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Metals & Mining Research

Best Undeveloped Projects

November 2022

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Cover Photo

Cover photo is Leo Lithium's Goulamina Project in Mali (source LLL)

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This year's BUPs includes more projects than in previous years

Low costs and high margins are key selection criteria, ensuring wider investor and funding appeal

The commodity spread of BUPs projects reflects an ongoing focus on the decarbonisation theme

We discuss the supply side reality in this year's BUPs, which threatens to derail the "net zero" trajectory

Could the long downward trend in real commodity prices be over?

Important Disclosures:
Please refer to important disclosures for AUC, BEM, BKY, CTM, DEG, EV1, GL1, LM8, NXG, ORR, PDI and other disclosures from page 114

Argonaut's Best Undeveloped Projects

Argonaut has completed its 2022 analysis of the best undeveloped projects (BUPs) in the metals and mining sector that are majority owned by ASX listed companies.

Selection criteria: Our 'bottom-up' approach is generally management agnostic although we apply some commodity and jurisdictional filters where we see unacceptable risk.

We use the following selection criteria to identify projects for BUPs:

1. Development stage between scoping study and pre-commercial production
2. An Internal Rate of Return (IRR) exceeding 25%
3. Profitable through all market/commodity price cycles (assumed 7 years)
4. A high likelihood of achieving >$100m project valuation within 24 months
5. The stock must have a market capitalisation less than A$5b

Selection focus: The focus of this book is on project quality. Inclusion does not necessarily imply a corporate level opinion, recommendation, or valuation, although we provide this detail if the stock is covered. That said, we continue to measure stock share price performance against relevant indices.

High margin, low risk: The key criterion for BUPs projects is low cost, high margin assets with the capability to maintain strong financial returns through the commodity price cycle. The quality of such projects enables a broader range of financing options and underpins likely development as well as increasing M&A appeal. We introduce some flexibility with regard to the pricing of commodities emerging due to the recent shift to "clean energy".

2021 BUPs project progression: BUPs selection is based on project quality not corporate value at a point in time, so ensuing project development is the key outcome to monitor. Pleasingly, all 2021 BUPs projects made good progress towards or through development.

2021 BUPs performance: A strong start to the year saw the share prices of project owners climb. At their peaks the BUPs list was up 46% and all stocks across both lists were in positive territory. As global sentiment changed the "risk off" attitude and a more difficult funding environment hurt explorers and developers in particular. Performance waned and BUPs companies ended the 12-months down 17%. Lithium exposure delivered the only positive share price return.

Key 2022 themes: Last year's BUPs focused on the demand side, specifically commodities exposed to decarbonisation. In 2022 we turn our attention to supply side reality, which we expect will prove inconvenient to the lofty requirements under a "net zero" trajectory.

Underinvestment in exploration has slowed discoveries. Even with success, the lag from discovery to production can take decades. Short-term uncertainty, jurisdictional and supply chain risks, and ironically the intense focus on environmental issues, compounds the supply-response problem. We speculate that the century long downward trend in real commodity prices is over. We shine a spotlight on lithium, uranium, and gold in our thematic analysis, and introduce our approach to the ESG issues that are a focus for both miners and their investors.

2022 Best Undeveloped Projects & Special Mentions

Best Undeveloped Projects

Based on our criteria, a list of thirteen projects have been selected for our 2022 BUPs as shown in Table 1 below.

Table 1: 2022 Best Undeveloped Projects

Company	Project	Ticker	Commodity	Location	Market Cap A$m	Cash A$m	Debt A$m	EV A$m
2022 Best Undeveloped Projects								
Bellevue	Bellevue	BGL	Gold	Australia	795	77	-	718
Berkeley Energia	Salamanca	BKY	Uranium	Spain	118	84	-	35
Centaurus Metals	Jaguar	CTM	Nickel	Brazil	406	47	-	359
De Grey	Mallina	DEG	Gold	Australia	1,718	167	-	1,551
Leo Lithium	Goulamina	LLL	Lithium	Mali	766	72	-	695
Liontown	Kathleen Valley	LTR	Lithium	Australia	4,283	420	-	3,863
NexGen Energy	Rook I	NXG	Uranium	Canada	3,135	177	99	3,057
Nico	Wingellina	NC1	Nickel	Australia	47	9	-	38
OreCorp	Nyanzaga	ORR	Gold	Tanzania	126	26	-	100
Peak Rare Earths	Ngualla	PEK	Rare Earths	Tanzania	87	5	-	82
Perseus	Block 14	PRU	Gold	Sudan	2,570	548	39	2,061
Sovereign Metals	Kasiya	SVM	Rutile	Malawi	202	16	-	187
West African	Kiaka	WAF	Gold	Burkina Faso	1,083	171	16	927

Source: Company data, FactSet, Argonaut Estimates

Stock Market capitalisation as at 8 November 2022. Cash and debt are generally as of 30 September 2022 unless later dated information available.

As befitting the best projects, all of them have attractive metrics based on feasibility studies and/or Argonaut calculations. As shown in Table 2, Internal Rates of Return (IRR) average 47% and range between 25% and 83%. There are some higher risk locations for projects on the list, although the biggest capex requirements are mostly for those projects located in lower risk jurisdictions.

Table 2: Best Undeveloped Projects metrics and feasibility assumptions

Project	Ticker	Commodity	Location	Project NPV (A$m)	Disc. Rate %	IRR (%)	Capex A$m	First Prod'n (Year)	Country Risk
Bellevue	BGL	Gold	Australia	943*	5%	68%	248	2023	Low
Salamanca	BKY	Uranium	Spain	824	8%	60%	233	2027(?)	Moderate
Jaguar	CTM	Nickel	Brazil	1,204	9%	37%	560	2025	Moderate
Mallina	DEG	Gold	Australia	1,890	7%	36%	1,053	2025	Low
Goulamina	LLL	Lithium	Mali	4,150	8%	83%	395	2025	High
Kathleen Valley	LTR	Lithium	Australia	4,200	8%	57%	473	2024	Low
Rook I	NXG	Uranium	Canada	4,802	8%	60%	1,301	2027	Low
Wingellina	NC1	Nickel	Australia	3,400	8%	35%	2,200	2027	Low
Nyanzaga	ORR	Gold	Tanzania	631	8%	30%	734	2025	High
Ngualla	PEK	Rare Earths	Tanzania	1,796	10%	37%	497	2025	High
Block 14	PRU	Gold	Sudan	500	7%	27%	619	2025	High
Kasiya	SVM	Rutile	Malawi	1,834	9%	62%#	524	2027	High
Kiaka	WAF	Gold	Burkina Faso	560	7%	25%	470	2025	High

Source: Company data, FactSet, Argonaut Estimates

Project NPV calculations are on a 100% basis after royalties and free carried interested

** NPV from FS2, does not factor in project update figures in June 2022*

 # IRR relates to Stage 1

Special Mentions

We list in Table 3 below twelve Special Mention companies which have either not reached the study phase, or do not meet all of our criteria at this point. Inclusion means we expect to see some of these projects progressing to our BUPs main list in coming years.

Table 3: 2022 Special Mentions

Company	Project	Ticker	Commodity	Location	Market Cap A$m	Cash A$m	Debt A$m	EV A$m
2022 Special Mentions								
Agrimin	Lake Mackay	AMN	Potash	Australia	108	4	-	103
Ausgold	Katanning	AUC	Gold	Australia	89	9	-	81
Auteco	Pickle Crow	AUT	Gold	Canada	87	11	-	76
Black Earth	Maniry	BEM	Graphite	Madagascar	27	4	-	22
Chalice	Julimar	CHN	PGE	Australia	1,626	115	-	1,510
Evolution Energy	Chilalo	EV1	Graphite	Tanzania	52	15	-	37
Global Lithium	Manna	GL1	Lithium	Australia	619	80	-	539
Ionic Rare Earths	Makuutu	IXR	Rare Earths	Uganda	167	23	-	144
Lunnon Metals	Kambalda	LM8	Nickel	Australia	151	28	-	124
Patriot Battery Metals	Corvette	PMET	Lithium	Canada	442	33	-	409
Predictive	Bankan	PDI	Gold	Guinea	299	50	-	249
Technology Metals	MTMP	TMT	Vanadium	Australia	73	15	-	58

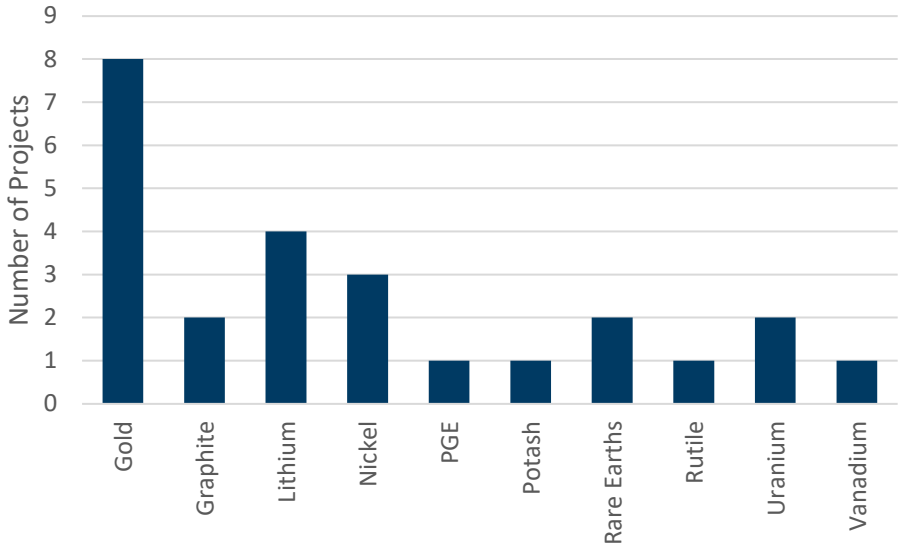
Source: Company data, FactSet, Argonaut Estimates

Stock Market capitalisation as at 8 November 2022. Cash and debt are generally as of 30 September 2022 unless later dated information available.

Commodity and Country Splits

Despite gold projects in BUPs delivering lacklustre performance over the last two years, we continue to make a strong case for the metal (refer discussion later in this section). Of the 25 projects included on both lists this year, 8 of them (or 32%) are gold-related. However, there are also tailwinds behind other metals, particularly those exposed to long-term global growth and the decarbonisation thrust. We have two or more projects with exposures to key battery related commodities like graphite, lithium, nickel, and rare earths. We also expect uranium to move more into the spotlight as realisation hits that it needs inclusion in a portfolio of energy options in order to stand a chance of meeting "net zero" goals.

Figure 1: 2022 BUPs & Special Mentions Commodity Splits by Number of Projects



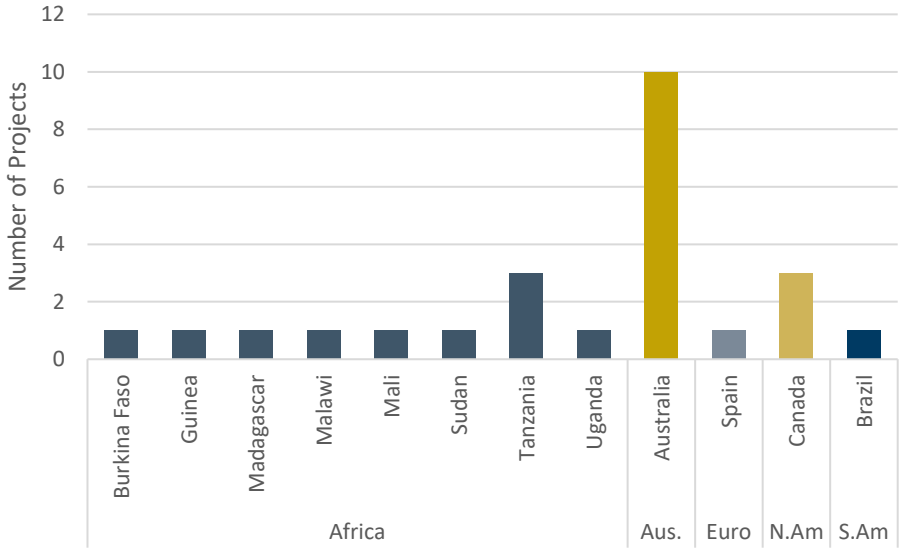
Source: Argonaut

It is worth noting how difficult it was to find an undeveloped copper project that met our return and risk criteria for this year's BUPs, despite our attraction to the metal given its broad usage and importance in the decarbonisation drive. It is a relevant case in point that drives much of our supply side reality discussion in this year's BUPs.

Given we're limited to ASX-listed companies in this book, it's unsurprising that the bulk of the projects (40%) are located in Australia. Only three of the ten Australian projects are gold related however, with others exposed to potash, PGE's, lithium, nickel and vanadium. Once again we find Africa to be a happy hunting ground for quality projects. Although risk is typically higher in this part of the world, so too are the potential rewards. Projects are located across the continent, although of the ten we have three in Tanzania (one graphite, one gold, and one rare earths) on the basis the Government expressed support for foreign investment into the mining industry is maintained.

Europe gets a look in this year with a reinvigorated uranium project in Spain and we include only one South American project in Brazil. Australian companies have typically found it difficult going in South America, but the nickel project identified in this year's BUPs is well worthy of inclusion. Finally, we have three projects located in Canada (one gold, one uranium, and one lithium).

Figure 2: 2022 BUPs & Special Mentions Regional/Country Splits by Number of Projects



Source: Argonaut

2021 Best Undeveloped Projects Review

Project Performance

BUPs selection is based on project quality not the corporate owner's value at a point in time, so ensuing project development is the key outcome to monitor. Table 4 below highlights the progression of the projects included in our 2021 book over the last year.

All 2021 BUPs projects made good progress towards or through development. Of the nine projects on the BUPs list, one project has achieved practical completion (Pantoro's and Tulla's Norseman project), one is well into development (Sandfire's Motheo project), one's development is underway (Leo Lithium's Goulamina project), and four are planning to release a DFS and/or commence development within the next year (Centaurus's Jaguar, De Grey's Mallina, Genesis's Ulysses and OreCorp's Nyanzaga projects). The other two (Black Earth's Maniry and NexGen's Rook I projects) continue to progress through feasibility and approvals.

The 2021 Special Mention projects tend to be earlier stage. All of these projects progressed through the last year (refer to table for detail), and noteworthy was the acquisition of Bardoc by St Barbara during the period.

Table 4: 2021 BUPs Project Progress

Project	Status October 2021	Progress to Date
2021 Best Undeveloped Projects		
Maniry (BEM)	Commenced DFS, expected completion Q2 2022 with production by May 2023. JV Agreement signed with Metachem Manufacturing Company to develop expandable graphite.	Large increase to Mineral Resource (20.2Mt @6.5% TGC to 40Mt @6.5% TGC). Updated Scoping Study released December 2021. Received maiden independent Environmental, Social and Governance ("ESG") rating from Digbee ESG. Commenced a Scoping Study to build battery anode material plant (producing graphite as required for Li batteries).
Jaguar (CTM)	Scoping Study released in March 2021. Value-add Scoping Study released May 2021.	Lodgement and updating of permitting. $75M raised in January 2022 to accelerate development of Jaguar. Updated MRE released in November 2022. DFS planned for release H1 2023. Then a push towards FID.
Mallina (DEG)	Major exploration campaign and additional discoveries (Diucon and Eagle). Maiden Mineral Resource Estimate released June 2021. Scoping Study released 4Q 2021. Board approval to advance PFS.	$125M placement in October 2021 in order to fund PFS. 25% Resource increase at Hemi (Mallina total of 10.6Moz @ 1.2g/t Au). PFS released September 2022. $130M placement in October 2022. Fully funded to DFS, including drilling, technical studies and pre development activities. DFS scheduled for June Quarter 2023.
Goulamina (LLL)	Full form legal agreements executed with Ganfeng in August 2021- a key step in completing the up to US$194M Goulamina JV Transaction. This was subsequently approved by the Malian Government in September 2021.	Goulamina DFS update in December 2021, with an NPV of A$4.1B and an 83% IRR. JV with Ganfeng provides project with US$130M equity funding, up to US$64M in debt, and offtake secured. In January 2022 a Final Investment Decision (FID) for the Project was approved. Completion of Leo Lithium spin out with commencement of trading in June 2022.
Ulysses (GMD)	Extensive Resource growth - Ulysses deposit had grown from 0.15Moz to 0.84Moz between 2016 and 2021. $26M invested in exploration during the 3 years 2018-2021.	Reported a 25% increase (+400koz) to the Leonora Resource (reaching 2Moz). Acquisition of Dacian Gold and subsequent $100M capital raising announced during July 2022. Aiming to commence mine development at Ulysses in the June quarter CY 2023.
Rook I (NXG)	Feasibility Study released February 2021.	In July 2022 the Canadian Nuclear Safety Commission (CNSC) accepted the Rook I Draft Environmental Impact Statement (EIS) for technical review and public consultation. Permitting continues to advance.

Project	Status October 2021	Progress to Date
2021 Best Undeveloped Projects (continued)		
Nyanzaga (ORR)	Special Mining License (SML) Cabinet approval in June 2021. Raised $56M to fund predevelopment activities. DFS expected 2Q 2022 and construction to start 3Q 2023.	In April 2022, Mining Licenses were granted, and transfer of environmental certificate was completed. DFS completed in August 2022, demonstrating a post-tax NPV of US$618M and an IRR of 25%. Construction expected to commence mid-2023 and first gold pour targeted for first half of CY2025. Regional exploration ongoing.
Norseman (PNR)	PNR completed $50M of sole expenditure obligations. PNR fully funded for share of development. Approvals granted and construction underway.	Completed a $45M placement to fund the advancement of Norseman and further exploration. Scotia Reserve and Resource update released in April 2022, followed by a Green Lantern Reserve and Resource update in August 2022. Practical completion of 1Mtpa Processing Facility in September 2022. Additional $25M raised in October 2022 to support ramp up and working capital. U/G and O/P mining are now underway with first gold poured in October 2022.
Motheo (SFR)	T3-Motheo DFS completed in December 2020. During July 2021, SFR received a Mining License for Motheo, granted by the Government of Botswana.	In April of 2022, SFR's contracting partner, African Mining Services (AMS), commenced open pit mining operations. Construction of a 750-room mine village and 132kV power line continues to advance. 5.2Mtpa Motheo Expansion DFS completed in August of 2022, with Cu production planned to peak at 55ktpa. First production scheduled for June Q of 2023.
2021 Special Mentions		
Lake Mackay (AMN)	Native Title Agreement signed in November 2017. Awarded Major Project status by the Australian Federal Government in May 2020. DFS completed in July 2020. First binding offtake signed in May 2021 with Sinochem.	In November 2021 Front End Engineering Design ("FEED") work delivered an 84% renewable energy penetration rate. In January 2022 the Company announced a 115,000tpa Binding Offtake Agreement with Nitron Group LLC, a leading global trader of fertilisers (7-year term). Environmental Assessment underway with indicative approval early 2023. Construction start anticipated in 2023.
Pickle Crow (AUT)	Current Mineral Resource 1.71Moz Au. Existing infrastructure at site includes a processing plant (which was never commissioned), a 24-person camp, 600kw generator and a Core facility.	Resource increase of 30% (+500koz) to 2.23Moz at 7.8g/t in February 2022. Currently undertaking a 50,000m drill campaign targeting Pickle Crow itself and regional targets.
Bardoc (BDC)	DFS Announced in March 2021. Optimisation Study released during September 2021. FID had been deferred due to tight markets for materials and labour.	Acquisition by St Barbara Ltd announced in December 2021. Transaction valued at $157M in St Barbara scrip.
Toliara (BSE)	Enhanced DFS completed in September 2021. Increased mining rates underpinned by a significant increase in Ranobe's Ore Reserves estimates (+45% increase in contained Heavy Minerals (HM) to 55Mt at 6.1%) sufficient to support a 38 year mine life.	Discussions with the Government of Madagascar on the fiscal terms applicable to the Project progressed substantially during the year and are now at an advanced stage, with a clear pathway for agreement to be reached. Suspension of on-ground-activities have since been lifted.
Julimar (CHN)	Maiden Mineral Resource Estimate was expected 4Q 2021. Scoping Study was expected 1H 2022.	Commenced drill testing using low-impact drilling north of Gonneville in the State Forest. In July 2022 Gonneville Resource estimate increased to 2Mt NiEq or 20Moz PdEq. Study work ongoing with Scoping Study planned for release December 2022.

Project	Status October 2021	Progress to Date
2021 Special Mentions (continued)		
Costa Fuego (HCH)	Commencement of Costa Fuego PFS.	Finalisation of Offtake Agreement with Glencore for future copper concentrate. Covers 60% of copper concentrate from Costa Fuego for 8 years from start of commercial production. In March HCH published a MRE update with 67% increase in Indicated Resources (M&I Resource of 3.41Mt CuEq). Scheduled to deliver PFS by Q1 2023.
Kathleen Valley (LTR)	PFS released in October 2020.	DFS released November 2021 demonstrating a Post Tax $NPV_{(8\%)}$ of A$4.2B and an IRR of 57%. Native Title Agreement signed November 2021.Offtake signed with LG Energy Solution January 2022. Entered into a supply agreement with Tesla February 2022. Offtake agreement signed with Ford Motors June 2022. Final Investment Decision made to commence construction (first production scheduled for Q2 2024).
Browns Range (NTU)	Production of heavy rare earth carbonate in late 2018 as part of a three year pilot assessment of economic and temporary technical feasibility of a larger scale development at Browns Range.	Review being conducted in relation to strategy for downstream processing. Ongoing feasibility work for full scale beneficiation plant. Supply agreement signed with Iluka Resources providing for Browns Range REO concentrate to be processed at Iluka's Eneabba plant.
Bankan (PDI)	Kaninko, Saman, Bokoro and Argo Exploration Permits all in good standing. Defined Resource of 3.65Moz. Predictive had undertaken a baseline social study and were nearing completion of a baseline environmental study.	Infill and regional exploration drilling ongoing. Increase in Bankan Resource to 4.2Moz (1.65g/t). Small grade control RC programme at surface at NE Bankan demonstrating good continuity. Environmental studies ongoing.
Kasiya (SVM)	Maiden Mineral Resource Estimate released. Scoping Study underway (DRA). Study on logistics & infrastructure completed to inform Scoping Study.	Reported initial and then expanded Scoping Studies. Updated MRE confirmed the deposit as one of the world's largest rutile Resources. Ongoing metallurgy and technical studies continue to support a robust, long life operation. MoU signed with Mitsui & Co Ltd, establishing a marketing alliance and offtake for 30,000 tonnes of natural rutile p.a.

Source: Company announcements, Argonaut

Market performance

The share prices and market capitalisations of stocks in the 2021 BUPs list decreased 17% and 5% respectively over the 12 months to 31/10/22 (Table 5). In comparison the ASX Small Resources Index (which includes a far broader range of companies than those relevant for BUPs) and the ASX 200 were down 8% and 6% respectively. Best performance came from Leo Lithium (LLL), up 24% assuming zero value for Firefinch (FFX) from which it demerged. It's worth noting that Bardoc (BDC) would have been up 33% if calculated based on the implied scrip-based value of St Barbara (SBM) shares at the time it was acquired.

Table 5: 2021 BUPs performance

Company	Project	Code	Commodity	Price 31/10/22	Price Change	Peak Share Price	SOI Change	Mkt Cap Change
2021 Best Undeveloped Projects								
Black Earth	Maniry	BEM	Graphite	0.10	-18%	0.18	28%	5%
Centaurus	Jaguar	CTM	Nickel	0.94	-12%	1.53	19%	5%
De Grey	Mallina	DEG	Gold	1.06	-5%	1.44	10%	4%
Firefinch / Leo Lithium[1]	Goulamina	FFX / LLL	Lithium	0.62	24%	0.80	N/A	N/A
Genesis	Ulysses	GMD	Gold	1.15	-6%	1.95	84%	73%
NexGen	Rook I	NXG	Uranium	6.50	-13%	8.90	1%	-10%
OreCorp	Nyanzaga	ORR	Gold	0.32	-52%	0.85	1%	-51%
Pantoro	Norseman	PNR	Gold	0.14	-36%	0.42	16%	-26%
Sandfire	Motheo	SFR	Copper	3.48	-37%	7.43	0%	-37%
Simple Average					*-17%*			*-5%*
2021 Special Mentions								
Agrimin	Lake Mackay	AMN	Potash	0.37	-8%	0.59	13%	5%
Auteco	Pickle Crow	AUT	Gold	0.05	-40%	0.10	24%	-26%
Bardoc Gold / St Barbara[2]	Bardoc	BDC / SBM	Gold	0.18	-54%	0.55	N/A	N/A
Base	Toliara	BSE	Mineral Sands	0.25	-20%	0.36	0%	-20%
Chalice	Julimar	CHN	PGE	4.27	-35%	10.18	7%	-32%
Hot Chili	Costa Fuego	HCH	Copper	0.98	-59%	2.40	36%	-44%
Liontown	Kathleen Valley	LTR	Lithium	1.89	-1%	2.12	15%	14%
Northern Minerals	Browns Range	NTU	Rare Earths	0.04	-19%	0.07	3%	-17%
Predictive	Bankan	PDI	Gold	0.15	-21%	0.28	26%	-1%
Sovereign Metals	Kasiya	SVM	Rutile	0.39	-29%	0.79	11%	-21%
Simple Average					*-29%*			*-16%*

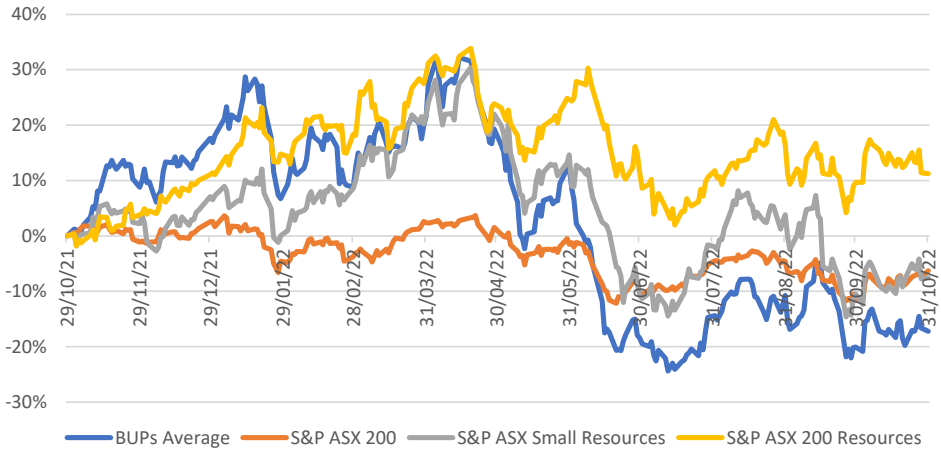
Price Change: For 12 month period to 31/10/2022; SOI: Shares on Issue. Source: Company data, FactSet, Argonaut Estimates
Note 1. LLL demerged from FFX on the basis of 1 LLL share for every 1.4 FFX shares. Calculation assumes no current value for FFX.
Note 2. SBM acquired BDC on the basis of 0.3604 SBM shares for every 1 BDC share. Calculation assumes BDC holders continue to hold SBM scrip.

It was a tale of two halves from a share price performance perspective. The BUPs and Special Mention portfolios performed strongly into 2Q 2022. At peak share prices the BUPs list was up 46% and all stocks across both lists were in positive territory. As global sentiment changed toward the middle of 2022 the "risk off" attitude and a more difficult funding environment hurt explorers and developers in particular. As shown in Figure 3 overleaf, the ASX 200 Resources (the constituents of which are mostly producing miners and oil & gas companies) fared comparatively much better since the middle of the calendar year.

Figure 4 overleaf suggests jurisdiction did not play a definitive role in share price performance, although we acknowledge a small dataset. Australian shares were marginally ahead of African shares (the latter helped by LLL performance) and ahead of performance out of the Americas. More telling on share performance was commodity exposure. Projects exposed to gold, copper and nickel fared the worst (down on average more than 30%), while lithium (unsurprisingly) delivered the only positive share price returns.

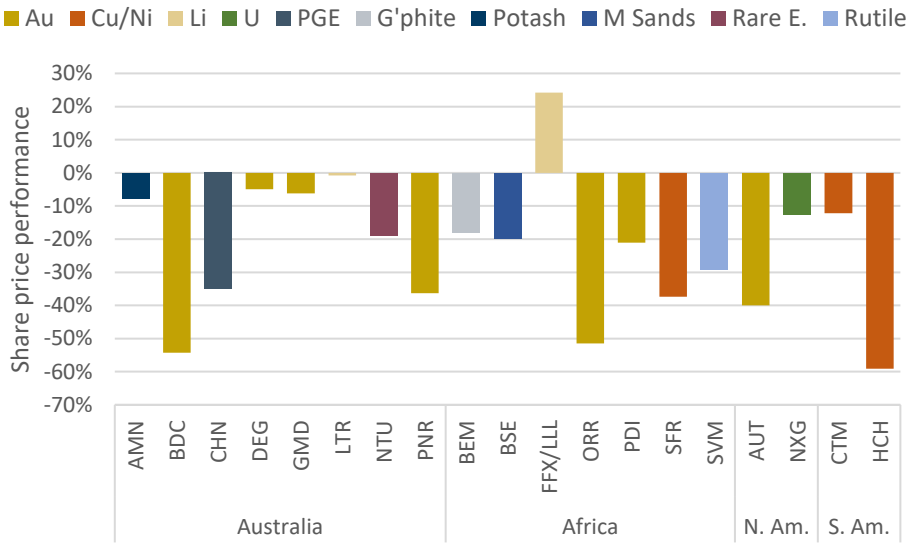
Over time the share prices of companies with BUPs projects have still delivered returns well ahead of the Small Resources and ASX 200 indices (see Figure 5 overleaf), with an average of 16% p.a. over an 8-year measurement period.

Figure 3: Argonaut BUPs share price performance vs ASX indices



Source: FactSet, Argonaut

Figure 4: 2021 BUPs performance by Commodity & Geography



Source: FactSet, Argonaut

Figure 5: BUPs performance over time

Year	Annual Performance			BUPs
	BUPs	Small Res.	S&P 200	Mkt. Cap (%)
2014	10%	-20%	-5%	27%
2015	62%	48%	3%	101%
2016	7%	17%	12%	85%
2017	-19%	6%	-2%	-11%
2018	34%	-7%	14%	59%
2019	51%	1%	-11%	74%
2020	-1%	46%	24%	10%
2021	-17%	-8%	-6%	-5%
Average	**16%**	**10%**	**4%**	**42%**

Source: FactSet, Argonaut

Shifting commodity focus – a recap

Last year's BUPs focus was on the commodities supportive of the energy transition

Last year's BUPs was focused on the shift towards those commodities supportive of the new energy paradigm and the move to net zero carbon emissions. We pointed out that the "business as usual" scenario and the "net zero by 2050" scenario delivered very different forecasts for specific commodities, but that either way demand for energy transition materials would grow significantly in the coming decades.

In summary, our key thoughts post this analysis were:

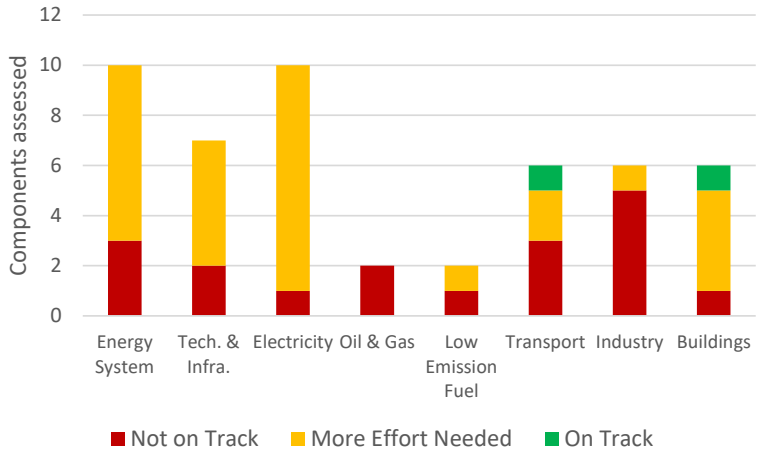
- The drive to zero carbon was in its infancy and we expected strong tailwinds behind "green" materials (see overleaf) to last decades
- Reality would fall somewhere between the "business as usual" scenario and the highly ambitious "net zero by 2050" scenario
- Innovation was likely to drive changes to existing technologies or introduce new ones, potentially leading to unpredictable commodity substitution
- Absent a dramatic technological breakthrough, fossil fuels would remain key components of the energy mix
- Investor focus should be on those commodities likely to be in demand regardless of technology, that are required to support energy transition infrastructure, and that demonstrate strong growth potential in both percentage *and* absolute terms
- Specifically:
    - We were attracted to copper, nickel, lithium (see "Spotlight on Lithium" later in this section), graphite, and cobalt
    - We thought uranium (see "Spotlight on Uranium" later in this section) would get a boost as an obvious emissions solution
    - Project quality was particularly important for small volume materials like rare earths

We highlighted that most demand side scenarios implied dramatically increased requirements for battery minerals

It is increasingly obvious that "net zero" by 2050 promises are much easier to make then execute

A year later, and confirming our view that 2050 promises are easier to make than execute, it is already clear that the timeline to "net zero" by 2050 is slipping. The International Energy Agency (IEA) tracks recent developments for components of the energy system it sees as critical to the "net zero by 2050" trajectory. As at July 2022 only two (electric vehicles uptake and building lighting) were on track (see Figure 6).

