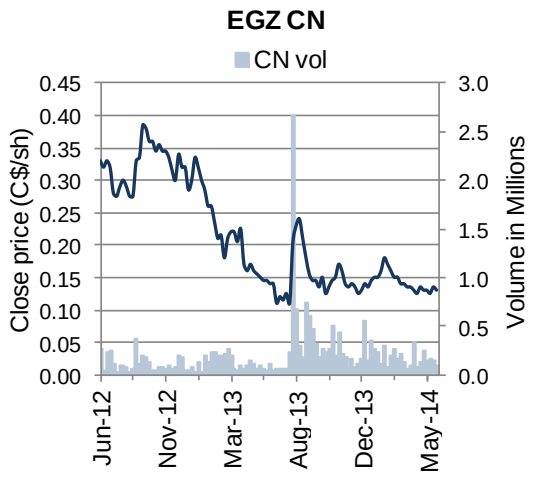
Energizer Resources[1,7]

Initiation of coverage: Best-in-class graphite, feasibility and off-take forthcoming

SUMMARY	
Rating	SPEC BUY
Target (C$/sh)	0.30
1.0xNAV (C$/sh)	0.81
KEY PROJECT METRICS	
Key asset:	Molo (Madagascar)
Graphite Resource:	124Mt @ 6.3%C
Flake size split (L/M/S):	44%/35%/21%
Molo project 1.0xNAV	195
Molo post-tax IRR	25%
SHARE DATA	
Shares (mm, basic/fully diluted)	266.1 / 294.6
52-week high/low (GBp/sh)	0.28 / 0.11
3M avg daily vol (000)	175
3M avg daily val (C$'000)	130
Market cap (US$m)	30
Net cash (debt) (US$m)	5
Enterprise value (US$m)	25
Projected return (%)	140%

FINANCIAL DATA

Year to June	FY13A	FY14E	FY15E
Revenue (US$m)	-	-	-
EBITDA (US$m)	(8.1)	(9.3)	(3.0)
Income (US$m)	(7.8)	(9.1)	(2.7)
EPS (USc/sh)	(4.9)	(4.1)	(1.0)
CFPS (USc/sh)	(4.1)	(3.7)	(0.7)



SPECULATIVE BUY

EGZ CN	**C$0.13**
Target	**C$0.30**

- **Energizer Resources is a TSX-listed graphite developer** focused on developing its wholly owned Molo project in Madagascar. The PEA shows a post-tax $NPV_{10\%}$ of US$341m for 84kt pa production with capex of only US$162m driving a 41% post-tax IRR using an average flake price of US$1,564/t. Based on our model assumptions, we estimate total CIF costs landed in Europe of ~US$635/t vs. spot prices of US$1,250/t.
- **World class in every aspect:** Energizer has taken Molo from discovery to feasibility stage in a little over three years. The project is unique, boasting a combination of good size, grade, purity, flake size distribution and a low strip ratio, which in our view makes it the best development option in the space against the many projects that have emerged since the graphite boom in 2011.
- **Outlook for flake ex-China remains attractive:** Demand for graphite has grown broadly in line with global GDP in the last decade, but new applications like lithium batteries are taking hold and likely supply cuts in China to the tune of ~200kt pa (~18% of global supply) support our view that the long-term fundamentals for graphite remain very attractive.
- **Securing a *definitive* off-take remains key:** We estimate the market can only absorb ~3 new mines (ex-China) over the next ~5 years. This implies that most developers simply won't see production anytime soon. Ultimately, we think it will be the end users who will decide through definitive off-takes. On this basis, we think Molo stands the best chance.
- **We initiate with a SPEC BUY and C$0.30 PT** based on our 0.4xNAV10% for Molo, carrying cash at face value and deducting for overheads. Stock-specific catalysts include a (i) feasibility study (4Q14) and potentially (ii) an MOU / off-take before year-end.

Prepared by GMP Securities Europe LLP.
Please see important disclosures on the last page of this report.

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INVESTMENT SUMMARY

Initiating on Energizer Resources with a SPEC BUY and C$0.30 price target on the belief that Energizer offers investors best-in-class exposure to high-quality graphite, a market we believe has good long-term supply-demand fundamentals. With more and more developers coming on the scene aiming to stake a claim to the finite pool of capital available to develop and build their respective projects, we think it is necessary to differentiate the likely winners from the losers. With this in mind, we believe Energizer's Molo project stands out as one of the best graphite projects globally because of its flake distribution, low strip and capital intensity.

Market opportunity for genuine graphite developers is significant: The global graphite market is ~0.8-1.1Mt pa large and worth ~US$1.2bn. China alone accounts for ~80% with the bulk of its output produced by a fragmented mining industry based in the Shandong and Heilongjiang provinces. Over 80% of *natural* graphite is used in industrial applications, which explains why demand has grown slightly ahead of global GDP at ~3%pa in recent decades. As with steel, many investors should find comfort in these numbers but also take note of two developments that give us reason to stay upbeat on the outlook for flake graphite. First, flake graphite is the only form of graphite that can be used in all applications, with the number of applications continuing to grow with some finally taking hold (lithium batteries are the fastest growing segments but refractories will continue to drive growth in absolute terms) and second, regulatory change and rising costs in China could force marginal suppliers to close.

Molo economics robust on conservative flake price: As with other commodities dominated by China Inc. that offer little to no visibility on supply and pricing, graphite end users are understandably keen to source flake from reliable miners elsewhere. Conditional on the production cuts in China, we believe there is room for anywhere between ~100–200kt pa (~2–3 mines) of flake supply ex-China in the next ~5 years. True, Canada, Brazil and Mozambique have some promising projects, but of the >60 listed developers, many are at an early stage and have yet to declare a resource, project economics and/or production specification. With a PEA complete, and a full feasibility due in 4Q14, Molo has a clear ~2–3 year head start but also benchmarks extremely well as a simple, low-strip, high-margin operation against peers. With our estimated CIF landed in EU cost of ~US$635/t vs. spot prices of ~US$1,250/t we feel that the project can withstand price shocks and highlight that even on spot prices, which are at 2010 levels, we get a NPV and IRR of US$110m and 19% respectively.

Off-take remains a transformational catalyst: We believe equity markets will play a key role in the financing of new graphite projects, but ultimately it will be the off-takers who will decide on which projects eventually get built and which fall by the wayside. As such, we think it is vital when looking at the space to understand that grade and size are not key determinants compared to flake distribution, purity and cost, which will determine (i) the project's value and (ii) off-taker appetite. In our view, Molo checks all these boxes and is not too low-grade that it requires a big plant (high capex) and not too high grade that it reduces the flake size distribution. Securing a *definitive* off-take remains the ultimate truth-o-meter in the space, which we think Molo will secure. To do this, we flag that a pilot operation may be required to avoid building on faith, and this could push out first production ~6 months but should open up financing alternatives.

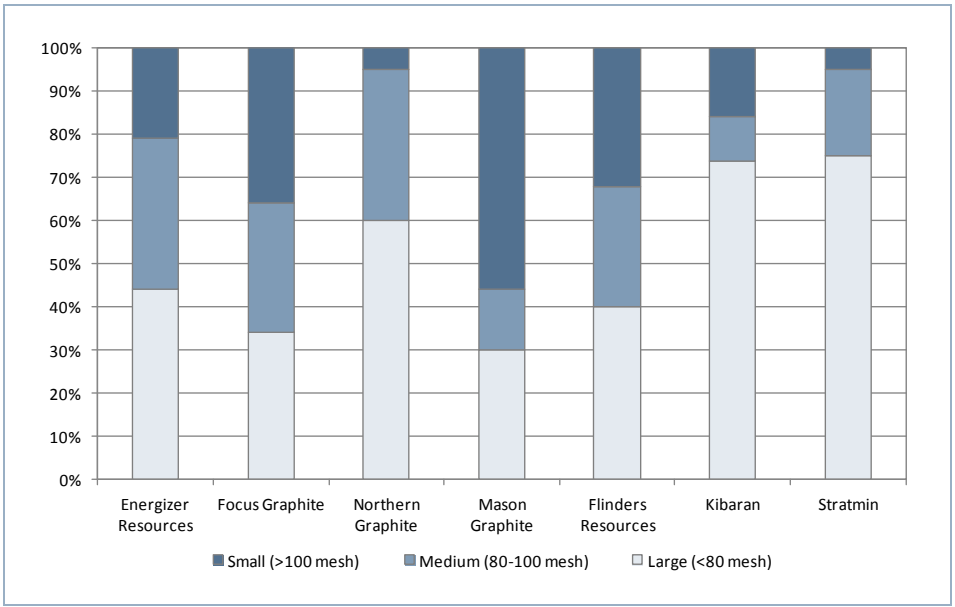
MOLO VERSUS PEER PROJECTS GLOBALLY

In this section, we compare the Molo project against global development projects. The push back for some investors looking at the graphite space has been on (i) new terminology, with terms like "jumbo flake", for example, often used, and (ii) claims from every developer to have the best undeveloped project. In this section, we attempt to address these issues and show that Molo benchmarks extremely well against peers.

High flake distribution drives high in-situ rock value

Large flake (94–97% carbon, +80 mesh) can sometimes be referred to as *jumbo flake* when mesh size exceeds +50. It is the most sought after flake size of graphite and typically used in refractory and battery applications. The larger the flake size the better the material performs and the less waste is produced during the shaping process, which lowers input costs for end users. Large flake can be sold into the medium flake market, which we flag currently sells CIF into Europe for ~US$1,250. Very simplistically, the higher the flake size distribution the higher the in-situ recoverable value.

