil insurgency that was finally quashed in recent years.

The disruption resulted in Iluka departing Sri Lanka in 2003, citing "accessibility" as a concern. The final defeat of the separatist forces in 2009 paved the way for the country to invite foreign investors to come back with even Iluka said to be considering a return to Sri Lanka's deposits.

The Wall Street Journal reported that the government intended to offer significant tax incentives and a liberal regulatory framework to woo incoming investors in the mining sector. These would include a royalty rate of 5%, according to the country's minister of environment and renewable energy, Susil Premajyantha. The minister added that the government "won't levy any other charges", presumably referring to extra taxes on mineral products.

Other Players in Recent Times

Production in recent years has been sourced from two graphite mines:

Kahatagaha Graphite Lanka Ltd., owned by the government of Sri Lanka

- Producing 80-100 tonnes monthly
- Currently mining at a depth of 650m (2,000 feet)
- Minimum 90% purity with the majority by weight being lump type at 95% carbon, +10mm

Kahatagaha's Kolongaha is one of the high-value mines accounting for Sri Lanka's current output of lump and chip graphite. The mine has been in production since 1872 and reportedly produces a product with total graphitic carbon content greater than 90%.

Bogala Graphite Ltd., a 90%-owned subsidiary of Germany's Graphit Kropfmühl AG (ETR:GKR)

- Producing 250 tonnes monthly from one single vein mine

- Being mined from both ends at 2,299 feet from underground

- Was producing 600 tonnes of value-added graphite annually prior to the global recession

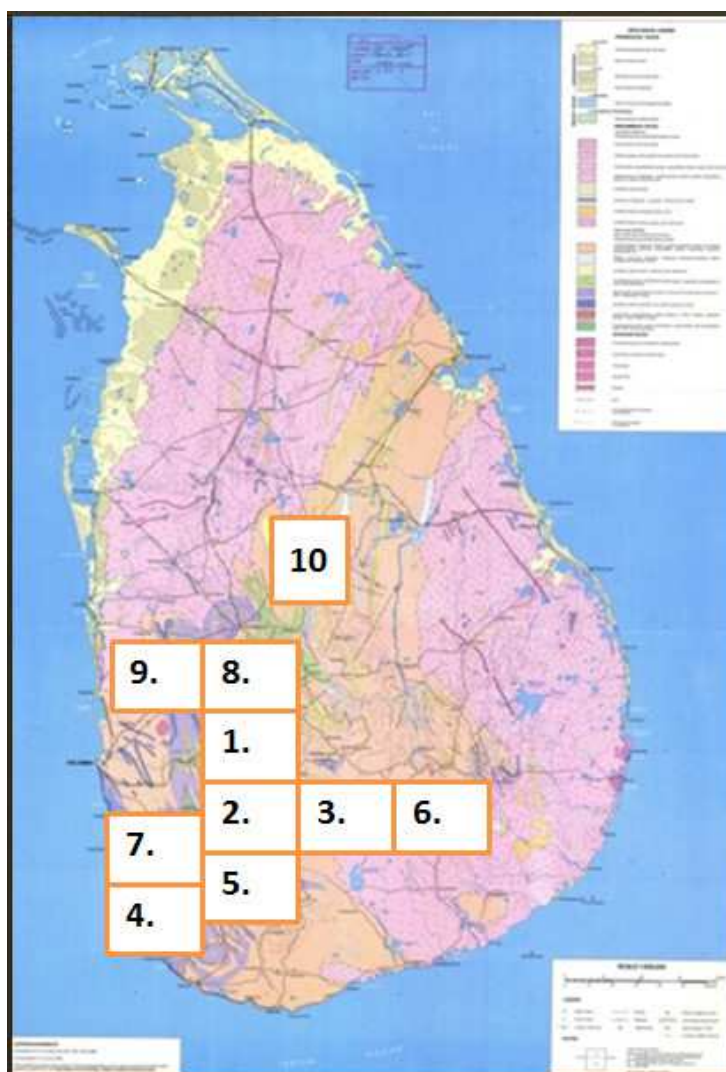
That company entered the Sri Lankan sector in 2000, buying control of the Bogala graphite mine, a historic operation dating back to 1847.

These two mines clearly show that there is graphite to be mined at depth and that the life of a mine could be well in excess of the normal 20/30 years.

Ceylon Graphite's Assets

The company's total land package is 121 km² (121 grids at 1x1 km) that comprises most of the geologically identified graphite resources on government land in Sri Lanka (excluding mines currently in production).

The projects and the number of grids



of which they are comprised are:

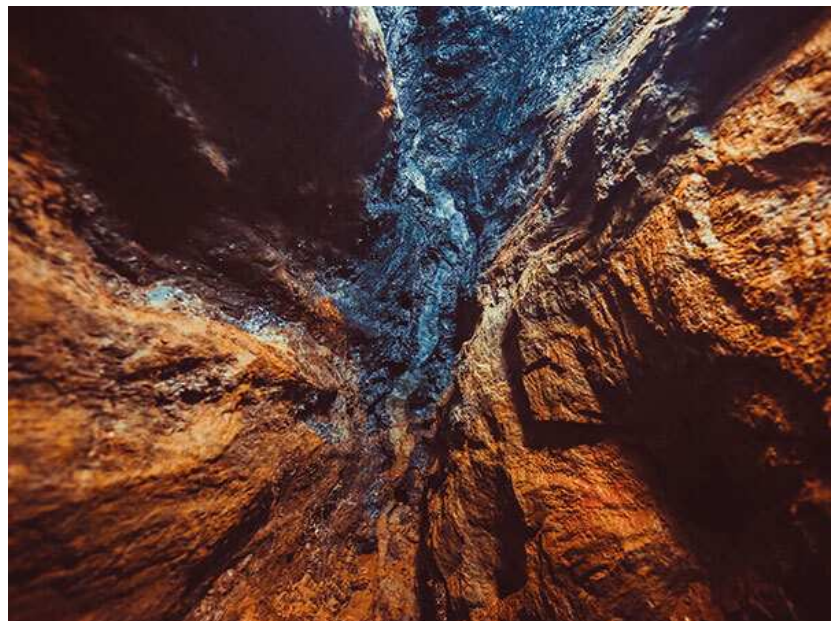
1. Avissawella 4 grids
2. Rathnapura 25 grids
3. Balangoda 2 grids
4. Ambalangoda 8 grids
5. Morawaka 2 grids
6. Nuwaraeliya 2 grids
7. Mathugama 24 grids
8. Kegalle 22 grids
9. Attanagalle 29 grids(K1, H1, P1)
10. Malsiripura 5 grids (M1)

AMC Mining Consultants conducted an explorative site visit of 43 of the 121 grids in the first half of 2013 in the Western Province of Sri Lanka. Ceylon Graphite has exclusive exploration licenses on the majority of the most prospective areas. These were identified by the company's geological team, in consultation with the Sri Lankan Geological Survey and Mining Bureau (GSMB)

Background to the K1 project

The K1 project is Ceylon Graphite's prime development focus. The K1 site was selected for its historic crystalline graphite production as it contains several abandoned mine shafts and adits and has ample dump material.

In May of 2017, the company announced assays conducted on a "pre-drilling" grab sample of historic dump material (graphite and quartzite) including substantial rock fragments of graphite from the



K1 site. Samples of dump site material from history production yielded 86.63% carbon, and samples were subject to weather and oxidation from more than 50 years.

K1 also has a drill rig on the property and shaft & adit refurbishment was completed in late 2019.

In April of 2018, the company announced the discovery of two new large graphite veins at a depth of more than 200 ft at the K1 site. Each vein is around 18 inches (46 cm) across and is situated in the ceiling of a drive on the north side of the tunnel (shown in the picture below). Samples were taken from the veins and sent to the country's Geological Survey and Mining Bureau for carbon testing. Laboratory tests indicated a Cg level of 89.2%. These samples were sent to laboratories for micronisation to 20 microns and then spheronisation tests.