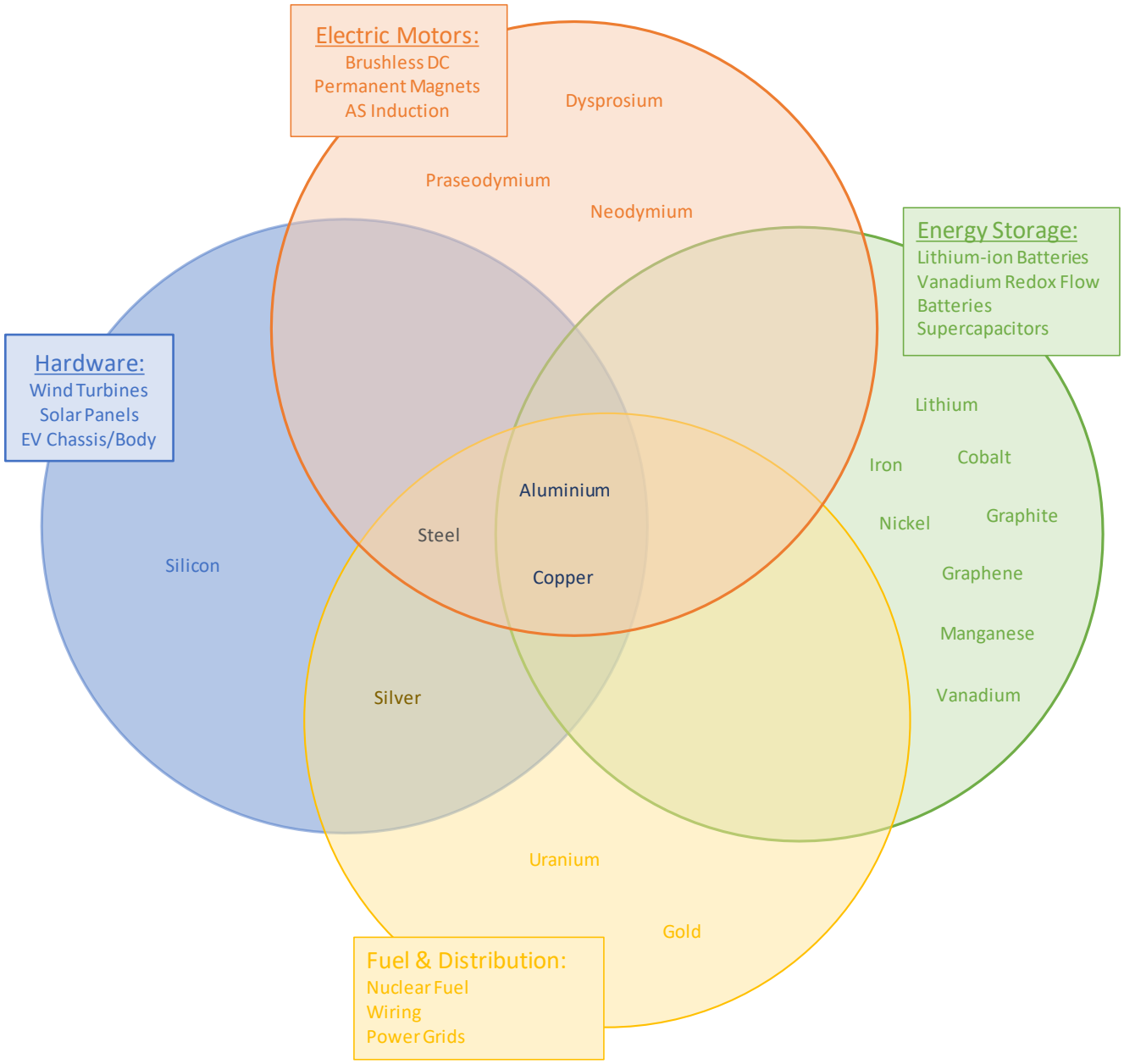
Figure 6: EIA's Tracking of Progress to Net Zero by 2050



Source: IEA, Tracking Clean Energy Progress (TCEP)

This year's BUPs focuses on other considerations, with a much bigger focus on supply side reality

Figure 7: The numerous raw materials needed to get to "net zero"



Source: Argonaut, adapted from Cambridge House International

Thematic considerations in this year's BUPs

Traditional commodity demand growth, driven by global population and income, would occur regardless of "net zero"

The energy transition and its impact on commodity demand has been written about extensively. There is little need to repeat ourselves or others. This year's BUPs delves into other considerations. We discuss these on the following pages and summarise below.

Traditional demand factors

In this report we discuss the more traditional demand drivers of population and income growth. We focus on the uncertain demand-side role of China, the country primarily responsible for the unprecedented and dramatic growth in commodity demand over the last three decades.

A key focus of this book is on the supply side realities that threaten lofty demand scenarios under the "net zero" shift

Supply side reality

We expand on last year's comment that consideration needs to be given to commodity supply. The reality is that the supply response may be very different to both prevailing expectations and lofty requirements under a net zero trajectory. We discuss that ongoing underinvestment in exploration has meant fewer discoveries, and that even with success, the lag from major discovery to production is likely to take well over a decade.

We shine a spotlight on both lithium and uranium from a supply side perspective

In the near term we see economic and project funding uncertainty, volatile commodity prices, and ironically the intense focus on environmental issues, compounding the supply-response problem. A further forceful issue centred on jurisdictional and supply chain risks has emerged recently. These issues threaten more than the energy transition, but economies as well, as European nations will attest.

From a supply side perspective we shine a spotlight on both lithium and uranium.

We speculate the long downward trend in real commodity prices may have bottomed

The case for gold

After 3,000 years at the heart of the financial system, gold always has a place in portfolios, as insurance against financial chaos and a hedge against fiat currency degradation. Gold equities provide leverage to gold and, on occasion, value added by management through exploration and project generation. In late 2022 we see pressure building. Central banks are strongly on the bid and western gold ETFs, the marginal price setters of gold, are running down their holdings as the US dollar surges toward an historic peak. With gold equity prices discounting troubled times, now is not the time to sell your gold shares.

We continue to make a case for gold

ESG issues

Finally, we discuss Argonaut's approach to incorporating ESG factors into research. The ratings industry is evolving, as will our approach, but it can't be ignored. At this stage our primary goal is to identify companies that deserve credit or where there are red flags with respect to their ESG credentials. We are not trying to come up with a numerical "rating", but to recognise that as ESG factors are likely to be reflected in a firm's cost of capital, they should also be reflected in its valuation.

Finally, we discuss how we have approached ESG in our research

Traditional commodity demand growth

With the intense focus on new energy commodities it's easy to forget about traditional demand drivers

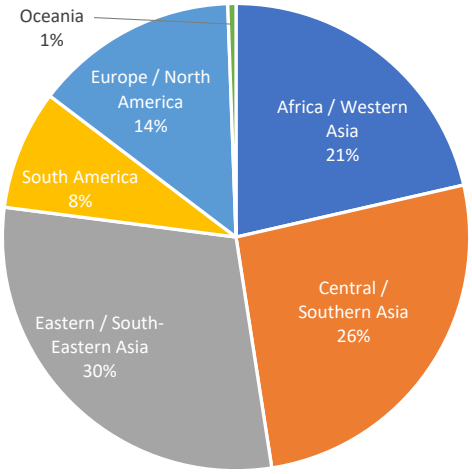
The trajectory to net zero by 2050 and its commodity implications has been a hot topic, but what about more traditional commodity demand drivers? Historically, population and income growth show strong correlation to commodity demand growth. An economy's stage of development, its income elasticity of commodity demand, and its per capita commodity usage, all provide important signals.

Population trends

The United Nations (UN) expects the global population to reach 8 billion before the end of 2022 (UN World Population Prospects 2022). Only 14% of these people live in Europe and North America, while nearly half live in rapidly growing regions like Africa, and Central and Southern Asia. The latter regions are primarily responsible for the expected additional 1.8 billion people on the planet by 2050 (Figure 8 and Figure 9).

Figure 8: Regional breakdown of current global population of ~8 billion people

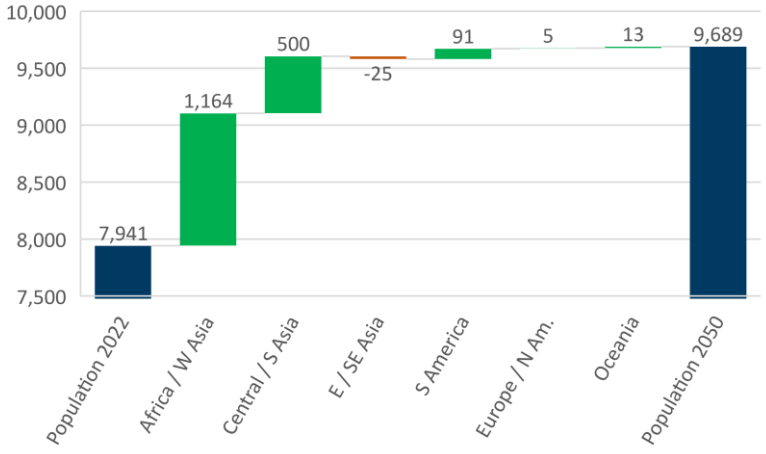
Of the 8 billion people on the planet nearly half live in rapidly growing regions



Source: United Nations World Population prospects 2022

Figure 9: Projected growth in global population by region to 2050 (millions of people)

Africa, and western and southern Asian countries, are mainly responsible for driving the global population closer to 10 billion by 2050



Source: United Nations World Population prospects 2022

Income growth and commodity demand

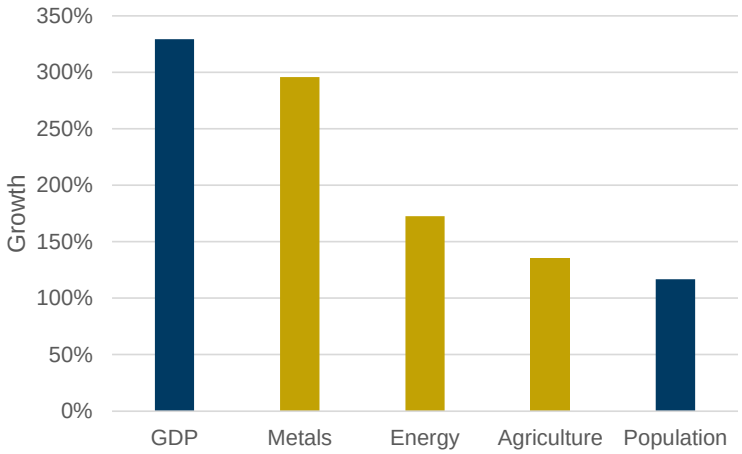
Global income tends to grow at a much faster rate than population (2.5x faster over the last 50 years)

While GDP growth exceeds population growth, per capita incomes rise. Over the 50 years to 2020 the global economy grew 330%, while the global population grew only 117% (World Bank, Commodity Markets: Evolution, Challenges, and Policies, 2022). Over the same period agriculture growth of 135% was close to population growth (as would be expected) while metals demand increased 296%, more closely matching GDP growth (Figure 10).

Since 1900, global metal production has followed the trajectory of global GDP (Figure 11). Even if future commodity consumption growth does not match the unprecedented increase driven by China in recent decades, and if the energy transition and high debt levels slow future GDP growth further, the trend in commodity demand would still be firmly upward. Wood Mackenzie, after factoring in the impact of the energy transition, sees global GDP of US$169T in 2050, *double* the current level (Wood Mackenzie, No Pain No Gain: The economic consequences of accelerating the energy transition).

There is a close correlation between income/GDP growth and commodity demand growth

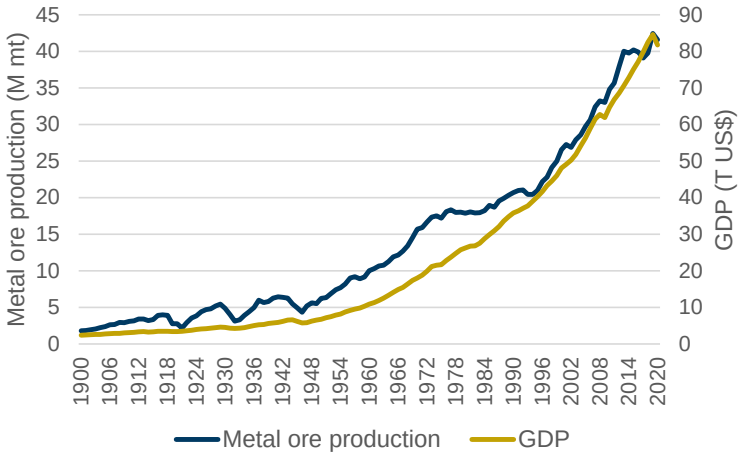
Figure 10: Commodity demand, GDP, and population growth (1970-2020)



Even under conservative estimates, global GDP is expected to double to US$169T by 2050

Source: Baffes, John, and Peter Nagle. Eds. 2022. Commodity Markets: Evolution, Challenges, and Policies. Washington DC: World Bank

Figure 11: Global mine production (Cu, Pb, Ni, Sn, Zn) and GDP growth



Clearly commodity consumption would need to follow this upward trend in incomes/GDP

Source: Baffes, John, and Peter Nagle. Eds. 2022. Commodity Markets: Evolution, Challenges, and Policies. Washington DC: World Bank

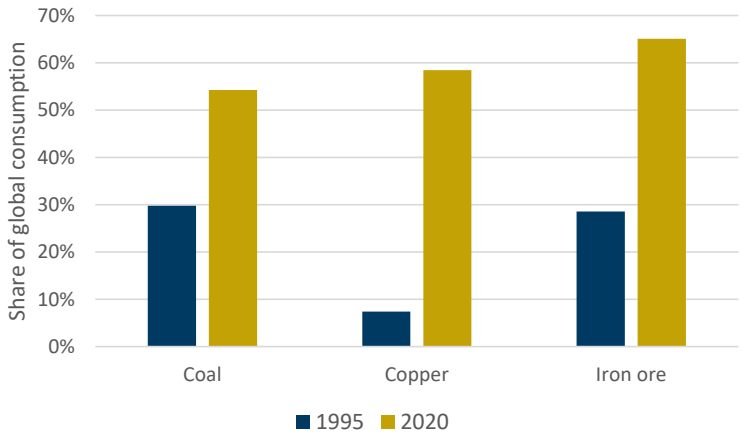
China uncertainty

From 1995 to 2020 global metals consumption more than doubled. At the start of this period advanced economies (AEs) accounted for nearly 75% of consumption, but by the end their share had fallen to less than 25% (World Bank).

Will the dragon continue to rise?

China accounted for 90% of the increase in metals consumption over the 1995 to 2020 period on the back of 8.8% p.a. economic growth, per capital income climbing from US$540 to US$10,550, and surging manufactured exports. China now accounts for more than 50% of the world's consumption of a number of commodities, including iron ore, nickel, copper, coal, as well as steel and cement (Figure 12).

Figure 12: China's share of global consumption



Source: Baffes, John, and Peter Nagle. Eds. 2022. Commodity Markets: Evolution, Challenges, and Policies. Washington DC: World Bank

China's demand side role remains critical, and there are reasons to be concerned

Even as other emerging markets and developing economies (EMDEs) start increasing their share of consumption, China's demand side role remains critical. Here there are concerns. Economic growth will slow to an estimated 3.5% this calendar year (FactSet consensus) after a contraction in the second quarter. The country's restrictive COVID containment policy, political and trade tensions, a weakening currency, and property market challenges have all contributed to economic weakness.

On a more positive note, inflation is largely contained and any ramp up in infrastructure spend to help boost growth will be positive for commodity demand. Politically, China escapes the short election cycle which drives most western economies' political decision making, allowing for longer term plans to be made and executed.

In the longer-term we expect broad commodity demand growth, albeit not matching recent pace, but certain commodities' demand growth will be dramatic

Demand outlook summary

In the longer term we expect continued growth in commodities demand on the back of global population and income growth, and/or easing of COVID restrictions, although this will not match the unprecedented pace of the last two to three decades. However, the demand for specific commodities will vary. Demand growth for traditional commodities to support economic development in EMDE's will be more benign, while the demand growth for those involved in a changed energy mix will be far more significant.

Supply side reality

Reality is that the timing of the supply response for specific commodities may be very different to expectations. In the case of the commodities required under the "net zero" trajectory, a slower than expected ramp up to meet significantly higher demand threatens to defer or derail ambitious decarbonisation targets.

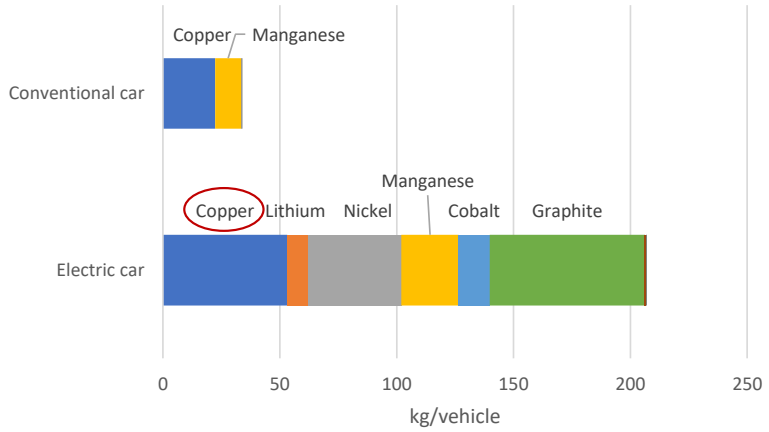
Low incoming green metal supply is an inconvenient reality for the push towards decarbonisation

Fewer discoveries

Mining sector underinvestment has meant fewer meaningful discoveries over the last couple of decades. Grades have been declining and explorers need look further and deeper than before. The "easier" resources are likely to have already been found.

A case in point is copper, a bellwether indicator for the global economy, given its broad usage. It is also a metal that is critical to meet decarbonisation goals. For example, more than twice as much copper is used to produce an electric vehicle (EV) compared to a conventional car (Figure 13).

Figure 13: Minerals used in electric vs conventional vehicles (kg/vehicle)



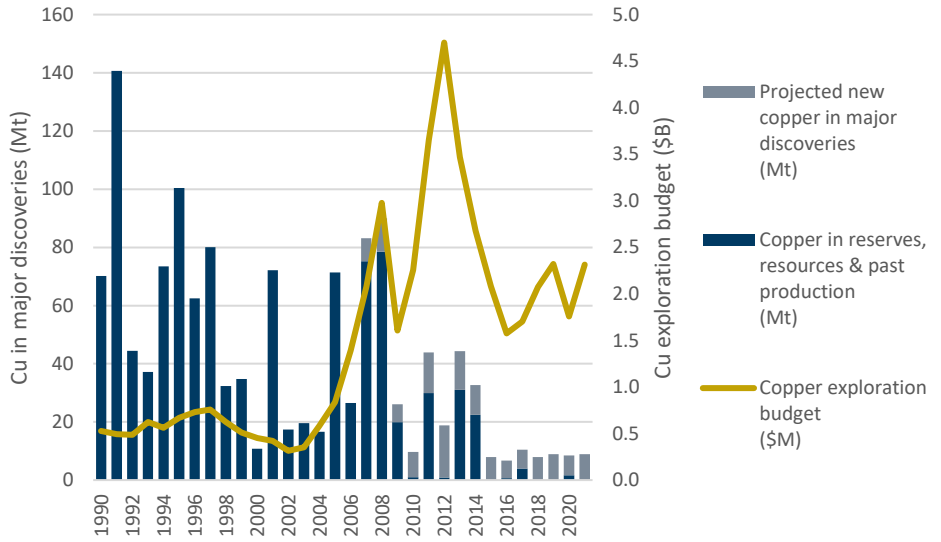
Source: IEA, Minerals used in electric cars compared to conventional cars. Note: Values for electric car based on a 75kWh nickel manganese cobalt (NMC) 622 cathode and graphite-based anode

Yet the environment is not conducive to new copper mine supply, despite the fact that S&P Global IQ estimates the world will need ~50Mt in 2035 (compared to ~25Mt today) and will be short 1.6Mt copper in the best case and 9.9Mt in the worst case by that time (S&P Global IQ, The Future of Copper, July 2022). Last decade saw underinvestment in exploration as miners opted for less risky brownfield expansion, and this has been reflected in a dearth of new major discoveries since 2008 (Figure 14).

Heightened risk associated with operating environments, permitting uncertainty & ESG sensitivities are hindering development of new projects

A wide range of non-technical issues continue to impact new developments. For example, in South America the potential for additional taxation adds a layer of uncertainty to projected economic returns. Environmental and heritage issues are also key. Rio Tinto's (RIO) Resolution project in the US, which reportedly has enough copper for 275M EV's, has stalled due to the Apache Nation's sacred ground at the site. It's a highly sensitive issue; RIO senior executives resigned recently after a heritage site in Australia was destroyed.

Figure 14: Copper in major discoveries by year, 1990-2021



Source: S&P Global Market Intelligence

New copper Reserves and discoveries continue to lag despite an uptick in exploration dollars since 2004

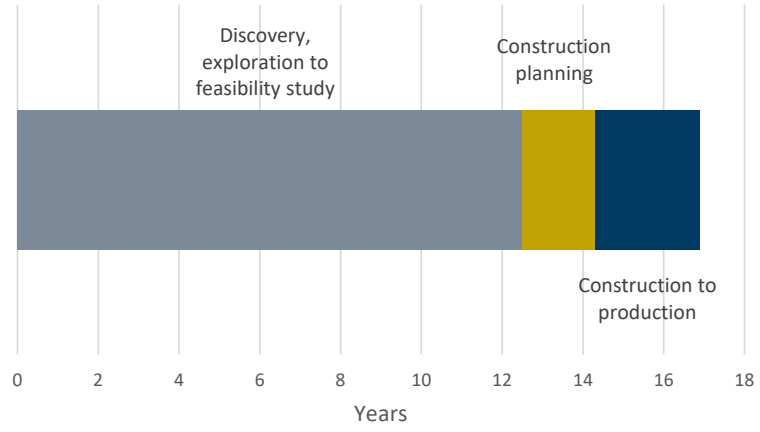
Meanwhile, the copper price has fallen 22% so far this calendar year, reflecting global economic concerns, Chinese economic data, rising interest rates, and the strength of the US$. It is at a point where the copper "price [is] insufficient to support new mine supply development" to quote Freeport McMoRan (2Q22 results presentation).

The lag from discovery to production

Major projects require ever more time to get from discovery to development

To compound the problem, once a major discovery is made, it can take well over a decade to get a project into production. According to the IEA, the major global projects that made it into production over the last decade took nearly 17 years to get there (Figure 15).

Figure 15: Global average lead times from discovery to production, 2010-2019



Source: IEA, The role of critical minerals in clean energy transitions. Global averages are based on the top 25 mining projects that came online between 2010 and 2019

Project funding and timing

The lengthy lag to get a project into production is ill-suited to a fast paced world where the focus is on near-term events and prices. Commodity prices are typically driven by short-term supply and demand factors, and price moves can be violent if there is an unexpected demand or supply shock. Russia's invasion has wreaked havoc in the supply of certain commodities, and even the "war on inflation" has shocked markets given Central Banks were insisting inflation was "transitory" until fairly recently.

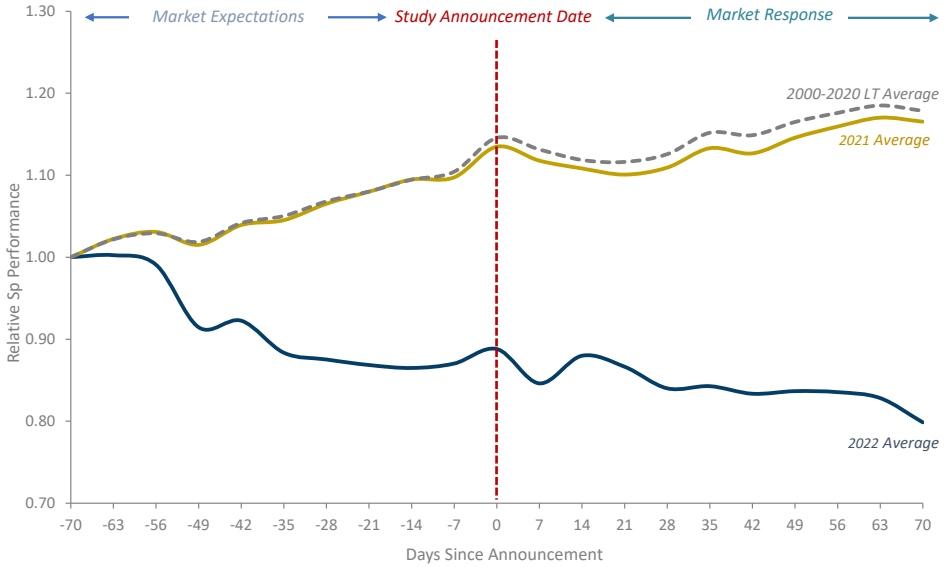
Cost inflation rapidly renders study estimates redundant

Current prices impact sentiment and availability of investor funding to progress projects, despite output from these projects being years away and the prices received determined by factors that may be very different to today's. Projects are therefore likely to be delayed due to a more difficult funding environment. This is compounded by cost inflation potentially making redundant any feasibility study more than a few months old.

Juniors invest time and effort into feasibility studies and tend to assume share prices will react positively to detail when released to the market. Our analysis suggests otherwise. Based on two decades evidence, share prices tend to climb leading up to feasibility study release but fall in the weeks post release as the hard numbers get digested. This calendar year has been an exception, with share prices declining on average pre and post feasibility study release – hardly an encouraging environment for investment even if the project is attractive longer term (Figure 16).

Figure 16: ASX Metals & Mining share price movements around study announcements, 2000-2022

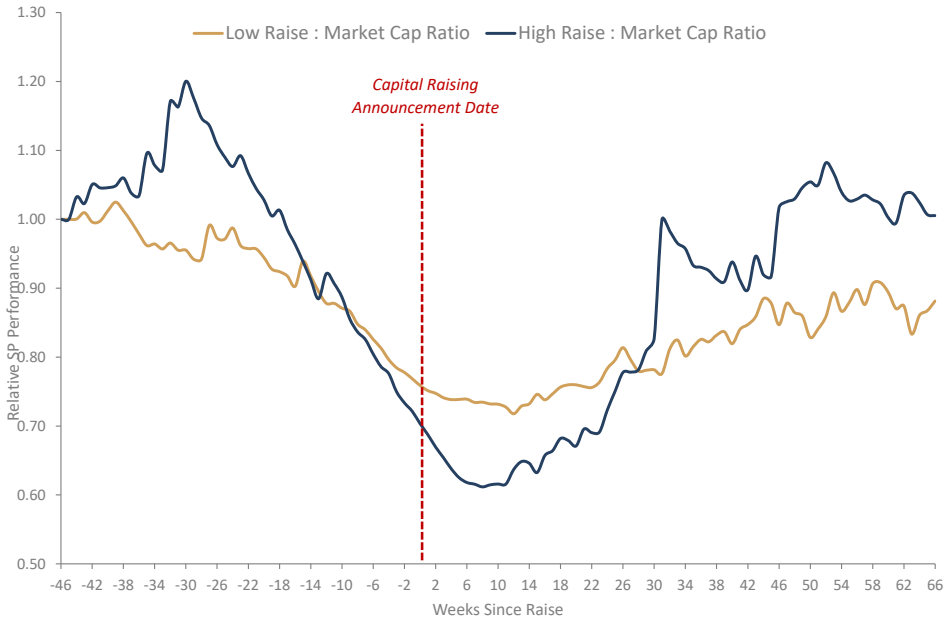
It seems the market would rather reward blue sky than the reality of a study



Source: Argonaut, with data from FactSet and S&P Global IQ

Once a feasibility study is released attention turns to the capital raise required to fund the project. Argonaut analysis shows share prices on average decline in the months preceding an anticipated raise, and then only recover the capital raise price 4-6 months later. This is magnified for companies with higher raises relative to their market caps (Figure 17).

Figure 17: ASX Metals & Mining share price movements around capital raisings, 2000-2022



On average it takes almost half a year for share prices to recover from an equity raise, and that's after declining pre-raise

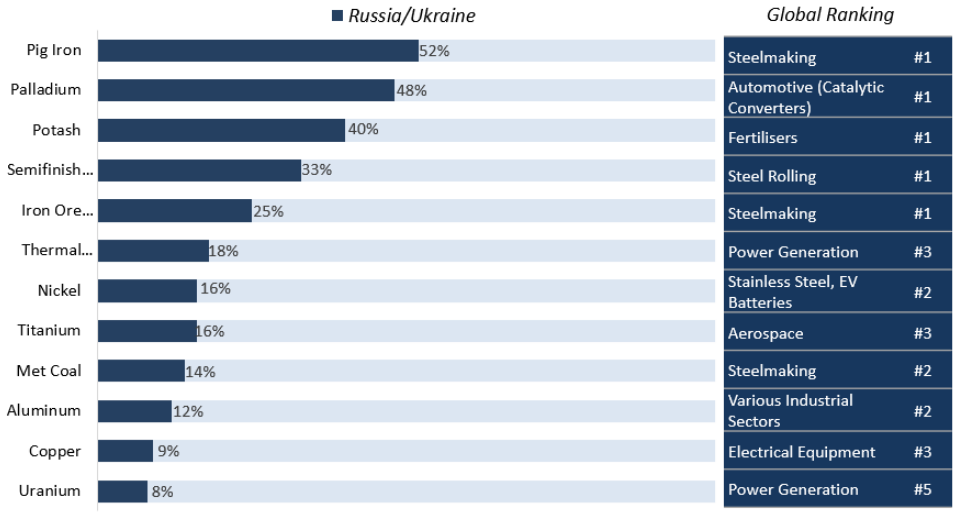
Source: Argonaut, with data from FactSet and S&P Global IQ

These results are intuitive (capital raises tend to be at a discount to the prevailing price), but the extent may surprise. It suggests junior miners should firstly not assume a share price jump post feasibility release, and secondly should consider raising capital early as the market is going to start pricing in a raise well before it happens.

Jurisdictional and supply chain risks

The Russia/Ukraine conflict has delivered a significant supply side shock, at a time when supply chains were already in disarray due to COVID (Figure 18).

Figure 18: Russia/Ukraine share of global trade in selected commodities, 2020



A war involving Russia was always going to be disruptive to commodity markets

Source: earth5r, The Net Zero Transition in the Wake of the War in Ukraine, citing various sources.
Note: Potash share includes Belarus

Europe's dependence on Russian oil and gas has not ended well

A European energy crisis has emerged as a result. About 41% of the natural gas consumed across Europe comes from Russia, so the region was highly susceptible to any pressure Russia chose to exert (Figure 19). Refer to our note "Poking the Bear – Implications for Metals & Energy Markets", 4th March 2022. Without trying to be wise after the event, it is painfully obvious that this was a high risk situation for many European countries.

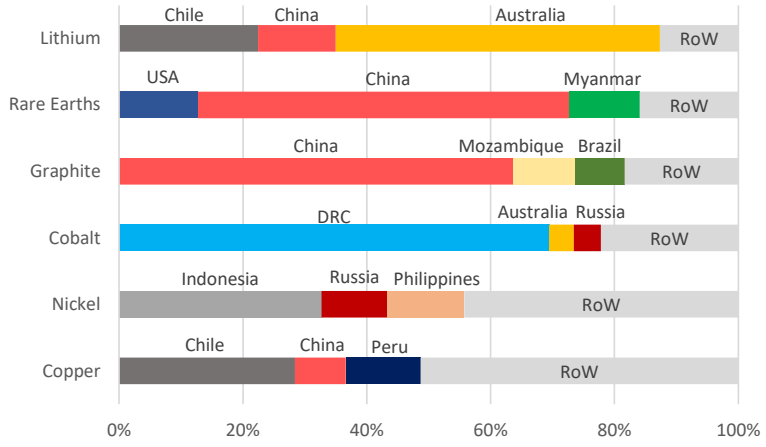
Figure 19: Oil & gas pipelines from Russia to Europe

Source: National Geographic Society

As a result, there is now much greater scrutiny around commodity sources and the associated jurisdictional and supply chain risks. The commodities associated with clean energy are particularly concentrated, with more than 50% of each of lithium, rare earths, graphite, cobalt, and nickel coming from just three countries (Figure 20).

Restricted sources of green energy metals render them susceptible to disruption in times of military or economic conflict

Figure 20: Share of top three producers in total production, selected minerals, 2019

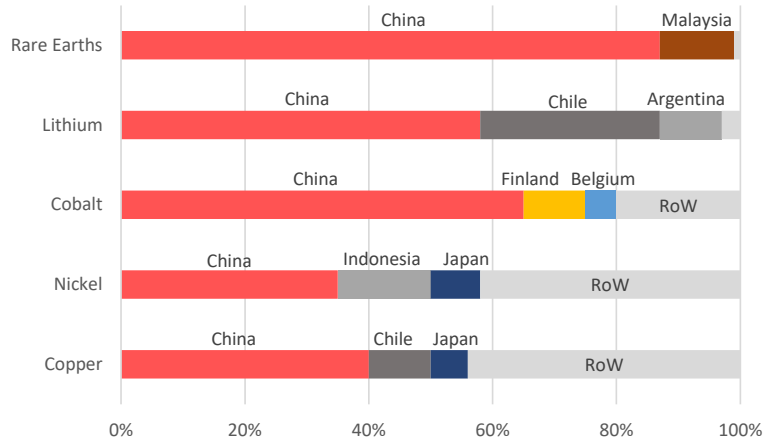


Source: IEA, The Role of Critical Minerals in Clean Energy Technologies

While China is an important commodity producer, its influence is even greater in refining and midstream activities. Not only is it heavily involved in the processing of copper, lithium, nickel, cobalt, and rare earths (Figure 21), it is also a key player in midstream activities around batteries, polysilicon, solar panels, and wind turbines.