Flake distribution for Molo and peer projects globally



Source: Company data, GMP; Note that not all have pilot testwork, so numbers may be subject to change

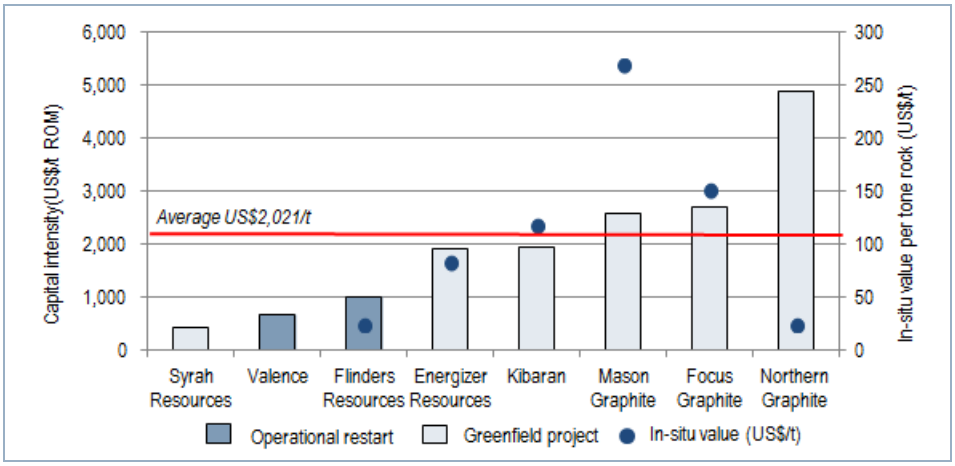
High purity levels with a straightforward flow sheet

Product grade (how much carbon contained in concentrate) and purity are key price determinants, but in the context of evaluating graphite projects these parameters aren't necessarily windows into asset quality. Molo screens well in terms of grade and purity against peers and benchmark contracts (94–97% C and >98%purity). Some deposits can't achieve ~99% purity levels through simple flotation and thus require additional processing plant to purify concentrate produced using physical and chemical processes. This can be costly, both from a capex and opex standpoint. The alternative is to sell a sub-spec product at a discount, which relies on tighter markets. That Energizer has pilot plant testwork confirming Molo ore can be easily upgraded to ~99% purity gives it a significant cost advantage over some of its peers. Together with its favourable flake distribution, Energizer is in a strong position to secure an off-take.

First-class capital intensity against peers globally

Graphite mines typically have a relatively small earth-moving component and plant throughput requirement compared to bulks and base metal mines. In broad terms, normally up to20t of ore is needed to produce one tonne of graphite product with benchmark spec versus Molo at ~14t with a low strip of ~1.0:1. We estimate the average capital intensity for development projects runs at ~US$2,000/t of product. On this basis, Molo ranks as one of the most capital-efficient greenfield open-pittable projects globally. With capital markets constrained, only the highest IRR and most capital efficient projects with off-take stand a chance, in our view. Moreover, staging Molo's development could reduce capital further and improve the IRR.

Capital intensity and recoverable in-situ value using spot flake graphite prices

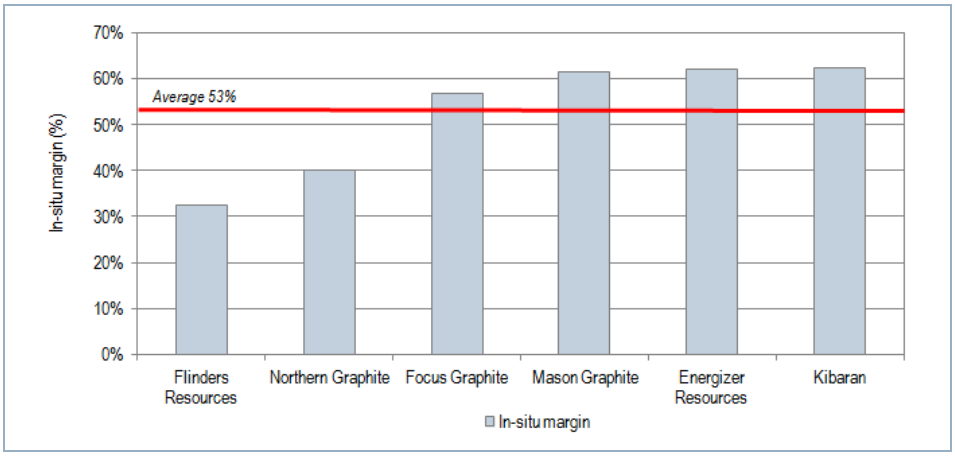


Source: Company data, GMP; spot prices – large flake US$1,200/t, medium-flake US$1,050/t and other US$900/t

Scalable deposit long-term, easier to expand then build new mines

In our view, resource quantum and grade are less relevant for graphite projects, but in the long term, size clearly helps, given it opens the door to incremental expansions in later years. It is far easier to expand an existing operation with a well-established product market penetration than building a project from scratch. On this basis, we think Molo would be in a strong position, once in production, to match global supply growth, which has been growing at a ~5% CAGR in recent decades. Furthermore, it is worth noting that Madagascan graphite is well known by existing end users and that starter production levels should not be supply and thus price destructive.

In-situ margin for graphite development projects



Source: Company data, GMP; spot prices – large flake US$1,200/t, medium-flake US$1050/t and other US$/900/t

Global graphite development comparison sheet sorted in order of capital intensity

	Syrah Resources	Valence	Flinders Resources	Energizer Resources	Kibaran	Mason Graphite	Focus Graphite	Northern Graphite	Stratmin
Project	Balama	Uley (re-start)	Woxna (re-start)	Molo	Mahenge	Lac Gueret	Lac Knife	Bissett Creek	Lohanro
Commodities	Graphite / Vanadium	Graphite	Graphite	Grpahite / Vanadium	Graphite	Graphite	Graphite	Graphite	Graphite
Country	Mozambique	Australia	Sweden	Madagascar	Tanzania	Canada	Canada	Canada	Madagascar
Ticker	SYR AU	VXL AU	FDR CN	EGZ CN	KNL AU	LLG CN	FMS CN	NGC CN	STGR LN
Market cap (US$m)	533	65	26	30	13	49	51	33	16
EV (US$m)	503	57	17	25	11	47	46	30	15
M&I Resource (Mt)	68	6	3	84	15	50	10	70	6
Resource Grade (%, C)	16.90%	7.10%	10.70%	6.36%	10.50%	15.63%	14.35%	1.74%	4.20%
Mining inventory (Mt)	-	6	2	39	15	4	6	28	-
Grade (%, C)	16.90%***	7.10%	10.90%	8.50%	10.50%	27.40%	15.66%	2.07%	4.10%***
Project stage	Scoping Study	PEA	PEA	PEA	Scoping Study	PEA	PEA	BFS	In production
First production	2016	In production	2014	2016	2016	2015	2016	2015	-
Mining method	Open pit	Open pit + stockpiles	Open pit	Open Pit	Open pit	Open pit	Open Pit	Open pit	Open pit
Strip Ratio (x)	-	3	5.3	1.65	-	0.76	1.12	0.79	-
Mine life (years)	12	8 (ex-stockpiles)	13	27	-	22	20	28	-
Plant throughput (Mt pa)	1.2	0.7	0.2	1.2	0.2	0.2	0.3	1.0	-
Head Grade (%)	-	-	11.0%	8.5%	0.1	27.4%	15.7%	2.2%	>90%
Graphite con prod'n (kt pa)	220	50	17	84	20	50	47	21	3
Flow sheet / processing	Crush, float	-	Grind, float, dry	Grind, float, dry	Grind, float, dry	Float, polish grinding	Grind, float, dry	Grind, float, dry	-
Recovery (%)	-	-	96%	89%	96%	97%	91%	95%	-
Flake distribution (L / M / S)	58% Large	-	40% / 28% / 32%	44% / 35% / 21%	73.8% / 10.4% / 15.8%	30% / 14% / 55%	34% / 30% / 36%	60% / 35% / 5%	75% / 20% / 5%
Purity (%)	100%	95%	94%	98%	94%	96%	94%	94%	-
Concentrate grade (%)	99%	-	90%	97%	93%	94%	92%	96%	-
Capex (US$m)	92	34	17	162	39	130	126	102	-
Capital intensity (US$/t prod.)	US$418/mtu pa	US$680/mtu pa	US$1007/t pa	US$1,929/t pa	US$1,950/mtu pa	US$2594/mtu pa	US$2704/mtu pa	US$4885/mtu pa	-
Capital intensity (US$/t L-M flake)	US$721/mtu pa	-	US$1481/t pa	US$2,442/t pa	US$2,316/mtu pa	US$5895/mtu pa	US$4225/mtu pa	US$5142/mtu pa	-
In-situ value per ton of rock (US$/t)	-	-	US$114/t pa	US$84/t pa	US$118/t pa	US$269/t pa	US$152/t pa	US$24/t pa	-
Mine gate margin (US$/t)	-	-	US$352/t pa	US$688/t pa	US$734/t pa	US$627/t pa	US$606/t pa	US$468/t pa	-
Site cash cost (US$/t)	102	550	730	418	440	390	458	695	350
Royalty rate	3.0%	1.5%	-	2.0%	3.0%	-	-	2.5%	3.0%
Tax rate	32%	30%	22%	22%	30%	22%	22%	20%	23%
Study price assumed (US$/t)	-	1,400	1,199	1,526	1,250	1,525	4,196	1,800	1,213
Off-take in place	Two MoU's	5500t sales contracts	Sales contract signed	None	Binding off-take	None	Yes	None	Sales contract
NPV 10% (pre-tax) (US$m)	-	87^	26.6**	421	74.5	364*	246	129.9*	75.1
IRR (pre-tax)	-	48%	34%	48%	30%	34%	32%	20%	-
Funded	No	No	No	No	No	No	No	No	In production