Graphite Vein at K1

Further work resulted in an announcement in September 2018 that assay test results of samples from the large, untapped natural graphite vein discovered in late August 2018 at its K1 site came in at 97.61%. K1 has now yielded six sizeable veins over a relatively short period of work.

The company's geologists expect there to be additional similar sized or larger veins at lower depths and the company continues to actively pursue its aggressive exploration plan at its K1 site.

There is no NI 43-101 compliant resource currently on this asset. In a move that is possibility reflective of the company's iconoclastic approach, it commissioned a resource estimate from an in-country expert on graphite vein resources. This resource calculation presented the following numbers:

K1 Indicated Resource				
Vein System	Average Vein width (m)	Assumed Area of vein (m2)	Assuming Volume (m3)	Indicated ore Resources
1	0.26405	142X160	6,000	13,380
2	0.27275	142X145	5,616	12,523
3	0.2684	142X145	5,526	12,523
4	0.3208	142X145	6,605	14,729
Total Indicated Ore Resources				52,955

Metallurgy

Samples were also sent to the leading graphite testing laboratory, Dorfner Anzaplan, in Germany. Dorfner Anzaplan certified that graphite from the K1 met the specifications of marketable battery-grade graphite. They also confirmed that the graphite obtained from the K1 project is upgradable and has a

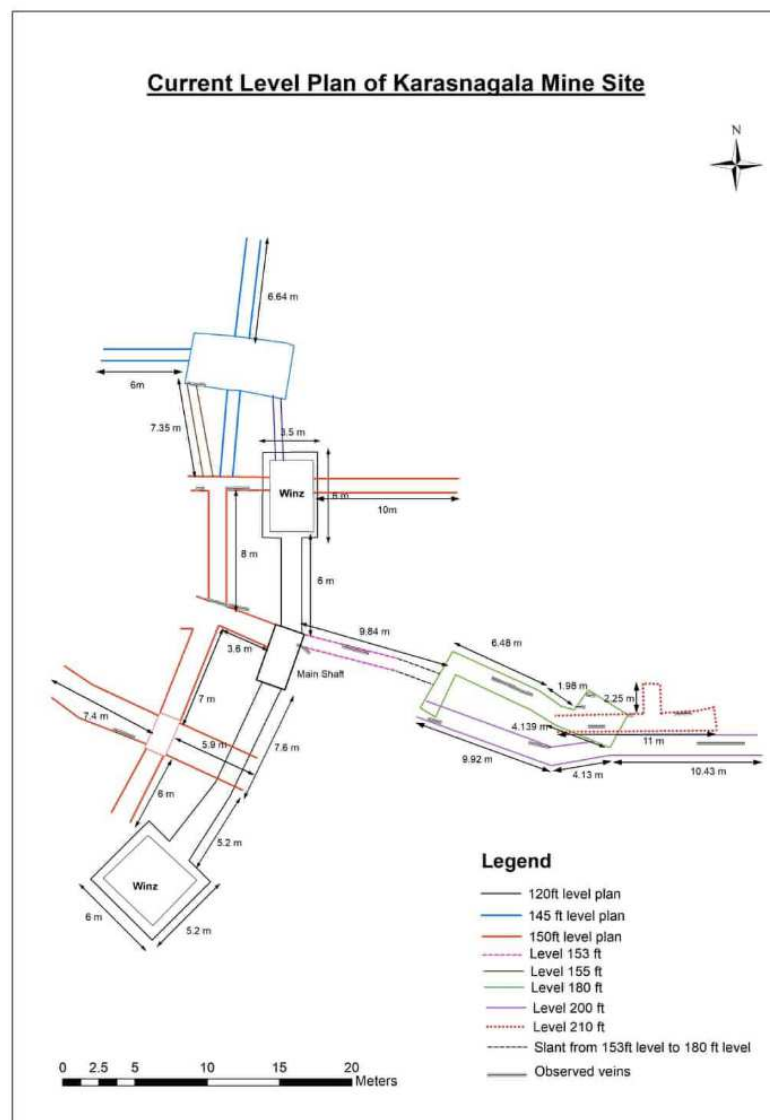
carbon content of about 99.96%.

American Energy Technologies Company tested samples of graphite from the K1 and M1 sites and certified that through simple Thermal Purification these samples can easily be upgraded to meet the specifications of marketable battery grade graphite. K1 graphite was upgraded to 99.9997wt% Cg and M1 graphite to 99.996 wt% Cg with very little cost incurred. These tests, conducted in June/July of 2019, confirmed the company’s near-term goal of producing a premium grade marketable battery grade product for prospective lithium-ion battery manufacturers and other energy storage end-users.

Key Progress on Licenses

In late August 2019 the company announced that its wholly-owned subsidiary Sarcon Development (Pvt) Ltd had been granted an industrial mining licence category A for its K1 project at Karasnagala from the Geological Survey and Mines Bureau (GSMB). The GSMB is the mining regulator in Sri Lanka. An industrial mining license category A (IMLA) is the highest category license in Sri Lanka and grants exclusive rights to mine, process and trade in graphite mined within the area specified in the license. It also allows for underground multi-borehole blasting, commercial production, use of all mining machinery and equipment and the export of graphite.

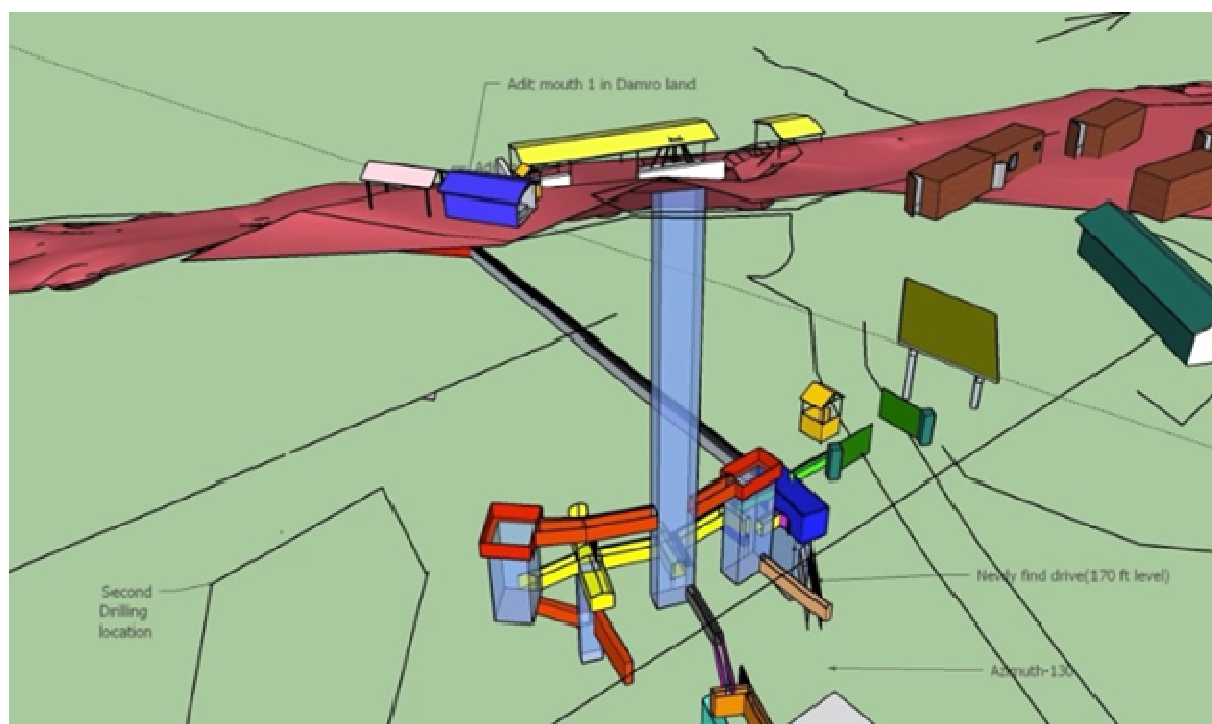
This was an important step. Historically the GSMB has granted just four IMLA licenses for graphite mining in Sri Lanka including the Sarcon/Ceylon Graphite license. Ceylon Graphite managed to achieve this license in a relatively short time.