China rules green energy downstream processing

Figure 21: Share of processing volume by country, selected minerals, 2019



Source: IEA, The Role of Critical Minerals in Clean Energy Technologies

Things are getting critical

It's increasingly uncomfortable for a country to be beholden to another, particularly with global tensions rising. The souring relationship between the US and China, the world's two largest economies, is an obvious case in point. The globalisation trend took a U-turn under Trump and accelerated during COVID as supply chains demonstrated they were only as strong as their weakest link.

Leaders are paying closer attention to "critical" minerals. The US Geological Survey (USGS), as an example, compiled a list of 50 minerals it deems critical to the US economy and national security in its 2022 List of Critical Minerals. We expect supply risks associated with "critical" commodities sourced from countries deemed unfriendly to lead to concerted efforts to encourage supply from friendlier sources.

This will take some time. The development of resources, and the refining and processing infrastructure needed to deal with them, has taken decades to build out. Growing nationalism, commodity and processing concentration, governance issues, and trade tensions are realities that pose further risks to supply in our view.

Near-term uncertainties

Developers need a clear line of sight, not uncertainty

The current macro picture is unclear. Significant economic uncertainty combined with heightened geopolitical risk is not conducive to stable commodity prices and mining project progression, nor does it help in finding attractively priced funding solutions. Further, the intense focus on environmental issues delays project progression while ignoring the uncomfortable truth that more needs to be dug out of the ground, not less, to support the "net zero" trajectory.

All of which compounds the supply-response problem as decisions deferred today are reflected in demand/supply imbalances tomorrow.

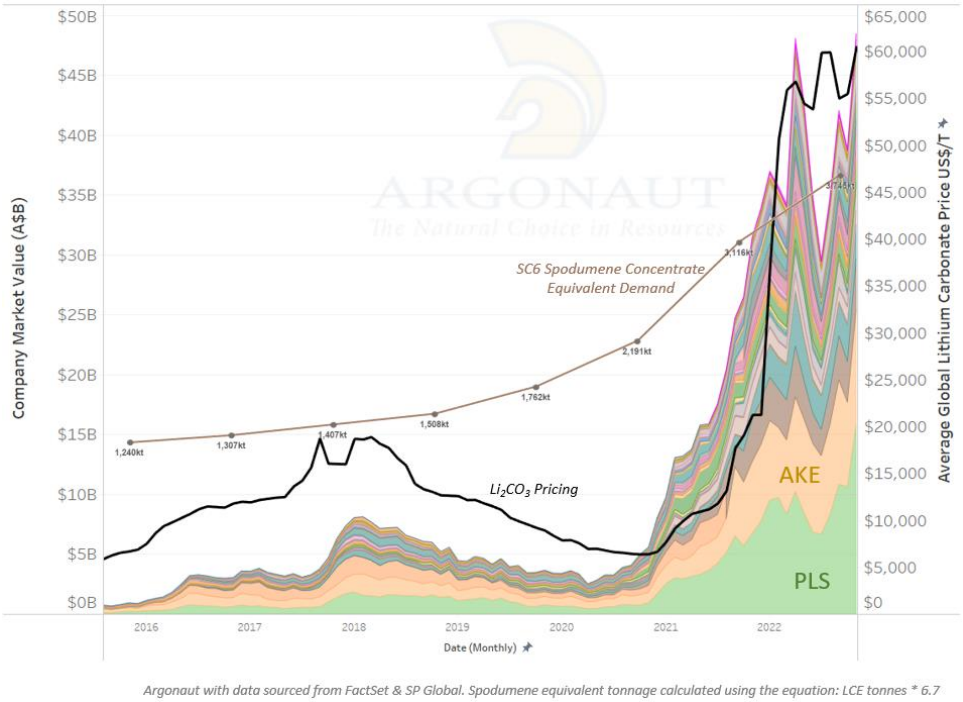
Spotlight on lithium

Lithium product pricing remains stubbornly high

The resurgence of lithium product pricing in late 2021 and continuing into 2022 caught more than a few pundits by surprise. Lithium carbonate is a refined intermediate product used in the manufacturing of lithium-based batteries. Its pricing is frequently used as an indicator of strength in less liquid markets such as spodumene concentrate. According to SP Global data, lithium carbonate sales pricing bottomed in late 2020 at ~US$7,500/t. By the beginning of 2022 prices had ascended above ~US$50,000/t, where it has hovered now, for a full 12-months.

Figure 22: Lithium carbonate pricing (black line), SC6 equivalent spodumene concentrate demand (brown line) and market capitalisations of lithium focused ASX listed companies (stacked area).

The value of lithium focussed ASX listed companies has benefited from high product prices



Source: Argonaut with data from FactSet & SP Global.

The main driver for demand has been an incredibly strong uptake of electric vehicles across advanced economies. Lithium derivative refiners have found themselves trapped within a supply-demand squeeze as spodumene concentrate and lithium brine carbonate production has failed to materialise as had been expected.

Increasing demand from non-Chinese lithium intermediate product refiners

Chinese refiners have traditionally dominated the refinement space. However, these groups now find themselves competing with western organisations who seek to provide battery manufactures with alternative non-Sino sources of lithium hydroxide. Western economic powers have learnt their lesson from China's monopoly over the rare earth element supply chain and seek to ensure domination of lithium space is avoided at all costs.

New intermediate processing facilities are being built throughout Asia, the US, Europe and in Australia. Three lithium hydroxide facilities are currently under construction in south-western WA, meanwhile a lithium sulphate project is proposed for Port Hedland.

The entry of new spodumene consumers has exacerbated offtake and supply tightness in an already competitive market. Groups like Pilbara Minerals (PLS) have taken advantage of market conditions by launching auction processes to sell modest size concentrate shipments well above prevailing product pricing.

High sales pricing from auction disposals indicates ongoing market tightness

We have also seen a dramatic retrace in the acceptability of spodumene concentrate quality. Not long ago 'SC6' (6% Li_2O) was the industry norm, however producers now routinely see SC5.5 (or lower) grades to customers who are more than happy to take material previously regarded as 'off-spec'. Northern Territory producer Core Lithium (CXO) is even reportedly selling direct shipping ore (DSO) grading 1.4% Li_2O. The thought of this would have been laughed at less than two short years ago.

The industry as a whole is beginning to realise that production of marketable spodumene concentrate or lithium brine carbonate is not as simple as first thought. The industry remains juvenile and while there have been improvements to processing technologies, most groups are still 'coming up to speed'. Spodumene processing requires sophisticated DMS and/or flotation circuits which are generally difficult to ramp-up to designed throughput specifications. Lithium brine carbonate production is equally, or perhaps even more difficult, requiring sophisticated chemistry sets manned by skilled process chemists to generate an acceptable purified product.

Production of primary lithium products isn't as easy as it looks

While we don't believe that lithium will maintain its incredibly heady pricing of today, we do think the overall market has changed and expect higher lows. Fundamental demand for primary lithium products continues to rise driven by an ever-expanding network of downstream processing and manufacturing infrastructure. While there is always a chance that a new battery chemistry will ultimately supplant lithium-based formulations in the future, it is clear that vehicle OEM's are betting big on what they know.

The performance of lithium focussed ASX listed companies has largely mimicked lithium product pricing. At the time of writing, lithium market giant Pilbara Minerals was valued above A$15B. Figure 22 shows that the total market value of lithium explorers, developers and producers now exceeds A$45B. For context, the total market lithium company market segment was around A$8B during the 2018 lithium boom.

In line with better value realisation from investors, we continue to see pivoting of small cap explorers to the lithium space. It seems like almost every week another nickel or gold explorer announces to the market the presence of lithium bearing pegmatites on their ground.

The total market capitalisation of lithium sector, ASX listed entities now exceeds A$45B

The lithium mining and processing spacing is a sophisticated sector. As with all new emerging markets, those with the best assets, deepest pockets and most influential partnerships will be the ultimate winners. Lithium Resources have only been defined by a handful of Australian explorers, those that have them are well positioned to capitalise upon the tight market we predict for the short to medium term.

Spotlight on uranium

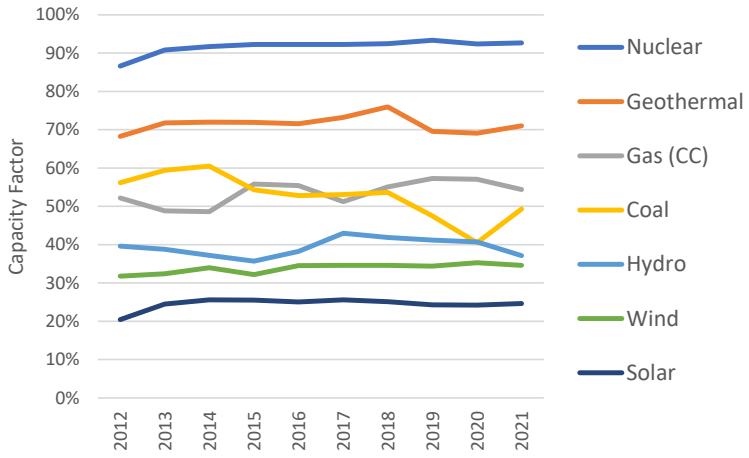
Argonaut's sector report, "Uranium gets its fizz back", 5th October 2021 remains just as relevant today. We extract highlights from this report below.

The global energy backdrop

For decarbonisation targets to be met, governments and industry will need to transition away from fossil fuels to low emission technologies. However, renewable electricity sources (solar, wind etc.) suffer from capacity factor issues (how frequently a power plant operates at maximum capacity), and are reliant upon additional storage infrastructure to supply electricity in non-productive periods (Figure 23).

Capacity factor is an important metric for comparison of energy sources

Figure 23: Annual capacity factors for select utility-scale generators (2012-2021)



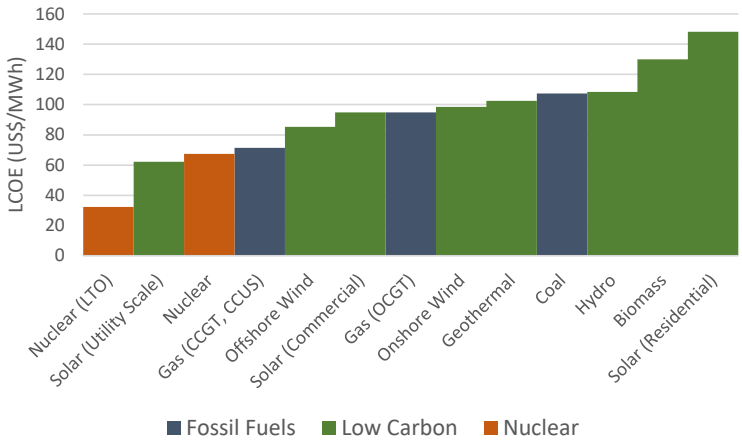
Source: UE EIA, Electric Power Monthly

The nuclear advantage

Nuclear electricity generation is a safe, low emission technology that provides dependable base load power from long life plants. While plants are expensive to build, they compete or outcompete all major sources of electricity on a lifetime levelised cost basis (Figure 24).

While initially expensive to build, the total levelised cost of nuclear electricity production is low compared to power plants with shorter life spans

Figure 24: Levelised cost of electricity (LCOE) (uses US$30/t CO_2 price, 7% discount rate)



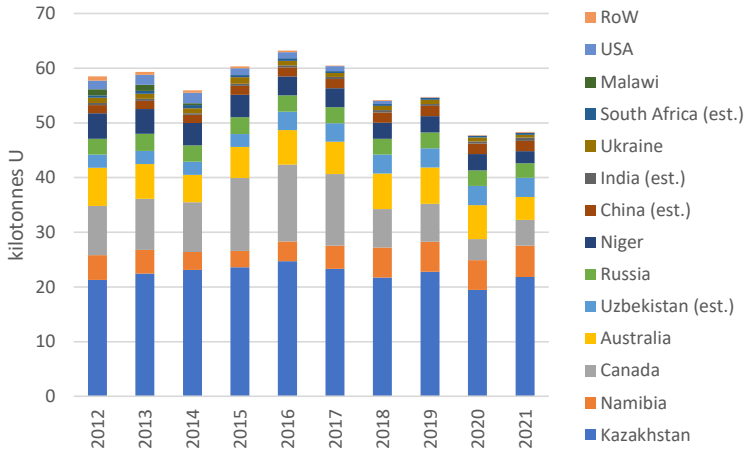
Source: IEA, 2020. Nuclear (LTO) = Nuclear Long-term Operation

Uranium market dynamics

Uranium is extracted by both conventional and in-situ recovery mining methods. Several very large deposits dominate, while many other deposits remain undeveloped. The bulk of production comes from Kazakhstan, Namibia, Canada and Australia (Figure 25).

Uranium is mostly sourced from Kazakhstan, Canada, Australia, Namibia & Russia

Figure 25: Uranium production from mines, 2012-2021

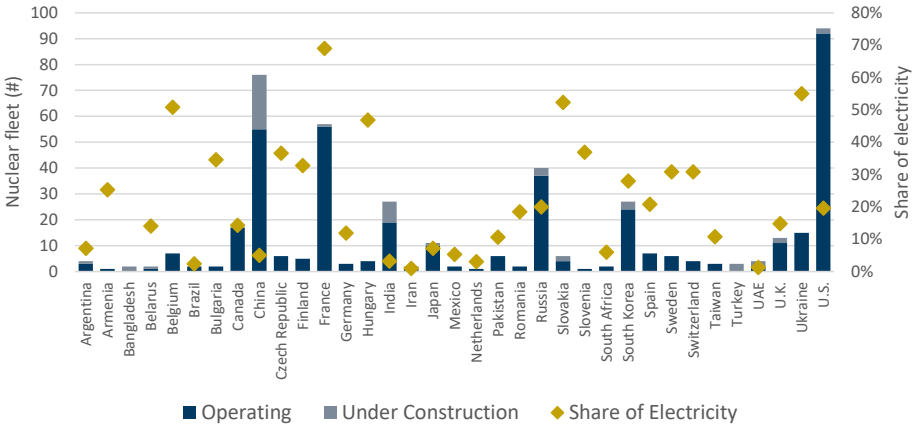


Source: World Nuclear Association

Global market demand is intimately linked to nuclear power generation capacity. Older reactors are frequently recommissioned to extend life at relatively modest cost compared with a new build. Most new reactors that are scheduled to be built over the approaching decade are located in China and India (Figure 26).

Most new reactor developments are located in China and India

Figure 26: Nuclear fleet, operating & under construction



Source: World Nuclear Industry Status Report, 2022

We expect nuclear will need to be included in the mix to meet global decarbonisation goals

Achievement of a decarbonised future will require a commitment to low emission sources of electricity, and in our view nuclear will have to be included in the mix to meet targets. Reactor demand for uranium is expected to either remain static or grow over the next two decades and we expect a US$50/lb U_3O_8 price to provide sufficient incentive for supply to meet long term demand forecasts. We expect new long-term contracts will be priced in the US$50-60/lb U_3O_8 range.

Spotlight on green gold

Gold and ESG

Gold has a place in investors' portfolios

Our view remains that gold has a place in an investor's portfolio, hedging against uncertainty. Gold's place under an ESG lens is more complicated. Unlike the commodities required for decarbonisation, gold has a limited direct role to play. Gold does have its uses in technology and dentistry, although a very small proportion of annual gold production is required to fill demand for these industries. For example, in 2021 8.2% of global demand for gold was from the technology sector, or ~330 tonnes. As of mid-2022, global banks hold an estimated 32kt of bullion in reserves.

Gold miners need to focus on minimising the environmental impact of their operations

With negligible downstream positive environmental contributions, gold production can only have a negative overall environmental impact. It is limiting this actual and potential impact that miners are able to influence. Minimising greenhouse gas emissions from production is one very measurable part of this focus, but all phases of mining have potential to cause environmental and social harm and these risks must be managed.

Gold mining does provide a social and economic benefit, especially in developing nations

Where gold mining does have a role to play is in the social and economic benefit it provides. In Australia for example, it is estimated that the gold industry contributed $23B to the economy in 2021, and directly employs upwards of 30,000 people in high paying roles. It is also estimated that for each direct employee in the industry an additional eight indirect jobs are created.

The positive social impact of gold mining in developing nations has the potential to be highly impactful. Poverty impacts climate resilience, so well governed mining operations that use local content may help to limit the social impact of extreme weather fluctuations over the long term. In regions reliant on subsistence farming that could be negatively impacted by prolonged droughts and floods, mining provides alternate employment pathways that builds local skillsets applicable to other industries. In developing countries, the number of indirect jobs created by mining activities is estimated at upward of 20 roles for each direct role.

Key is the trade off between negative environmental impacts and the positive social benefit

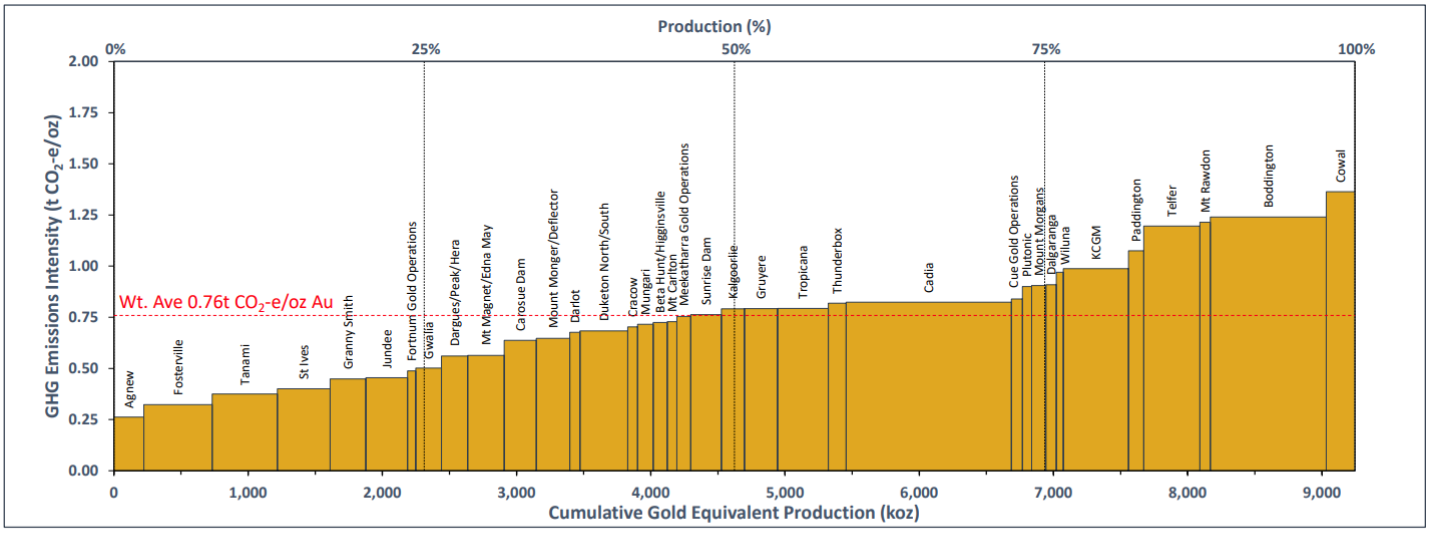
The key here, is the trade-off of the inevitable negative environmental impact from gold mining and related activities, and the positive social impact. Generally, information is not available to break down both the positive and negative impacts to a site level, and applying weightings to both sides of the ledger is subjective and relies on an individual's value judgements. For example, how do you trade off an extremely low risk of a catastrophic tailings failure that could destroy a village of 100 homes versus providing a clean and reliable source of water to that village today?

We are unable to provide a silver bullet to unpicking this trade-off. Variations in company reporting, and vast differences in environmental/social risks to each project adds to this complexity. Where known and potentially material, we already factor in environmental and social risks to our valuations of gold stocks. Argonaut has started rolling out subjective commentary in our Research, focusing on commitment, industry, and reporting, discussed below. This roll-out has been for future facing commodities to date but will progress to our gold coverage near term.

Australian gold miners on average produce 0.76 tonnes CO_{2-e} per ounce of gold produced, with grade having the biggest influence

As a quantitatively measurable environmental impact, greenhouse gas emissions are a simple metric to compare environmental performance across projects. Aurum Analytics collates data from company ASX and government submissions to determine greenhouse gas emission intensity of Australian projects. Aurum's analysis of Australian projects has determined that as of 1st October 2022 the weighted average CO_{2-e} of Australian gold mines is 0.76 tonnes per ounce of gold produced. The biggest driver of emissions on a per ounce basis is grade of ore mined, with energy mix for power generation on site (or on grid in some cases) the second most influential factor.

Figure 27: GHG Emission Intensity by Project, sourced from Aurum Analytics



Data current as of 1 October 2022. Data sourced from company annual and sustainability reports, and the National Greenhouse and Energy Reporting dataset provided by the Clean Energy Regulator. Gold equivalent ounces were calculated using the average annual commodity prices for the corresponding period and may differ from company reported values.
Contact: Sam Ulrich – Email: sam@aurumanalytics.com.au – Website: www.aurumanalytics.com.au

Miners should be able to withstand the carbon cost

If we consider this with a possible cost on carbon emissions in mind, then depending on the carbon priced used, if recent cost inflation winds back then Australian miners should be well placed to absorb the costs. For instance, if we assume a cost of US$50/t or US$100/t of CO_2e emitted, this would equate to US$38/US$76 (average) on top of AISC. Some mines, such as Gold Fields' (JSE:GFI) Agnew, have invested heavily into replacing existing power generation with renewables. Some new mines such as Bellevue (ASX:BGL) are committing to the installation of wind, solar and battery capacity as part of the mine build.

Digital Gold?

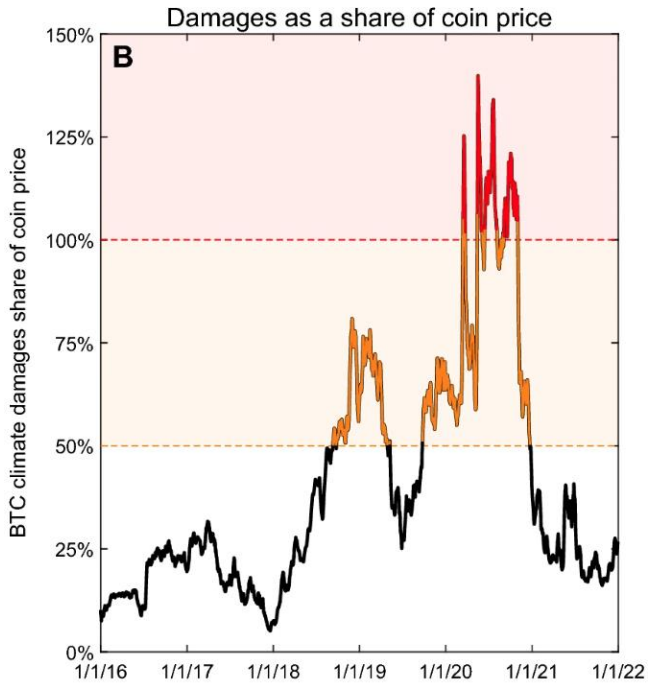
Interestingly, in percentage terms the carbon cost of producing gold is far less than the carbon cost of mining bitcoin

When compared to the value of the metal produced, gold mining is not overly carbon intensive on average. Bitcoin has been touted as an alternative store of wealth, a recent study found that in 2021, if using a US$100 carbon price, the carbon cost of mining a single bitcoin was US$11,314 per coin. If projected forward to today's bitcoin price (10/11/2022, ~US$16,000/coin) that equates to around 70% of the value of an individual coin. Using the same carbon price, the average carbon cost of producing gold in Australia is around 4.4% of the bullion's value.

As proof of stake calculations increase in complexity, the carbon cost of 'mining' bitcoin increases at a rate outpacing the global transition to renewables. Throughout periods of 2020 and 2021, when the bitcoin price was depressed, there were periods where, if using a US$100/t carbon price, the carbon cost of mining a bitcoin was greater than the value of the coin mined.

It is energy intensive mining bitcoin

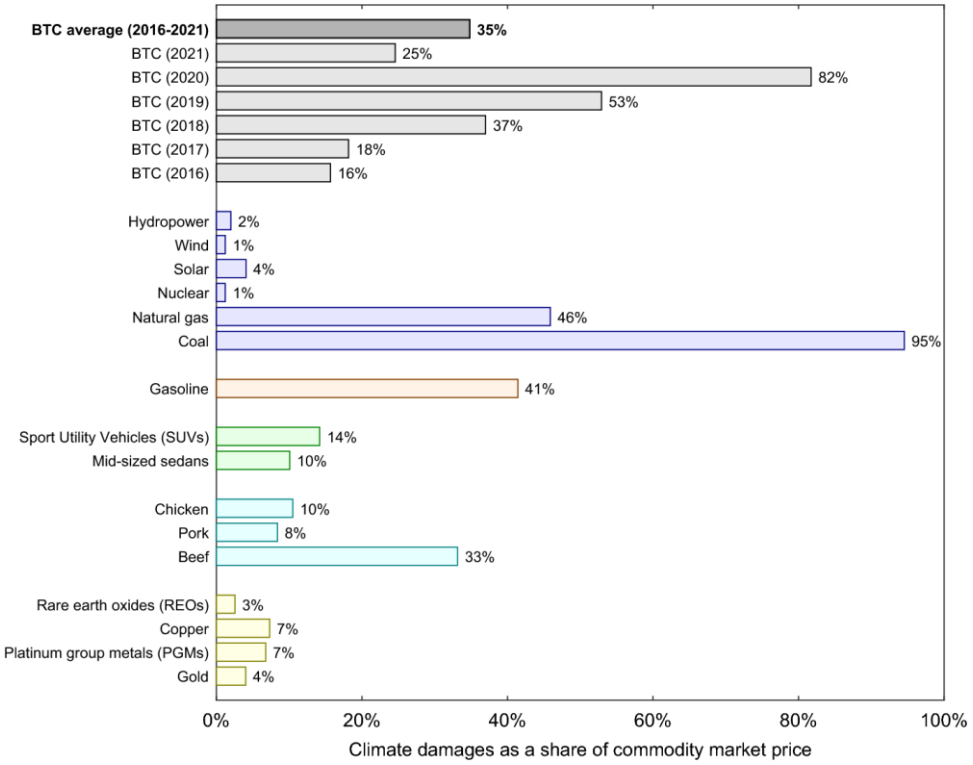
Figure 28: Climate Damages as a Share of BTC Price



*Source: Jones, B.A., Goodkind, A.L. & Berrens, R.P. Economic estimation of Bitcoin mining's climate damages demonstrates closer resemblance to digital crude than digital gold. Sci Rep **12**, 14512 (2022). https://doi.org/10.1038/s41598-022-18686-8*

The carbon cost of mining gold is relatively low compared to the carbon cost of producing other commodities

Figure 29: BTC Mining Climate damage as a Share of Commodity Market Price Using Full Lifecycle Analysis



Source: Jones, B.A. et al.

Gold has a Place – Timing is everything

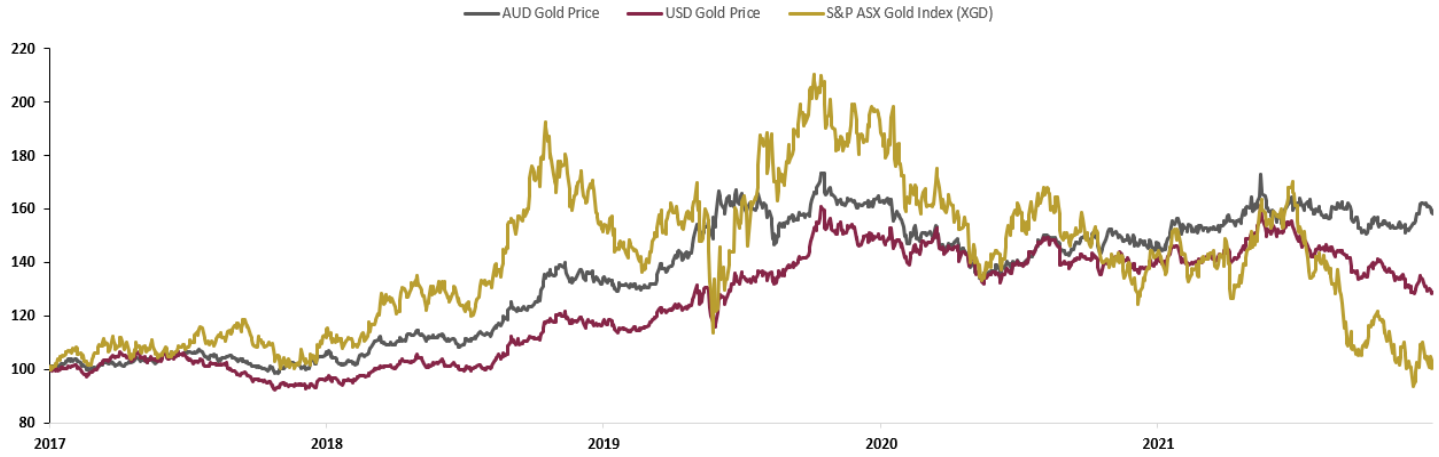
Gold reduces overall portfolio risk

The risks highlighted above firmly cement our view that gold has a place in an investor's portfolio, hedging against uncertainty. Correlations, both positive and negative, are relatively weak against other asset classes, suggesting ownership will help reduce overall portfolio risk.

Timing is important

Australian gold equities have underperformed compared to both the AUD and USD gold price over the last 12 months. In the 12 months to end of October 2022 the A$ gold price appreciated ~7% while Australian gold equities dropped 22%. When indexed over the last five years, gold equities generally outperform the A$ gold price, so assuming gold price holds or appreciates reversion to this norm would result in significant upside for equities.

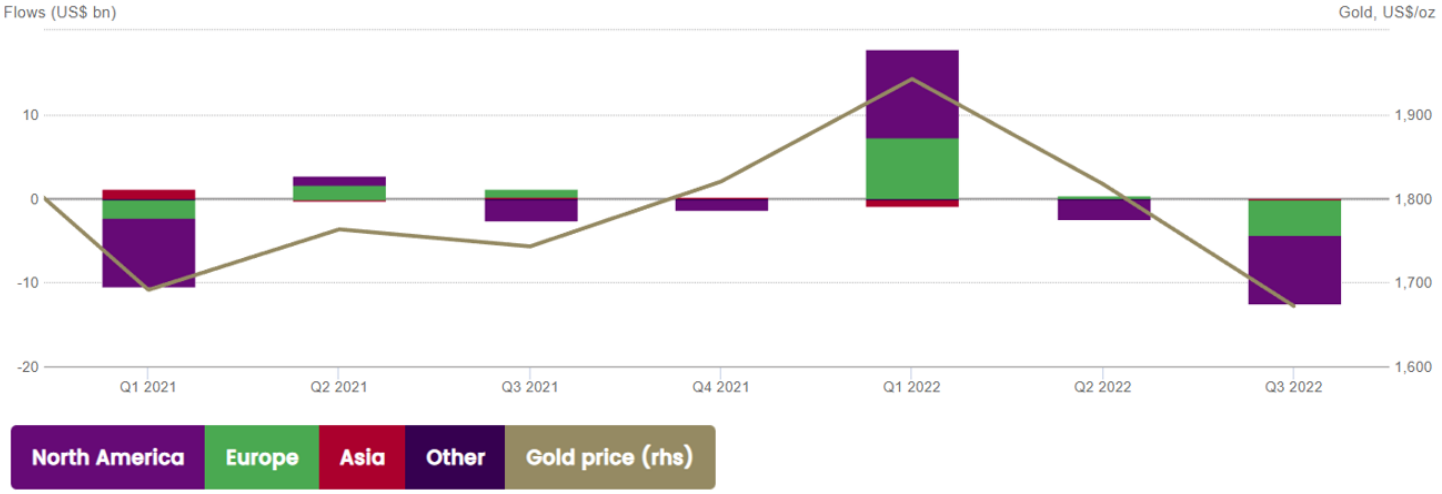
Figure 30: A$ Gold Price vs. US$ Gold Price vs. ASX Gold Index (XGD)



Source: Factset & S&P Capital IQ

Investment flows remain a dominant driver in the demand for gold, with ETF inflows and outflows impacting price. Significant inflows at the start of this year coincided with an increase in gold price, with a reversal seen through the middle of the year.

Figure 31: Gold ETF Regional Flows



Source: World Gold Council (data to 30 September 2022)

It would not be surprising to see ETF flows back into gold during our 2022 BUPs measurement period

It would not be surprising to see ETF inflows back into gold sometime during our measurement period for the 2022 BUPs. While we are not brave enough to try to pinpoint when or for what specific reason, we think there are enough economic, political, and market risks at the moment to believe it's a reasonable bet. If so, we believe having gold exposure will provide diversification benefits and help smooth portfolio performance, exposure to gold equities likely providing higher leverage than physical gold or ETFs.