*Source: Company data, GMP; *NPV8%; **post-tax; ***resource grade;^NPV12%;*

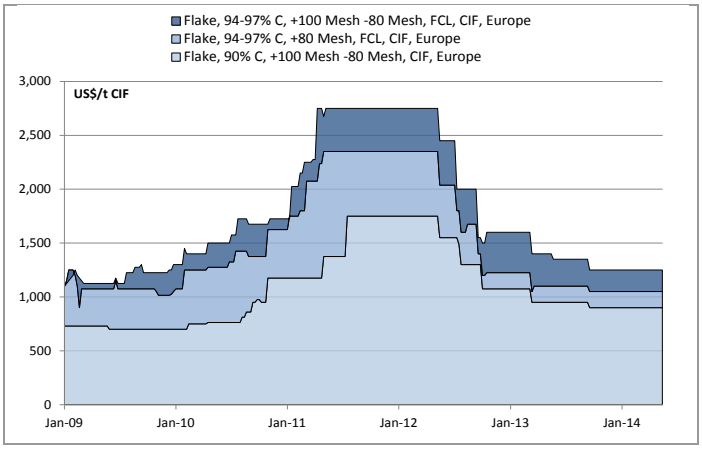
VALUATION

Our valuation is based on a DCF for Molo, assuming a 31Mt reserve, which equates to just 25% of the declared resources. We model a broadly similar production profile to that outlined in the PEA, and despite the large resource base, conservatively assume flat production levels long term and thus no incremental expansions in later years. Other than a lower average graphite price, we do not expect any material changes in the upcoming feasibility study. In fact, we believe any surprises could be positive given the weaker Rand, potential to reduce the strip ratio by processing lower grade but higher flake ore, and further optimisation to the flow sheet.

We have modelled construction commencing soon after the completion of the full feasibility study, which management is aiming to release before year-end. Conservatively assuming two years to finance and build the mine implies first graphite in 1Q17 with nameplate production in 1H18. That said, the ramp-up should not be constrained at the mine, but instead dictated by speed at which end users, outside of the product off-take commitments, are willing to switch over to a new supplier and product. Energizer may have to prove it can deliver on volumes before longer term commitments emerge, given there are some switch-over costs for end users.

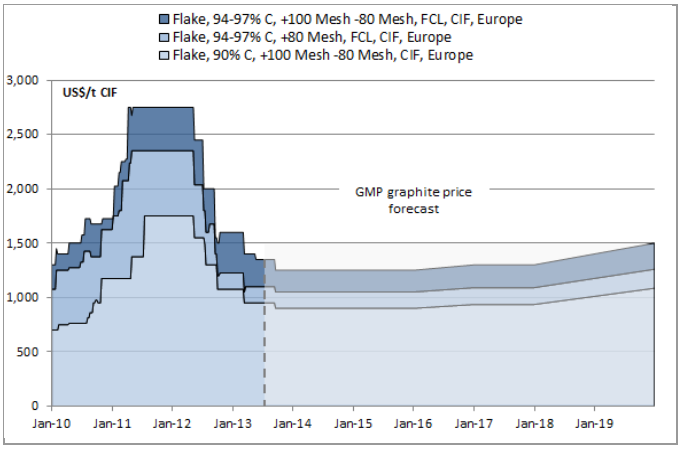
We have arrived at our DCF valuation of US$195m for Molo based on the flake price deck shown below for the various grades (mesh sizes). Graphite pricing is likely to be a point of contention for some investors, given the boom years witnessed in 2011/12 have since dissipated, with prices back to 2010 levels. With little or no visibility on what the industry cost curve could look like, we believe choosing only the very high-margin projects remains the most defensive and appropriate investment approach, hence our preference for Energizer, given Molo. We estimate Molo should operate with a ~50% operating margin at spot graphite prices and on our price deck return an IRR of 25%.

Historical prices for flake graphite



Source: Industrial Minerals, GMP

GMP graphite price forecast to 2020



Source: GMP

The +80 mesh commands the highest benchmark price, but there is also +50 mesh flake, known as *jumbo flake,* which fetches a premium on this product grade. While we fully expect Energizer to realise the jumbo premium on its product, to be conservative, we model all +80 mesh flake selling as one product against our forecast benchmark price. We view this premium very much as a key and achievable source of upside, given a ~30% premium for jumbo flake (based on historic levels) would lift our calculated $NPV_{10\%}$ and IRR by 26% and 4%, respectively.

Our target price is derived on a fully diluted basis and includes a nominal US$50m for the company's vanadium resource and likely resource additions at Molo, when drilling resumes in later years. While a larger resource does not materially add to our NAV if the production levels remain flat, it does open the door to incremental expansions, which adds to the project's strategic appeal. We hold cash at face value and deduct for overheads, which includes financing costs on negative cash balances. For industrial mineral stocks under our coverage, we typically ascribe a 0.40xNAV multiple for projects approaching feasibility stage, which gives our C$0.30 price target.

SoTP valuation for Energizer Resources

	O/ship	US$m	NAVx	US$m	C$/sh
Molo	100%	195	0.40	78	0.29
Exploraiton	100%	50	0.40	20	0.07
Cash	-	5	0.40	2	0.01
Debt	-	-	0.40	-	-
SG&A and central	-	(40)	0.40	(16)	(0.06)
Valuation (FD)		**217**	**-**	**87**	**0.32**

Source: GMP

Price target sensitivities

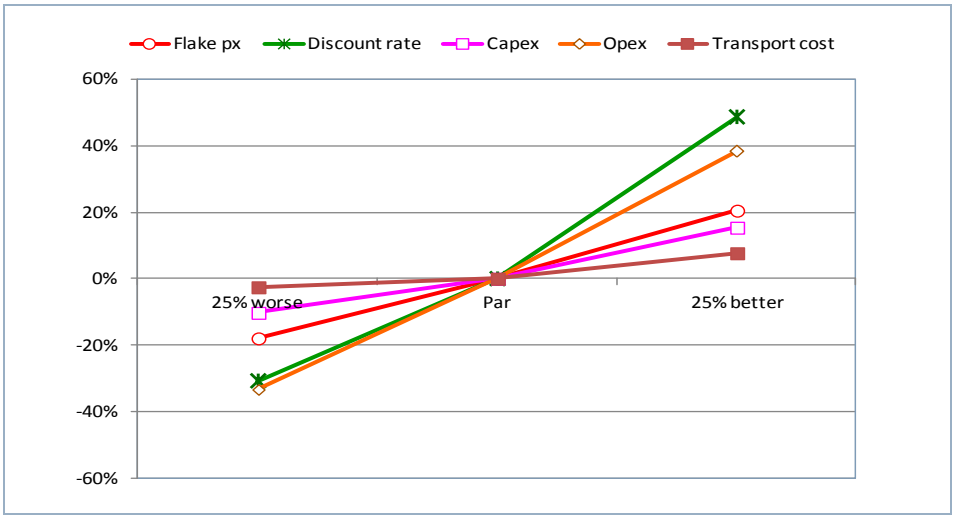
To discount rate	*-20%*	*-10%*	*0%*	*+10%*	*+20%*
11% discount	0.14	0.21	0.27	0.34	0.41
10% discount	0.17	0.25	0.32	0.40	0.48
9% discount	0.20	0.29	0.37	0.47	0.56
To NAVx @ 10%	*-20%*	*-10%*	*0%*	*+10%*	*+20%*
0.30xNAV	0.12	0.19	0.24	0.30	0.36
0.40xNAV	0.17	0.25	0.32	0.40	0.48
0.50xNAV	0.21	0.31	0.40	0.50	0.60

Source: GMP

The stock trades at a meagre 0.15xP/NAV, which offers investors an inexpensive entry level for what we believe to be a genuine graphite developer. The discount appears to ascribe greater development and off-take risk, which is unwarranted, in our view, given the quality of Molo versus the plethora of developers that have emerged following the 2011 price boom. With no potential red flags evident, and bulk samples already with off-takers, we believe securing a definitive off-take remains the single most important catalyst for the stock or any developer, for that matter.

Sensitivity

Our valuation for Molo is most sensitive to discount rate and unit mining and processing costs, with flake distribution and price change for the various flake splits half as sensitive. In contrast, the NAV appears to be less sensitive to capex and transport costs from mine gate to port allowing some room to cope with capex creep.



Source: GMP

Risks

Commodity price risk: Graphite prices have come off the boom years and are now trading at 2010 levels, which suggests normal buying has resumed. Going forward, we expect steady demand growth (~5% pa CAGR) and believe there is potential for new applications to accelerate large flake demand. However, commodity prices remain a key risk for any miner, which should be noted.

Financing uncertainty: While the PEA was carried out to a detailed level, it does contain more uncertainty than a full feasibility. The capex requirement of ~US$162m and a likely overrun facility to cover overheads and contingencies means an equity injection, and thus dilution, is a risk. This is hard to quantify at this stage, but an off-take agreement should open up alternative forms of financing to equity, in our view.

Off-take risk: An MOU is a good starting point, but we find very few actually translate into a binding document that lenders are happy to lend against. Building on faith makes attracting debt more challenging, which increases the financing risk. However, this risk is somewhat lower for Energizer given extensive pilot testwork has been undertaken and sizeable samples have been sent to end users for analysis.

Development risk: The Molo project is a relatively straight forward vanilla build, but there is always some risk that the mine build and ramp-up do not progress as fast as management would like. Moreover, we typically find that capex creep is to be expected in African mine builds, given the infrastructure and labour challenges.