Management estimates the operating expenditure (opex) to be slightly less than US\$200 per tonne of graphite. As noted, Sri Lankan vein graphite sells at around USD\$2,300 per tonne in its raw form. Even if the upgrading to battery-grade graphite costs US\$100 per tonne (and that is a far cry from reality), with the selling price of the upgraded material in the US\$5,000 per tonne range the economics are very favourable for Ceylon Graphite.

The Mine Build at K1

Cheap, cheap cheap is the mantra at Ceylon Graphite. At the K1 mine, the company has already refurbished the shaft down to 150 feet from where it can access other parts of the old mine. Below is a plan of the mine.



Reactivation of the mine is an exceedingly low capital expenditure (capex) operation in Sri Lanka. Every 100 feet of shaft refurbishment only costs around US\$40,000.

The K1 main shaft is currently down to a depth of 155 feet and with winzes and other adits reaches down to 240 feet. The plan in the short term is to add another 40 feet to the main shaft.

Other planned constructions are a powder magazine, collaring of the shaft and a horizontal adit into the hillside to meet the shaft for egress of ore.

Below can be seen the entrance to the rehabilitated shaft.



Shaft at Depth



First Production

Production Hits the Spot

Somewhat ahead of projections for first production in 1Q20 the company announced in mid-December 2019 that the K1 mine was finally in commercial production mode and that it had sold its first container of Sri Lankan vein graphite. Production was stopped due to the pandemic at the end of the first quarter.

As production resumes in December 2020, production will start with 20 tons per month (tpm) by the end of 2021 and it is expected that production would be running at 200 tpm and then up to 400 tpm by the end of 2022 at a grade of 95% Cg. The exceptional grade is because of the highly focused nature of graphite vein mining.

The company has estimated an off-take price of US\$2,500 per tonne of raw Sri Lankan graphite and US\$4,500 - US\$5,000 for upgraded battery marketable graphite.

The product would be shipped to end-users or processors in container loads at a transport cost of around US\$1,200 per unit.

The costs of these site enhancements, additional shaft depth and work on M1 between now and the end of the first quarter of 2020 (Q1-20) are between US\$500,000-\$700,000.

The Pandemic & Operations

The pandemic has thrown mining operations all around the world into varying degrees of chaos with interruptions ranging from minimal to total shutdowns. Sri Lanka has not been immune to this as, over the past seven months the government has had various lockdowns e.g. no inter-district movement/no public transportation available.



Ceylon Graphite needed specific provincial government approval to start work above ground given the number of people involved and then to go underground, medical testing of all employees was mandated and a plethora of government regulations. Whilst the K1 mine has never been closed or any staff let go the workforce have not been actively going underground.

The company is opening the mine for the public and GSMB consumption from the start of December. Currently the team is undertaking spraying and have engineers and miners back underground. With new funds the company is in process of ordering new equipment and hopefully by Christmas/New Year will be back to 100% operations.

M1 – Next Cab off the Rank

The Malsiripura project (abbreviated to M1) is located at about 120 km NE of Colombo, the capital of Sri Lanka. Within 30 kilometres of the licence area, are the larger regional centres of Kurunegala and Dambulla. The smaller village of Malsiripura, located some 15 kilometres south from the mining property, acts as a support base. Ceylon Graphite picked up the property in mid-2018.

Anecdotally graphite has been known in the Malsiripura for over a century. There are stories of old underground workings on the property in the first half of the 1900's. There is evidence of the existence of graphite potential within the Malsiripura property. The circumstantial evidence is in the form of a local oral history of each of the mined areas indicating there has been varying degrees of mining within the selected area in the form of scattered shallow pits within the top soil and the laterite. Sometimes, there is an apparent continuity of strike suggesting that there is a lateral extension of veins.

According to the villagers, all these shafts were shallow shafts and were driven in the overburden cover and saprolite with a maximum depth of 10-15 m. Economical grade graphite veins are available for further mining at this abandoned mine. Graphite bearing fragments are observable in the dumps.

According to villagers, when the mine was in operation, graphite veins, 0.10 m to 0.25 m thick, with good quality needle type semi-crystalline graphite were discovered at different levels of all shallow shafts. They further mentioned that considerable amount of economically viable graphite could be mined from the remaining parts of the vein system in this mine.

Exploration Work

The area had not been subject to any modern exploration work prior to 2012. In that year, the acquisition of 75% of licence EL/211 by Bora Bora Resources (then ASX:BBR) from Australia spurred an exploration program. The lands surround the aforementioned Kahatagaha Kolongaha graphite mine.

BBR's program comprised a compilation of all previous data by the Geological Survey and Mine Bureau of Sri Lanka, a helicopter-borne magnetic and VTEM survey, road building, trenching, followed by a 5,000m drilling program, assaying and a bench metallurgical test.

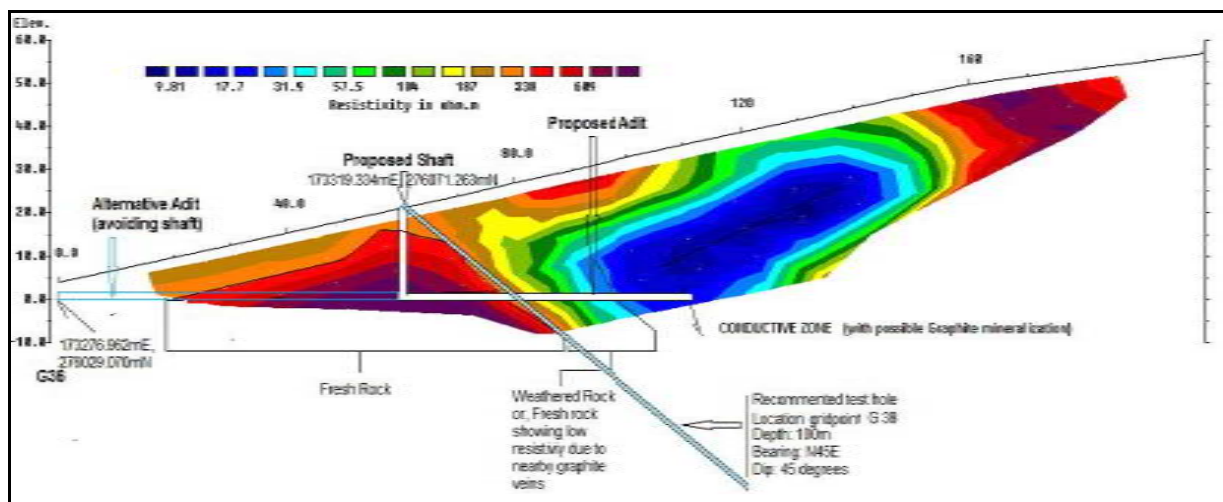
The drill campaign in 2015 showed that the graphite mineralized zone intersected from 52.32 m to a depth of 120.90 m and gave an average of 10.60% Cg over a true width of 62.65 m.



Core from M1 showing near pure graphite vein intersected by hole PLB004 at 88.0 m, down to 102.0 m.

Numerous narrow veins and some meter-wide massive graphite veins were intersected. The mineralised zones encountered during the drilling program have returned several high-grade intersections of crystalline graphite. The digitalisation of the drill results with the assays showed the presence of several mineralised zones comprising high-grade veinlets and veins (80% to 98.6% Cg) and disseminated to semi-massive graphite mineralisation (5% to 50% Cg).

Exploration by Bora Bora ceased in 2016.