M&A – Who Blinks?

Inorganic growth is a low risk option to add resources

For the gold producers, share price performance has been generally poor over the last year. Cost increases and Covid related disruptions resulting in limited cash generation is the main reason for this. It appears that costs are plateauing, meanwhile Reserves are still depleting so replacement of ounces is likely a key consideration in boardroom discussions. Inorganic growth is the lowest risk option for miners to add Resource ounces which may eventually convert to Reserves.

If domestic gold miners can return to reasonable margins from operations we anticipate a renewed focus on inorganic growth from this group, perhaps even if they don't, developing a new project may provide an opportunity to lower their cost base.

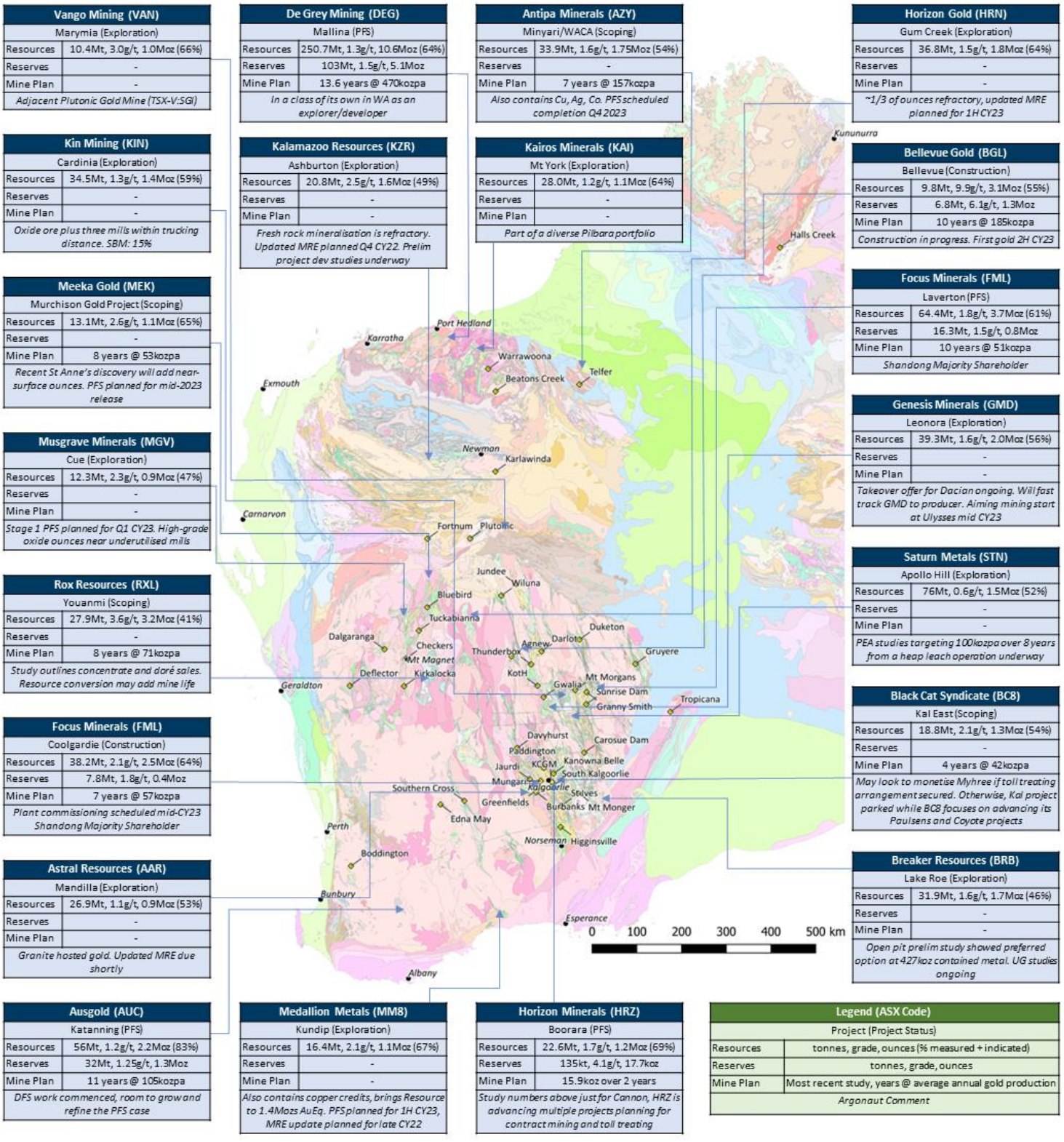
Larger projects such as De Grey's Mallina are likely to attract interest from the larger international gold producers. Down the curve we don't see a lot of projects of requisite scale to justify standalone development in Western Australia, more growth required or regional consolidation the two options here.

We expect to see a renewed focus on M&A

The hunt for copper projects of scale continues, operating projects have changed hands over the last year and there is speculation that further transactions will occur, e.g. BHP's bid for Oz Minerals. Our analysis of developing copper projects has highlighted the lack of quality, near-development, low-risk propositions. Any discoveries in this space will see to-be suitors scrambling over each other for a seat at the table.

The jostling for position in the new, battery economy has led to more corporate activity, with the resource owners holding the aces. Recently, murmurings from OEM's out of the US and Europe looking to security surety of supply for their own production has increased, so we wouldn't be surprised to see further developments here over the next year.

Figure 32: Select WA Gold Projects with Substantial Resources



Source: Argonaut, Company Filings, Geological Survey of Western Australia

Commodity long-term price trend bottomed?

Longer term commodity supply/demand expectations

In summary, we surmise that:

- Global population and income growth will continue to drive overall commodity demand, albeit not at the unprecedented pace of the last two to three decades
- Prospects will vary appreciably for specific commodities, with demand growth:
  - For *traditional commodities* needed to support economic development in emerging markets and developing economies to be sedate in comparison to the last couple of decades
  - For the *decarbonisation commodities* required to support the changing energy mix to be significant
- Supply side reality will emerge as a likely constraint in the coming years, given:
  - Prior underinvestment in exploration and development, the fact that high grade resources are increasingly difficult to find, and the significant time lag between discovery and production
  - Near-term uncertainty, weak sentiment, environmental concerns, and funding issues, which compound the potential longer term supply problem by delaying today's investment decisions

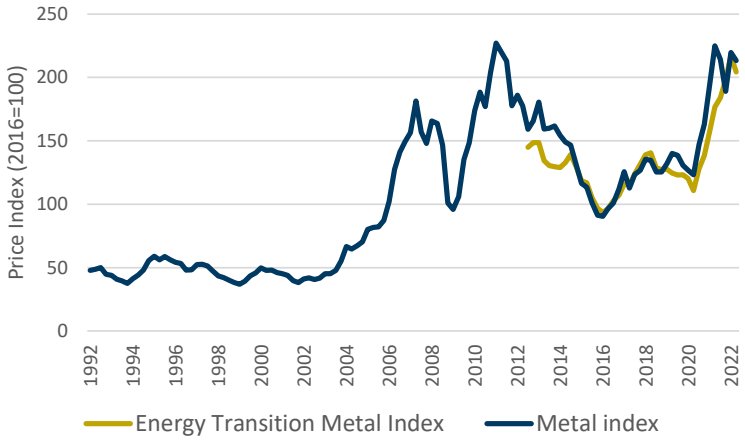
Decarbonisation associated commodities will need unprecedented supply

Commodity price implications

Since the turn of the last century real commodity prices have been volatile through boom and bust cycles, but the overall real price trend has been steadily downward. More recently, the last two decades have seen commodity prices cycle up then down, before a confluence of events (liquidity from Central Banks, fiscal largesse, and supply disruptions) in the last couple of years caused prices to spike (Figure 33).

Figure 33: Commodity price indices

Many metals will need a higher base price to encourage ongoing development and production



Source: IMF, Primary Commodity Price System. Energy Transition Index: Al, Cr, Co, Cu, Pb, Li, Mn, Mo, Ni, Pd, Pt, REEs, Si, Ag, V, Zn. Metals Index: Al, Co, Cu, Fe ore, Pb, Mo, Ni, Sn, U, Zn

From here tighter monetary policies' impact on global demand, slower growth in China, and geopolitical tensions suggest negative sentiment, volatility, and downward pressure on commodity prices in the short term.

However, looking beyond the near term our comments on supply and demand suggest there are sound reasons to believe the long downward trend in real commodity prices may have bottomed. In our view higher prices across a number of commodities will likely be needed to incentivise the supply response necessary to meet the demand growth in the coming decades.

Investors should focus on the decarbonisation thematic and those critical to supply chains

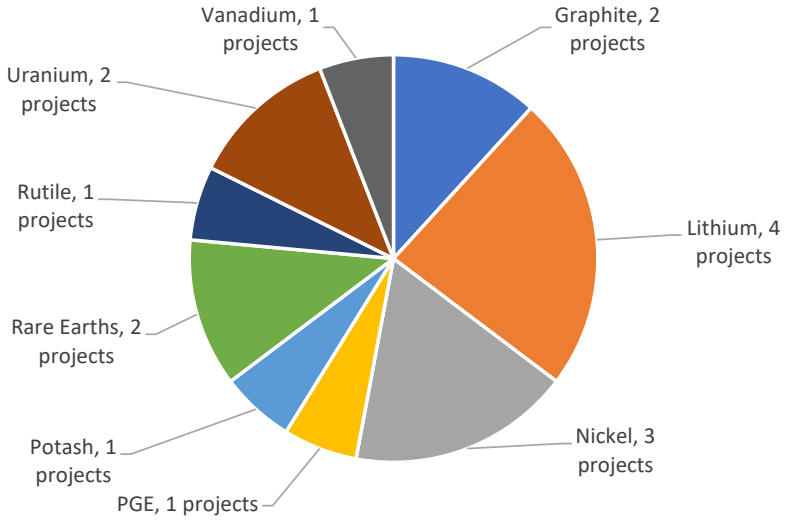
As highlighted in last year's BUPs, on a longer-term view we believe:

- Investors should focus on those commodities likely to be in demand to support the decarbonisation thrust, energy transition infrastructure, and that demonstrate strong growth potential in both percentage *and* absolute terms
- We remain particularly attracted to copper, nickel, lithium, graphite & cobalt
- We maintain nuclear energy, and therefore uranium, provides an obvious solution to the decarbonisation thrust
- In the absence of a significant technological breakthrough, fossil fuels will remain a key component of the energy mix longer than that envisaged under ambitious decarbonisation scenarios

The commodities to which the mining projects in this year's BUPs are exposed reflect the views outlined above (Figure 34). Excluding gold, we include two or more projects with exposure to lithium, nickel, graphite, rare earths, and uranium. Other projects provide exposure to PGE's, potash, rutile, vanadium, and zinc.

This year's BUPS includes a diverse mix of projects

Figure 34: 2022 BUPs & Special Mentions Commodity Splits by Number of Projects (excluding gold projects)



Source: Argonaut

An important caveat is that innovation may render current views redundant. Changes to existing technologies, or the introduction of completely new ones, may lead to commodity demand transitions that are unpredictable. Keeping on top of these changes, and reacting to them in a timely manner, will be critical in coming periods.

ESG considerations in Argonaut research

ESG-related attributes or risks are impacting investment attractiveness, cost of capital, and valuation. The ESG ratings and analysis industry is still evolving, and is characterised by numerous reporting frameworks and measurement practices. Although it is work in progress, it can't be ignored.

Our approach to ESG focuses on commitment, industry, and reporting

Argonaut's current approach (see "Building ESG into Research", 17th August 2022) is not set in stone and will adjust to reflect developments in industry best practice and an expanding knowledge base. Our commentary is mostly subjective as we believe this provides more value at this stage than a specific numerical "rating".

We ask three basic questions (Figure 35):

- *Commitment:* Is the Company convincing and does it "walk the talk"?
- *Industry:* How ESG friendly is the industry or sector in which it operates?
- *Reporting:* How well does the Company report on these ESG issues?

Our main goal is to identify companies that deserve credit or point out red flags with respect to their ESG credentials. The size and life-cycle stage of the company needs also to be taken into account. Where ESG/sustainability risks are high relative to company size/maturity, we will consider an appropriate adjustment to the valuation and/or opinion to reflect this risk.

Figure 35: Argonaut's ESG approach. This is not all inclusive and we do not purport to provide a rating that is inclusive of all the factors that may be considered in a full ESG ratings report

We assess a broad range of attributes

Measure	Selected Analysis factors	View
Commitment, operational delivery & risk mitigation	Largely subjective: • Visible efforts to embrace a more sustainable future • Nature of operations, jurisdiction and environmental impact • Comparison to peers in the same industry/sector • Efforts to mitigate identified risks • Engagement with stakeholders • Corporate governance considerations and good citizenship • Diversity, equality, and inclusion • Company actions supportive of aspirational targets • Energy usage and efforts to mitigate climate risks • Any reported ESG-related/corporate governance issues	Positive Neutral Negative
Industry/Sector sustainability	Largely subjective: • Commodity/product/service contribution to sustainable future • Industry/sector/business model resilience as pertains to ESG factors • Sector energy intensity and/or carbon emissions • Downstream/supply chain impact on sustainability	Positive Neutral Negative
Company ESG reporting	Largely objective (but in context of company size/maturity): • Sustainability/corporate governance report/audit • Availability of data to back up narrative (emissions, water usage etc.) • Reference to ESG-related framework (GRI, SASB, TCFD, UN SDGs, MSA) • Rating from a recognised global ESG ratings agency	Detailed Acceptable Limited

Source: Argonaut

NOT COVERED

Current Price	$0.76
Market Cap	$795M

Ticker:	**BGL**
Sector:	**Metals & Mining**
Shares on Issue (m):	**1,046.0**
Market Cap ($m):	**794.9**
Cash Est. ($m)	77.3
Debt Est. ($m)	0.0
Enterprise Value ($m):	**717.6**
52 wk High/Low:	**$1.01** **$0.64**
12m Av Daily Vol (m):	**2.5**

Projects	**Stage**
Bellevue	Comissioning / Construction

Mineral Resource	**Mt**	**Au (g/t)**	**Au (Moz)**
Bellevue	9.8	9.90	3.1

Ore Reserve	**Mt**	**Au (g/t)**	**Au (Moz)**
Bellevue	6.8	6.10	1.3

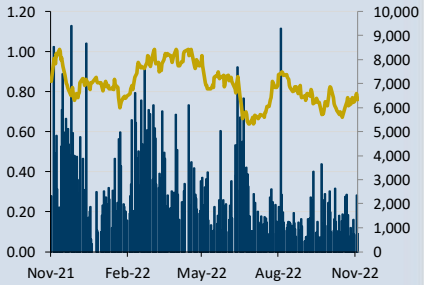
Cashflows	**2021**	**2022**
Operating Cashflow	-5.6	-8.9
Investing Cashflow	-57.4	-102.7
Financing Cashflow	133.1	137.4
Cash Balance	94.1	117.5

Directors & Management:

Kevin Tomlinson	Non-Execuive Chairman
Stephen Parsons	Managing Director
Fiona Robertson	Non-Executive Director
Shannon Coates	Non-Executive Director
Michael Naylor	Non-Executive Director
Darren Stralow	CEO
Guy Moore	CFO

Substantial Shareholders:	**%**
BlackRock Group	17.9%
Bank of Nova Scotia (and associates)	9.1%
Van Eck Associates	7.9%

Share Price Graph and Trading Volumes



Bellevue Gold (BGL)

Building Bellevue

Analyst: Royce Haese

Quick Read

By the end of 2023 Bellevue will be Australia's newest gold producer. The most current optimisation study forecasts it to also be one of the most profitable gold mines in the country producing +200kozpa on average over the first five of its current ten year mine-life, at an AISC of $1000-1100/oz. Bellevue gold will be the greenest gold produced in Australia, at a forecast emission intensity of 0.15t CO_2e/oz to 0.2t CO_2e/oz. Both the low cost and emission intensity is afforded by Bellevue's high-grade ore, from a Resource estimated at 3.1Mozs @ 9.9 g/t Au, the diluted Reserve grade has been estimated at 1.34Mozs @ 6.1 g/t Au. With construction of its 1.0Mtpa processing facility underway and capital development well advanced, the foundation is being laid for a long-term, highly profitable asset.

Overview

Room to Grow: While the present focus is on starting the mine, the two underground diamond rigs are completing grade control and some Resource conversion drilling near to existing development. Once in production, drill platforms for exploration drilling will become available and the current 1.34Moz Reserve will no-doubt grow, the rate of this growth will determine whether Bellevue extends the mine-life or increases production rate. The planned 1Mtpa processing facility has been designed to flex to 1.2Mtpa with minimal adjustments, and 1.5Mtpa with a small amount of additional capital.

Figure 36: Bellevue's Current Mine Plan Based on Existing Study, Current Production Gaps Highlighted with Future Drilling to Back-Fill

Source: BGL

Not Without Risks: As the studies have advanced, we have become increasingly comfortable that Bellevue has answers to the risks associated with narrow-vein gold mining. With four mining fronts available at start-up and investment into capital development now, the 1Mtpa production rate should be achievable early in the piece. Stopes are designed to a minimum mining width of 1.5 m, with 15 cm skins included either side, which is tight but not unachievable, we do see risk for extra unplanned dilution within these narrow sections of the mine. Australian developers have a poor track record for cost overruns/delays resulting in additional capex requirements of late. Bellevue has 90% of pre-production capex locked in, so mostly buffered, but we see risk here also.

Optimisation Study Results and Development Progress

In June 2022 Bellevue released a project update outlining a simplified production profile factoring in industry-wide cost escalations

In June 2022 Bellevue released a project update that saw a review of the previous plan and some updated cost and mining assumptions to factor in simplified production and industry-wide cost escalations. The study outlined a 1.85Moz life-of-mine inventory for a 10-year mine life underpinned by a 1.34Moz Probable Reserve.

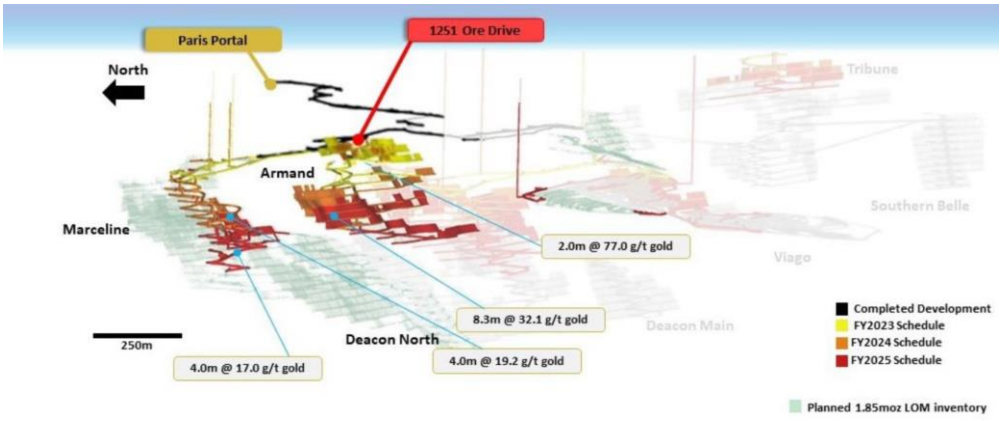
Bellevue estimates a 68% IRR

Total pre-production capex was estimated at $248M inclusive of contingency. AISC was estimated at $1,000 to $1,100/oz. Using a gold price of $2,500/oz, project level IRR is estimated at 68% (pre-tax) and annualised pre-tax cashflow over the initial ten-year mine life is forecast at $231Mpa. Project level NPV is not given in the study. The now outdated FS2 forecasted a project level post-tax NPV_5 of $943M.

Underground mining is well advanced, having commenced in July 2020. First ore at Armand was intersected in July this year

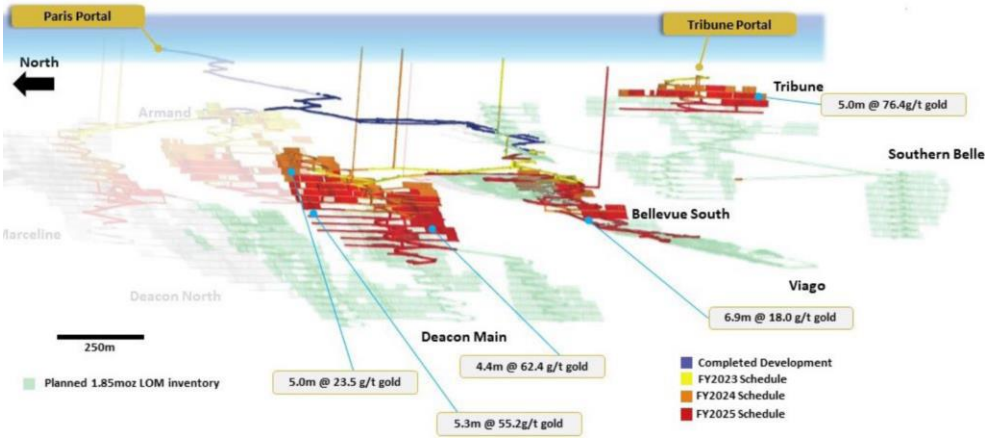
The project update simplified the mine schedule, with paste-fill and sub-horizontal mining pushed back in the plan. Top-down mining also reduces up-front capex and allows for more flexibility in the schedule. Underground rehabilitation and capital development commenced in July 2020, and first ore in the Armand lode was intersected in July this year. The mine is split into southern and northern production areas, both on separate tag boards and vent circuits to allow for independent firing. On start-up, ore will be accessed from four separate mining fronts.

Figure 37: Oblique View of Northern Production Area as at end of Q3 2022



Source: BGL

Figure 38: Oblique View of Southern Production Area as at end of Q3 2022



Source: BGL

Mill construction has commenced. First gold is scheduled for the second half of 2023

Bellevue forecasts 200kt of ore at an average grade of 5 g/t Au to be stockpiled ahead of commissioning. Construction has commenced on the 1Mtpa processing facility. The project has simple metallurgy, with +97% recovery expected with a high gravity component, >60%. First gold is scheduled for the second half of next year. Bellevue has $200M Project Loan Facility.

Almost all contracts are locked in

Bellevue has recently commissioned its 343-person camp and signed an early works agreement for power. Almost all contracts for construction and development are locked in, with the main final contract outstanding a surface miner to mine the Vanguard pit which is located at the site of the future tailings storage facility.

Figure 39: Project Development Timeline as at End of Q3, 2022

Source: BGL

Project Geology

Historically, Bellevue produced 800kozs at an average grade of 11 g/t Au

The original Bellevue lode was mined for 800kozs at an average grade of 11 g/t Au in the late eighties/early nineties. The more recent discoveries in Armand, Marceline, Deacon and Tribune are a series of parallel ore shoots both down-dip and along strike from the original lode. There are also flat-lying linking structures between the main zones. The host basalt and gabbro is hard and competent, with minimal ground-support required underground.

Mineralisation is associated with sulphides, enabling downhole EM to assist with targeting

Mineralisation is structurally controlled, the steeper mineralisation averages around 60 degrees dip to the west, shallowly dipping mineralisation makes up a smaller proportion of the deposit and dips gently towards the east. Mineralisation is associated with quartz veining and sulphides, generally pyrrhotite and chalcopyrite. This strong sulphide association has meant that downhole electromagnetics has proven an effective targeting tool resulting in a high hit-miss ratio in early exploration results.

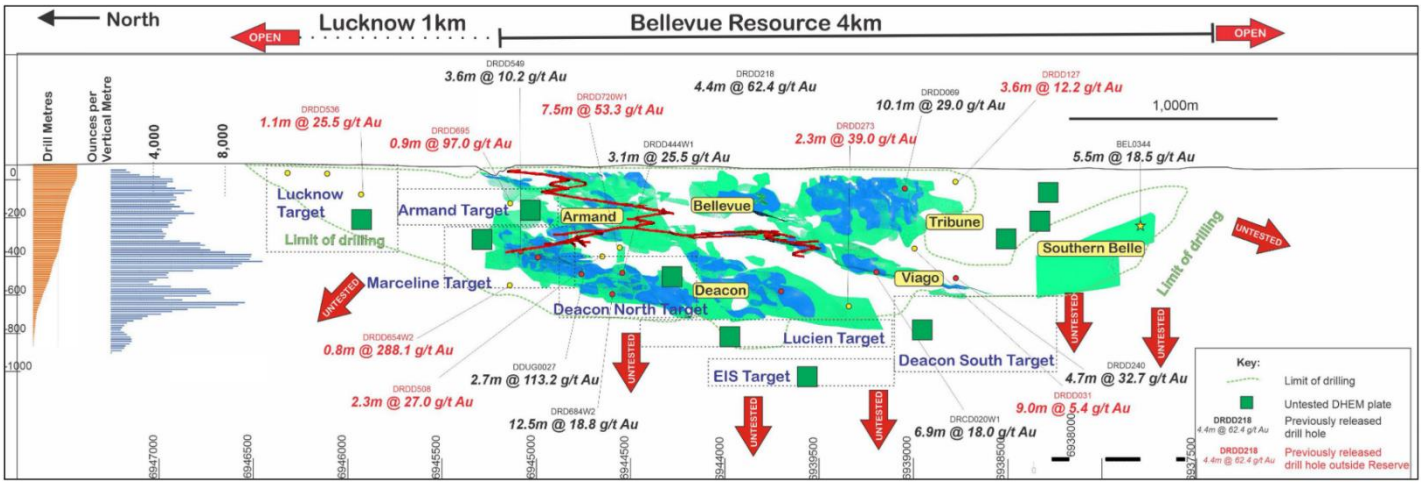
A series of late structures cross-cut mineralisation, with displacement varying from the metre scale to upwards of 100 metres. The location of these cross-cutting structures is factored into the mine plans.

Exploration upside remains

Significant exploration upside remains, with the current Resource limited by drilling and not by Geology. There is also potential for further structural repetitions of mineralisation. An EIS co-funded diamond hole intersected one such potential zone, subsequently named

the Duckula lode. Bellevue will renew its exploration focus once in production, with drilling from underground faster and more cost effective.

Figure 40: Bellevue Long Section with Reserve Shapes and Potential Drill Targets Outlined



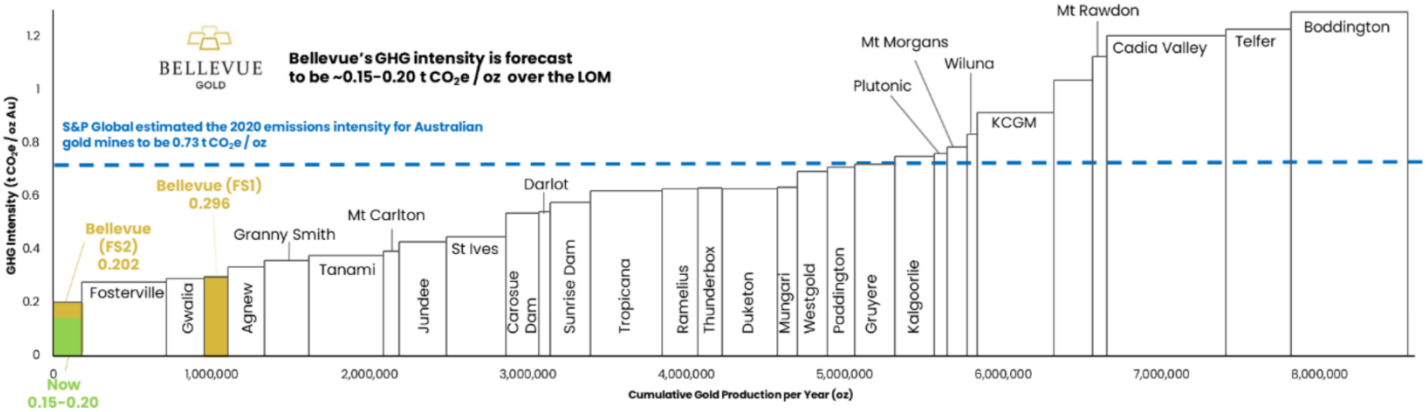
Source: BGL

Bellevue has a forecast emission intensity of 0.15t to 0.2 CO_2e/oz produced, and aims to achieve net-zero emissions by 2026

Responsible Development

On start-up, Bellevue gold will be the lowest carbon intensity gold produced in Australia, at a forecast emission intensity of 0.15t CO_2e/oz to 0.2t CO_2e/oz. The Company has aspirations of achieving net-zero emissions by 2026. 80% of energy required to run the site is expected to be renewable, with a contract in place to construct solar and wind farms, a battery facility, and a gas power plant. The hybrid power station is designed to operate 100% on renewables when wind and solar conditions permit.

Figure 41: Greenhouse Gas Intensity for Major Australian Gold Mines



Source: BGL

Bellevue also recently signed a Native Title Agreement with the Tjiwarl Native Title Holders. The Bellevue project has been designed with the Native Title Holders in mind, with considerations included to protect sensitive areas.

NOT COVERED

Current Price	$0.27
Market Cap	$118M

Ticker:	**BKY**
Sector:	**Metals & Mining**
Shares on Issue (m):	**445.8**
Market Cap ($m):	**119.3**
Cash Est. ($m)	83.6
Debt Est. ($m)	0.0
Enterprise Value ($m):	**35.7**
52 wk High/Low:	**$0.59** **$0.14**
12m Av Daily Vol (m):	**1.2**

Projects	**Stage**
Salamanca	Resource Development

Mineral Resource	**Mt**	**U3O8 (PPM)**	**U3O8 (Mlb)**
Salamanca	82.6	514	89.3

Cashflows	**2021**	**2022**
Operating Cashflow	-5.6	-5.8
Investing Cashflow	-0.1	0.0
Financing Cashflow	0.0	-0.1
Cash Balance	79.1	79.9

Directors & Management:	
Ian Middlemas	Chairman
Robert Behets	Acting Managing Director
Francisco Bellón del Rosal	Executive Director
Adam Parker	Non-Executive Director
Dylan Browne	CFO & Company Secretary

Substantial Shareholders:	**%**
Paradice Investment Management	9.9%
Packer & Co.	6.4%

Share Price Graph and Trading Volumes

Berkeley Energia (BKY)

The Salamanca Solution

Analyst: George Ross

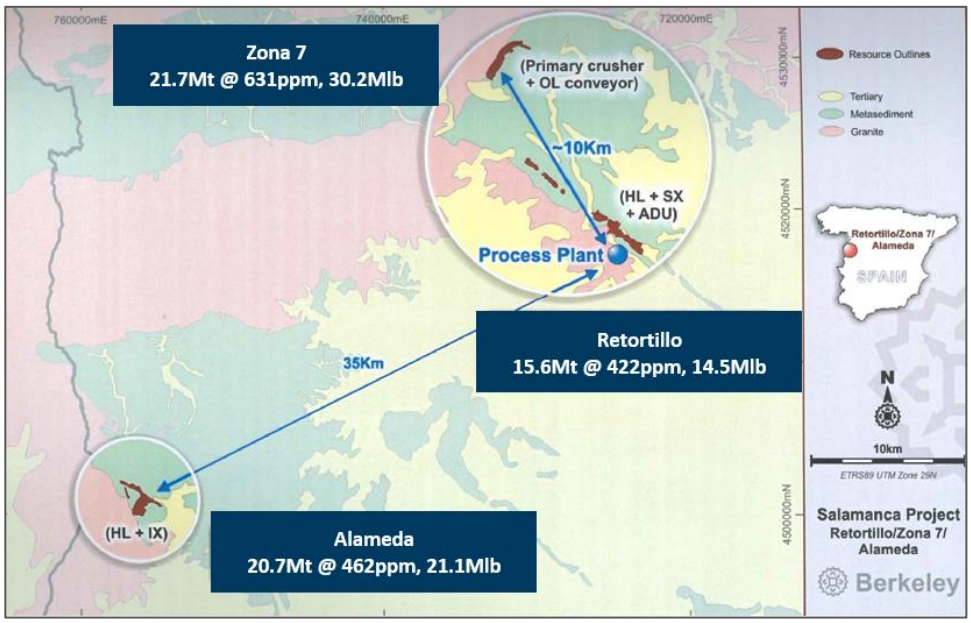
Quick Read

Berkeley Energia Limited (BKY) remains focused upon bringing its 100% owned Salamanca uranium project into production. Salamanca is located in western Spain, approximately three hours west of Madrid, within an area historically mined for uranium. The Project hosts Mineral Resources and Reserves containing 89.3Mlbs and 54.6Mlbs of U_3O_8 respectively. Despite facing ongoing permitting challenges, Salamanca is backed by strong underlying technical fundamentals. Ongoing energy challenges in Europe may help to ease regulatory pain, paving the way for development.

Project Overview

Location: The Salamanca Project is located in the central western Salamanca Province of Spain, within 40 kilometres of the border with Portugal.

Figure 42: Deposits and regional project infrastructure.