Key sources of upside

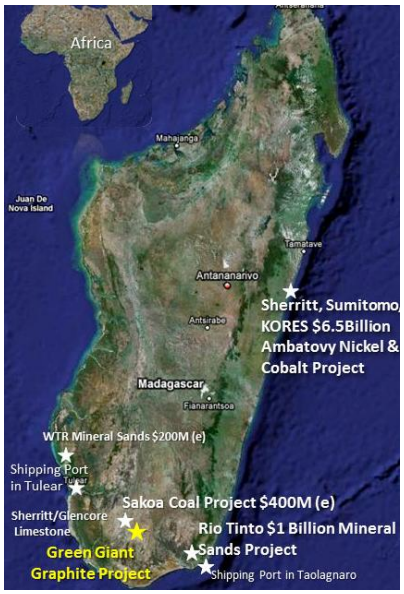
Rand weakness and lower capex: The capital requirement of US$162m includes ~10% contingency and was calculated using a Rand / USD exchange rate of 8.5. Since the PEA in 2012, the Rand has weakened to ~10.5, which translates to a potential ~US$30m capex saving. While we do not expect the saving to be so pronounced, this is a key source of upside potential, given it reduces the funding requirement.

Flow sheet optimisation: The pilot testwork released in 1Q14 revealed that product quality and spec was better than previously thought. The higher flake distribution improves the overall *in situ* value, but more importantly, enables the third flotation circuit to be removed, given little value is generated from improving -400 mesh, finer flake graphite. This not only reduces plant capex, but should also lower unit costs.

Lower strip: The PEA used a 1.65:1 strip ratio and an 8.5%C head grade, but the pilot testwork showed that larger flake is hosted mainly in lower grade ore. As such, ore previously classified as waste could be mined and processed, which should significantly reduce the strip ratio ~1.0:1 and thus lower the overall mining cost.

Future expansion: We expect graphite demand to continue growing steadily on the same ~5% pa trajectory it has enjoyed over the last two decades, with potential for tighter markets should the Chinese state crackdown on environmentally unfriendly mines and further applications take hold. Herein lies the opportunity, given Molo is scalable and easily expandable once in production.

Green Giant – Molo graphite location



Source: Company data

COMPANY OVERVIEW AND ASSETS

Energizer Resources is a TSX-listed company that is focused on developing its wholly owned Molo graphite project in southern Madagascar. The company floated on the TSX as Uranium Star Corp in July 2007 and was originally focused on developing the Sagar uranium project in Quebec in Canada but changed focus after making a vanadium discovery at its Three Horses (now Green Giant) claim in southern Madagascar.

In 2009, the company acquired the remaining 25% interest in the Green Giant Vanadium deposit from Madagascar Minerals and a year later reported a maiden resource of ~26Mt @ 0.75% V_2O_5. Energizer advanced with preliminary studies and resource drilling programmes, boosting the resource but changed direction once more in 1Q12 following the discovery of flake graphite at the nearby Molo target, with drilling returning highlights of 61m @ 7.5% C, 106m @ 7.1% and 119m @ 7.0% C.

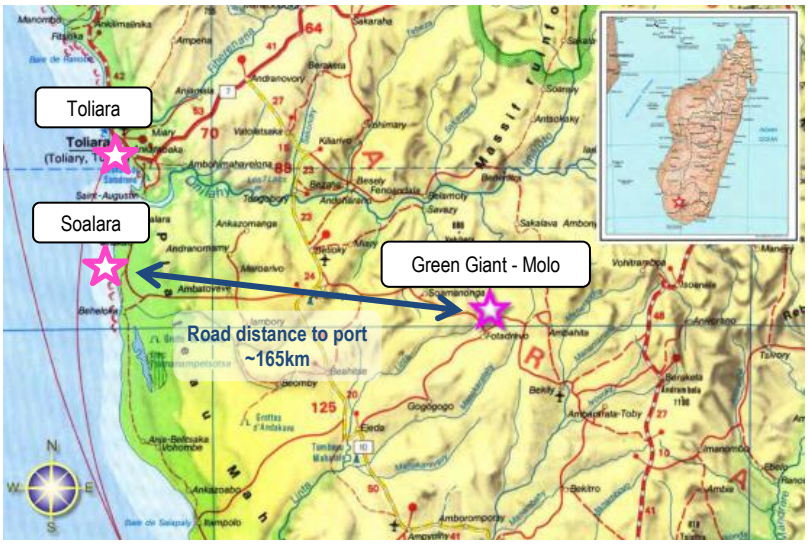
Following a full field season which comprised 48 drill holes (9,551m) and 18 trenches (3,637m), a maiden resource (including indicated) of 124Mt @ 6.3% C was declared; including two high-grade zones on western and eastern flanks of the deposit which host a combined indicated resource of 60Mt @ 8.1% C using a 4% cut-off grade. More recently, in 1Q13, a PEA was completed outlining a ~84kt pa operation over a 27-year mine life.

MOLO GRAPHITE PROJECT

Ownership and location

The Molo project is wholly owned by Energizer and is one of the few advanced graphite development projects globally that has a completed PEA. It sits within the company's Green Giant claims in south-central Madagascar, some ~145km southeast of Toliara. The property comprises two blocks that encompass a 225km^2 area that was previously held in JV with Malagasy Minerals. However, Energizer recently acquired its position for US$2.1m – payments will be staged upon reaching key milestones, which include a feasibility study and declaring commercial production.

Property location with Toliara city highlighted



Source: Company data, GMP

Molo project area and landscape

Source: Company data

The landscape around Molo is mostly flat-lying dry savannah grassland, and is sparsely populated with few inhabitants within a potential blast zone radius that would be required for open-pit mining. Access is via a network of dirt roads that radiate outwards from Fotadrevo, the nearest village, which is ~15km from the project. Infrastructure, though, is fairly limited given the remote nature of the project, with no grid power or paved roads within the immediate area. Regional access is via an 80km laterite road which connects to a ~70km paved highway to Toliara city and port.

Taxes and royalties

Molo is wholly owned by Energizer and is free of backing rights or first refusal rights. It does, however, have a ~2% royalty held by Malagasy Minerals, previous JV partners to the project. At government level, tax of ~22% and royalties of 2% are broadly in line with China, Canada and Australia. Moreover, we understand Energizer can carry forward losses, which should reduce taxes and maximise cash flows in early years.

Global fiscal terms for graphite producing / developing nations

Country	Australia	Canada	China	Madagascar	Mozambique	Sweden	Tanzania
Tax / Profit sharing (%)	30%	27%	25%	23%	32%	22%	30%
Royalty rate (%)	0-4%	1-4%	-	2%	3-12%	0.2%	0-5%
Govern't carried interest (%)	-	-	-	-	-	-	-
Govern't Buy-in (%)	-	-	-	-	-	-	-
Tax break / Deprecreciation	SL	AD	SL	TH	AD	SL	AD
Dividend witholding tax (%)	15%	5-15%	5%	-	-	15%	5-10%

Source: Company data, Country data and GMP; SL = Straight line depreciation; AD = Accelerated depreciation; TH = Tax holiday

Geology

Molo sits in the Bekikiy block, within the Tolagnaro-Ampnihy high-grade metamorphic province that is underlain by moderately to highly metamorphosed and sheared graphitic (biotite, chlorite and garnet-rich) quartzo-feldspathic schists and gneisses. The Ampanihy shear is well developed and trends in a north-south direction.

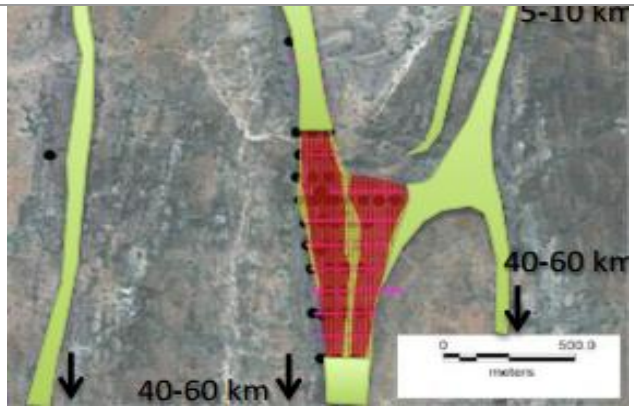
The Ampanihy shear essentially served as a conduit for fluids from the lower crustal elements to flow upwards and accumulate. The unique regional geological setting played host to a high temperature and pressure metamorphic system, that is a necessary condition to create pure, high-quality graphite material. Of the entire pressure contact known to host graphite, Energizer has pegged ~80% of this.

The Molo graphite deposit comprises steeply dipping, multi-folded graphitic layers that outcrop and extend over a ~10km strike. Rocks are oxidised at surface with saprolite extending to a depth of ~10m with mineralisation hosted within schist and gneiss. Graphite is hosted within two discrete zones consisting of a high-grade core and lower grade halo, which is underlain by a barren footwall contact onto granitic gneiss. Aside from being very visible, which helps to reduce dilution during mining open-pit mining, mineralisation is wide and thus amenable to bulk mining methods.

Molo core – visibly clean and homogenous

Source: GMP

Plan view of deposit and graphite known extensions



Source: Company data

Reserves and resources

The resource at Molo is estimated at ~125Mt @ 6.4% C with low-grade and high-grade domains calculated using a 2%C and 4%C cut-off grades, respectively. The resource spans over a ~2km strike length, but remains open in all directions, and was calculated over ~20% of the overall strike length outlined thus far on the property. On this basis, we think potential exists for significant additions to the resource base in later years.

Molo resource statement

Molo	Tonnage (Mt)	Grade (C%)
Low grade	43.1	4.72
High grade	40.9	8.09
Total Indicated	**84.0**	**6.36**
Low grade	21.1	4.64
High grade	19.2	8.11
Total Inferred	**40.3**	**6.30**
Total	**124.3**	**6.34**

Source: Company data

Since publishing the PEA in 1Q13, Energizer has completed ~35 diamond infill holes, ~9 geotechnical holes, 3D variability tests and detailed topographical surveys, which should lead directly into a maiden reserve in 3Q14. This will be used to backstop a full feasibility study, which is due for completion and release before year-end.