Resource at M1

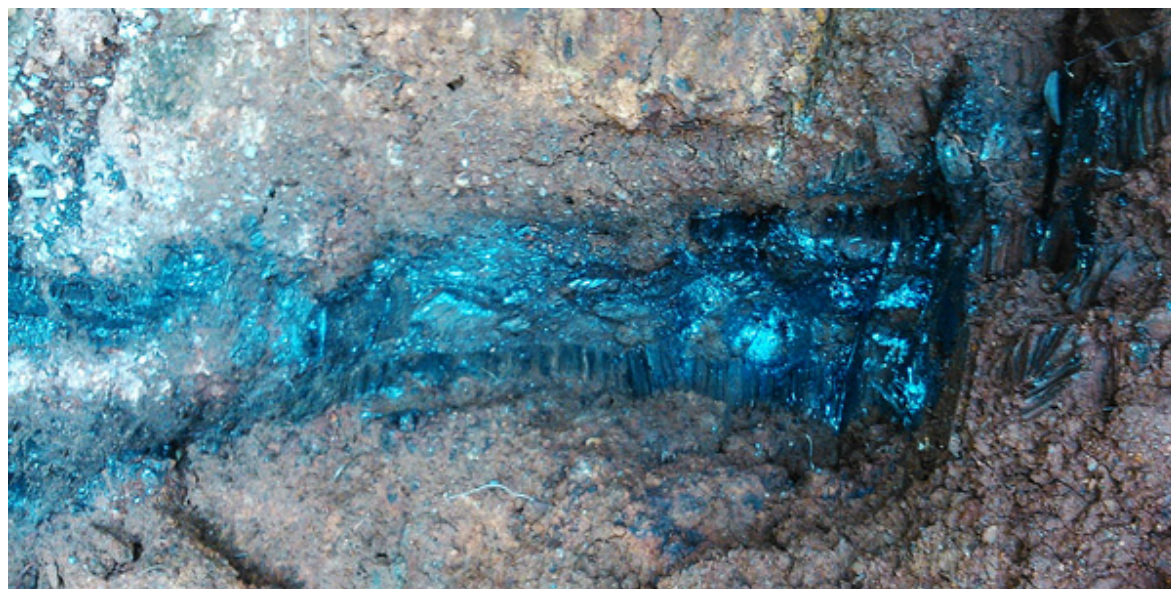
In May 2018, the company commissioned a senior mine geologist to prepare a mineral estimation based on the 2015 borehole data. The consulting geologist interpreted the presence of four E-W (east-to-west) orientated veins (Kahatagaha vein-type) which gave a mineral resource of 76,574 tonnes with no

specified Cg grade. Sinking of a shaft on the south vein and the boring of a NNE oriented adit were recommended.

In the resulting NI43-101 report was published in August 2018 with the consultants (CDGC of Quebec) using a low cut-off grade of 2% Cg. This calculated a mineral resource of 159,544 tonnes averaging 8.15% Cg. This scenario was identified as the base case for an Indicated Mineral Resource of 37,234 tonnes at 9.79% Cg and 122,309 tonnes at 2.76 % Cg classified as inferred mineral resources. These resources contained all the known lump veins grading between 80.2% and 98.6% Cg over thicknesses ranging from few centimetres to 0.72 m. Their length ranges from a few metres to a maximum of 75m. A total of 13,000 tonnes of Carbon Graphite is contained within the mineralised envelope.

M1 Resource					
VEIN	Length metres	Depth metres	Thickness metres	Specific Gravity	Tonnage tonnes
Vein 1	137.8	55	1.23	2.29	21348
Vein 2	137.4	67	1.40	2.15	27707
Vein 3	147.3	72	1.10	2.15	25081
Vein 4	105.0	72	0.15	2.15	2438
Total (tonnes)					<u><u>76574</u></u>

Below can be seen one of the underground graphite veins at M1.



With a prioritization of the grade and considering the zone continuity optimization, Christian de Rosier in the NI43-101 from 2018 considered that the 159,544 tonnes at 8.15 % graphite, is the preferred scenario. These mineral resources contain all the known lump veins grading between 80.20% and 98.60% Cg over thicknesses ranging from few centimetres to 0.72 m. Their length ranges from few metres to a maximum of 75 m. A total of 13,000 tonnes of Carbon Graphite is contained within the mineralized envelope.



Above: Graphite veins in shaft

Road to Production at M1

At the construction site at M1 the workforce is back. The company has appointed Janaka Rathnayaka, a seasoned mining engineer as its head of operations for all the business. He used to manage M1. He has worked at GSMB/Kahatagaha/Australia/MRL.

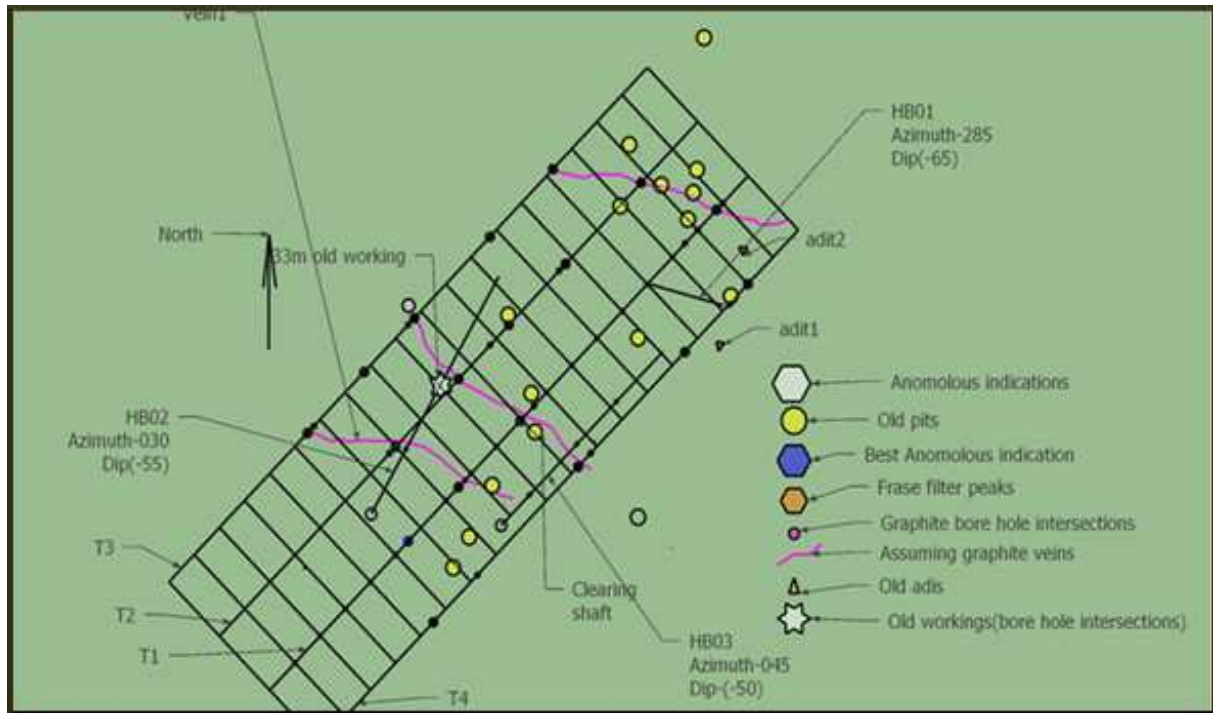
In preparation for the restart of the mine build the company is already ordering new machinery etc. However M1 still needs its IMLA to be issued. This is expected by about April or, at least, that is what the GSMB have promised.

Additionally the company now has in its employ a local geologist who ranks as a Qualified Person under NI 43-101.

Other Sites

Ceylon Graphite has identified three new mine sites for immediate work. All three targets are past producers and two on the same set of grid blocks as K1. H1 is on a plot of 50 acres in Hakbewa and P1 on a 5-acre plot in Pasyala. Both are relatively close to the K1 site and will be serviced during the initial

development from KI. The third site is in the Sabargamuwa area and the geological team has started geophysical work to follow up on high-grade rich graphite intercepts.



Vein Pattern at H1



H1 Vein



Drill Machine at H1

Impressive surface vein at the P1 deposit.



On Value-Added

Once the facility is ready for production the further processing of the high-grade material will be undertaken by one or various sources inside or outside Sri Lanka. To this end, the company is engaged in talks with several groups at this time, including the potential for a joint venture (JV) with a local processor.