Source: BKY

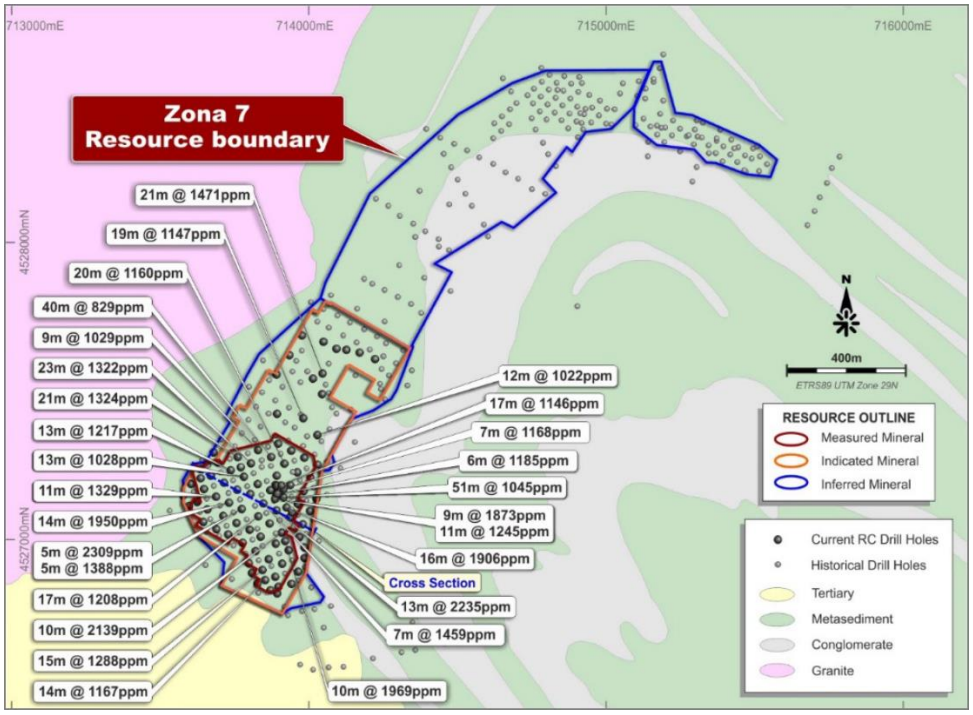
Geology: The project includes 13 separate Resources grading between ~400-760ppm U_3O_8. The planned initial operation will focus upon production from the three largest deposits: Retortillo, Zona 7 and Almadea. Uranium mineralisation is hosted within metasediments adjacent to a granite. Uranium mineralisation includes veins, stockworks and disseminations of uraninite and coffinite. Supergene enrichment occurs as flat tabular mineralised bodies at depth of weathering.

The Proposed Development: In 2016, BKY released a positive DFS with initial 14-year operation, capable of producing 4.4 million pounds of U_3O_8 per annum. The study envisages low-cost conventional mining of three deposits. Mining will initially begin at

Retortillo, followed by Zona 7 in year two and Alameda in year three. Processing will be completed at centralised plant built adjacent to the Retortillo deposit. Primary crushing of Zona 7 ore will occur at the pit, prior to it being transported to the plant via a 10km conveyor. Ore will be crushed, screened and agglomerated prior to stacking onto on/off heap leach pads for uranium extraction using sulphuric acid.

The Retorillo > Zona 7 >Alameda deposits will be developed sequentially over years 1-3

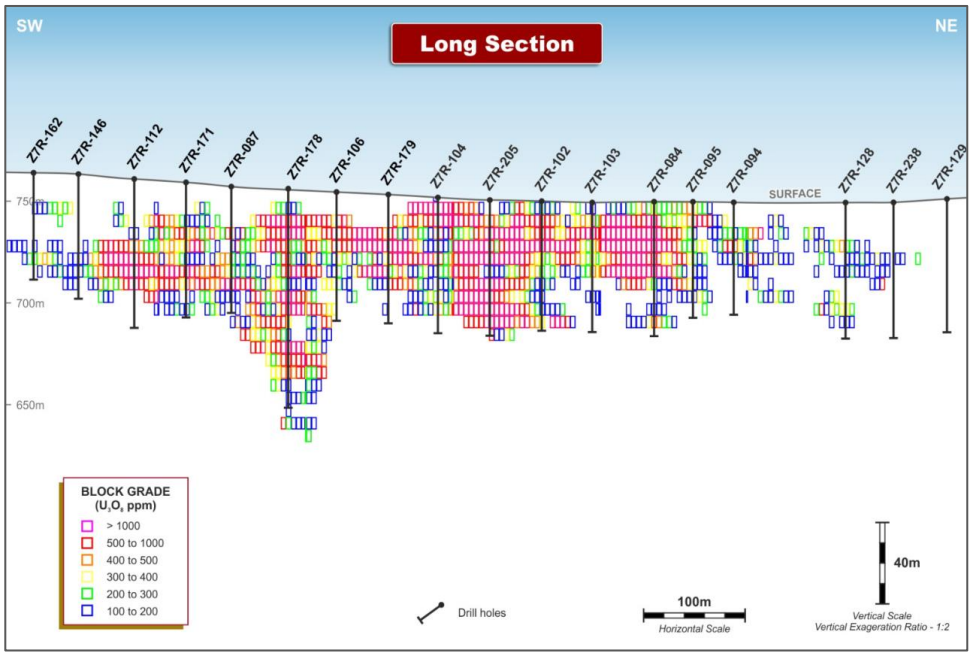
Figure 43: Zona 7 Resource boundary with select drilling results.



Source: BKY

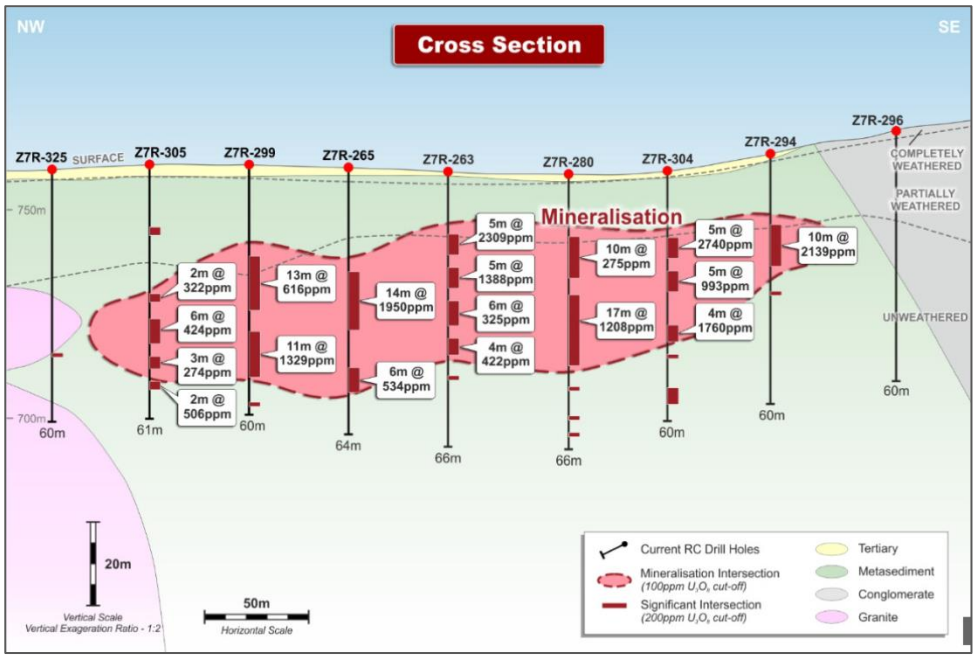
Figure 44: Long section of Zona 7 block model. Note vertical exaggeration of 1:2.

The Zona 7 Resource has a simple geometry



Source: BKY

Figure 45: Zona 7 cross section with geology and drilling results.



Source: BKY

88% metallurgy recovery with low acid consumption

Results from metallurgical test work programs suggest an 88% recovery with low acid consumption over a short residence time. Following treatment, ore will be reclaimed from the pads and backfilled into pits. Leach solution will be purified within a solvent extraction plant, prior to be calcined to produce a yellowcake product for external refinement.

Capital costs to first production US$94M with expansion requiring an additional US$139M

The Salamanca study estimated capital costs to first production from Retortillo of US$94M. Development of Zona 7 and Alameda will require an additional US$139M in capital expenditure to be incurred during the first and second year of production. The study derived a C1 cash cost of US$13.3/lb U_3O_8 and C2 cash cost (C1 plus depreciation and amortisation) of US$17.2/lb U_3O_8.

Permitting Pain

Ongoing permitting issues have blocked project advancement

In December of 2019 BKY reported the project was fully funded and would start construction in 2020. In August of 2020 municipality authorities granted BKY a land-use permit known as an Urbanism Licence, allowing construction of the mine to begin. In December of 2021 year, against a backdrop of anti-nuclear sentiment Spain's Ministry for Ecological Transition and the Demographic Challenge (Miteco) formally rejected BKY's authorisation to build a uranium processing plant at the Salamanca Project. Denial of the 'NSC II' application followed an unfavourable report by the Nuclear Safety Council in July 2021. Salamanca is unable to proceed without approval of the NSC II permit.

BKY believes that MITECO has infringed regulations on administrative procedures in Spain, as well as Berkeley's right of defence, which would imply that the decision on the rejection of the Company's NSC II application is not legal. NSC II is the only key approval required to commence full construction of the Salamanca mine. Berkeley is currently appealing this decision.

EU Energy Crisis – Spain Focus

Russian is a major supplier of oil, gas and uranium to Western Europe. Disruption of Russian supply triggered by the Ukraine conflict has triggered energy scarcity throughout the region and directed a spotlight towards energy security. Dramatic energy price hikes are being seen across Europe, causing ongoing social and economic unrest.

Security of supply power concerns to plague Spain with 39% of uranium imports sourced from Russia

In response, the European Parliament voted to reject objections to the inclusion of natural gas and nuclear power in its taxonomy plan which had been subjected to extensive debate since late 2021. Further, the European Commission released its proposed "REPowerEU Plan" in response to the Russian invasion of Ukraine. The Plan looks to reduce/eliminate the European Union's dependency on fossil fuel imports from Russia. Security of supply concerns continue to be raised in Spain, given that the country's existing nuclear power and fuel fabrication facilities import approximate 39% (2020) of their required uranium from Russia.

Earlier this year Spain's main opposition party outlined its proposals to counter ongoing economic turmoil associated with the EU's energy crisis. The party's proposed actions include life extension of Spain's fleet of seven operating reactors which are currently scheduled for phase-out from 2027.

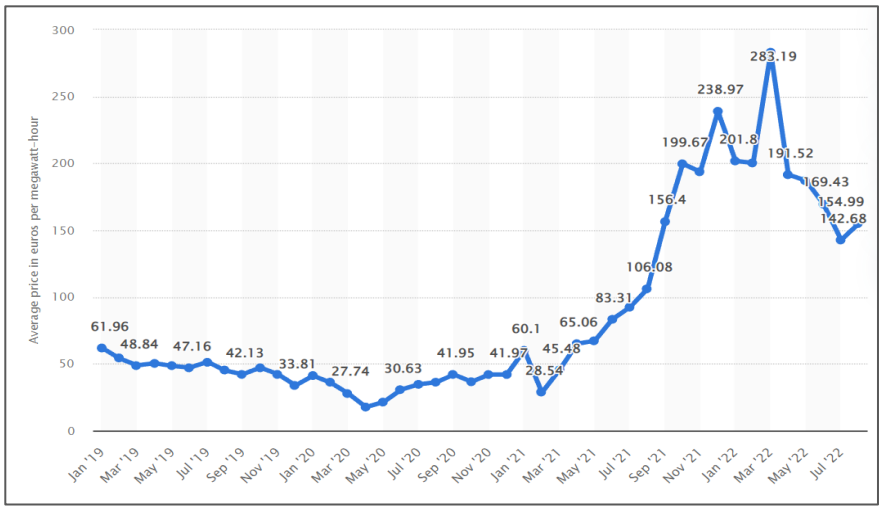
Will power tensions lead to nuclear having its day in the sun?

In August 2022 Spain's wholesale electricity cost was ~€155 per megawatt-hour, around 43% higher than the August 2021, and 320% higher than August 2020. Power costs are expected to spike again over the winter period as more electricity is used for heating.

We think the onset of a cold and expensive winter may ultimately thaw Spain's anti-nuclear sentiment, enabling Salamanca to have its day in the sun.

Figure 46: Spanish monthly electricity wholesale price from January 2019 to August 2022

Spain's wholesale electricity price currently ~€155 per megawatt-hour



Source: Statista

Project Valuation

BKY's 2016 financial model generated a post-tax NPV8 of US$532M with a 60% internal rate of return. The model incorporates uranium sales pricing starting at US$39/lb in Year 1, US$45/lb by Year 5 and incrementally escalating to US$67/lb by Year 14.

Centaurus Metals (CTM)

Green Nickel Machine

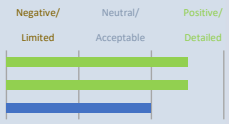
Analyst: George Ross

SPEC BUY

Current Price	$0.95
Valuation	$1.87

Ticker:	**CTM**
Sector:	**Metals & Mining**

ESG Ratings:



Key Financials

Shares on Issue (m):	**427.1**
Market Cap ($m):	**414.3**
Cash Est. ($m)	47.1
Debt Est. ($m)	0.0
Enterprise Value ($m):	**367.2**
52 wk High/Low:	**$1.53** **$0.87**
12m Av Daily Vol (m):	**1.1**

Projects	**Stage**
Jaguar Nickel Sulphide	Scoping Study
Jambreiro Iron Ore	Pre-Feas Study

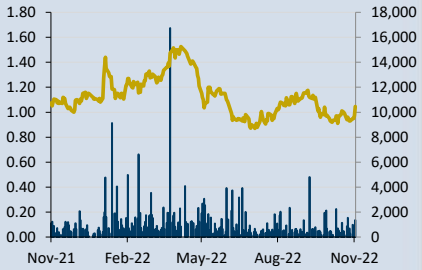
Mineral Resource	**Mt**	**Ni (%)**	**Ni (kt)**
Jaguar Nickel Sulphide	108.0	0.87%	939.0

Cashflows	**2021**	**2022**
Operating Cashflow	-8.1	-15.2
Investing Cashflow	-1.2	-5.8
Financing Cashflow	24.8	5.3
Cash Balance	24.1	8.3

Directors:	
Didier Murcia	Chairman
Darren Gordon	Managing Director & CEO
Bruno Scarpelli	Executive Director
Mark Hancock	Non-Executive Director
Chris Banasik	Non-Executive Director
Natalia Streltsova	Non-Executive Director

Substantial Shareholders:	**%**
Mccusker Holdings	14%
Sprott Inc.	9%
Regal Funds Management	6%
Dundee	5%
Harmanis Holdings	5%

Share Price Graph and Trading Volumes



Quick Read

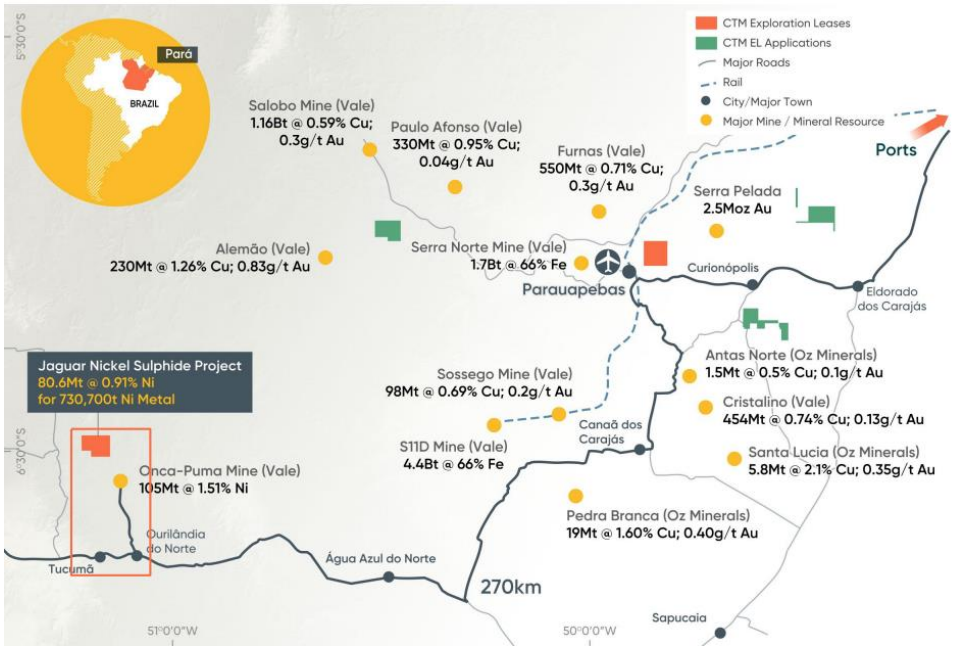
CTM's Jaguar Nickel Sulphide Project has made significant advancement during the past year. The project's Resource base continues to expand with over 60,000m of drilling completed in the last 12 months. Total contained nickel is expected to reach 1Mt in future MRE updates. Comprehensive technical studies will form the basis of a Definitive Feasibility Study scheduled for release in mid-2023. FID remains on track for later that year, with construction to begin in 2024 and production to commence in late 2025.

Project Overview

Location

The Jaguar Project site is located within Brazil's Carajás Mineral Province within the State of Pará. The region is synonymous with large to giant iron, copper-gold & nickel deposits. The site accessed from the township of Tucumã via approximately 40km of unsealed roads with alternative access provided past Vale's large US$2.8B Onca Puma mine and ferronickel refinery.

Figure 47: Location of Jaguar Nickel Sulphide Project.



Source: CTM

Geology & Resources

The Jaguar mineralised system is somewhat of a geological oddity. Nickel, copper, zinc and cobalt sulphide is hydrothermal in nature, with a strong structural control. Mineralisation is most reminiscent of an IOCG (Iron-Oxide-Copper-Gold) system, but with nickel as the dominant metal. Within the project area, hydrothermal fluids have pulsed upwards through sheared rocks, resulting in emplacement of vertically continuous breccias and

veining. The deepest hole completed to date at Jaguar South has intersected mineralisation below 550m vertical depth.

Figure 48: Jaguar nickel sulphide breccia (Jaguar South) in drill core.

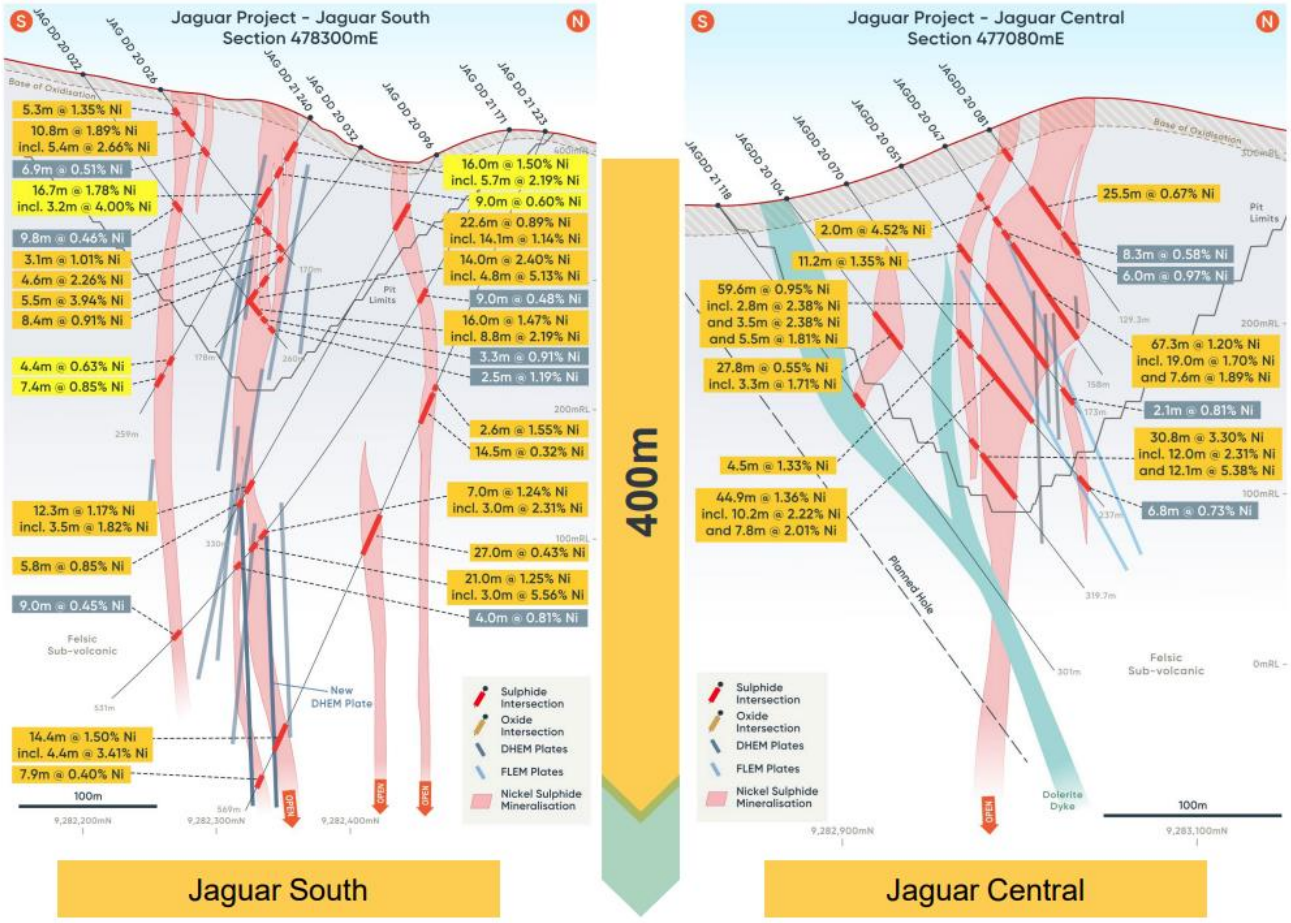
Spectacular nickel sulphide breccia

Source: Argonaut

Resources contain 939kt of nickel metal

Since acquisition of the Project in 2019, CTM has more than doubled the global Resource base to 108Mt grading 0.87% Ni for 939kt of contained nickel. Further expansion of the Resource is expected in mid-2023. It appears increasingly likely that the mid-2023 MRE update will see Jaguar admitted into an exclusive club of nickel sulphide deposits with greater than 1Mt of contained nickel metal.

Figure 49: Example cross sections through the Jaguar South and Jaguar Central deposits.



Source: CTM

Potential Development

The May 2021 Jaguar Value-Add Scoping Study considers a 2.7Mtpa operation for production of 20kt+ of nickel in sulphate product per annum over an initial 13-year mine life. A Detailed Feasibility Study scheduled for mid-2023 is expected to positively revise study parameters based on the 2023 MRE update. Construction is on track to commence in 2024, with first production in late 2025.

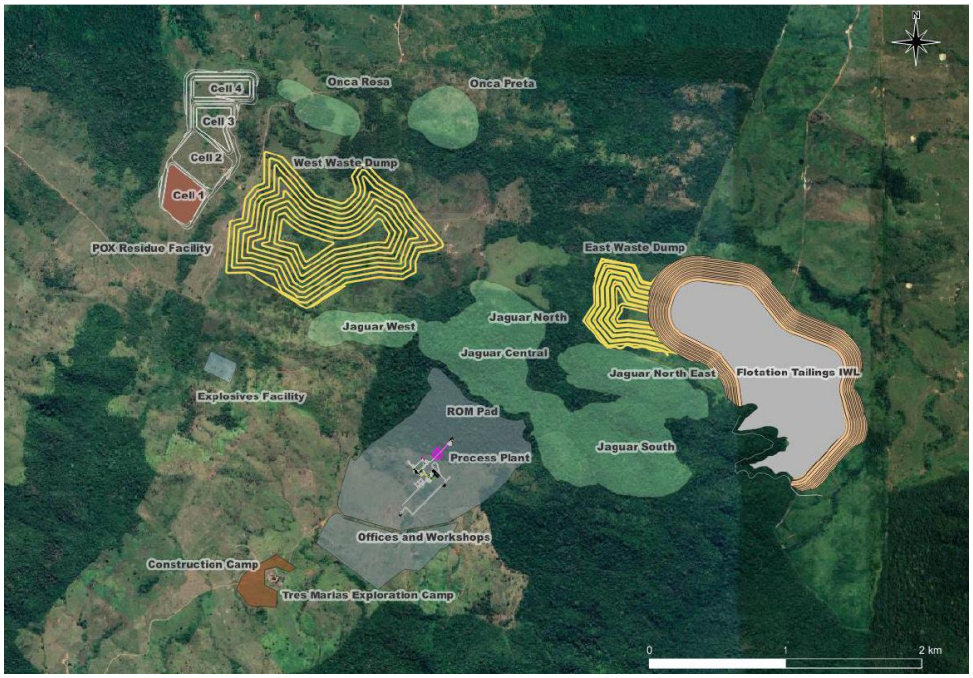
Mining

Mining to initially focus on Jaguar Central, Jaguar South & Onca Preta

During the first 3 years of Jaguar mine life we expect high-quality ore will be sourced from low strip ratio open pits at the Jaguar Central, Jaguar South and Onca Preta deposits. These early years should facilitate rapid payback of development capital expenditure. Recent pit optimisations for the Jaguar group of deposits based on the December 2021 MRE update suggest these will ultimately coalesce into a singular 3km long x 1km wide super pit with a LOM strip ratio of 7.5:1. With proven vertical ore body continuity we expect that mining will inevitably migrate to underground operations.

Figure 50: Planned Jaguar site infrastructure layout.

Jaguar pit will eventually merge to a 3km x 1km surface area



Source: CTM

Metallurgy & Processing

Low intensity POX key to unlocking full value from nickel sulphide

The hydrothermal nature of mineralisation benefits flotation recoveries and processing. To maximise available ore feed, the plant will be fed with Reserve grade ore blended with low grade mass upgraded through ore-sorting. The plant will be designed for 2.7Mtpa throughput of Jaguar's hardest ore type. This will enable the operation to sprint through softer ore tonnes when desired. The Jaguar flotation circuit will separate a metal enriched sulphide concentrate which will then be oxidised within a low intensity pressure oxidation vessel (POX). The POX liquor will subsequently be purified before sulphate precipitates of nickel and by-products are crystallised for sale. The market for nickel sulphate has surged in the past two years, driven by increased demand from the EV battery sector. Nickel sulphate demand is estimated to grow at 18-19% CAGR through to 2030. Production of a

nickel sulphate enables CTM to capture +100% payability compared with the ~70% payability received by traditional nickel sulphide concentrate producers. This benefit greatly enhances Jaguar's project economics.

Permitting

Environmental permitting submitted

In mid-August 2021 CTM reported that key environmental approvals had been lodged with the state environmental authority SEMAS. The Company is targeting approval of the Environmental Impact Assessment (EIA/RIMA) and grant of a Preliminary Licence (LP) in the near term. The EIA/RIMA submission was prepared using parameters for the Value-Add development scenario, for production of a nickel sulphate product.

Upon grant of an LP, CTM will apply for an Installation Licence (LI), which once granted will allow for construction of site infrastructure. Final Investment Decision and grant of the LI is targeted by the end of 2023, allowing for plant construction to commence in 2024.

CTM has secured possession of three key properties required for development of the Jaguar project.

Green Credentials

Top class carbon emission credentials

Jaguar's sulphate production pathway will produce nickel at a carbon cost of 4.69t of CO_2 per tonne of nickel equivalent metal. This ranks Jaguar's nickel carbon footprint better than 97% of global peers. The production of low carbon footprint metals is becoming increasingly important against the backdrop of decarbonisation.

We maintain that CTM will become an increasingly attractive investment proposition to OEM's seeking low greenhouse gas footprint metal and ESG focused funds.

Project Valuation

Argonaut's Jaguar project valuation model assumes predominantly open pit mining with lesser underground extraction from Year 4 onwards. We include US$420M in development capital (including pre-strip) funded by an ~50:50 split of debt and equity.

Argonaut estimates a build date NPV9 of A$1.2B based on a US$17,500/t nickel price

In our model, an integrated flotation-POX plant produces in excess of 20ktpa of nickel metal in sulphate product over a 17-year mine life. Our current model estimates a LOM C1 Ni Cash Cost of ~US$5/lb which may be improved with optimisation to mining and process pathways.

Using a flat US$17,500/t nickel price, Argonaut's Jaguar financial model estimates a build date NPV9 of A$1.20B, with revenues in excess of A$500M per annum, comparable to a ~200koz per annum gold producer. At a US$20,000/t nickel price Argonaut estimates a build date project NPV9 of A$1.62B.

De Grey Mining Ltd (DEG)

Stand Out Gold Asset

Analyst: John Macdonald

BUY

Current Price	$1.12
Valuation	$1.40

Ticker:	**DEG**
Sector:	**Metals & Mining**
Shares on Issue (m):	**1,540.8**
Market Cap ($m):	**1,718.0**
Cash Est. ($m)	166.9
Debt Est. ($m)	0.0
Enterprise Value ($m):	**1,551.1**
52 wk High/Low:	**$1.44 $0.74**
12m Av Daily Vol (m):	**6.1**

Projects	**Stage**
Mallina	Feasibility Study

Mineral Resource	**Mt**	**Au (g/t)**	**Au (Moz)**
Mallina	250.7	1.30	10.6

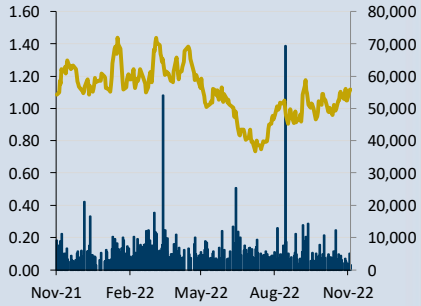
Ore Reserve	**Mt**	**Au (g/t)**	**Au (Moz)**
Mallina	103.4	1.50	5.1

Cashflows	**2021**	**2022**
Operating Cashflow	-4.1	-6.3
Investing Cashflow	-57.3	-121.5
Financing Cashflow	104.2	120.3
Cash Balance	70.9	63.5

Directors:	
Simon Lill	Non-Executive Chairman
Glenn Jardine	Managing Director
Andrew Beckwith	Technical Director
Peter Hood	Non-Executive Director
Paul Harvey	Non-Executive Director
Peter Canterbury	CFO

Substantial Shareholders:	**%**
Gold Road Resources	20.0%
Jupiter Asset Management	7.0%

Share Price Graph and Trading Volumes



Quick Read

Mallina passed its second study iteration in September 2022, on the way for a DFS conclusion by November 2023. We think a group will eventually pay up for control of Mallina, because Hemi's long-life, high-volume potential transcends gold price and cost inflation concerns.

Overview

PFS: De Grey completed a pre-feasibility study for the Mallina project in September 2022.

Key findings from the study include:

- The mine plan, including the regional deposits, assumes a 6.8Moz inventory, in 137Mt grading 1.56 g/t gold.
- Within the total inventory, Hemi's estimated inventory is 114Mt at 1.54g/t (5.6Mozs) at 6.1:1 waste:ore ratio. 90% of the Hemi inventory in the mine plan is estimated in ore reserves. Open pit only is considered at this stage.
- The PFS considered plans to process 10Mtpa ore at Mallina. 800ktpa of flotation concentrate will be pressure oxidised ahead of CIL processing along with the flotation tails.
- Capital costs are estimated at $1,053M including a $68M pre-strip.
- Estimated processing costs are $24/t. Mining costs are $31/t ore, using rates available in mid-2022.
- De Grey is looking at average output of 550kozspa over the first five years, with some grade streaming taking the early head grade average up to 1.75 g/t. Metallurgical recovery of gold is projected at 93.6%.

A schedule is set for completion of a DFS in 2023, construction from 2023 to 2025 and production from 2025.

In our model Mallina's post tax NPV at a 7% discount rate is $1.9B and the internal rate of return is 36%.

Main Risks: The projected flotation performance, and oxidation/CIL recoveries from all ore types and sources are very good at a very tolerable costs, and that may be an area that potential financiers or acquirers will want to bed down.

Recommendation

Our valuation and recommendation are $1.40/share and buy, respectively.