Infrastructure

Road access: Molo is in a remote part of Madagascar with access via secondary, unpaved roads. Transport infrastructure is less relevant for graphite projects compared to more traditional bulk projects, given the relatively small output and high-value nature of the graphite concentrate, which transports well. The distance between Molo and the proposed port at Soalara is ~165km, although we understand different routes will be looked at in the feasibility study. The existing road requires a modest upgrade to ensure the mine is accessible all year round, namely during the wet season, which runs between November and April. Energizer envisages using a fleet of 60 haul trucks with fully contracted trucking costs estimated at ~US$105/t of concentrate to haul, handle and load a handymax vessel.

Typical road between the project and Soalara

Source: Company data

The main road network in Madagascar could be in for a significant upgrade following the first Presidential elections in 1Q14 since the 2009 coup. Development agencies appear keen to resume funding of infrastructure projects and the route National 13 is being upgraded by the EU in cooperation with the Madagascar government. The project plans to pave the road between Beraketa to Antananarivo, opening the door to exports via the existing port of Fort Dauphin. Whilst the distance from Fort Dauphin is greater, the company would benefit from lower port fees and transhipment costs.

Port: The Soalara port is located ~20km south of Toliara city. The port area currently has no infrastructure or loading facilities in place, although Energizer plans to build a container shed (~7kt capacity / ~8% of annual output) and concrete apron to handle and load the concentrate using one tonne bags onto a transhipment vessel. The transhipment vessel will ferry and load concentrate to a handymax further off-shore.

Aerial view of Soalara loading area

Source: Google maps

Power: With no grid power on-site, Molo will be powered using on-site diesel or HFO generation. The operation's power requirement is fairly modest at ~8MW, which may rule out HFO, given it is only typically viable over ~15MW. As such, any upside from lower-opex HFO is limited at this stage, but potential exists in the long-run to reduce costs in the event of an expansion and thus higher power draw. PEA capex and opex numbers outlined consider diesel generation with off-balance sheet financing.

Water: The project is situated in an arid part of Madagascar. Water is not readily available on-site with most of the nearby streams and rivers running dry for most of the year. To get around this, Energizer plans to build a raw water dam ~20km from the proposed plant site, which aims to cover the mine nameplate requirement of ~240m^3/hour. More long-term, an expansion or new dam facility could be required to support an expansion.

Molo pilot plant at SGS laboratories

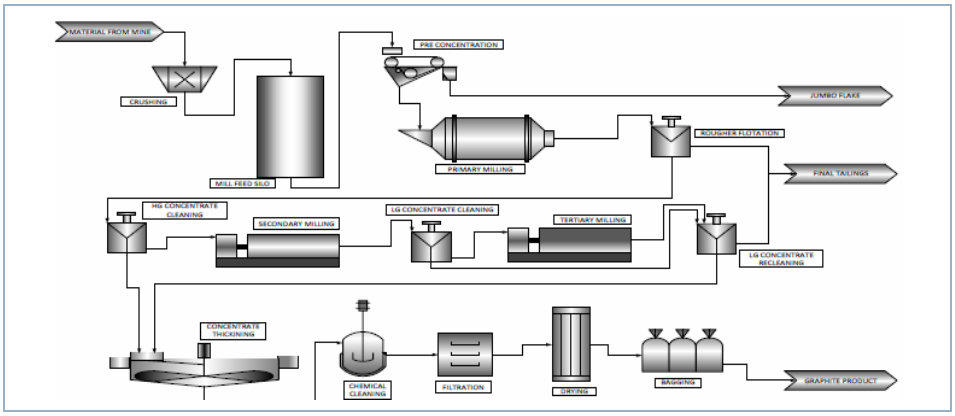
Source: Company data

Mining and processing

Mining will use conventional truck and shovel methods, with the deposit's favourable geometry supporting a relatively low 1.65x strip ratio. That said, pilot testwork has shown that the bulk of the larger flake is hosted in the lower grade ore, which was previously considered as waste. On this basis, incorporating the lower grade into the mine plan in early years could convert waste to ore and reduce the strip to ~1.0x. In turn, this should reduce overall mining costs on a per tonne of concentrate produced.

The flow sheet envisages a three-stage crush followed by primary milling and a three-stage flotation. However, there is potential to remove the third flotation circuit, which is there to recover and improve the quality of low-value concentrate. The plant is designed to treat ~1.2Mtpa of ore with recoveries of 89% and average ore grade of 8.5% C, although this could come down on lower grade / larger flake ore being incorporated into the mine plan. Overall, we consider this to be a simple flow sheet.

Simplified flow sheet



Source: Company data

Graphite products

Revenues and thus *in situ* value is determined by flake size, a bit like diamonds and size frequency of larger stones. The Molo deposit has a >50% distribution of medium-to-large flake confirmed by recent pilot testwork which produced ~12t of finished product. This revealed a product split of ~16% jumbo (48 mesh), ~28% large (+80 mesh), ~35% medium (+150 mesh), with the balance as small flake (-200 mesh).

Molo average flake size analysis and grade

Size mesh	% of total con	Con grade %C
48	15.7%	97.7%
65	17.6%	97.4%
80	10.2%	96.7%
100	9.7%	96.4%
150	15.0%	96.1%
200	10.1%	95.2%
-200	21.6%	88.2%

Source: Company data

The pilot plant results showed a marked improvement on the Mintek flake distribution used in the PEA. In fact, the flow sheet in the PEA included a third circuit which we believe could be removed without impacting the production of medium and large flake graphite. The third flotation circuit was designed to upgrade sub-400 mesh flake, which is less sought after and less relevant to the project's economics. We expect a trade-off study to show that the potential saving in capex is worthwhile.

In addition to proving up the flake size distribution of the deposit, the ~12t of concentrate produced was also used as test samples. These were sent to end users with a view to securing a definitive off-take arrangement, although a non-binding MOU to start with may be needed. This is a key step to unlocking financing alternatives.

Capex

Total upfront capital is estimated at US$162m, which includes some 10% of contingency. Costs were calculated in Rand because almost all the plant and equipment will be sourced from South Africa. As such, we believe the upcoming feasibility study capex numbers may benefit from the recent weakness in the Rand. Management used a 8.5 Rand/USD rate, which implies a theoretical ~US$30m saving could be possible. However, projects typically see some capex creep as they advance to final feasibility stage, so in all likelihood the saving might not be as pronounced.

Costs

By and large, costs can be split into three categories: (i) mining; (ii) processing and overheads; and (iii) transportation costs from mine gate to vessel. Contract unit mining costs are estimated ~US$2.20/t, which equates to ~US$5.83/t on a milled basis, assuming the PEA's 1.65:1 strip ratio. However, for every tonne of graphite concentrate produced, ~14t of ROM must pass through the front end of the plant, which gives a mining cost of ~US$31/t concentrate produced. This equates to ~8% of mine gate costs and ~6% of the FOB cost loaded onto a handymax ship.

Processing and overhead costs are estimated at US$23/t milled, which equates to ~US$320/t of graphite sold. Together with mining, this gives a mine gate cost equal to ~US$415/t with transport and selling costs adding ~US$105/t to give ~US$520/t FOB costs. Add to this a likely marketing fee and shipping costs and we estimate an average CIF landed cost in Europe of US$635/t. Against spot graphite prices (average product price of US$1,124/t) using Molo's flake size distribution this implies an operating margin of ~50% margin, which should translate into cash given the modest sustaining capital over the mine's life.

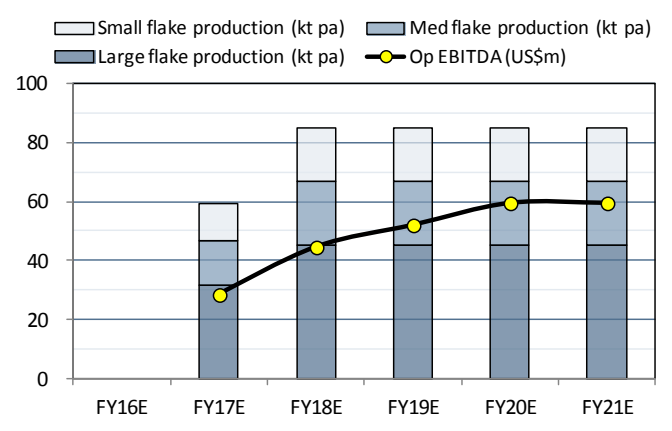
PEA

The 2013 PEA outlined a ~1.2Mt pa / ~84kt pa open-pit operation over a ~27 year mine life for US$162m upfront capex with the build schedule estimated at ~12–16 months. This returned a NPV10% of US$421m and a post-tax IRR of 48% using an average graphite price of US$1,564/t. Individually US$2,026/t for large, US$1,881/t for medium and US$684-1,688/t for small flake graphite prices, which have come off since the PEA was reported. We note that spot large, medium and small flake graphite prices are trading at US$1,250/t, US$1,050/t and US$900/t, respectively CIF into Europe.

MOLO VALUATION

We model Molo with same production profile to the PEA, but with ~30% lower strip at ~1.1:1 given the likely reduced waste movements from processing lower grade ore, which hosts larger flake distribution, which was previously treated as waste. Keeping unit processing costs unchanged at ~US$23/t versus the PEA, this reduces our mine gate costs ~6% to US$390/t. While we believe potential exists for savings in unit processing costs from optimising the flow sheet, we keep these costs unchanged to remain conservative, but increase transport, loading and shipping costs to US$220/t from US$105/t (excluded shipping component) to arrive at our landed ~US$635/t cost on a CIF basis in Europe. This compares to the average spot price of ~US$1,250/t.