We would emphasise that the company is not looking to get into the business of spheronisation in the short-term.

Other factors

There is a 6% royalty payable on industrial minerals not exported and 7% royalty payable on exported industrial minerals. These payments are not required until mining operations commence and are then payable from sales or determined market value of mine output.

Earnings Outlook

Below can be seen our current revenue model for Ceylon Graphite. If anything we probably

underestimate the production from M1 in 2021 but prefer to err on the side of caution. We have both it and K1 gradually ramping up volumes. We then add in a third mine (either P1 or H1) in FY22. We also are employing quite conservative graphite price estimates and prefer to be surprised to the upside.

Ceylon Graphite Corp				
FY ending 31st March - US\$				
	2020	2021	2022	2023
Production Metrics				
K1		1,000	3,000	5,000
M1		100	1,000	3,000
Mine 3			500	1,000
Total Production (tonnes)		1,100	4,500	9,000
Price assumption (per tonne)		\$1,650	\$1,775	\$1,825
Total Revenue		\$1,815,000	\$7,987,500	\$16,425,000
Gross Profit		\$1,234,200	\$5,271,750	\$10,512,000
Margin %		68%	66%	64%
EBITDA		\$363,000	\$4,313,250	\$9,526,500
Margin %		20%	54%	58%
Pre-tax Profits		\$148,104	\$2,214,135	\$4,835,520
Tax		0	398,544	967,104
Post Tax Profits		\$148,104	\$1,815,591	\$3,868,416
Shares on Issue		122.27	197.64	205.64
EPS		0.001	0.009	0.019
Cashflow				
CapEx		(\$960,000)	(\$760,000)	(\$640,000)
Project cash flow	\$0	(\$597,000)	\$3,553,250	\$8,886,500
Net Cash	\$1,783,333	\$1,186,333	\$4,739,583	\$13,626,083

Our earnings estimate for FY21 is low as the ramping production is carrying all the overhead but as revenues expand the margins thereupon are also enhanced. By the third year of production the cashflow is expanding strongly and all capex is self-funding.

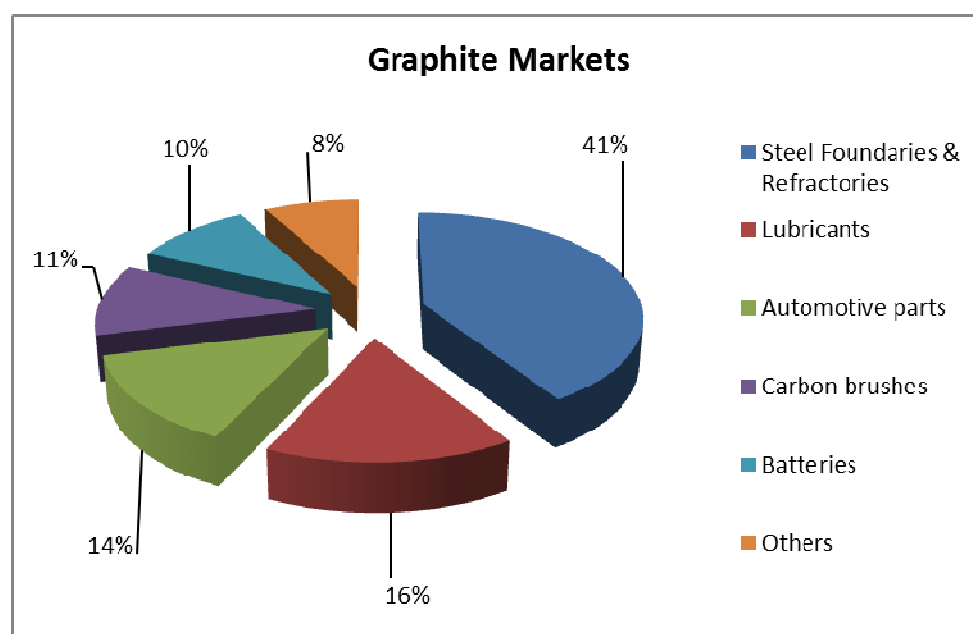
Graphite

The mineral graphite has the chemical symbol C (as do diamonds and coal). The application for graphitic material is constantly evolving due to its unique chemical, electrical and thermal properties. It maintains

its stability and strength under temperatures in excess of 3,000°C and is very resistant to chemical corrosion. It is also one of the lightest of all reinforcing elements and has high natural lubricating abilities.

The mineral is considered as one of the more strategic elements in some surveys coming out of leading industrial nations, though this is relatively new as its main uses were for cathodes (as in aluminium smelting) and steel-industry crucibles which, while important, scarcely rank as strategic uses. Two qualities of graphite that are driving the new applications are its electrical conducting powers and its lubricant qualities (both in wet and dry forms). Much talk relates to the new application known as graphene that has been endowed with a variety of powers by its enthusiasts.

Below can be seen the current usages for graphite:



The proven usage that has generated most excitement in recent times is that of batteries, primarily nickel-metal-hydride and Lithium-ion batteries. The demand is not phantom by any means, as it has been a prime driver of graphite demand since the late 1980s. The underlying reason for this growth was the expansion in the usage of portable electronics, such as portable CD players and power tools. Laptops, mobile phones, tablet, and smartphone products have increased the demand for batteries. Electric vehicle batteries are anticipated to massively increase graphite demand. Natural and synthetic graphite are used to construct the anode of all major battery technologies.

The Lithium-ion battery format uses roughly twice as much graphite as a Lithium carbonate battery. As an example, a Lithium-ion battery in a fully electric Nissan Leaf contains nearly 40 kg of graphite. An oft-quoted statistic is that the average Lithium-ion battery in a mobile phone or laptop has ten times as much graphite as there is Lithium. A lot of the more bulk uses of graphite (e.g. crucibles) utilize the more

prolific grades; hence the lack of crisis mode in government circles in the West with relation to this mineral.

Graphite Reality Check

Firstly we shall start with the great truism of the graphite space: the West needs its own secure sources of supply but no one is willing to pay a premium for that security, or for environmentally sustainable supply either, especially when they are trying to drive battery costs down.

The second truism may seem an oxymoron but is worth repeating: deposits produce a range of flake sizes. The prices of XL flake categories are much better than small flake, but the markets are not nearly as big. The flake graphite market is 750,000 tpa. Most graphite juniors are basing their economics, such as they are, on being able to achieve high large/XL flake prices. But there is only room for one or two new producers (or a multiple of that if Syrah was not present).

All that being said, there is opportunity in graphite, but it is not just in batteries.

Production of large/XL flake graphite is declining and there are shortages because most comes from Shandong Province in China which is suffering from the depletion of ore reserves and strict environmental regulations. Production growth in China is coming from Heilongjiang Province, which is almost all small flake and destined for the LiB market.

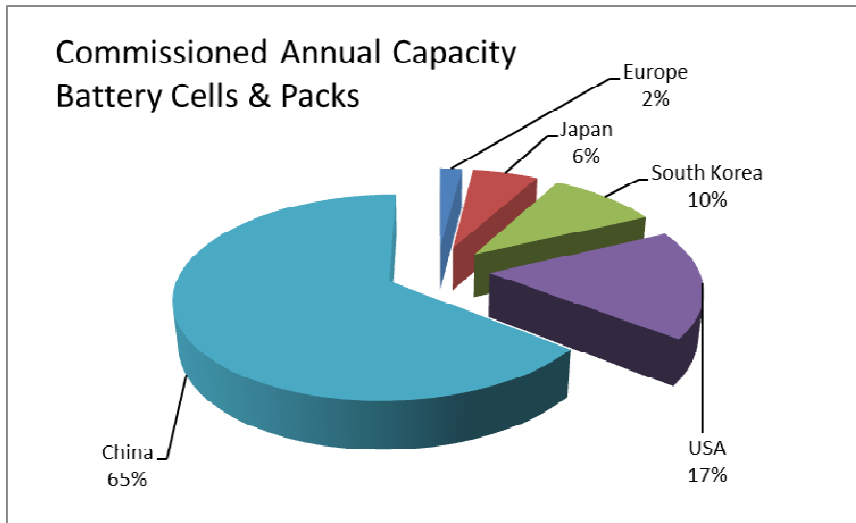
Large/XL flake graphite is mainly used in higher price, high margin industrial markets. In the West, these markets are dominated by a small number of trading companies, most of which are privately owned. They essentially buy, grade, inventory, repackage and do value added processing on Chinese graphite and sell it into many small, specialty markets. This should be a matter of concern to the US (and particularly the US military).