De Grey Mining

Equities Research

Analyst: John Macdonald

Recommendation	**Buy**	**Sector**	**Metals & Mining**
Current Price	**$1.12**	**Issued Capital (Mshs)**	**1,409**
Valuation	**$1.40**	**Market Cap (M)**	**$1,582**
			Tuesday, 8 November 2022

Profit & loss ($M) 30 June	2022E	2023E	2024E	2025E
Sales Revenue	**0**	**0**	**0**	**0**
+ Other income/forwards	0	0	0	0
- Operating costs	0	0	0	0
- Royalties	0	0	0	0
- Corporate & administration	-10	-28	-28	-28
Total Costs	**-10**	**-28**	**-28**	**-28**
EBITDA	**-10**	**-28**	**-28**	**-28**
- margin	0%	0%	0%	0%
- D&A	0	0	0	0
EBIT	**-10**	**-28**	**-28**	**-28**
+ Finance Income/Expense	0	0	-2	-6
PBT	**-10**	**-28**	**-30**	**-34**
- Tax expense	1	6	6	7
- Impairments and other				
NPAT	**-9**	**-22**	**-24**	**-27**

Cash flow ($M)	2022E	2023E	2024E	2025E
+ Revenue	0	0	0	0
- Cash costs	-10	-28	-28	-28
- Forwards	0	0	0	0
-Tax payments	1	0	6	7
+ Interest & other	0	0	-2	-6
Operating activities	**-10**	**-28**	**-24**	**-27**
- Property, plant, mine devel.	-89	-42	-493	-560
- Exploration	-4	-32	-20	-20
Investment activities	**-93**	**-74**	**-513**	**-580**
+ Borrowings	0	0	400	400
- Dividends	0	0	0	0
+ Equity	126	135	360	0
Financing activities	**126**	**135**	**760**	**400**
Cash change	**24**	**33**	**224**	**-207**

Balance sheet	2022E	2023E	2024E	2025E
Cash & bullion	**85**	**118**	**341**	**134**
Other Current Assets	0	0	0	0
Total current assets	**85**	**118**	**341**	**134**
Property, plant & equip.	167	209	702	1262
Investments/other	0	0	0	0
Total non-curr. assets	**167**	**209**	**702**	**1262**
Total assets	**252**	**327**	**1043**	**1396**
Trade payables	12	13	6	40
Short term borrowings	0	0	0	120
Other	12	13	68	68
Total curr. liabilities	**24**	**26**	**74**	**107**
Long term borrowings	0	0	400	680
Other	0	0	0	0
Total non-curr. liabil.	**0**	**0**	**400**	**680**
Total liabilities	**24**	**26**	**474**	**787**
Net assets	**228**	**301**	**570**	**609**

Shares	2022E	2023E	2024E	2025E
New shs issued/exerciseable	118	152*	301*	3
Average issue price	1.07	0.89*	1.19*	0.00
Ordinary shares - end	1409	1561	1862	1865
Diluted shares - end	1415	1565	1865	1865

*Argonaut assumption

Price assumptions	2022E	2023E	2024E	2025E
AUDUSD	0.726	0.725	0.725	0.725
Gold	1819	1810	1775	1750
Gold	2504	2497	2448	2414

Financial ratios		2025E	2026E	2027E	2028E
GCFPS	A¢	-1.9	36.8	36.7	36.2
CFR	X	0.0	3.1	3.1	3.1
EPS	A¢	-1.9	28.2	29.4	28.7
PER	X	0.0	4.0	3.8	3.9
DPS	A¢	0.0	0.0	0.1	0.1
Yield	%	0.0%	0.0%	6.2%	6.2%
Interest cover	x	-5.1	66.9	82.5	99.2
ROCE	%	-2%	43%	47%	50%
ROE	%	-6%	53%	44%	36%
Gearing	%	112%	59%	37%	22%

Operations summary	2025E	2026E	2027E	2028E
Mallina project				
Ore processed (Mt)	0.0	9.0	10.0	10.0
Head grade (g/t)	0.00	1.75	1.75	1.75
Met. recovery	0.00	0.94	0.94	0.94
Gold prodn (kozs)	0	474	527	527
Cost per milled tonne (A$/t)	0	53	56	58
Cash costs pre royalty (A$/oz)	0	1097	1168	1189
All in sustaining costs (A$/oz)	0	1223	1292	1310
Growth capital ($M)	560	3	6	6

Valuation summary	A$M	A$/sh
Mallina project 7% real after tax DR	1891	1.34
Exploration, all sites	284	0.20
Corporate overheads	-147	-0.10
Cash	75	0.05
Debt	0	0.00
Tax benefit	60	0.04
Hedging	0	0.00
Option/equity dilution	-186	-0.13
NAV	**1,977**	**1.40**

Directors, management	
Simon Lill	Non-Executive Chairman
Glenn Jardine	Managing Director
Andy Beckwith	Executive Director
Peter Hood	Non-Executive Director
Paul Harvey	Non-Executive Director

Top shareholders	M shs	%
Gold Road Resources	280	19.9
State Street Corporation	110	7.8
Jupiter Investment Management	99	7.0
Invesco Australia	71	5.0

Resources June '22	Mt	g/t Au	Kozs	Mkt cap/oz
Mallina gold project	**251.0**	**1.32**	**10,635**	**149**
Measured & indicated	158.0	1.34	6,808	
Inferred	93.0	1.28	3,828	
Includes probable reserves	**103.0**	**1.55**	**5,133**	**308**

Argonaut model Jun '22	Mt	g/t Au	Kozs	
TOTAL INVENTORY	**139.0**	**1.55**	**6,931**	**228**
Hemi open pit	114.0	1.54	5,645	
Satellite open pit	25.0	1.60	1,286	

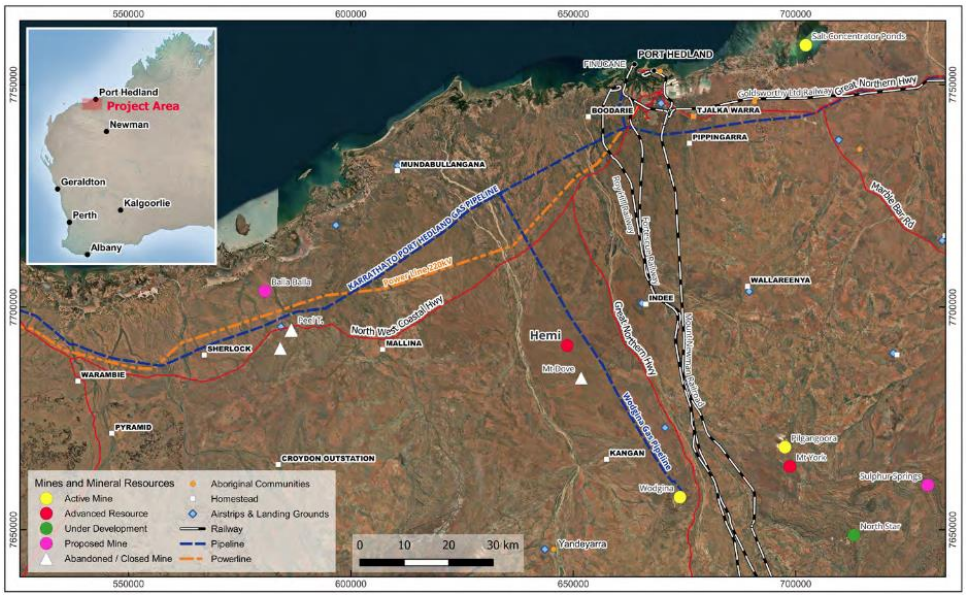
Background

A total of 136Mt ore production at 1.56 g/t gold is modelled within the pit shells, at a waste:ore ratio of 6.9:1.

Geology

Mallina is 70km south of Port Hedland in the Pilbara region of Western Australia, adjacent to established infrastructure including sealed highways, gas pipelines and a 220kV power transmission line. The project has an estimated resource of 250Mt at 1.3 g/t, containing 10.6Mozs.

Figure 51: Plan showing simplified geology and 2016 ore outlines.



Source: DEG

The Mallina flow sheet includes flotation of a sulphide concentrate and full pressure oxidation (POx) of the concentrate. CIL processing of concentrate and flotation tailings is planned, producing gold dore on site at +90% total metallurgical recovery

Resources and reserves

A September 2022 pre-feasibility study considered optimised pit shells that included measured, indicated and inferred resource estimates at both Hemi and regional deposits. A total of 136Mt ore production was modelled at 1.56 g/t gold within the pit shells, at a waste:ore ratio of 6.9:1. The Hemi deposits (Aquila, Brolga, Crow, Diucon, Eagle and Falcon) contribute 80% of the first ten years of planned output. Ore reserves at Hemi are estimated at 114Mt at 1.54 g/t gold, containing 5.1Mozs.

The gold mineralisation at Hemi is associated with stockwork chlorite-arsenopyrite-pyrite veins in felsic intrusive rocks. The deposits are under 40m of transported cover. Oxidised and transitional material comprises 15% of contained gold in reserves.

Metallurgy and processing

A portion of Hemi's gold is locked up within sulphide minerals such as arsenopyrite. In September 2022 De Grey selected a processing flow sheet that includes flotation of a sulphide concentrate and full pressure oxidation (POX) of the sulphide minerals in the concentrate. Flotation is expected to concentrate +90% of the gold into about 8% of the initial ore mass. CIL processing of concentrate and flotation tailings is planned, producing gold dore on site at +90% total metallurgical recovery. High pressure grinding rollers (HPGR) form part of plans to process 10Mtpa ore at Mallina. The POX circuit is to treat 800ktpa of flotation concentrate. The decision to use POX comes after extensive trade-off studies against alternatives including Glencore's proprietary Albion system. De Grey says

De Grey is aiming to be in a position to make a decision on Mallina's development by November 2023.

Hemi material has advantages with respect to POX treatment. In particular, De Grey's consultant Wood has found the exothermic reaction driving the oxidation of the concentrate to be manageable without the need for external heating or cooling. De Grey and Wood have found that carbonates picked up in the flotation concentrate will significantly reduce the lime consumption in the neutralisation step.

Approvals, project timing

De Grey says negotiations with the traditional Hemi land owners, the Kariyarra people, are well advanced. Business opportunities, employment training and community programs are being considered. Heritage clearances have been completed over the key deposits and infrastructure corridors.

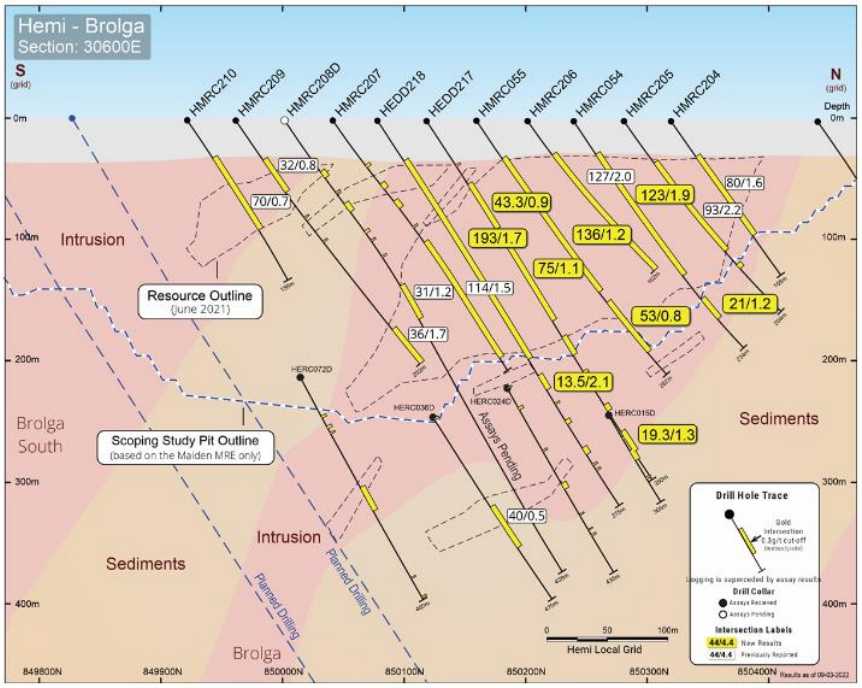
Whether Mallina's development includes Matters of National Environmental Significance (MNES) requiring referral under the EPBC Act to both Federal and State processes, is still to be determined. The indicative timetable for approval in the absence of MNES is 14 months. With MNES, assessment occurs at one of five levels, with no indicative timeframe set for approval.

De Grey is aiming to be in a position to make a decision on Mallina's development by November 2023.

Project Valuation

Argonaut's De Grey valuation is based on a discounted cash flow valuation of the Mallina project, and an informal estimate of exploration assets value and nominal assessment of De Grey's other assets and liabilities, as at June 2022. Assumptions about Mallina's future development and cash flows are based on De Grey's September 2022 feasibility study, with differences in timing and price settings. A real, after-tax discount rate of 7% is used.

Figure 52: Brolga (Hemi) section 30600E.



Source: DEG

NOT COVERED

Current Price	$0.64
Market Cap	$767M

Ticker:	**LLL**
Sector:	**Metals & Mining**
Shares on Issue (m):	**1,197.6**
Market Cap ($m):	**766.5**
Cash Est. ($m)	71.5
Debt Est. ($m)	0.0
Enterprise Value ($m):	**695.0**
52 wk High/Low:	**$0.80** **$0.37**
12m Av Daily Vol (m):	**8.5**

Projects	**Stage**
Goulamina	Early Works

Mineral Resource	**Mt**	**Li_2O (%)**	**Li_2O (kt)**
Indicated & Inferred	108.5	1.45	1570.0

Reserves	**Mt**	**Li_2O (%)**	**Li_2O (kt)**
Proven & Probable	52.0	1.51	785.2

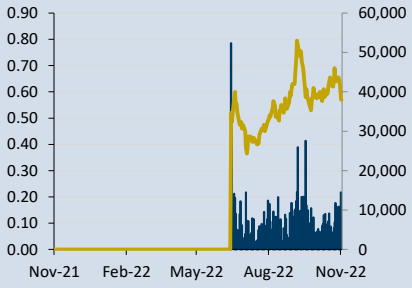
Modelled Production	**SC6 Conc. (ktpa)**
Stage 1	506.0
Stage 2	831.0

Directors:

Rick Crabb	Non-Executive Chairman
Simon Hay	Managing Director
Brendan Borg	Non-Executive Director
Mark Hepburn	Non-Executive Director
Rod Baxter	Non-Executive Director
Amber Banfield	Non-Executive Director

Substantial Shareholders:	**%**
Firefinch Ltd	17.6%

Share Price Graph and Trading Volumes



Leo Lithium (LLL)

Grand Goulamina

Analyst: George Ross

Quick Read

Goulamina is a standout lithium development located within southern Mali. The project is being developed and will be run under a Joint Venture with Chinese partner, lithium giant Ganfeng. Goulamina hosts Resources totalling 109Mt grading 1.45% Li_2O, although these are expected to grow significantly with further drilling. Upon full completion of its two-stage development Goulamina is anticipated to produce over 800ktpa of SC6 concentrate for >20 years. The development of Goulamina is well timed to address apparent insatiable demand for lithium driven by the switch from Internal Combustion Engine to Electric Vehicles.

Goulamina Lithium Project

Location & Tenure

The Goulamina Lithium Project is located within southern Mali, approximately 150km south of the capital Bamako and 50km east of the border with Guinea. The deposit is situated within a single Exploitation Licence that was granted for 30 years on 23 August 2019. The State owns all lands within the Exploitation Licence area.

Goulamina is fully permitted, with all environmental and mining licences in place. Process water will be provided via a 100km water pipeline from the Selingue dam.

Figure 53: Goulamina project location map.

Source: LLL

Project Ownership

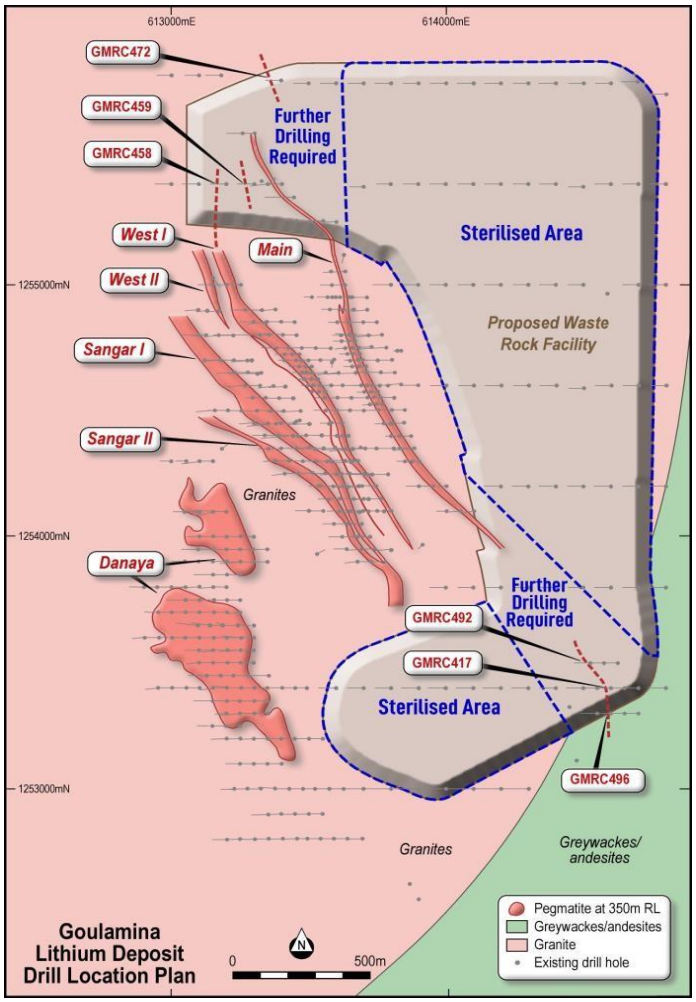
Leo Lithium and global lithium chemicals giant Jiangxi Ganfeng Lithium Co. share 50:50 ownership of Netherlands domiciled Mali Lithium BV (MLB). MLB and the State of Mali will be partners for the development and operation of Goulamina through co-ownership

of project company Lithium du Mail SA (LMSA). LLL will be responsible for management of the day-to-day activities of LMSA.

State of Mali likely to take 20% ownership

The State of Mali will be free-carried by the Goulamina joint venture on its initial 10% interest in LMSA and has the option to subscribe for a further 10% interest, for 20% total ownership. If the Malian government exercises its LMSA Option, LLL will hold an indirect interest in Goulamina of 40%. If the government does not exercise its Option, LLL will hold a 45% effective interest in the project.

Figure 54: Goulamina defined pegmatites with proposed waste rock facility and drilling.



Source: LLL

Plenty of room for deposit expansion

Funding & Offtake

The Goulamina JV has immediate access to US$170M for project development. Under the formation terms of the JV, Ganfeng invested US$130M in MLB. These funds have been ringfenced to fund project development. Ganfeng has also backed an expandable US$40M debt facility for LMSA for project development. If mutually agreed between LLL and Ganfeng, this facility can be increased should further funding be required. Opportunity also exists to forward sell concentrate if additional funding is required.

Funding largely facilitated by JV partner Ganfeng

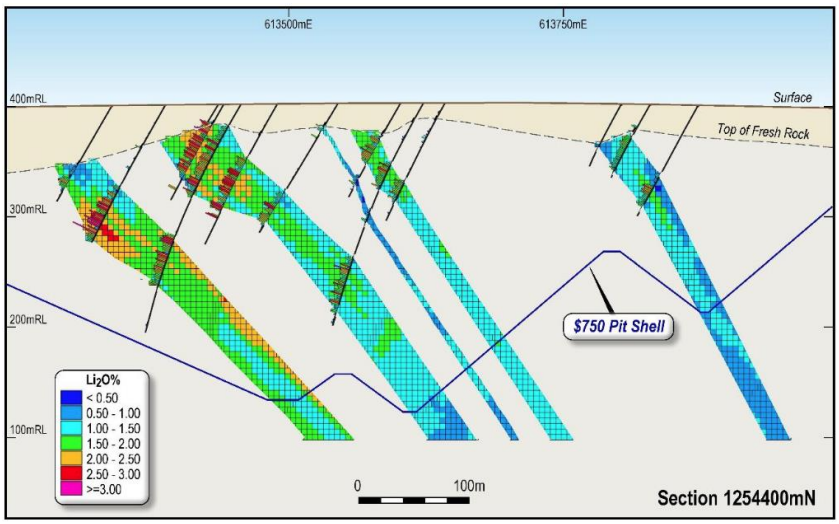
Ganfeng will take 50% of Goulamina's lithium spodumene and retains the right to increase its offtake to 100% under certain circumstances.

Deposit & Resource

Already one of the world's best hard rock lithium deposits

Goulamina is regarded as one of the world's best hard rock lithium deposits. Deposit geology is characterised by a swarm of coarse to fine pegmatites intruding into a granodiorite. Individual pegmatites extend up to and beyond 2km, and typically dip 50-70° to the north-east. Individual mineralised pegmatites vary in thickness up to ~50m true width. The deposit is unconstrained at depth with the lower limit of drilling being ~200m below surface.

Figure 55: Block model cross section through north-eastern pegmatite domains.



Source: LLL

Current MRE reported as 109Mt grading 1.45% Li_2O

The 2020 published Mineral Resource Estimate is reported as 109Mt grading 1.45% Li_2O above no cut-off grade. Considerable opportunity exists to expand the Resource both along strike and at depth.

Development infrastructure sterilisation and Resource extension drilling continue at site. Over 16,000 metres of Resource infill and extension drilling are scheduled for 2022/2023. The programs will aim to upgrade a large proportion of 43Mt of Inferred Resources to Measured and Indicated JORC categories for conversion to Ore Reserves. Results received to date are consistent with the existing deposit model.

Mining

3.3:1 pit strip ratio & 80% spodumene recoveries expected

Ore will be contract mined using traditional open-pit drill and blast mining with truck haulage. The current Open Pit Ore Reserve is reported as 52Mt grading 1.51% Li_2O (October 2020). This tonnage is likely to increase with revision and upscaling of the development. Current pit optimisations indicate a low 3.3:1 strip ratio.

Metallurgy and Processing

Goulamina deposit metallurgy benefits from advantageous geology. Mineralised pegmatites are typically tens of metres wide, and without significant internal dilution. Recent test work supervised by partner Ganfeng suggests an expected 80% Li_2O recovery for an SC6 product using conventional flotation processing with an accompanying magnetic separation circuit. Concentrate characterisation tests have determined the product will be low iron (<0.6% Fe_2O_3) and have low mica.

Transport

Spodumene concentrate trucked to port over a 6-7 day round trip

Spodumene concentrate will be trucked to port for international transport. Approximately 40 trucks are expected to depart each day. LLL is considering three port options and may adopt two to mitigate risk caused by potential transport disruptions. The round trip to port in neighbouring Cote D'Ivoire is approximately 6-7 days.

Morila SA Insolvency Associated Risk

LLL was spun out of ASX listed Firefinch (FFX) in mid-2022. In early November 2022, FFX reported it would no longer fund its Malian subsidiary and owner of the Morila Gold Mine, Morila SA. Consequently, Morila SA is expected to enter insolvency. While the two companies are separate corporate entities, FFX remains LLL's major shareholder. A risk exists that the Malian government, contractors and other stakeholders may act indiscriminately towards LLL due to corporate links with FFX.

Project Development

Project specifics indicate exceptionally good financial outcomes

The December 2021 Project update assumes a two staged development. Following steady state production of the initial 2.3Mtpa plant will be expanded to 4.0Mtpa throughput. Construction and commissioning of the Stage 2 expansion is expected to take 18 months. Average annual SC6 annual spodumene concentrate production during is 506ktpa for Stage 1, and 831ktpa for Stage 2. The current mine plan considers production of 15.6Mt of SC6 spodumene concentrate over a 21-year initial mine life, from an Ore Reserve of 52Mt grading 1.51% Li_2O.

LLL estimates US$255M in development capital costs for Stage 1 and US$70M for Stage 2. Cash Costs are modelled at US$312/t and an All in Sustaining Cost of US$365/t of concentrate over life of mine.

Beyond supporting the State of Mali's 10% free carried interest, the project will be subject to royalties totalling 6%, a Corporate Tax rate of 30%, and a VAT rate of 18%. LLL will receive partial holidays for VAT and Corporate Tax rates for the first three and fifteen operational years respectively.

Project Status

30% of engineering complete, tenders underway

Early works including site access roads, a pioneer camp and perimeter fencing under construction began in Q3 of 2022 and major works will begin in Q1 of 2023. At the end of the September Quarter 30% of engineering was complete and 43% of tender packages had been issued to vendors. The project remains on track for commissioning and start up in the first half of CY2024.

Project Valuation

LLL estimates a build date NPV9 of A$4.1B. LLL's attributable share of this value is ~$1.6B assuming a 40% retained interest in the project (Ganfeng 40%, Mali Government 20% ownership). This figure accounts for the State of Mali 10% free carry.

LLL's financial model incorporates a US$978/t SC6 sale value and operating costs of US$312/t SC6. LLL's assumptions include a two-stage plant build with production scaling up to 4Mtpa of ore processed by the end of the third year of production.

NOT COVERED

Market Cap	$4.3B
Current Price	$1.95

Ticker:	**LTR**
Sector:	**Metals & Mining**
Shares on Issue (m):	**2,196.4**
Market Cap ($m):	**4,283.0**
Cash Est. ($m)	419.8
Debt Est. ($m)	0.0
Enterprise Value ($m):	**3,863.2**
52 wk High/Low:	**$2.12** **$0.88**
12m Av Daily Vol (m):	**14.9**

Projects	**Stage**
Kathleen Valley	Comissioning / Construction

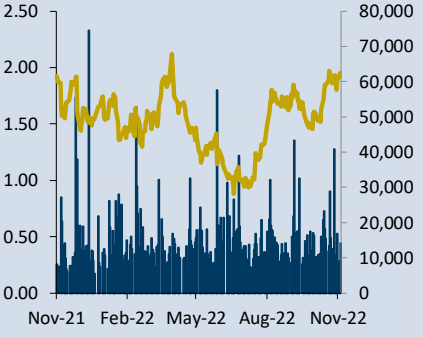
Mineral Resource	**Mt**	**Li_2O (%)**	**Li_2O (kt)**
Kathleen Valley	156.0	1.35	2184.0

Cashflows	**2021**	**2022**
Operating Cashflow	-8.2	-47.0
Investing Cashflow	1.4	-14.0
Financing Cashflow	14.1	501.5
Cash Balance	12.5	453.1

Directors:	
Timothy Goyder	Chairman
Antonio Ottaviano	Managing Director & CEO
Anthony Cipriano	Non-Executive Director
Craig Williams	Non-Executive Director
Jennifer Morris	Non-Executive Director
Shane Mcleay	Non-Executive Director
Adrienne Parker	Non-Executive Director
Craig Hassson	CFO

Substantial Shareholders:	**%**
Timothy Goyder	15.0%

Share Price Graph and Trading Volumes



Liontown Resources (LTR)

King of the Valley

Analyst: Royce Haese

Quick Read

Liontown plans for Kathleen Valley to be a globally significant spodumene producer by the middle of 2024. One of the largest lithium projects currently under development in the world; upon start-up, the 2.5Mtpa processing facility will deliver 500ktpa SC6 concentrate to its Tier-1 offtake partners. A planned expansion will increase capacity to 4Mtpa processing/700ktpa concentrate delivery by the end of the decade. Liontown is also investigating downstream processing opportunities to capture value-add potential.

Overview

Liontown's 100% owned Kathleen Valley Lithium Project is located on the western edge of the Norseman-Wiluna Greenstone Belt, approximately 680km North-East of Perth, Western Australia. Kathleen Valley is proximal to well-established transport and energy infrastructure and numerous major Nickel and Gold Mines.

Figure 56: Kathleen Valley Location

Source: LTR

Ready to Roll - Studied, Funded, Permitted

Liontown has defined a substantial Resource base, completed Definitive level studies, secured funding and offtake agreements, and has commenced construction.

Project Mineralisation

The project holds a Mineral Resource estimate of 156Mt at 1.35% Li_2O and 130ppm Ta_2O_5 (+80% Measured and Indicated), with an Ore Reserve of 68.5Mt at 1.34% Li_2O and 120ppm Ta_2O_5. Twenty individual pegmatite bodies have been identified at the project which are broadly classified into two swarms: a shallowly dipping north-eastern swarm (Kathleen's Corner), which contains 18 mapped pegmatites with an average thickness of 8 m, and a

The two pegmatite zones are interpreted to merge at depth

steeper dipping south-western swarm (Mt Mann) with two mapped pegmatites of average thickness 10 m. Most lithium is hosted within spodumene, with small zones of petalite in isolated sections of the orebody. The two pegmatite bodies merge at around 300 to 400 m depth, and coalesce into a single mineralised body that is interpreted to extend a further 700 m down-dip. Mineralisation is open at depth.

Figure 57: Coarse spodumene in drill core from Kathleen Valley

Source: Argonaut

The bulk of ore will be mined using underground methods

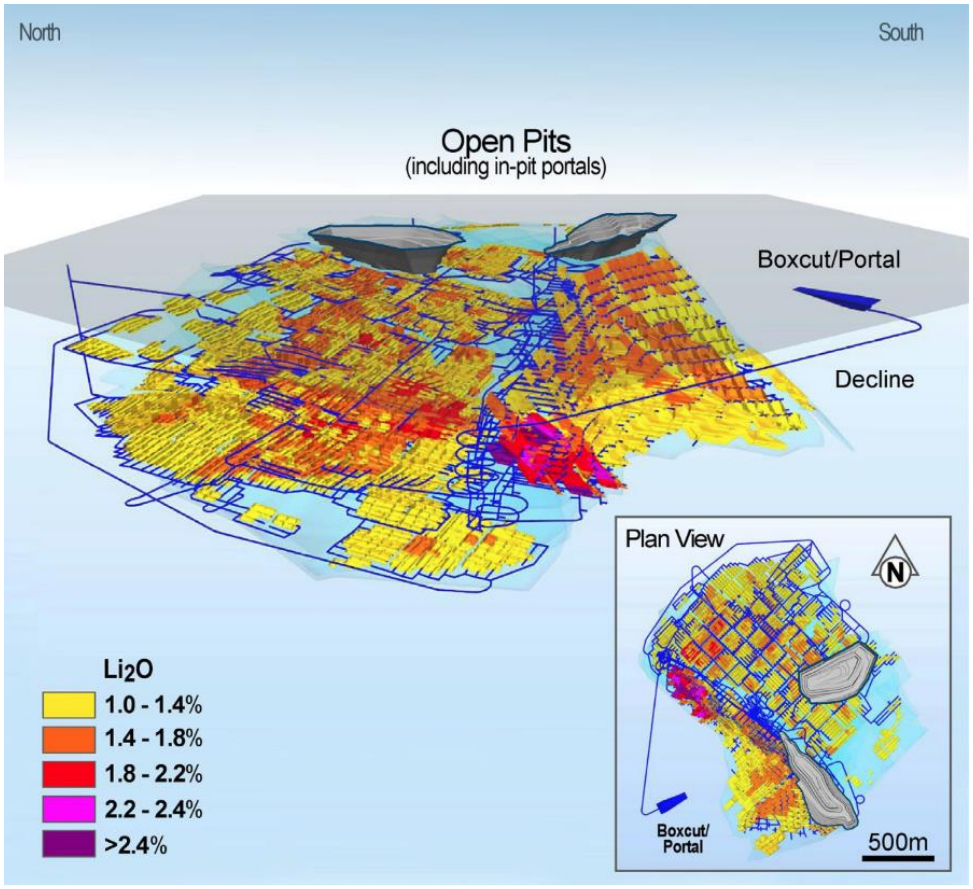
Study Physicals

Two small pits will transition to two underground mining operations at Kathleen Valley. The underground mines are separated into the two pegmatite swarms. At the sub-vertical Mount Mann deposit, transverse long-hole open stoping with cemented paste fill as backfill will be utilised. Within the north-eastern sub-vertical swarm both cut-and-fill and room-and-pillar mining will be utilised with paste fill. At steady state both mines will contribute fairly evenly to mill throughput.

Figure 58: Forecast ore production profile by mine area

Source: LTR

Figure 59: Proposed mine development with stopes and grades



Source: LTR

Liontown plans to double production capacity from 2029

Liontown assumes 78% spodumene recovery to concentrate

At start up, the proposed 2.5Mtpa processing facility will generate 500ktpa SC6 concentrate. A planned expansion will increase capacity to 4Mtpa processing/700ktpa concentrate delivery in 2029. Based on three phases of metallurgical test work Liontown assumes 78% recovery to concentrate across LOM. The project will be powered by a hybrid power station with capacity to generate 46MW from wind and solar, with a 17MW battery storage system plus 27MW of gas generation with 5MW diesel standby capacity.

Study Financials

Study financials show a high-margin operation, with potential to outperform if spodumene prices remain elevated

Total pre-production capital expenditure was estimated at $473M, with an additional $66M assumed for the expansion to 4Mtpa at year six. Estimated AISC for the first ten years of production was costed at US$452/t. Using a US$1,392/t FOB SC6 weighted average price assumption for concentrate, the study delivered a post-tax NPV_8 of A$4.2B and an IRR of 57%. If the 3-month average spot price of US$1,822/t FOB SC6 were utilised, the NPV_8 improved to A$6.6B and IRR to 87%. With recent reports of +US$7,000/t FOB SC6 prices there is significant potential for outperformance.

Downstream

Liontown is also investigating downstream options

A Scoping Study investigating downstream options was presented alongside the DFS. This study investigates generation of a battery-grade precursor product (lithium hydroxide monohydrate - LHM) produced from Kathleen Valley spodumene. PFS level work is ongoing assessing this option.

Fully Funded with Tier-1 Offtake secured

Kathleen Valley is fully funded to production

In December of 2021, the Company undertook a $450m institutional placement, this was followed by a series of announcements outlining binding offtake arrangements, including a funding facility agreement with Ford to provide Liontown with a $300M debt facility to use for project development. Liontown's offtake commitments of up to 450,000 DMT per annum represent approximately 90% of KV's start-up SC6 production capacity of ~500ktpa. With cash and debt available, Kathleen Valley is fully funded to production.

Figure 60: Overview of LTR's Offtake Agreements

Company Overview	TESLA	LG Energy Solution	Ford
Description	Largest EV automotive company globally	Second largest battery manufacturer globally	Leading global automaker
Headquarters			
Current Market Cap	US$599B	US$100B	US$55B
Select Customers	TESLA	HYUNDAI, VW, GM general motors	Ford
Offtake Terms			
Term	5 years	5 years with an additional 5 year extension option	5 years with an additional 5 year extension option
Quantum	100ktpa (Year 1) 150ktpa (Year 1-5)	100ktpa (Year 1) 150ktpa (Year 1-5)	75ktpa (Year 1) 125ktpa (Year 2) 150ktpa (Year 3-5)
Pricing	Formula-based mechanism referencing market prices for lithium hydroxide		

Source: LTR

Construction Underway

FID was approved in June 2022

Final Investment Decision was approved in June 2022. Liontown has required agreements and permits in place to commence development. It signed a Native Title Agreement with the Tjwarl native title holders in November 2021, and more recently received approval for its Mining Proposal from the Western Australian Government.