Molo forecast production and EBITDA forecast



Source: Company data, GMP

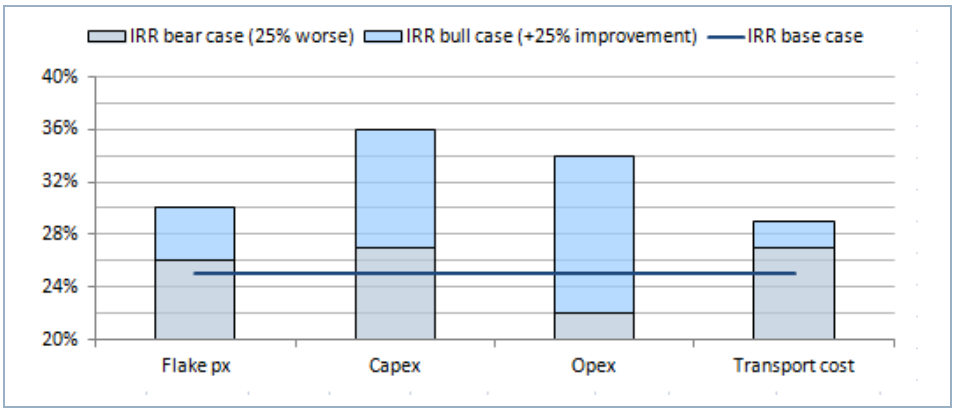
GMP model assumption

Molo GMP model parameters	PEA	GMP
Mineable inventory (Mt)	32	32
Strip ratio (x)	1.65	1.10
Mill throughput (Mt pa)	1.20	1.20
Mass pull (%)	7.2%	7.5%
Graphite con prod (kt pa)	84	85
Flake split (L / M / S)	33/36/31	53/25/22
Avg. graphite price (US$/t)	1,564	1,350
Mine gate C1 cash cost (US$/t)	415	390
CIF cash cost landed Euorpe (US$/t)	nr	635
Upfront capital expenditure (US$m)	162	162
NPV10%	341	195
Post-tax IRR (%)	41%	25%

Source: Company data, GMP

Despite the Rand weakness and potential for an implied ~US$30m in capital savings, we continue to model ~US$162m in upfront capex and use a long-term average graphite price, based on the Molo flake distribution, of ~US$1,350/t, which is ~8% higher than spot. The deposit is very scalable, so our DCF valuation may be overly punitive given the ~27 year mine life based on the PEA mineable inventory used. Naturally, any expansion would bring cash flows forward and improve the overall project NPV. Using a 10% discount rate we estimate the 1.0xNAV of Molo at US$195m and post-tax IRR at ~25% with payback achieved in just under ~3 years.

IRR bull, bear and base case



Source: Company data

PILOT PLANT

As we previously noted, securing a *definitive* off-take remains the single most important catalyst for any graphite developer given the (i) size and (ii) illiquidity of the market, (iii) limited number of end users and (iv) switching costs involved in using a different product. On this basis, we think Energizer may opt to build an on-site pilot plant, like the diamond mines, not only to prove the flake distribution split, which reduces the flow sheet and product risk, but to also secure a definitive off-take with an end user. This should open the door to financing alternatives and give confidence to debt providers, which directly benefits investors (e.g., less dilution).

While there are clear benefits from building a pilot plant, there are two implications that could weigh on the economics. Firstly, a pilot operation would push out full-scale production which, in turn, pushes out cash flows and reduces the overall project NPV. Secondly, it could cost the company ~US$10m and in all likelihood would not provide any material savings to the upfront capital number outlined for the build. As such, to sidestep the issue of both capex and time, management may decide to mine and ship >3,000t of ore and run it through a full-scale pilot plant operation in North America. We estimate this would cost ~US$3-5m, which equates to more than a 50% saving.

Either way, this is a more conservative and sensible development approach which avoids building on faith. We have a bullish view on Energizer precisely because we believe that they can secure a *definitive* off-take and thus are a credible near-term production story in what we believe to be an attractive market with strong long-term fundamentals. The lack of visibility on precise timing and whether an off-take can be secured remains a risk, but also a key source of upside. However, to remain conservative, we ascribe a 0.4xNAV multiple to drive our valuation to factor in for this, as well as financing and build risks.

POTENTIAL TO STAGE DEVELOPMENT

With the natural graphite market approximately 1.1Mtpa, some investors may query the size of 'big bang' development projects that target multiples of annual growth, which we estimate at ~5% CAGR. Molo at ~85ktpa equates to ~1.5 years of growth, but should take ~2–3 years to build, commission and ramp up. On this basis, the initial output envisaged by Energizer at Molo should not impact in any material way the supply demand fundamentals of the natural graphite market. That said, to reduce capex and appease some investor concerns, Energizer still has the option to stage development and thus may opt for a ~40–50kt pa starter operation, which reduces the upfront capital required, given it enables self-funding to >85kt pa. That the operation is scalable should be viewed as a sensible alternative, not a sub-optimal development approach, in our view. Moreover, biggest producer China is facing a number of challenges, including (i) lower grades and quality, (ii) rising costs and (iii) central government halting environmentally damaging mining operations, which we think will see ~200ktpa or ~18% of supply drop out of the market.

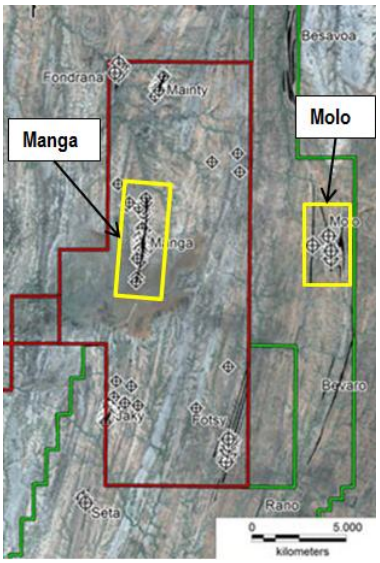
OTHER PROJECTS

Green Giant Vanadium Project

In addition to the Molo deposit Energizer holds 100% of the Manga Vanadium project, also located in southern Madagascar. The company holds 2155 permits covering 1,052km^2, 36 of which are 100% owned with, the remaining 2,119 in a 75% JV with ASX-listed Malagasy Minerals. These permits cover over 100km of strike and host a sedimentary vanadium deposit that may have the potential to produce high purity (99.5%) Vanadium Pentoxide (V_2O_5).

The company has been working on the area since August 2007, completing a range of exploration and geophysical surveys defining a 21km vanadium trend. Energizer then focused on the priority Manga, Jaky and Mainty targets, completing a ~22km drill programme and a resource estimate for the priority area defining 59Mt @ 0.68% V_2O_5 for 460Mlb of V_2O_5. The company has since halted all activity to focus on Molo.

Manga deposit location relative to Molo



Source: Company data; GMP

Manga resource statement

Manga	Tonnage (Mt)	Grade (V_2O_5%)	V_2O_5 (Mlb)
Indicated	50	0.69	756
Inferred	10	0.63	135
Total	**59**	**0.68**	**460**

Source: Company Data

MANAGEMENT

Richard Schler, MBA – CEO has over 30 years of financial management, engineering and business operations experience, including significant experience in the manufacturing sector. An engineer by training he has served on the board of Energizer since 2006.

V. Peter Harder – Chairman has a wealth of expertise in public policy and serves on a number of boards. He is Senior Policy Advisor to international law firm Dentons and has been the President of the Canada China Business Council since 2008.

Craig Scherba – Chief Operating Officer is a professional geologist (P. Geol) with significant exploration and mining experience in Africa and North America, including involvement with Nevsun's Bisha mine. He currently holds VP Exploration roles with a number of TSX-listed exploration companies.

Peter Liabotis – Chief Financial Officer is a chartered account with significant experience both with global accounting firms and in financial management of natural resource companies. He currently holds VP Finance roles with a number of TSX-listed exploration companies.

Brent Nykoliation, BCom – SVP of Corporate Development has over 15 years' experience in various senior management roles in marketing and corporate development at Fortune 500 companies. He currently sits on the board of directors for a TSX listed exploration company

Robin Borley – SVP Mine Development has over 25 years of diverse experience in resource project management, evaluation, exploration and mine development across Southern Africa, most recently as a managing director of the mining consultants DRA Mineral Projects.

Quentin Yarie – SVP Exploration is a professional geophysicist (P.Geo) and has a range of exploration and business development experience spanning over 30 years. He is currently President and CEO of a number of TSX-listed exploration companies.

Roland Fok Seung – Madagascar Country Manager is a chartered accountant and has been Energizer's in-country manager for the last five years.