The prices they get are far higher than those quoted by industry sources that glean data from a small number of large volume "commodity" buyers. These companies are effectively sales agents for Chinese graphite miners and as we have seen over the last two years the relationship between China and the US is in rocky territory indeed. Almost none of these intermediaries own their own source of supply and the only North American graphite mine (that of Imerys) will be closing in the next year or two due to the depletion of reserves.

With respect to the bigger picture, potential demand growth from producers of Lithium ion batteries used in the EV and grid storage markets has focused a lot of attention on graphite, but junior graphite wannabees are facing a number of significant challenges.

Asian Dominance

Ceylon Graphite is well positioned geographically as the overwhelming weighting of the battery production space is still (for the moment) in Asia.

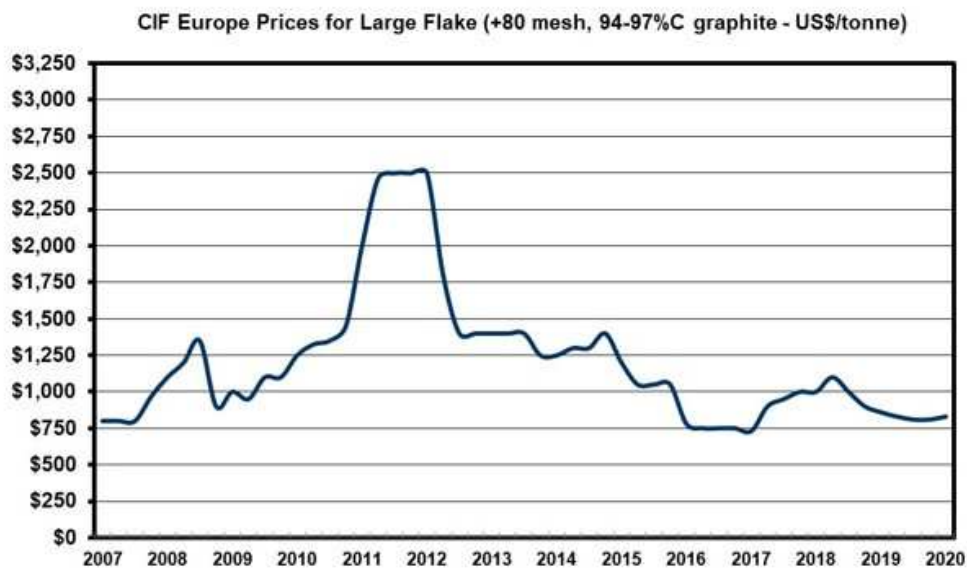


Source: Bloomberg

Recently, this has started to change with a surge in new battery plant construction in Europe and the US.

Graphite – the Ups & Downs

While graphite no longer shows potential for the same type of price squeeze that propelled other battery metals higher in 2017, there is a distinct feeling that major Western end-users want to see a non-Chinese graphite supply (and downstream value-added chain) industry evolve so they will not be vulnerable to Chinese policy gyrations or attempts at market manipulation.

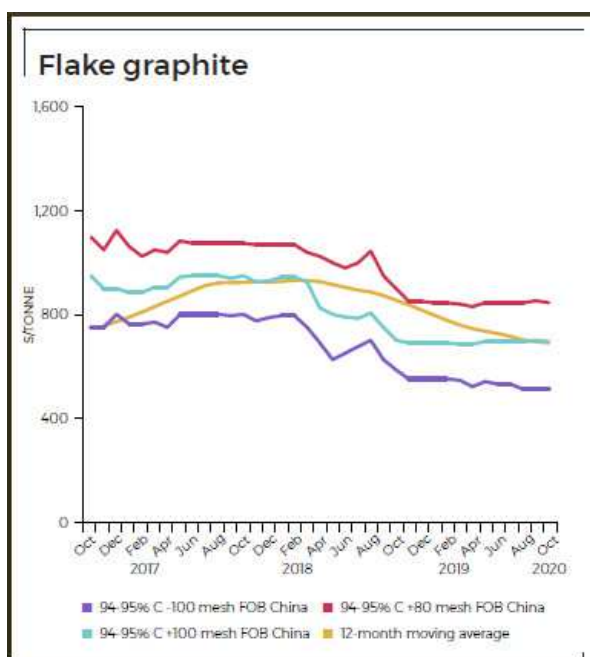


Source: Northern Graphite

The turn in graphite prices occurred in mid-2017 with the price of large flake (+80 mesh) graphite increasing by around 30% in the space of a few months, again breaching the key US\$1,000/tonne (FOB China) level. The move was driven by tightness in the supply of large and XL flake graphite and some speculative investment.

European and North American prices usually trade US\$50-100/tonne higher than China FOB, most of the time. XL flake (+50 mesh) prices have also risen significantly while smaller flake sizes have experienced more moderate price increases.

Since the price uplift of 2017/18 the mineral in all its categories has largely flatlined as shown in chart at the right:



Source: Benchmark Minerals

The underpinnings for an optimistic outlook on graphite prices include:

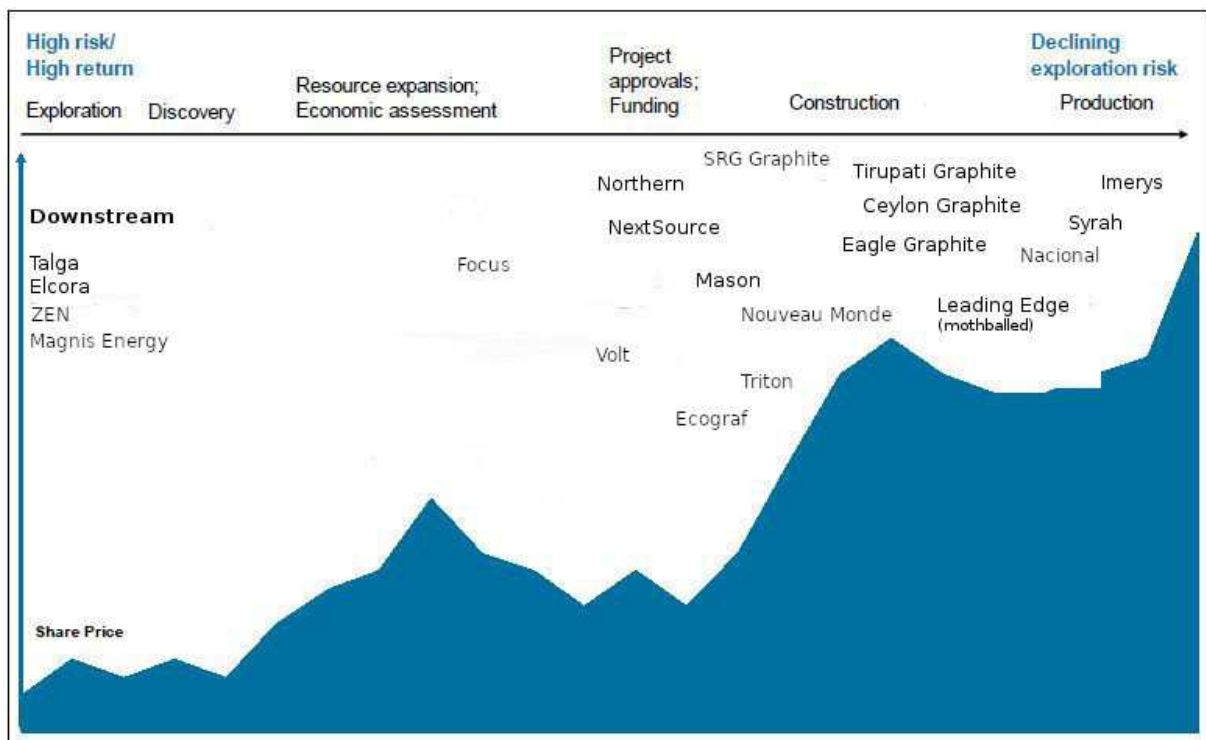
- Production and supply problems in China due to stricter enforcement of environmental and safety standards and restrictions on the use of dynamite in some areas. High purity and large flake sizes have been particularly affected. Also, production costs have continued to increase due to environmental regulations, higher taxes and land fees, labour and power cost inflation and shortages of ore supply. China introduced a new environmental tax in January, 2018 which was expected to have a significant effect on the graphite industry. Meanwhile China announced its intention to build a graphite stockpile equal to 80% of annual production by 2020. Whether this has been achieved is not clear.
- The steel industry started to recover in 2017, but that then faltered, however it has picked up again since 2019, despite the pandemic. World crude steel production for the 64 countries reporting to the World Steel Association was 156.4 mn tonnes in September 2020, a 2.9% increase compared to September 2019. Refractories remain the largest market for flake graphite and mainly require larger flake sizes.
- Continued strong growth in Lithium ion battery demand. Small flake graphite is used to make LiB anode material because it has been plentiful and low cost. If LiB demand growth meets expectations, anode material suppliers will likely have to start using larger flake sizes and to compete with traditional markets for supply creating further pressure on prices.
- Synthetic graphite prices have surged due to environmental and capacity problems relating to