ESG Focus

From early stages Liontown has aimed to develop Kathleen Valley in the most sustainable way possible. Continual engagement with traditional owners has resulted in a strong collaborative relationship.

Liontown aims to be a net-zero carbon emitter by 2034

Underground mining was selected as the preferred mining method as it results in a smaller surface footprint and lower tonnage of material moved equates to lower emissions. Combined with 60% renewable penetration, Kathleen Valley will be a low emission producer at start-up. Liontown aims to improve upon this and has an aspiration target for net-zero emissions from operations by 2034.

NexGen Energy (NXG)

Rook I - Elite Status

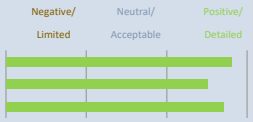
Analyst: George Ross

SPEC BUY

Current Price	$6.54
Valuation	$9.35

Ticker:	ASX:NXG, NYSE:NXE, TSX,NXE
Sector:	Metals & Mining

ESG Ratings:



Key Financials

Shares on Issue (m):	**479.4**
Market Cap ($m):	**3,135.4**
Cash Est. ($m)	177.0
Debt Est. ($m)	99.0
Enterprise Value ($m):	**3,057.4**
52 wk High/Low:	**$8.00** / **$4.55**
12m Av Daily Vol (m):	**1.7**

Projects	**Stage**
Rook I	Feasibility

Mineral Resource	**Mt**	**U308%**	**Mlb**
Arrow MI&I	8.2	1.9%	337.4

Ore Reserves	**Mt**	**U308%**	**Mlb**
Arrow Probable	4.6	2.37%	239.6

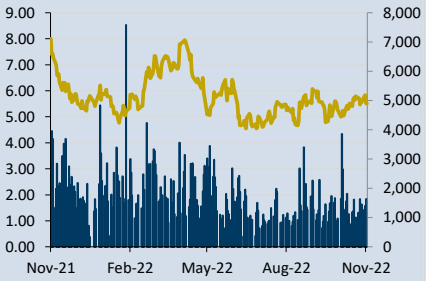
Cashflows	**2021**	**2022**
Operating Cashflow (C$m)	-19.2	-19.8
Investing Cashflow (C$m)	-18.2	-46.7
Financing Cashflow (C$m)	59.8	194.3
Cash Balance (C$m)	74.0	201.8

Directors & Management:

Christopher McFadden	Chairman
Leigh Curyer	President / CEO
Brad Wall	Executive Director
Warren Gilman	Non-Executive Director
Karri Howlett	Non-Executive Director
Richard Patricio	Non-Executive Director
Trevor Thiele	Non-Executive Director
Sybil Veenman	Non-Executive Director
Don Roberts	Non-Executive Director

Significant Shareholders:	**%**
Affiliates of CEF Holdings Limited	19.5%
Mega Uranium Limited	4.1%

Share Price and Trading Volumes (TSX:NXE)



Quick Read

By our measures, the Rook I development remains the world's standout undeveloped uranium project. The shear controlled, high-grade Arrow Resource is hosted within stable crystalline basement. This provides technical and financial advantages over typical Athabasca Basin unconformity deposits that require extensive ground freezing to mine. When developed Rook I will be capable of producing up to ~29 Mlbs of U_3O_8 in yellowcake product over its first five years of operation.

Overview

Arrow: Arrow style mineralisation is characterised by hydrothermal uraninite veining within steeply dipping shears and faults, with an average width of 60m. The Arrow deposit hosts a Resource of 8.15Mt grading 1.87% U_3O_8, including a high-grade component reported at 497Kt grading 15.9% U_3O_8.

Rook I Development: The currently proposed operation will mine and process approximately 450ktpa of Arrow Deposit ore. Under the currently proposed mine schedule head grades into the plan will range from 1.5-3% U_3O_8. Vat leach processing will be used to produce a saleable yellowcake product.

Permitting: The Rook I Environmental Impact Statement has been submitted to the Canadian Government for comment and assessment. The period for public comment expired on the 12th of October 2022.

Elite ESG: NXG strive to achieve 'elite' performance in all aspects of the business' activities including ESG performance. NXG scores highly with Argonaut's Commitment, Industry and Reporting ESG framework of ratings.

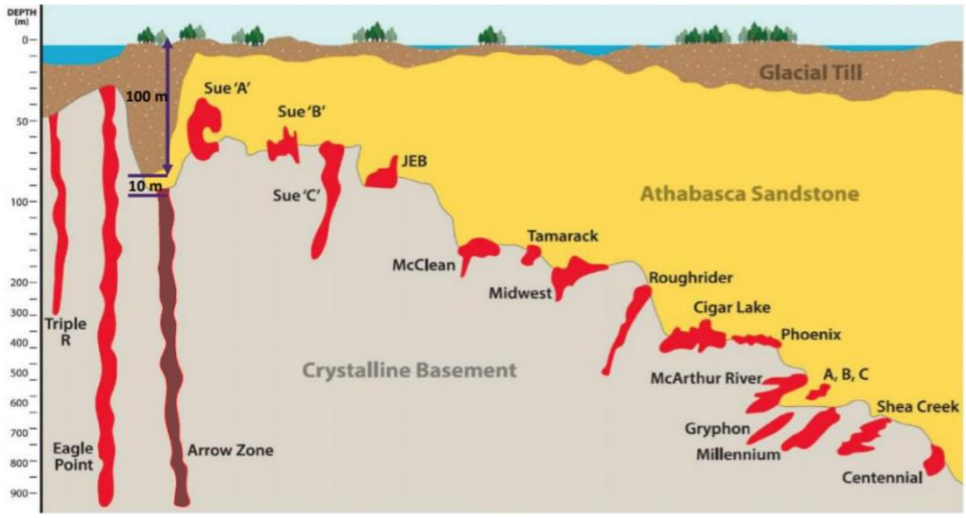
Exploration Upside: Arrow remains open along strike and at depth. Potential exists to discover a quiver of Arrows within NXG's prospective exploration tenure.

Project Location

Rook I is located just outside of the south-eastern boundary of the Athabasca Basin, Saskatchewan, Canada. A benefit of Rook I's location is the absence of competing commercial ventures. The harsh weather in this part of the world impairs vegetation growth, rendering the area largely unsuitable for commercial farming.

The Athabasca Basin region is regarded as one the world's great uranium provinces and hosts the famous McArthur River and Cigar Lake high grade mines. Unlike these deposits, NXG's Arrow Resource is hosted within competent crystalline basement rocks, older than overlying semi-consolidated Athabasca Sandstone basin sediments (Figure 61).

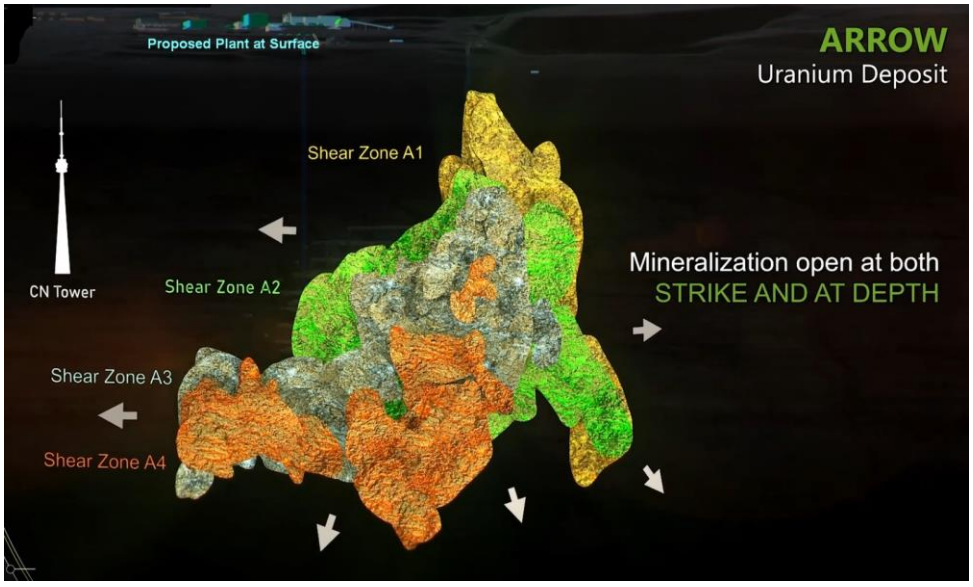
Figure 61: Schematic section with setting of different uranium deposits within the Athabasca basin area. Note non-linear vertical depth scale.



Source: Argonaut after NexGen Energy

Arrow is a bit different to most other Athabasca Basin deposits

Figure 62: Arrow deposit Resource model with individual shear zone domains (coloured). Relative size of the CN Tower (Toronto) shown for scale.



Source: NXG

The deposit remains open along strike and at depth

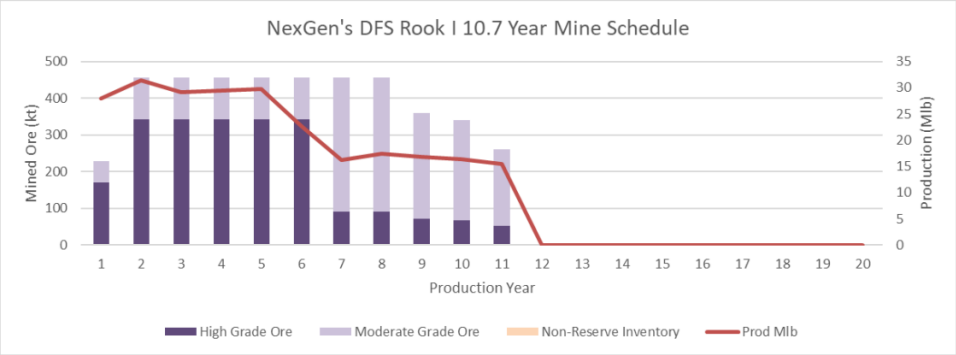
Proposed Development

The Rook I feasibility study was released in 2021

In February of 2021, NXG released a Feasibility Study for development of the Arrow Resource within the Rook I project. The study envisages an initial 11-year mine life, producing a total of 233Mlb of U_3O_8 from Mineral Reserves totalling 4.58Mt grading 2.37% U_3O_8.

The high-grade Arrow deposit provides NXG with scheduling optionality. The mine could be developed as planned for an 11-year life with very high initial U_3O_8 output. Otherwise, the production curve could be flattened, increasing mine life. Initial capital expenditure is estimated by NXG to be C$1.3B.

Figure 63: Rook I currently planned mine schedule.



Source: Argonaut

Permitting underway

Elite ESG credentials

Our present-day Rook I Project NPV exceeds A$4.8B

Infrastructure

Surface infrastructure will include the mill, batch plant, waste rock stockpiles, camp and airstrip. Tailings will be stored in a multichambered underground tailings management facility located to the north-west of the underground development.

Under the current development scenario, mine access will be provided via an 8m diameter Production shaft and 5.5m Exhaust shaft. Sinking of the shafts will occur through a shallow sequence of saturated overburden that will be temporarily frozen during development.

Mining & Processing

Approximately 1,300 tonnes of ore will be mined per day via longhole underground mining methods across up to five fronts. The mine will have 13 levels, spaced at 30m intervals. Stopes will be backfilled with a combination of process waste, cement and fillers.

Mine design and methods have been selected to reduce worker exposure to physical hazards and radiation. The mine will utilise a high degree of equipment mechanisation and remote operating capability.

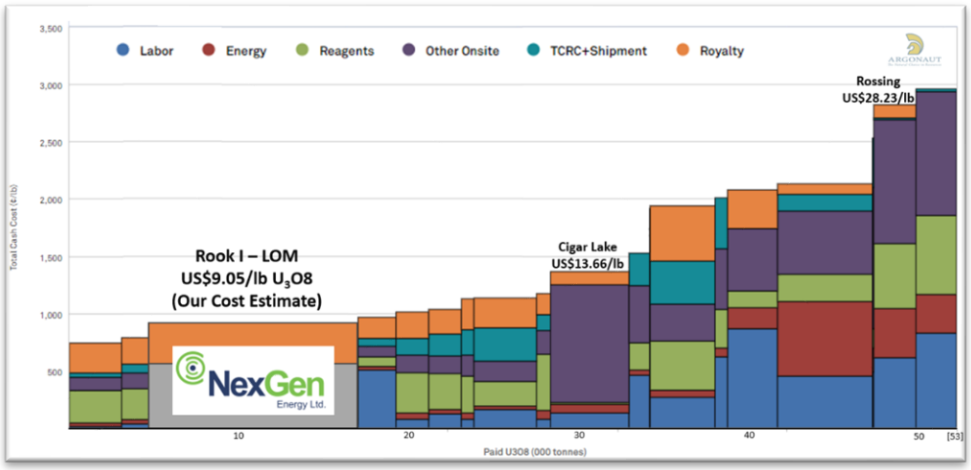
Operating Costs

We derive a Total operating cost of US$9.05/lb by adding revenue royalties to our C1 costs. Figure 64 compares Rook I's production output and Total Cost with major producing peers (data sourced from S&P Global). Rook I's unit costs compare favourably with other global producers, especially when also considering output tonnage (x-axis).

Underground Tailings Management

A key feature of the Rook I development is the Underground Tailing Management Facility (UGTMF). The UGTMF will be established during the Project's development phase with non-radioactive crystalline waste rock mined and discarded at surface. During operation processing plant tails will be combined with cement to form a paste that will be injected into UGTMF for permanent storage. This innovative disposal solution eliminates the risk of surface contamination due to dam or structure failure. The crystalline host rock has lower hydrological conductivity, ensuring radioactive tailings are isolated from regional groundwater aquifers.

Figure 64: Uranium production cost curve (per pound) for ~69% of global U_3O_8 plus Argonaut's Rook I LOM cost estimate based on a $US50/lb U_3O_8.



Source: Argonaut after S&P Global

Rook I will be an exceptionally low cost per pound operation compared to most peers

Permitting

On July 12, 2022, the Canadian Nuclear Safety Commission (CNSC) approved the Rook I Draft Environmental Impact Statement (EIS) for technical review. EIS approval is expected to be approved relatively quickly, at worst, the process may take up to two years. Work continues to advance on CNSC Uranium Mine and Mill Licence Applications. These will be submitted following finalisation of Environmental Assessment.

ESG Credentials

The planned UGTMF is considered a best in class environmental management solution

Facilities at the exploration site are world class in their design to ensure the safety of personnel and environment. This standard is expected to be upheld for planned mine and process infrastructure. The Underground Tailings Management Facility (UGTMF) exemplifies NXG's approach to environmental issues. NXG has a strong track record of engagement with stakeholders and has signed Indigenous Benefit Agreements with three of four claimant groups. Uranium is primarily used as a fuel within nuclear power plants. Nuclear energy is the only fuel based, scalable, non-carbon emitting source of electricity.

Valuation

Argonaut's A$4.8B valuation for Rook I is based on a discounted post-tax cash flow model for an 11 year operation using modified inputs from NXG's 2021 Arrow Feasibility Study. A real, after-tax discount rate of 8% is used for net present value estimation. A flat US$60/lb U_3O_8 price and 0.77 USD:CAD exchange rate were applied to the life of project.

Nico Resources Ltd (NC1)

Wingellina Nickel – Market Needs the Metal

John Macdonald

NOT COVERED

Market Cap	$47M
Current Price	$0.52

Ticker:	**NC1**
Sector:	**Metals & Mining**
Shares on Issue (m):	**91.0**
Market Cap ($m):	**47.3**
Cash Est. ($m)	9.3
Debt Est. ($m)	0.0
Enterprise Value ($m):	**38.0**
52 wk High/Low:	**$1.73** **$0.36**
12m Av Daily Vol (m):	**0.8**

Projects	**Stage**
Wingellina	Feasibility Study

Mineral Resource	**Mt**	**Ni (%)**	**Ni (kt)**
Wingellina	215.6	0.91%	1,954.0

Ore Reserves	**Mt**	**Ni (%)**	**Ni (kt)**
Wingellina	168.4	0.93%	1,561.0

Directors:	
Warren Hallam	Non-Executive Chairman
Rod Corps	Managing Director
Brett Smith	Non-Executive Director
Fergus Kiley	General Manager
Amanda Burgess	Company Secretary

Substantial Shareholders:	**%**
MetalsX Ltd	17.0%
Blackstone Minerals	15.0%
Board & Management	17.0%

Share Price Graph and Trading Volumes

Quick Read

This sleeping giant could quickly come to life because of its technical merits, falling infrastructure barriers, and the imperative of developing large scale, long term nickel sources.

Overview

40 years, 40ktpa: Wingellina is one of few undeveloped projects worldwide that could realistically supply 40kt of nickel per year for 40+ years, addressing one of commodity markets' greatest ongoing conundrums; how to get sufficient nickel supplies developed to meet projected demand.

Green and clean: EPA approved, land owner agreement in place, renewable power potential.

Limonite & HPAL: High pressure acid leach (HPAL) was devised for Wingellina style ore bodies. The low MgO and clay content in limonite or ferrous nickel laterites like Wingellina lower acid consumption and costs associated with HPAL processing. Wingellina is a rare geological example of a well developed nickel-cobalt bearing limonite profile preserved over 10km strike, 1km width and +100m depth. Wingellina's estimated 170Mt at 0.93% Ni, 0.07% Co reserve comes at a 1.1:1 strip ratio and it is mostly free dig material.

PFS: A feasibility study (to today's PFS standards) was completed in 2008. Resources and reserves were re-estimated in 2016. Updated numbers at PFS standard are to be completed by Nico by December 2022. The basic project plan is unchanged, with a mixed nickel cobalt hydroxide precipitate produced at site for sale. Renewable power options will be incorporated into the new study.

Taming the tyranny of distance: Wingellina has lain undeveloped since its discovery in 1956 because of the high cost hurdles of building and operating a major industrial complex in remote Western Australia. The barriers are crumbling. Glencore's Murrin Murrin HPAL project (+35ktpa Ni metal, +2.5ktpa Co) near Laverton in WA has operated since 2000. In September 2022 OZ Minerals (OZL) committed to developing its $1.7B West Musgrave nickel-copper project 120km west of Wingellina by 2025. The 800km stretch of gravel road from Wingellina to Laverton will be sealed by 2030. Renewable power generation advances are further reducing infrastructure build costs.

The nickel market is coming: Wingellina's failure to hook a major development partner in the past does not mean it will not happen. Nickel demand is growing at breakneck rates and developed supplies are depleting. Wingellina is a big undertaking with a large (+A$2.2B) up-front capital commitment and its time is coming.

Wingellina

Background

Nico is updating a 2008 DFs to PFS standard by the end of December 2022

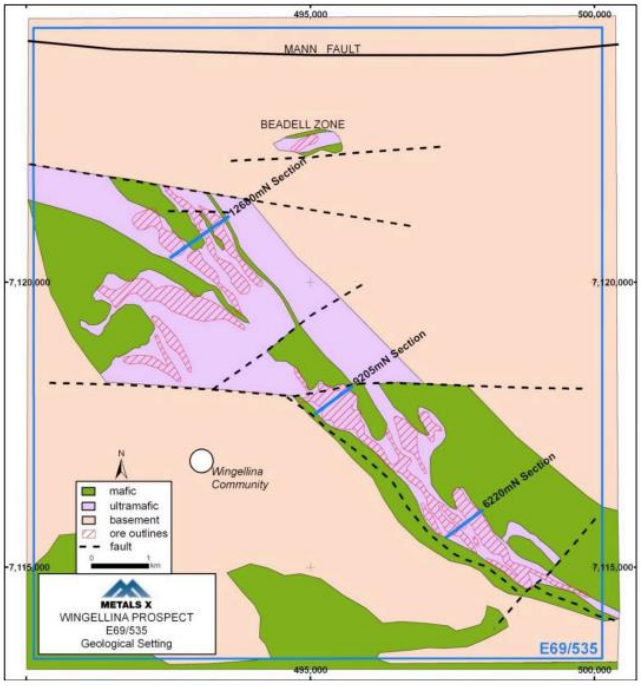
Wingellina is part of the Central Musgrave lateritic nickel-cobalt project spanning the Western Australian and South Australian border, near the border junction with the Northern Territory. The potential of Wingellina to be developed as a large-scale high pressure acid leach (HPAL) project was first identified by International Nickel (INCO) in the 1950s. The amenability of Wingellina's limonitic ore type to the HPAL process route drew INCO and successive owners to various levels of development study, including Metals X's 2008 DFS (subsequently relegated to pre-feasibility status). Nico floated independently from Metals X in early 2022 as a dedicated vehicle for the Central Musgrave project. The Company appointed Worley Services to update the capital and operating costs at PFS standard in April 2022. The study is due for completion by the end of December 2022.

Geology

The enriched nickel laterites extend up to 250m depth, over 8.5km of strike, and 1km across strike.

The Wingellina nickel cobalt deposits were formed by deep weathering of an olivine rich gabbro. Magnesium and silica have been almost completely leached from the weathered profile, upgrading the less mobile metals nickel, cobalt, iron and aluminium. The ultramafic host rock is weathered in some places to 250m depth. In plan the ore outlines extend over 8.5km of strike, with across strike width of up to 1km.

Figure 65: Wingellina Plan showing simplified geology and 2016 ore outlines.



Source: Metals X Group

Resources

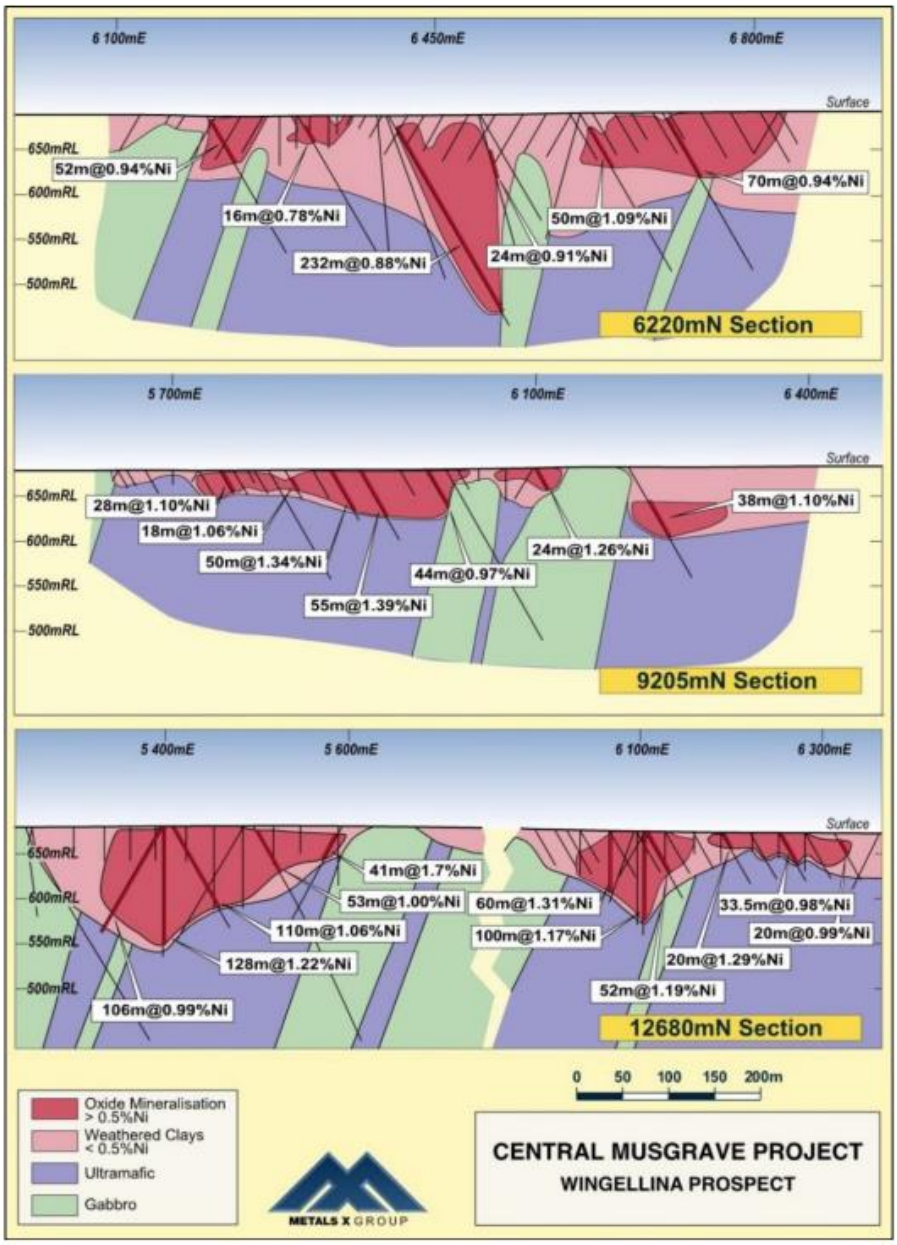
Metals X re-estimated Wingellina resources in 2016, marginally scaling back the nickel grades from the 2008 figures, and retaining the tonnage.

Wingellina resources 2016	kt	%Ni	kt Ni	%Co	kt Co
Measured	38	0.98	368	0.08	28
Indicated	131	0.91	1191	0.07	94
Total	169	0.93	1560	0.07	121

Additional inferred resources of 14Mt were estimated at similar nickel and cobalt grades. In conjunction with the resource estimate, ore reserves equivalent to the measured and indicated resources were declared. In 2022 consultants CSA Global considered the 2016 resource and reserve estimations consistent with JORC 2012 guidelines and industry practices. Nico expects to revise the estimates as part of the pre-feasibility studies in progress.

Reserves of 170Mt at 0.93% Ni and 0.07% Co were estimated in 2016.

Figure 66: Schematic Wingellina cross sections looking north west.



Source: Metals X Group

Mining and metallurgy

A mining rate of 4.3Mtpa ore and a waste:ore ratio of 0.5:1 for the first 20 years were assumed in previous studies. Waste:ore of the reserve is estimated at 1.1:1. 90% free dig material is anticipated.

The 2008 feasibility study was based on HPAL processing comprising parallel autoclave trains, calcrete neutralisation, and production of saleable nickel-cobalt hydroxide. Planned metallurgical recovery is 92% nickel and 89% cobalt. Acid consumption of 300kg/t ore was assumed.

Approvals

In 2010 the Wingellina Project Agreement was executed by the traditional land owners, providing for the future grant of mining leases, the construction and operation of the Wingellina mine and process plant, and associated compensation terms.

In 2016 the Environmental Protection Authority gave approval to implement the Wingellina Nickel project proposal following Public Environmental Review

In 2016 the Environmental Protection Authority (EPA) gave approval to implement the Wingellina Nickel project proposal following Public Environmental Review. In 2021 Nico requested extension of the timeframe for substantial commencement of the project by a further five years.

Logistics, development

The 2008 estimate of capital cost to build a 40ktpa nickel and 3ktpa cobalt HPAL project at Wingellina was A$2.2 billion. Capital costs included those for an on-site acid plant burning sulphur transported through the port of Darwin, gas power generation and development of a regional borefield.

OZ Minerals is committed to developing the nearby West Musgrave nickel-copper project by 2025 at an estimated cost of $1.7B.

In September 2022 OZ Minerals (OZL) committed to developing its West Musgrave nickel-copper project by 2025 at an estimated cost of $1.7B. West Musgrave is 120km west of Wingellina on the same (WA) side of the WA/SA border. OZL's West Musgrave sulphide to concentrate project is different to the Wingellina HPAL proposal. However Wingellina is affected by the OZ decision because the cost of infrastructure and access to services is a major consideration for Wingellina. OZL's chosen bulk transport route is by truck from the Musgraves to Leonora and rail from Leonora to Esperance. Federal and state governments have committed to sealing the Musgraves-Leonora road by 2030. OZ is planning one of the world's largest off grid, hybrid power projects at West Musgrave, and a camp featuring a pool, basketball court, 2 km running track, gymnasium, playing field, music rooms, a library, golf simulators, yoga/pilates/meditation space, multi-faith prayer rooms and a gaming centre. Something like the West Musgrave infrastructure plans will need to be shared or duplicated if Wingellina is to be developed in future.

Financials

In 2008 Metals X estimated a NPV (8% real, after tax) of A$3.4B for Wingellina and a 5 year pay back on the $2.2B capex.

OreCorp (ORR)

Tanzanian Treasure

Analyst: Royce Haese

SPEC BUY

Current Price	$0.32
Valuation	$0.90

Ticker:	**ORR**
Sector:	**Metals & Mining**
Shares on Issue (m):	**399.0**
Market Cap ($m):	**125.7**
Cash Est. ($m)	25.6
Debt Est. ($m)	0.0
Enterprise Value ($m):	**100.1**
52 wk High/Low:	**$0.85** **$0.32**
12m Av Daily Vol (m):	**0.2**

Projects	**Stage**
Nyanzaga	Definitive Feasibility Study

Mineral Resource	**Mt**	**Au (g/t)**	**Au (Moz)**
Nyanzaga	23.7	4.03	3.1

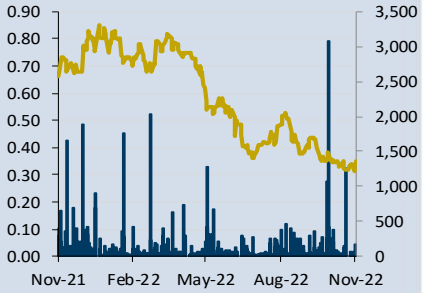
Ore Reserves	**Mt**	**Au (g/t)**	**Au (Moz)**
Nyanzaga	40.1	2.02	2.6

Cashflows	**2021**	**2022**
Operating Cashflow	-7.0	-23.1
Investing Cashflow	-0.2	-16.9
Financing Cashflow	49.8	5.1
Cash Balance	66.3	31.9

Directors & Management:	
Matthew Yates	Executive Chairman
Henk Diederichs	Managing Director & CEO
Mike Klessens	Non-Executive Director
Alastair Morrison	Non-Executive Director
Robert Rigo	Non-Executive Director
Michael Davis	Non-Executive Director
Tania Cheng	CFO

Substantial Shareholders:	**%**
Federation Mining	12.4%
WAM Capital	11.3%
Rollason	9.8%
Mutual Investments	6.6%
Directors & Associates	10.0%

Share Price Graph and Trading Volumes



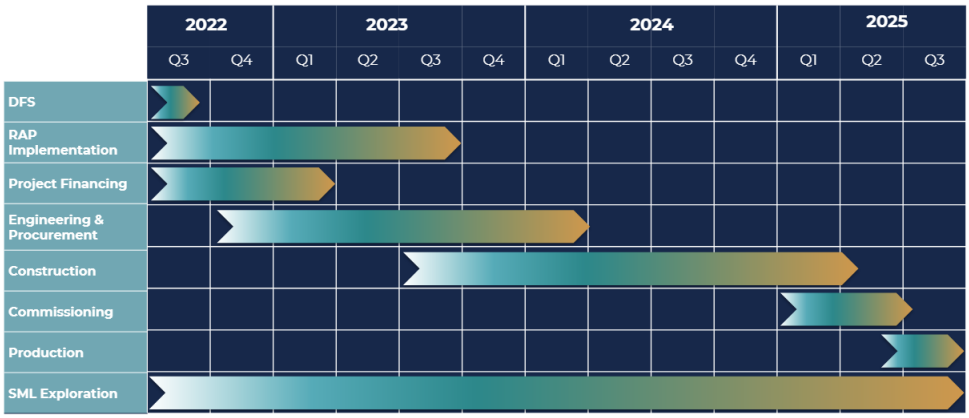
Quick Read

While most attention was levelled on the capex, the recent Nyanzaga DFS outlined a long-life, high-output, strong margin gold project. Despite the US$474M pre-production capital requirement, using a US$1750 gold price a post-tax US$618M NPV_5 (100% basis, excluding 16% govt free carry interest) was estimated with a 25% IRR. With peak gold production at 295kozs, over the first ten years the mine is forecast to produce 242kozpa. The deposit in unconstrained at depth, Orecorp has an exploration target of 4-6Mt at 3.4-4.0 g/t Au sitting beneath the August 2022 production target.

Overview

Big Ticket Items: With the DFS now complete, project financing is the next step towards development. OreCorp reports that discussions are advancing with banks and other financial institutions to provide debt funding for the project. OreCorp plans to commence construction in Q3 of 2023, which would facilitate commissioning early 2025 and commercial production by the middle of the year. On this timeline Nyanzaga would be the first major gold mine built in Tanzania in over 15 years.