Ticker: EGZ CN	Share price	C$0.13 /sh	Stock rating:	SPEC BUY	Implied return:	140%
Analyst: Filipe Martins	Market cap	C$33m	Target price:	C$0.30 /sh	Market P/NAV	0.15x

Year to June

Ratio analysis	FY13A	FY14E	FY15E	FY16E	FY17E
Average shares outstanding (m)	164.5	266.1	266.1	266.1	266.1
EV (US$m)	17.1	29.6	55.7	178.6	228.1
Adj. EPS (USc/sh)	(4.9)	(4.1)	(1.0)	(5.9)	(17.2)
CFPS before work cap (USc/sh)	(4.1)	(3.7)	(0.7)	(5.5)	(3.5)
FCF PS before work cap (USc/sh)	(4.4)	(3.2)	(9.8)	(46.2)	(18.6)
PER (x)	-	-	-	-	-
EV/EBITDA (x)	-	-	-	-	8.8
P/CFO (x)	-	-	-	-	-
P/FCF (x)	-	-	-	-	-
ROCE (%)					
Income statement (yr to Jun)	**FY13A**	**FY14E**	**FY15E**	**FY16E**	**FY17E**
Revenue (US$m)	-	-	-	-	66.9
COGS (US$m)	-	-	-	-	(38.6)
D&A (US$m)	(0.0)	(0.0)	-	-	(36.0)
Gross profit (US$m)	**(0.0)**	**(0.0)**	-	-	**(7.7)**
Exploration expense (US$m)	(3.7)	(5.3)	(0.5)	-	-
Corporate expense (US$m)	(4.4)	(4.0)	(2.5)	(2.9)	(2.5)
Investment income (US$m)	0.3	0.1	0.3	-	-
Finance costs (US$m)	-	-	-	(12.8)	(35.6)
Earnings before tax (US$m)	**(7.8)**	**(9.2)**	**(2.7)**	**(15.7)**	**(45.8)**
Tax (US$m)	-	-	-	-	-
Net income (US$m)	**(7.8)**	**(9.1)**	**(2.7)**	**(15.7)**	**(45.8)**
EBITDA (US$m)	*(8.1)*	*(9.3)*	*(3.0)*	*(2.9)*	*25.9*
Cash flow (yr to Jun)	**FY13A**	**FY14E**	**FY15E**	**FY16E**	**FY17E**
Profit before tax for period (US$m)	(7.8)	(9.2)	(2.7)	(15.7)	(45.8)
Depreciation (US$m)	0.0	0.0	-	-	36.0
Change in work cap (US$m)	(0.6)	1.2	-	(3.1)	(5.2)
Other (US$m)	1.2	0.9	0.9	0.9	0.5
CFO (US$m)	**(7.3)**	**(7.0)**	**(1.8)**	**(17.9)**	**(14.5)**
Purchase of PP&E (US$m)	(0.0)	-	(24.3)	(105.0)	(35.0)
Net finance income (US$m)	0.1	0.1	-	-	-
Other (US$m)	-	-	-	-	-
CFI (US$m)	**0.1**	**0.1**	**(24.3)**	**(105.0)**	**(35.0)**
Proceeds of share issue (US$m)	4.1	9.7	-	-	-
Warrants excercised (US$m)	0.1	-	-	-	-
CFF (US$m)	**4.2**	**9.7**	-	-	-
Net change in cash (US$m)	(3.0)	2.8	(26.1)	(122.9)	(49.5)
Balance sheet (yr to Jun)	**FY13A**	**FY14E**	**FY15E**	**FY16E**	**FY17E**
Cash and cash equiv. (US$m)	0.8	3.6	(22.5)	(145.3)	(194.8)
AR (US$m)	0.2	0.3	0.3	1.3	6.5
Inventory (US$m)	-	-	-	1.4	7.1
PP&E (US$m)	0.0	0.0	24.4	129.4	128.3
Other (US$m)	0.1	0.1	0.1	0.1	0.1
Total Assets (US$m)	**1.2**	**4.0**	**2.2**	**(13.2)**	**(52.8)**
AP (US$m)	0.8	2.1	2.1	1.4	7.1
Current debt (US$m)	-	-	-	-	-
Provisions (US$m)	-	-	-	-	-
Share capital (US$m)	75.5	86.1	87.0	87.9	88.4
Accum. earnings (US$m)	(75.1)	(84.3)	(87.0)	(102.6)	(148.4)
Other (US$m)	0.0	0.1	0.1	0.1	0.1
Total Liabilities and Equity (US$m)	**1.2**	**4.0**	**2.2**	**(13.2)**	**(52.8)**

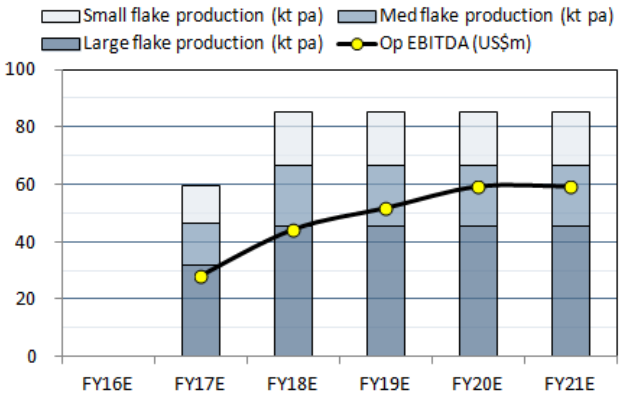
Year to June

Inputs	FY13A	FY14E	FY15E	FY16E	FY17E
Large flake price (US$/t)	1,380	1,250	1,250	1,250	1,300
Med flake price (US$/t)	1,110	1,050	1,050	1,050	1,090
Small flake price (US$/t)	960	900	900	900	935
USD/CAD f-x rate	0.97	0.92	0.91	0.91	0.91
Other data					
Basic shares (m)	266.1			12M high:	C$0.28/sh
Fully diluted shares (m)	294.6			12M low:	C$0.11/sh

Resource / Reserve	Tonnes	%C	C (Mt)	Attrib. C	EV/t
Resource (M&I + Inf)	124	6.34	7.9	7.9	3.2
GMPe reserves (P+P)	32	7.50	2.4	2.4	10.4

Production (100% basis)	FY16E	FY17E	FY18E	FY19E	FY20E
Large flake prod'n (000t)	-	40	59	63	68
Med flake prod'n (000t)	-	16	23	25	27
Small flake prod'n (000t)	-	12	17	19	20
Total flake prod'n (000t)	-	**60**	**85**	**85**	**85**
C1 cash costs (US$/t)	-	395	390	390	390
C1 + transport (US$/t FOB)	-	637	633	635	637
Op EBITDA margin (%)	-	*42%*	*45%*	*49%*	*52%*

**C1=mining, processing, site SG&A; Transport costs = road haul + ship loading*



Estimate share valuation	O/ship	US$m	NAVx	US$m	C$/sh
Molo	100%	195	0.40	78	0.29
Exploraiton	100%	50	0.40	20	0.07
Cash	-	5	0.40	2	0.01
Debt	-	-	0.40	-	-
Options	-	7	0.40	3	0.01
SG&A and central costs	-	(40)	0.40	(16)	(0.06)
Valuation (fully diluted)		**217**	-	**87**	**0.32**

Valuation sensitivities (C$/sh) to graphite flake price deck:					
To discount rate	*-20%*	*-10%*	*0%*	*+10%*	*+20%*
11% discount	0.14	0.21	0.27	0.35	0.41
10% discount	0.17	0.25	0.32	0.40	0.48
9% discount	0.20	0.29	0.38	0.47	0.56
To NAVx @ 10%	*-20%*	*-10%*	*0%*	*+10%*	*+20%*
0.30xNAV	0.13	0.19	0.24	0.30	0.36
0.40xNAV	0.17	0.25	0.32	0.40	0.48
0.50xNAV	0.21	0.31	0.41	0.50	0.60

Source: Company data, GMP

APPENDIX: GRAPHITE MARKET

Graphite is a polymer of carbon that is used in over 180 applications, including a number of high-end industrial applications, because of its thermal, electrical and self-lubricating properties. At present, the global graphite market is estimated at ~2.2Mtpa, with an even split between natural *(in situ)* and synthetic (manmade) graphite.

Natural graphite

Over ¾ of natural graphite is used in industrial applications, with refractories accounting for ~40% of overall demand. The natural graphite market was an estimated~1.1Mt in 2013, comprising 55% flake, 45% amorphous and the balance, vein graphite. Global output now stands at ~0.8–1.2Mt with the product splits remaining largely unchanged. Natural graphite has no substitutes in its biggest end market, refractories, and is considered a critical mineral under the EU's classification methodology. China is both the world's biggest producer (~80%) and exporter of natural graphite, with Brazil (~10%) and India (~3%) the next biggest, albeit more domestic-oriented, producers.

Natural and synthetic graphite summary

	Natural Graphite			Synthetic Graphite
	Amorphous	***Vein***	***Flake***	
Grade C (%)	70-85%	>90%	>85%	Any
Quality	Low	High	High	Low-High
Form	Lump / powder	Lump / powder	Flake	Shapes / powder
Main countries of production	China / Austria / Mexico	Sri Lanka	China / Brazil / India	Worldwide
Dominant uses	Lubricants / forging	Refractories	Refractories / Industrials	Electrodes
Total estimated market size (kt)	600	10	500	1,100
Pricing (U$/t)	150 - 500	1,950	1,500 - 2,200	500-2,000

Source: Industrial Minerals, GMP

Worldwide graphite production numbers include the three main forms of natural graphite – (i) vein, (ii) flake and (iii) amorphous. Amorphous and flake dominate volumes, but it's flake and vein grades that command the highest prices because of their unique characteristics, which make them suitable for high-end application. Flake graphite is high purity and the most sought after product produced today, with the carbon content ranging from 85–97%. The flake morphology provides physical strength to refractory bricks and also feedstock for spherical graphite used in battery products. Production is split by flake size between large (+80mesh), medium (80–100 mesh) and small (>100mesh), with larger flake fetching a premium price. Today, flake graphite sells for US$2,200–1,000/t CIF into Europe, whereas amorphous trades for generally US$150–500/t. Over the last ~5 years, flake has typically sold at a ~2.5x premium to amorphous.

Amorphous graphite is generally higher in impurities and contains a lower distribution of flake size, with deposits typically forming in very large tonnages with product grades of 75–85% vs. the +90% carbon purity of other natural graphite types. Due to this, amorphous typically has to compete with other coke alternatives in lower quality carbon applications. Vein graphite is a very small proportion of the natural graphite market (<1%) and is only mined commercially in Sri Lanka. As a simplistic comparison, this is like a DSO iron ore with no beneficiation required.