its main use in electrodes for the steel industry. This is seriously affecting the supply and pricing of synthetic LiB anode material which makes natural graphite more attractive.

- XL flake production is declining as resources in Shandong Province, a major source, are being depleted and it has also been heavily affected by environmental closures. Heilongjiang Province, the largest producing region, has mainly smaller flake. The expandable graphite market, which is largely based on XL flake, is one of the fastest growing along with LiBs and this is putting additional pressure on prices. Expandable graphite is used for thermal management in consumer electronics, as a gasket material in the automotive, petroleum, chemical and nuclear industries, to make conductive plates for fuel cells and flow batteries, and as a fire retardant.

The Graphite “Lifecycle”

Below can be seen our “lifecycle” chart for the Graphite space. Imerys, the grandfather of the industry is clearly ahead. But with its main mine nearing the end of its life and the fluctuating fortunes of its new mine in Namibia the question is who shall be the supplier (if any) to its processing plants and others.



Players, Wannabes & Dreamers

The graphite industry is competitive with a number of companies such as Imerys S.A., Qingdao Hensen Graphite Co., Ltd., Nacional de Grafite Ltda. (and until March 2020, Syrah) supplying the graphite market. While the first company is often mentioned due to its plant in Quebec, the latter, with three

plants, all located close to major deposits in the state of Minas Gerais, Brazil produces around 70,000 tonnes of graphite of different characteristics.

Elcora was briefly producing at its small mine in Sri Lanka but despite still listing it on their website they appear to be graphene developers now. Eagle Graphite has a graphite quarrying operation in British Columbia but production restart seems to be awaiting firm offtakers.

Syrah Resources, after years of trials and tribulations, declared commercial production in Mozambique in 2018, and ever since has been operating at only a fraction of nameplate capacity. Its viability was questionable before because the project is “too big for the market” but running at low capacity inevitably raises the question of whether or not it can survive. But Jeremiahs have been proven wrong and it struggled on. Interestingly it has moved into midstream battery anode production with a plant in the US. The company took advantage of the pandemic to shutter its mine at Balama. Rebooting it will take time when it decides to return to the fray.

Category		Ticker	Market Cap
Midstream	Talga	ASX:TLG	AU\$447mn
	Ecograf	ASX: EGR	AU\$65.5mn
	AGT	Pre-listing	n/a
	Elcora Advanced Materials	TSX: ERA	CAD\$6.9mn
	Zen Graphene	TSX-v: ZEN	CAD\$135.11mn
Producer	Syrah Resources Ltd	ASX: SYR	AU\$431mn
	Ceylon Graphite	TSX-v:CYL	CAD\$29.96mn
	Tirupati Graphite	Pre-listing	n/a
Near Producer	Eagle Graphite	TSX-v:EGA	CAD\$2.08mn
	Leading Edge Materials	TSX.v: LEM	CAD\$39.54mn
Developers	Nextsource Materials	TSX: NEXT	CAD\$41.86mn
	Battery Minerals	ASX:BAT	AU\$48.2mn
	BlackEarth Minerals	ASX:BEM	AU\$5.23mn
	Focus Graphite	TSX.v: FMS	CAD\$16.8mn
	Magnis Energy	ASX:MNS	AU\$123.7mn
	Mason Graphite	TSX.v: LLG	CAD\$51.2mn
	Northern Graphite Corp	TSX-v: NGC	CAD\$16.6mn
	Nouveau Monde Mining	TSX-v: NOU	CAD\$186.7mn
	SRG Graphite	TSX-v:SRG	CAD\$45.5mn
	Triton Minerals	ASX:TON	AU\$45.5mn
	Volt Resources	ASX:VRC	AU\$23.3mn
	Walkabout Resources	ASX:WKT	AU\$54.13mn

	Ticker	CapEx	Grade Cg Resource	Cost per Tonne	Location	Status
Battery Minerals	ASX:BAT	US\$39.5mn	8.1%	US\$361	Mozambique	Feasibility Feb 2017 - morphing to copper-gold
BlackEarth Minerals	ASX:BEM	-	7.1%		Madagascar	BFS under way
Ceylon Graphite	TSX-v:CYL	CAD\$6.75mn	90% (vein)	US\$220	Sri Lanka	Production - 2nd mine to be added in 2021
Elcora Resources	TSX: ERA	-	n/a	n/a	Sri Lanka	Mothballed - focussing on downstream
Focus Graphite	TSX.v: FMS	US\$141mn	15.0%	US\$468	Canada	Feasibility 2014
Ecograp	ASX: EGR	US\$77.5mn	8.3%	US\$500	Tanzania	BFS 2017 - funding
Leading Edge Materials	TSX.v: LEM	US\$16.7mn	9.3%	US\$730	Sweden	Mothballed plant
Magnis Energy	ASX:MNS	US\$269mn	5.4%	US\$502	Tanzania	BFS 2016 - EPC awarded - "building" gigafactory
Mason Graphite	TSX.v: LLG	CAD\$258mn	28.0%	US\$484	Canada	Feasibility 2018 - mine plans halted - seeking value-added in downstream
Nextsource Materials	TSX: NEXT	US\$60.1mn	6.1%	US\$485	Madagascar	Feasibility 2019 - Moving downstream into battery anode
Northern Graphite	TSX-v: NGC	US\$85.5mn	2.2%	US\$766	Canada	Feasibility 2012, PEA 2018
Nouveau Monde Graphite	TSX-v: NOU	US\$211mn	4.0%	US\$382	Canada	Feasibility study 2018 - Demonstration plant
SRG Graphite	TSX-v:SRG	US\$105.1mn	5.6%	US\$502	Guinea	PEA 2018 - claims to have offtakers for 90% of production
Syrax Resources Ltd	ASX: SYR	US\$300mn	11.0%	US\$475	Mozambique	Mothballed
Triton Minerals	ASX:TON	US\$99.4mn	6.2%	US\$634	Mozambique	DFS Dec 2017 - Chinese partner with 34% stake
Volt Resources	ASX:VRC	US\$31.8mn	5.4%	US\$664	Tanzania	Feasibility July 2018 - looking to staged development
Walkabout Resources	ASX:WKT	US\$27.8mn	10.8%	US\$347	Tanzania	DFS March 2019 - morphing into a gold developer
Zen Graphene	TSX-v: ZEN	US\$411mn	3.9%	US\$2,046	Canada	PEA 2015 - excessive capex - focussing on downstream

After that come a bunch of developers, that are milling around in the eternal search of offtakers or financiers. Tirupati Graphite is the (eternally) upcoming London listing of assets controlled by an Indian group that are currently graphite processors in India and own some small mines in Madagascar. NextSource continue with their plans for a modular approach to adding capacity in Madagascar but are not, as yet, producers.