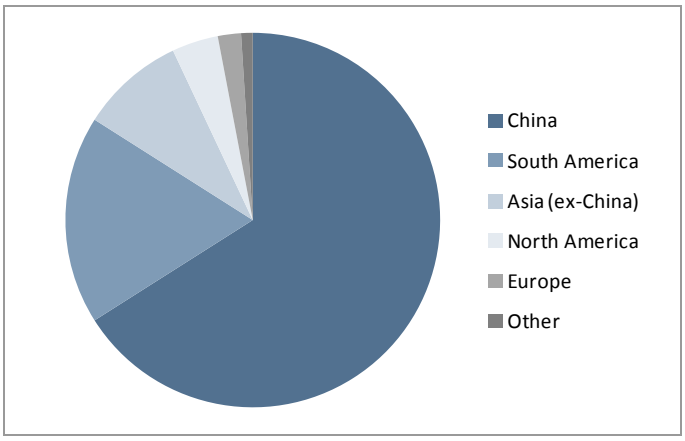
Synthetic graphite

Synthetic graphite is a man-made form of graphite that is sometimes referred to as artificial graphite; it is formed by the high temperature processing of amorphous carbon material at a cost of ~US$1,000/t. It can be formulated for an entire range of % C similar to natural graphite, and of the ~1.1Mt market size, the two dominant uses are in synthetic graphite electrodes and synthetic carbon. Due to the cost of production and product flexibility, synthetic graphite can be sold at a range of prices.

Supply

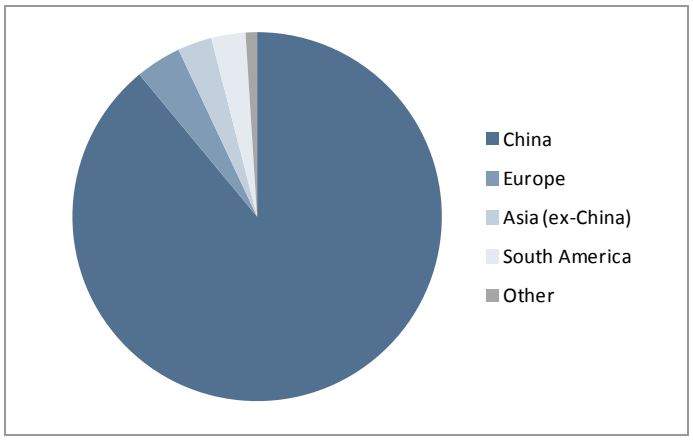
Supply in the graphite market is dominated by China, which produced an estimated 68% of global graphite in 2013, dominating both the flake and amorphous markets with 100% of vein graphite currently produced in Sri Lanka. However, it should be noted that vein production volumes and quality can vary and that this comprises a tiny portion of global supply.

World flake graphite production 2012 by region



Source: Industrial Minerals

World amorphous graphite production 2012 by region

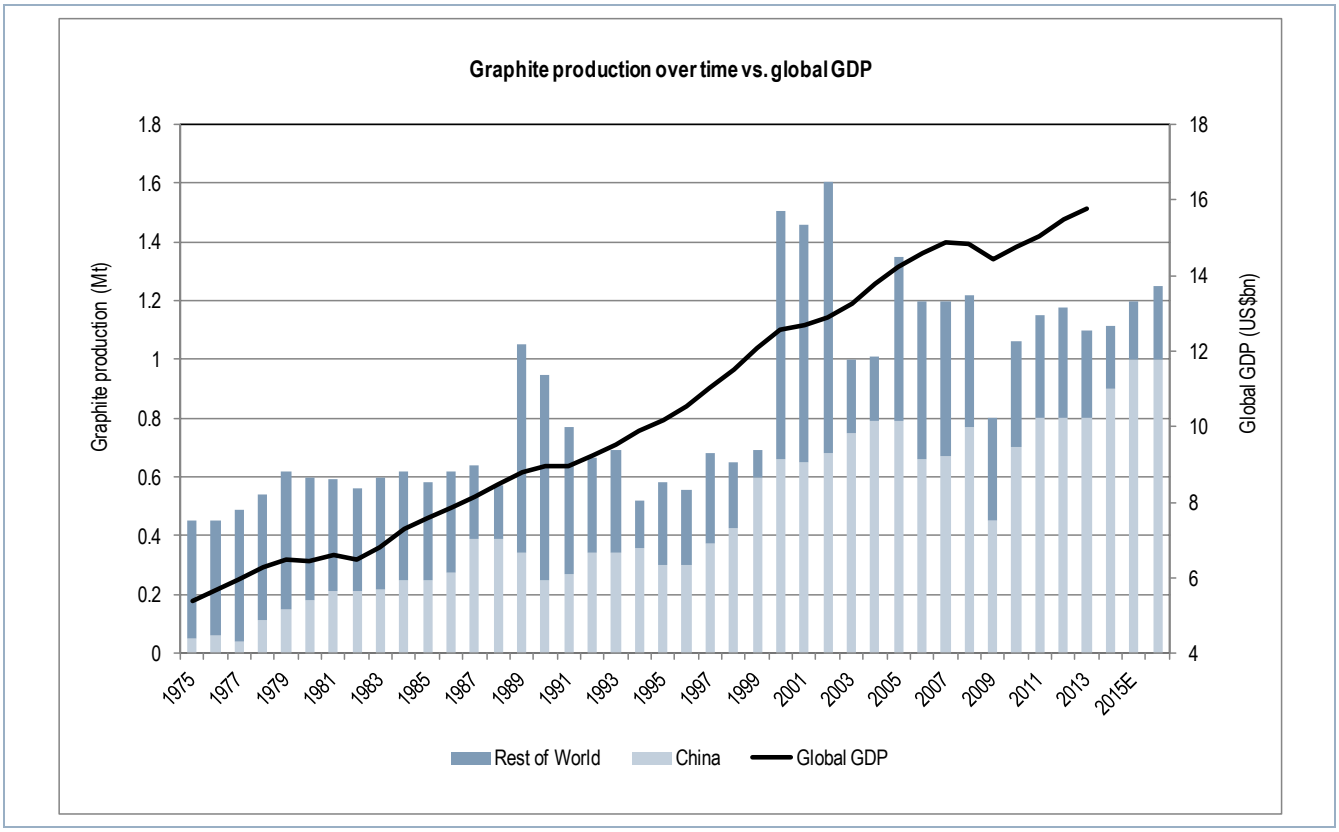


Source: Industrial Minerals

China's flake graphite output has been stable for some time, but most miners there are domestically oriented with few actually selling into western graphite end users. Similarly to India and despite steps to consolidate the country's flake graphite industry, it is still very fragmented and dominated by a handful of small miners with production capabilities ranging from ~1,000 to 6,000tpa. Flake miners serve the domestic refractory markets whose fortunes are very much linked to the country's growing steel industry. That said, global steel demand has grown at ~8% CAGR over the last decade with estimates that this may be higher within China.

China's lake production is in decline and facing a number of challenges as ore quality declines, production costs rise and the central government tries to halt environmentally damaging mining operations. Due to this and predicted demand increases, we estimate that there is capacity for ~200kt of new graphite supply over the next five years. Industry observers have noted that China may have some capacity to increase flake production, despite capping amorphous production in 2012, but exports may be capped as the government looks to encourage beneficiating and processing in country.

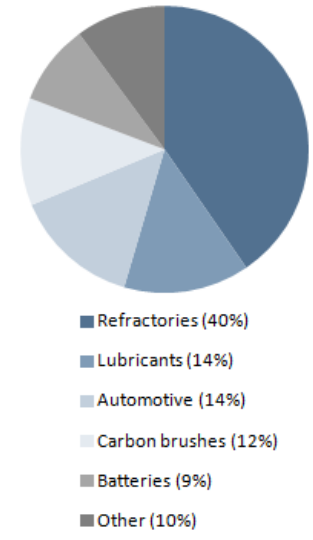
Graphite production over time



Source: Industrial Minerals, GMP

In terms of synthetic graphite supply, although there is an abundance of raw materials for the process, such as the residual products of the oil-refining process, the energy-intensive nature of the process means that China again dominates supply due to the cheap power and labour in country. Other global supply is small scale and dominated by specialist providers in Europe covering local demand.

Current graphite demand by sector



Source: Industrial Minerals

Demand

Global graphite demand is currently around 2.2Mtpa, with end-use applications largely driven by the carbon purity of the product. Overall graphite demand has risen over the last 20 years at a CAGR of 4% in a similar trend when compared to GDP rising at a 2.5% CAGR over the same period. Flake graphite is generally the most in-demand product as it is used in industrial applications for conductivity and heat resistance, with uses such as battery anodes requiring high graphite grades of 85–95%.

The most common end use for graphite, representing 40% of demand, is from steel refractories where graphite forms a protective insulator. This requires mostly medium and large flake, and importantly, this market is protected as synthetic graphite cannot be used as a substitute. Both automotive parts and lubricants account for 14% of demand, with carbon brushes used in electrical motors forming 12%. The fastest growing demand sector for graphite is battery anodes that currently only make up 9% of the total graphite demand and is expected to grow at 9% pa in the coming years, which equates to ~1% of global demand.

Potential growth markets

- Li-ion batteries now form 15% of the battery market and industry insiders estimate that this will have a 30–40% annual growth, equivalent to ~5kt pa of at a minimum medium diameter flake graphite, with larger flake preferred.

- Automotive industry, with electric vehicle companies planning to increase electric vehicle manufacturing with market predictions that Tesla alone could by 2020 represent 126kt of flake graphite, a 152% increase in current battery consumption.

- Consumer electronics use graphite foil made exclusively from extra-large, *jumbo*, flake (+50 mesh) for screens and touch pads, an application which can only use natural graphite; demand is currently 6% and is expected to grow exponentially as developing nations increase use of these electronics.

- Emerging energy technologies are also a potentially important growth market, albeit one that has not been quantified to date. These include stationary fuel cells, vanadium redox batteries and pebble bed nuclear reactors.

- Graphene is often quoted by the graphite industry as an emerging market but this will not be a volume driver for graphite and will firmly remain as a niche R&D product for at least the next 5–10 years.

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