Possibly Leading Edge will return to fray by reactivating their plant in Sweden (which briefly got into production several years ago).

In preparing our estimation of where the various players are in the race to the graphite “finish line”, we have discarded some well-known names, such as Great Lakes, Lomiko, Focus and Canada Carbon, from the running. The recent travails of Zenyatta (now gone ZEN in a makeover) make us suspect it will never be a miner and its releases are focused on its technologies.

Talga is an intriguing situation with a market cap recently as high as AU\$520mn that suggests that someone knows something about this that is not apparent to the jaded eye.

Over the last 12 months the siren sounds of the revived precious metals and base metals markets have prompted several other graphite wannabes to move on and seek a different metal to hitch their fortunes to.

Recent Financings

In late October 2020, the company announced that it had placed 51,428,566 units at a price of \$0.0875 per Unit for gross proceeds of CAD\$4,500,000. Each unit is comprised of one common share, and one full warrant with each warrant at an exercise price of \$0.15 at any time up until October 28, 2023.

PowerOne Capital Markets Limited and Primary Capital Inc. acted as finders for the placing.

The proceeds will be used to accelerate the commercial production at the K1 site, finish development and attain mining licensing approval for its M1 site, advance development of additional sites and for general corporate purposes.

Over and beyond the commission the finders received in units – 7%, they also received 7% non-transferable broker warrants entitling the finders to purchase one Unit at the price of CAD\$0.15 per Unit at any time until October 28, 2023.

The company announced in mid-September that it had arranged for a loan of CAD\$150,000 from Michael Judge (an arm’s length third party) as a result, the company agreed to issue 250,000 common share purchase debt warrants, entitling the lender to acquire one common share at an exercise price of CAD\$0.15 at any time up until September 15, 2021. The loan has been repaid.

The company has slightly over 75mn warrants on issue, with most priced at \$0.15, and all series falling due from April 2021 to October 2023.

Directors & Management

Bharat Parashar, Chairman & CEO, Director, former Managing Director and Co-Head of Salomon Smith Barney's Investment Banking business in South and South East Asia. 42-years of Investment and Corporate Banking experience in Asia, including Chief Executive for American Express Bank in India and Head of Chemical Bank's Investment Banking business in Asia (ex-Japan). He has engineered numerous debt and equity transactions, raising over US\$8 billion for regional corporations and governments.

Kevin Aylward, a non-executive director, has extensive public/private sector management experience in the resource and transportation sectors. Most recently Mr. Aylward has worked in the oil sands industry and with First Nations groups on business development and environmental technology issues. Previously, he served as CEO of the Goose Bay International Airport and Nunacor Development Corporation. He also served as a Provincial Cabinet Minister for nine years with the Government of Newfoundland and Labrador including the Environment, Labour and Forestry portfolios. Mr. Aylward also served as Leader of the Liberal Party of Newfoundland and Labrador during the Provincial Election in 2011.

Abbey Abdiye, CFO, has extensive experience in the financial sector, in both public and private companies. He is a chartered professional accountant (CPA), and current chief financial officer of reporting issuers, where he is responsible for all financial, fiscal management, regulatory compliance matters and reporting aspects of company operations. He also provides strategic guidance and direction in capital structuring and is engaged in innovative financing programs that leverage sales and development.

Brett James, a non-executive director, has been a partner and principal of Sussex Strategy Group since 2000. Brett provides clients with strategic counsel on major business issues, informed and intelligent guidance on their government interaction and communications advice to leverage public opinion on issues affected by government decisions. He has been a political and communications commentator on several major Canadian media outlets and a guest speaker at many major business, communications and advocacy conferences in Canada and the United States.

Don Baxter, non-executive director, is a leading graphite expert, having built one of only two producing graphite mines in North America. He is presently Chief Executive Officer of Applied Graphite Technologies. Prior to this, he served as President, CEO and Executive Director of Alabama Graphite (a company we covered at that time), completing the company's Preliminary Economic Assessment (PEA) and introducing a new, battery-focused strategy. As President and Chief Operating Officer of Focus Graphite, he updated the company's PEA then completing a Feasibility Study. He was also responsible for advancing Focus's effort in the development of coated spherical purified graphite for the Lithium-ion battery sector.

He also served as President of Northern Graphite (another company we have covered) and was responsible for the technical aspects relating to the Bissett Creek graphite project, including the

company's Feasibility Study, metallurgical test work, environmental and mine permitting. He also served as Mine Superintendent at the Kearney Graphite Mine and was Director of Mining at Ontario Graphite Ltd.

Risks

It is important to highlight general and specific risks which, in the case of Ceylon Graphite, we perceive as being:

- ✘ Graphite price weakness
- ✘ Financing difficulties
- ✘ Country risk in Sri Lanka
- ✘ Excessive supply from too many projects coming online mid-term

Price weakness is less a case of potential demand faltering (which is highly unlikely) but rather of some sort of malevolent price-spoiling action emanating from China or the likes of a resurgent Syrah. If it did it would be self-harming for either of them.

Financing is a perennial issue in mining markets but with a mine in Sri Lanka up and running (and on minimal capex) the company would be moving into that sweet spot where it does not have sizeable financing needs *per se* but has the luxury, as a producer, of being able to expand from cash flows or funding from off-takers that now realise that the company is "real".

Exotic locations like Sri Lanka come with their tribulations, but the civil war in the country is now retreating further into the past. Also left behind are the strange nationalist/socialist economic policies that ruled for decades after independence. The lessons have been learnt that these did not help the mining sector in particular.

As noted many of the remaining graphite projects won't be going anywhere due to excessive capex numbers attached to their aspirations. Syrah will most likely be the only "big" producer to come to market with the other likely entrants being non-disruptive smaller capex developers. Thus Ceylon Graphite is likely to be part of a small band of producers, rather than trampled in a rush of bigger players.

With K1 in production and M1 following in its wake, Ceylon Graphite would be achieving a first amongst listed entities in having not one but possibly two graphite mines producing by the end of 2021.

Conclusion

The mantra at Ceylon Graphite is our favorite three words: production, production and production. It is only those in production, after all, that can benefit from price spikes or improved demand. Management is not interested in going through the motions of endless drilling and reporting to avoid the inevitable; they have been focused from the get-go on achieving production as soon as possible, and in 2020 they

have achieved that goal in the teeth of the economically debilitating virus with its fluctuating lockdown regimes.

Graphite was not the first battery metal to have its "day in the sun"; Lithium was a first-mover late last decade then fizzled. Graphite, however, had its boomlet in 2012-13 and then went back into quiescence; however, prices for the whole suite of battery "metals" snapped out of their doldrums in 2017 then sagged yet again. Fortunately Graphite, unlike Lithium and Cobalt, did not have a crazy spike in 2017, so has not least the bitter aftertaste that speculators suffered from in those two metals.

Ceylon Graphite mercifully missed the first go-around in the market so was not scarred by that event. It arrived on the scene mid-decade and was able to learn from the mistakes of others.

While Graphite shows little potential for the same type of panicked sentiment about a supply crisis that (briefly) propelled other battery metals' prices in 2017, there is a distinct feeling that major Western end-users want to see a non-Chinese graphite supply (and elaboration) industry evolve so they will not be vulnerable to Chinese policy gyrations or attempts at market manipulation. Additionally, it is almost impossible to attest to the "green" credentials of Chinese sourced graphite in light of the processing methods used in that country (not to mention the use of CFCs).

With K1 advanced towards production and M1 following in its wake, Ceylon Graphite would be achieving a first amongst listed entities in having not just one, but possibly two, graphite mines producing by the end of 2021.

We have a **LONG** rating on Ceylon Graphite with a twelve-month target price of 76 cents.



Important disclosures

I, Christopher Ecclestone, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject securities and issuers. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

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