Figure 67: Nyanzaga Preliminary Project Timeline



Source: ORR

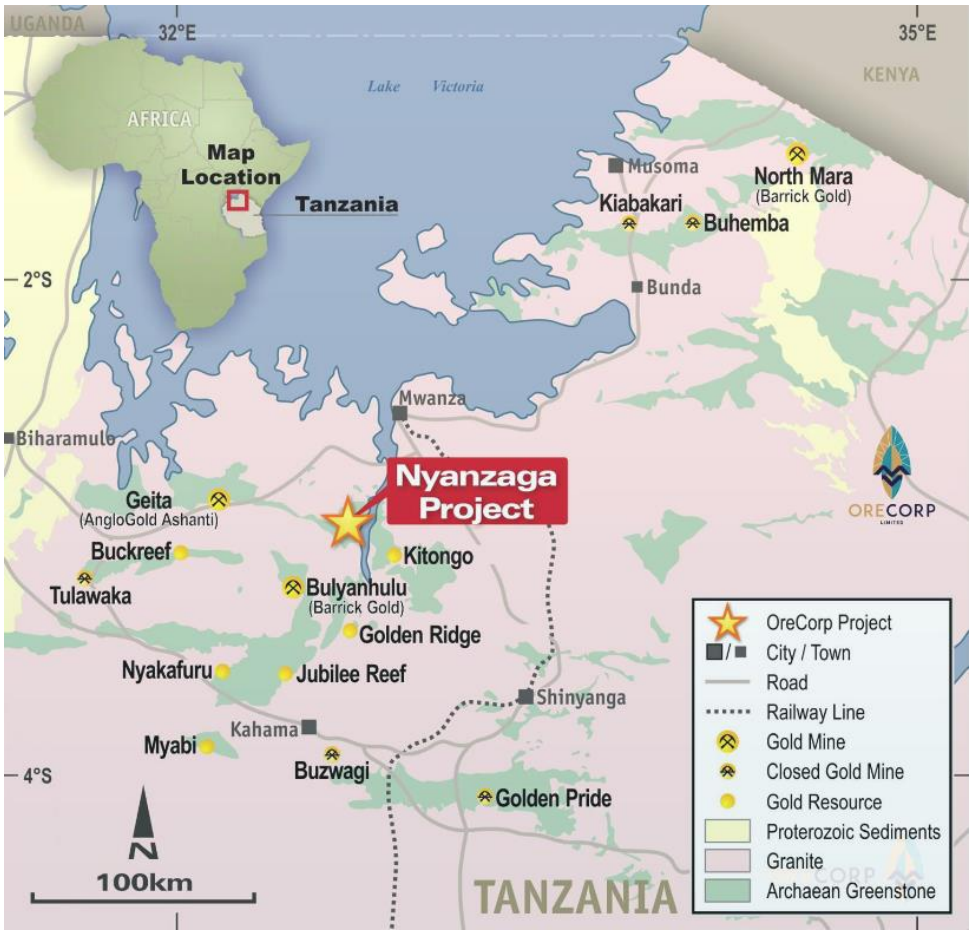
In our view, the ability to secure financing is the biggest risk to this project. Total pre-production spend is now estimated at US$474M. This estimate includes: US$89M for construction of the planned 4.0Mtpa processing facility, US$110M for mining (includes pre-strip, box cut and underground capital development), US$72M in infrastructure (including required powerline construction and upgrades), US$135M in other contractor/construction/project/management costs and $36M in contingencies.

The US$474M funding requirement is a large ticket, but a project of this scale both warrants and requires an investment in this range. Undercapitalising would more than likely result in negative outcomes for shareholders. With industry-wide costs appearing to plateau at least, there is a chance OreCorp's costings have timed the top of the market.

Project Overview

The Nyanzaga project is located in the Archean Sukumaland Greenstone Belt in the Lake Victoria Goldfields of Tanzania. These goldfields host several large gold mines and account for ~25Moz of historical production.

Figure 68: Location of the Nyanzaga Project and Nearby Projects



Source: ORR

Mineralisation at Nyanzaga is unconstrained at depth

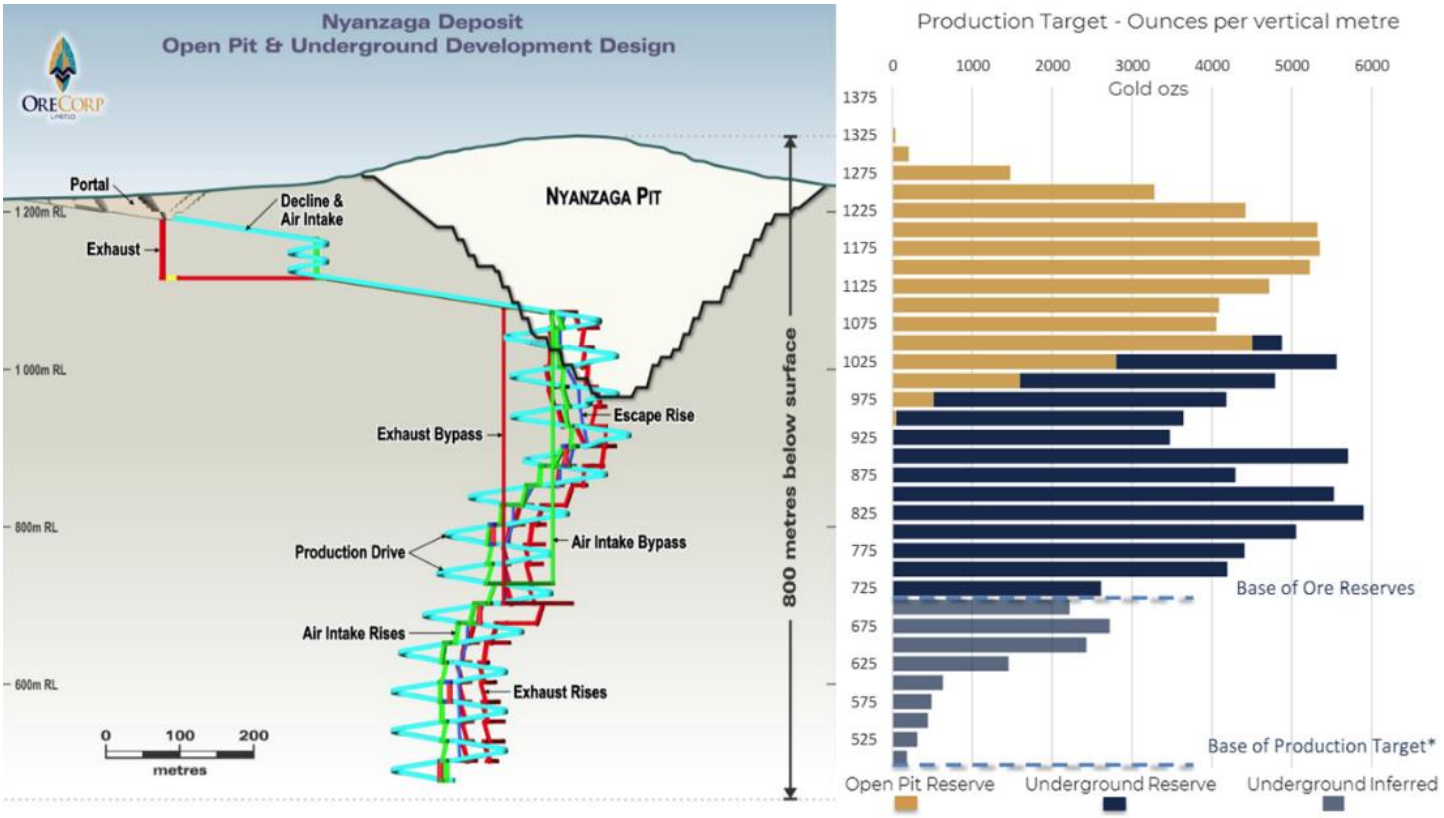
The Nyanzaga deposit is described as a hybrid orogenic gold system with a pipe-like geometry and an overprinting of brittle-ductile shear zone hosted higher grade internal to, and on the margins of the main pipe. This has resulted in a very thick zone of mineralisation with higher grade internal. Mineralisation is unconstrained at depth. The geometry of mineralisation lends itself to efficient open-pit extraction, with OreCorp estimating a waste to ore ratio of 3.7:1 in its DFS.

OreCorp estimates a Reserve of 40Mt @ 2.0 g/t Au for 2.6Mozs

OreCorp has a Mineral Resource Estimate for the Nyanzaga deposit of 23.7Mt @ 4.0 g/t Au for 3.1Moz using a cut-off grade of 1.5 g/t Au. Of note, should a cut-off of 0.5 g/t Au be used this estimate increases to 103Mt @ 1.6 g/t Au for 5.2Moz. In 2020 OreCorp declared a Maiden Mineral Resource estimate for the Kilimani prospect of 5.6Mt @ 1.2 g/t Au for 220koz, ~450 m NE of the Nyanzaga deposit. The 2022 DFS included a maiden Probable Ore Reserve for the project. A Global Reserve of 40.1Mt @ 2.02 g/t Au for 2.6Mozs is estimated. This includes 2.4Mt @ 3.57 g/t Au for 1.42Mozs from the Nyanzaga

underground, 25.6Mt @ 1.35 g/t Au for 1.1Mozs from the Nyanzaga open pit, plus a small contribution from Kilimani.

Figure 69:Left, Nyanzaga DFS Open-pit and Underground Development Design. Right, Nyanzaga Production Target Ounces per Vertical Metre.

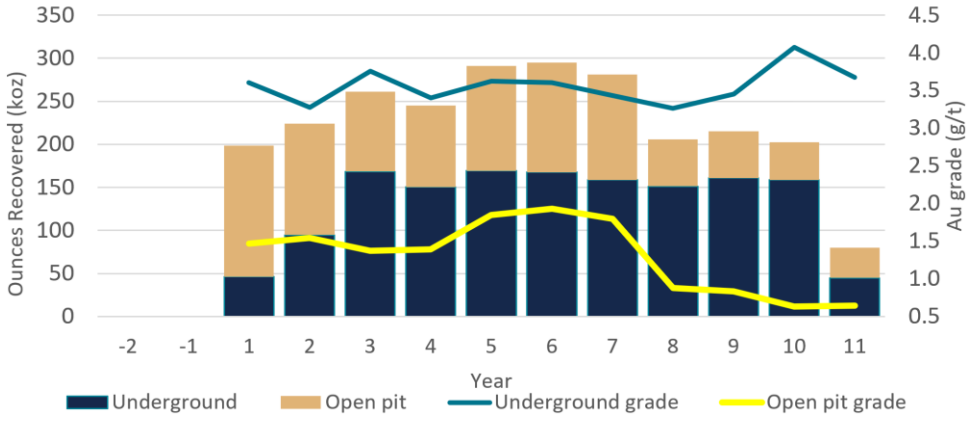


Source: ORR

Peak gold production of 295kozs is forecast in year 6 of the mine plan

Bringing forward the underground mining enables ore processing from both underground and open pit sources at start-up. This front ends ounces in the mine-plan, with +250kozs forecast in year three, and peak gold of 295kozs forecast in year six. Average output over the first ten years is forecast at 242kozpa.

Figure 70: Nyanzaga DFS Planned Production Schedule by Source



Source: ORR

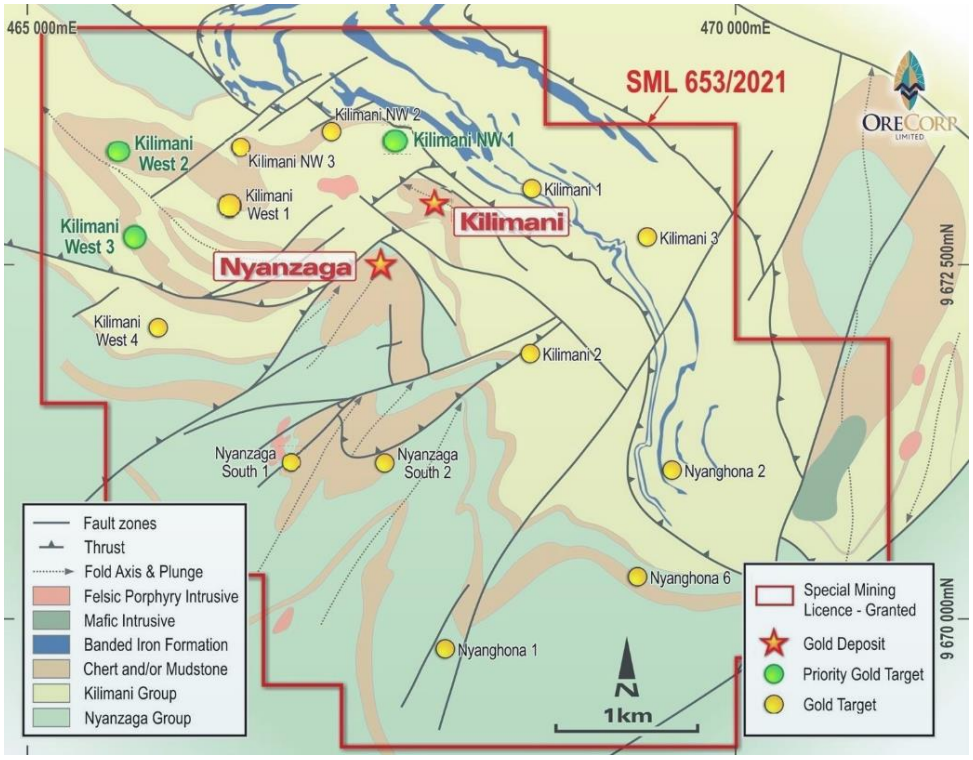
Nyanzaga has significant exploration upside, OreCorp will drill for depth extents from underground drill platforms once available

The project has room to improve on a number of fronts. Both the Resource and Reserve are limited at depth by drilling, at ~800 m below surface and with an 11-year Reserve life outlined it has become uneconomic to continue to drill Nyanzaga at depth. Orecorp has an exploration target of 4-6Mt at 3.4-4.0 g/t Au sitting beneath the August 2022 production target, as the underground develops and drill platforms become available then this target will be shored up by drilling. The pit reserve estimate in the DFS was a 3 stage design containing 26Mt at 1.3 g/t (3.8:1 SR). At a higher gold price a 4th stage might be justified, adding 8Mt at 1.2 g/t at an incremental 6.1:1 strip ratio.

Regional exploration potential remains

Exploration activities continue to target regional prospects, which have had limited attention with the focus on Nyanzaga itself. Unlike the majority fresh-rock Nyanzaga, the satellite deposit Kilimani estimate is around 95% oxide material. Potential for high-grade shoots at depth remain at Kilimani, and the gap between Nyanzaga and Kilimani is poorly tested.

Figure 71: Nyanzaga Regional Exploration Targets Inside the SML



Source: ORR

Geopolitical conditions in Tanzania appear to be improving

Previously, we'd flagged local fiscal policy and in-country security as the main risk to the project, while this remains a risk, positive news out of country and progress on agreement signing has increased our confidence in ongoing stability. Both domestic and foreign commitment to infrastructure projects continues to increase, and the government remains supportive of foreign investment into its mining industry. This year's Tanzania budget presentations reiterated this view and included a commitment to reduce the gold royalty rate to 4%, from 6%. OreCorp has most major agreements in place for development with SML licence grant and associated agreements signed December 2021.

NOT COVERED

Current Price	$0.42
Market Cap	$87M

Ticker:		**PEK**
Sector:		**Metals & Mining**
Key Financials		
Shares on Issue (m):		**207.3**
Market Cap ($m):		**87.1**
Cash Est. ($m)		5.2
Debt Est. ($m)		0.0
Enterprise Value ($m):		**81.9**
52 wk High/Low:	**$0.92**	**$0.30**
12m Av Daily Vol (m):		**0.3**

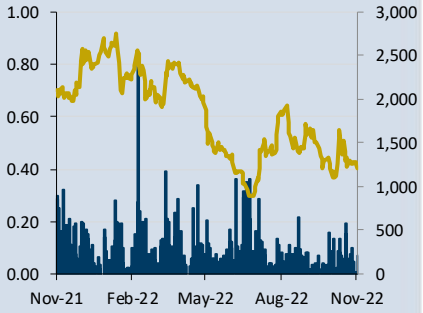
Projects	**Stage**
Ngualla	Bankable Feasibility Study

Cashflows	**2021**	**2022**
Operating Cashflow	-4.5	-12.1
Investing Cashflow	0.0	-0.2
Financing Cashflow	4.6	19.2
Cash Balance	2.7	9.5

Directors & Management:	
Russell Scrimshaw	Executive Chairman
Tony Pearson	Non-Executive Deputy Chair
Bardin Davis	CEO
Abdullah Mwinyi	Non-Executive Director
Giselle Collins	Non-Executive Director
Giles Stapleton	Non-Executive Director
Philip Rundell	Co. Sec. & CFO

Substantial Shareholders:	**%**
Shenghe Resources	19.9%

Share Price Graph and Trading Volumes



Peak Rare Earths (PEK)

A Rare Breed

Analyst: George Ross

Quick Read

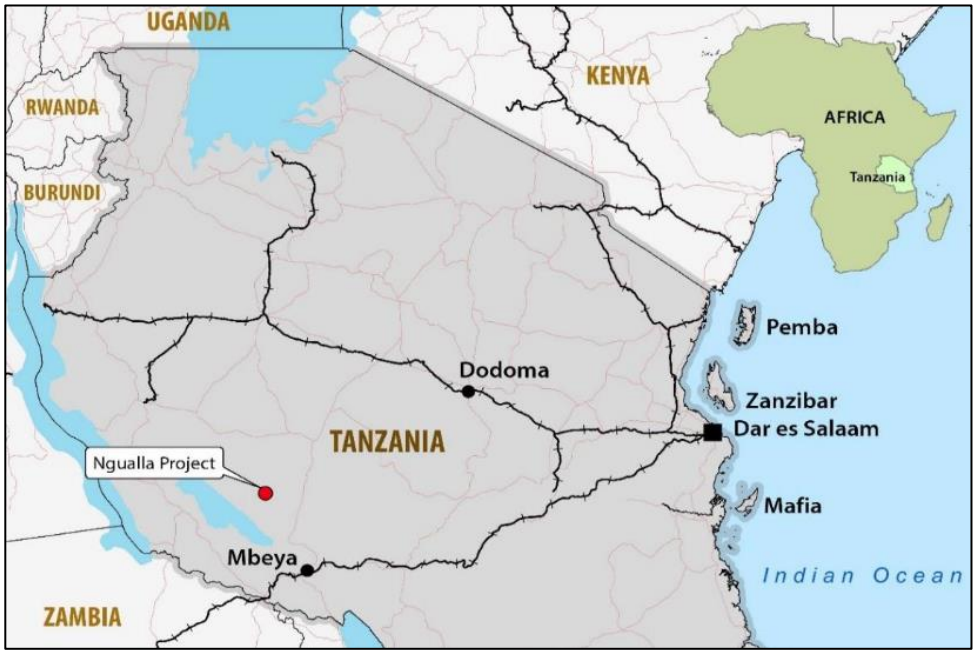
Ngualla stands as one of the largest and highest grade undeveloped NdPr deposits, with a defined Ore Reserve of 18.5Mt at 4.80% REO (887kt contained REO). The Project will include the construction of a mine, mill, concentrator, community projects and associated infrastructure. The Project's Special Mining Lease application was approved by the Tanzanian Cabinet in July 2021, whilst Framework Agreement negotiations remain well advanced.

Project Overview

Location & Tenure

The world class Ngualla Rare Earth Project is located approximately 150km from the regional city of Mbeya, Tanzania.

Figure 72: Ngualla Project location. Source: PEK



Source: PEK

Background

Ngualla was discovered in 2010 and its Maiden Resource Estimate published in 2012. Extensive technical test work programs followed, culminating in a PFS in 2014 and BFS in 2017. Further progression of the project was fouled by the 2018 introduction of mining reforms introduced under then President, John Magufuli. These changes to legislation included the introduction of a 16% Tanzanian Government free-carried-interest, and a ban on concentrates and unprocessed mineral exports. PEK has previously planned to export beneficiated ore to a planned rare earth separation refinery to be built in Tees Valley, North-East England.

Following a lengthy period of lobbying and negotiation, execution of Framework Agreement and subsequent grant of a Special Mining Licence appear imminent. Grant of these permits will enable the project to move forward in its current form. As part of its commitments, PEK will commission an independent study into the feasibility of a Tanzanian rare earth refinery. The outcome of this study will govern the location of future downstream facility options.

Partnerships

Chinese integrated REE processor Shenghe on board with a 19.9% interest

In February 2022, Shenghe Resources, a US$3.8B Shanghai listed rare earths company acquired a 19.9% interest in PEK, paying a 25% premium to the Company's previous closing price. Shenghe has mining, smelting, separating, and processing capacity, whilst also bringing practical downstream expertise and demand for concentrate. In October, PEK reported it had signed a non-binding offtake and strategic cooperation MOU with Shenghe. The deal provides for offtake, technical co-operation and potential project level investment by Shenghe. Shenghe is already a strategic partner to MP Minerals, owner of the Mountain Pass (US) REE operation and provided financial support in the form of a prepayment to support restart.

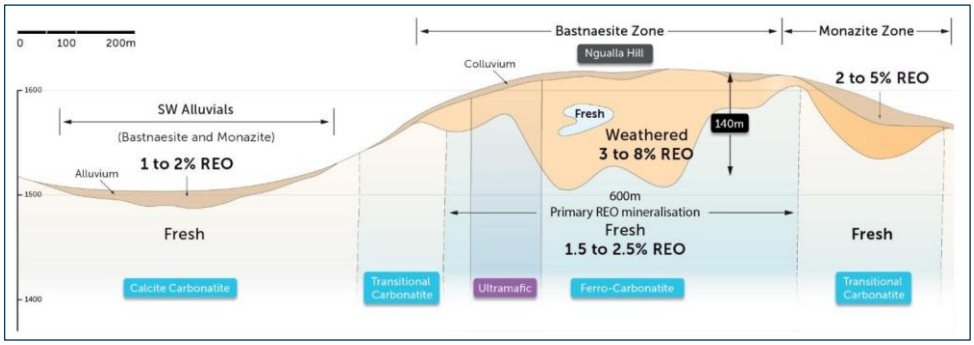
Under the terms of the proposed Ngualla Framework Agreement, the Tanzanian Government will take a non-dilutable 16% Free-Carried-Interest in the Project. The Tanzanian Mining Act includes provisions to enable the Government to purchase up to an additional 34% active interest in mining projects.

Deposit and Resources

Ngualla in an exceptional bastnaesite rare earth deposit

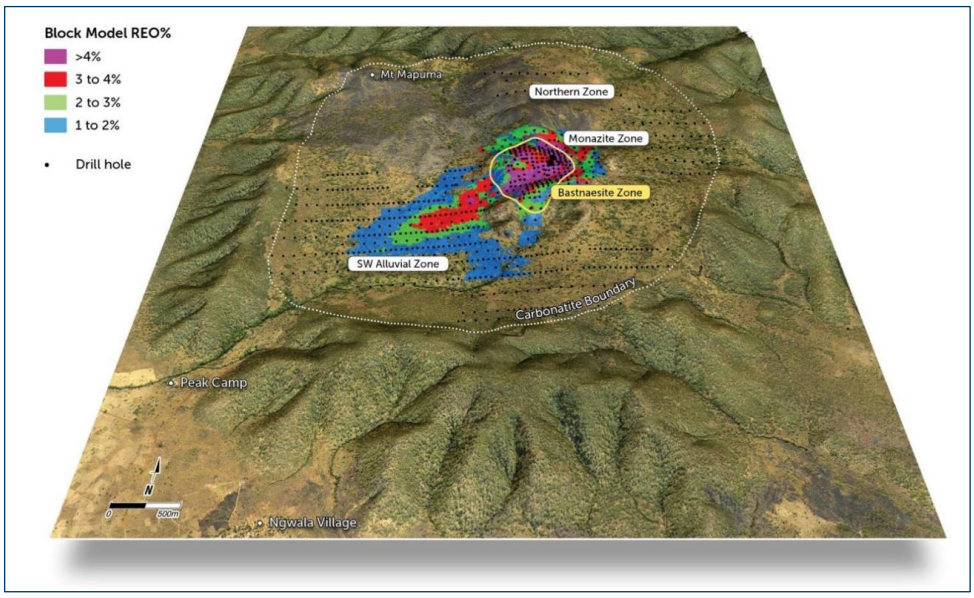
The Ngualla deposit is hosted within a carbonatite complex. Rare earth mineralisation is associated with both bastnaesite and monazite. The ferro-carbonate core of the deposit manifests as a topographic high with a deep zone of weathering up to 140m depth. Primary ferro-carbonate rock in the Bastnaesite Zone grades 1-2% total rare earth oxides (TREO). Weathering induced near surface oxidation and leaching of soluble minerals within the Bastnaesite Zone has resulted in enhancement of grade to 3-8% TREO. Oxidised material in the adjacent Monazite Zone grades between 2-5% TREO and remobilised alluvial deposits of bastnaesite and monazite grade between 1-2% TREO in the south-west.

Figure 73: Ngualla deposit schematic cross section with geological domains.



Source: PEK

Figure 74: Ngualla rare earth deposit block model relative to topography.



Source: PEK

Scope of Development

Shenghe holds a 7-year offtake for 75-100% of production

On the 24th of October 2022, PEK reported results for an updated Ngualla BFS. The study outlines initially developing Ngualla as a standalone mine, producing a rare earth concentrate for sale to third parties. The October signed non-binding Shenghe MOU includes offtake arrangements covering 75-100% of concentrate production for an initial 7-year period. Advancement of potential downstream processing facilities will be delayed until the Tanzanian rare earth refinery feasibility study is completed.

Electing to initially develop just the mine without downstream processing facilities, reduces immediate upfront capital expenditure, associated funding requirements, and shifts processing risk to recipients of the concentrate. Product sale revenue will however take a hit with lower metal payability received for the unrefined mineral concentrate.

Preliminary Mining Operation

The mine will initially be developed in isolation

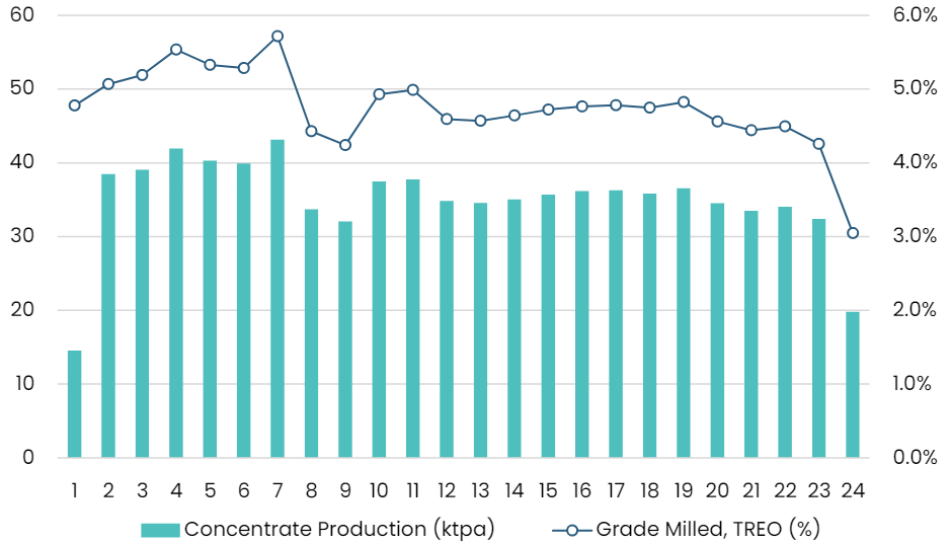
The initial Ngualla mining operation is expected to cost in the order of US$321M, including EPCM and Owners Costs and Contingency. The mine will extract 18Mt of 5.4% TREO ore over an initial 24-year mine life. A 1.2Mtpa processing plant will initially crush and grind ore to 53µm. This material will then pass through a flotation circuit to separate barite from the main process stream. The barite circuit tails will be grinded to 38µm and then fed into a second flotation circuit for concentration of rare earth minerals. Following thickening and filtering, concentrate will be bulk bagged for shipment. The mining operation is expected to produce ~36ktpa of 45% TREO concentrate per annum. With product transported to Dar es Salaam Port by road for international shipping.

Downstream Development Potential

A downstream processing solution may follow

As we have previously discussed, PEK will examine the potential for downstream processing within Tanzania or abroad. If the commissioned Independent Tanzanian Downstream study concludes it is unfeasible to operate a rare earth oxide refinery within Tanzania, PEK could advance plans for a refinery at the company's UK Tees Valley site.

Figure 75: PEK's Ngualla mine production schedule.



Source: PEK

Ngualla will produce ~36kt of ~45% TREO concentrate per annum

Niobium, Tantalum, Phosphate and Fluorite

Accessory mineral occurrences provide upside

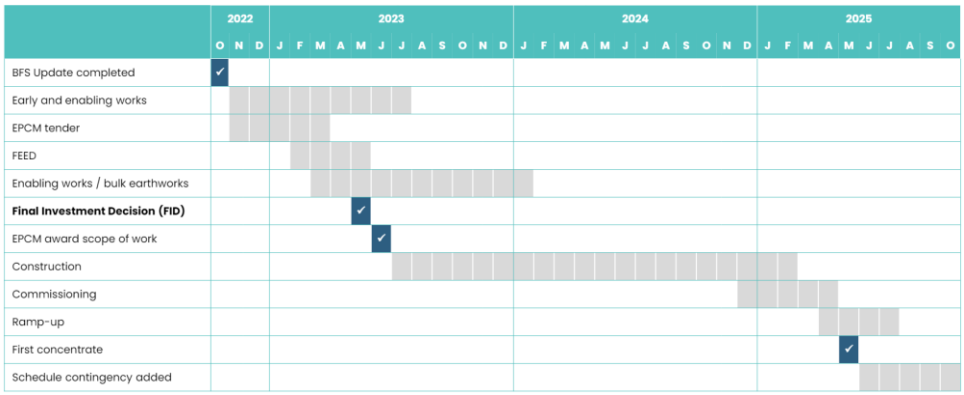
Outside of the rare earth enriched core, the Ngualla carbonatite hosts extensive high-grade occurrences of niobium, tantalum, phosphate and fluorite. These deposits provide an additional source of value for the project which could be realised through separate processing operations.

Project Valuation

PEK's Ngualla model generates an NPV10 of US$1.16B

For Ngualla, PEK has estimated a life of mine operating cost of US$5.8/kg TREO or US$93M per annum. The project is expected to generate annual revenues of US$538M per annum based on a LOM US$232/kg NdPr oxide price and 61% payability. PEK estimates an NPV10 of US$1.16B and post-tax IRR of 37% for the proposed Ngualla concentrate operation.

Figure 76: Ngualla development timeline.



Source: PEK

Perseus Mining (PRU)

Block 14 - A Coup for Perseus

John Macdonald

BUY

Current Price	$1.88
Valuation	$1.99

Ticker:	**PRU**
Sector:	**Metals & Mining**
Shares on Issue (m):	**1,366.9**
Market Cap ($m):	**2,569.8**
Cash Est. ($m)	547.5
Debt Est. ($m)	38.7
Enterprise Value ($m):	**2,061.0**
52 wk High/Low:	**$2.05** **$1.34**
12m Av Daily Vol (m):	**5.2**

Projects	**Stage**
Block 14	Feasibility Study

Mineral Resource	**Mt**	**Au (g/t)**	**Au (Moz)**
Block 14	98.4	1.28	4.1

Ore Reserves	**Mt**	**Au (g/t)**	**Au (Moz)**
Block 14	79.9	1.11	2.9

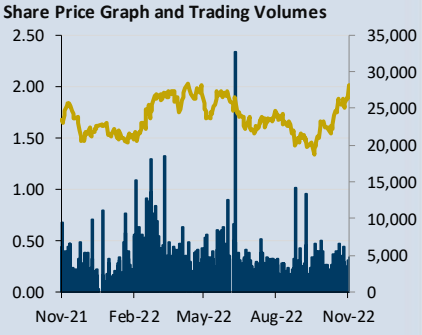
Cashflows	**2021**	**2022**
Operating Cashflow	290.1	513.8
Investing Cashflow	-249.2	-165.7
Financing Cashflow	-69.4	-104.2
Cash Balance	181.5	426.8

Directors & Management:

Sean Harvey	Non-Executive Chairman
Jeff Quartermaine	Managing Director & CEO
John McGloin	Non-Executive Director
David Ransom	Non-Executive Director
Elissa Cornelius	Non-Executive Director
Dan Lougher	Non-Executive Director
Amber Banfield	Non-Executive Director
Lee-Anne de Bruin	CFO

Substantial Shareholders:	**%**
Van Eck Associates Corp.	11.0%
T. Rowe Price Associates Inc.	4.6%

Share Price Graph and Trading Volumes



Quick Read

A beach head for Perseus in another corner of the African continent. Perseus is spearheading the sector with judicious gold project developments in Africa that reward shareholders and local communities.

Overview

Post-coup: Perseus acquired Block 14 from Orca Gold at point of development in early 2022. A military coup in Sudan five months earlier preceded the deal and Perseus, now an African development specialist, entered the transaction well prepared and well qualified for the task ahead. Perseus is infill drilling the resource and completing front end engineering designs to cap off the feasibility studies conducted by Orca and Lycopodium in 2020.

Pit reserve: Orca and MPR Consultants estimated ore reserves of 80Mt at 1.11 g/t Au (2.8Mozs) in 2020. The bulk of the reserve estimate lies within a cluster of pit designs at Gulat Sufar South, with an overall waste:ore ratio of 1.44:1. The smaller, high grade Wadi Doum pit is 70km to the east of the planned plant site.

Late 2023 FID: The 2020 study estimated the capital cost of establishing a 6Mtpa open pit and CIL process operation at Block 14 was US$320M. Perseus expects to update all plans and cost estimates before the end of 2023. Target start of gold production is late 2025. Argonaut assumes there will be a capital cost increase and presumes US$420M for valuation purposes.

Average annual gold output in the first seven years of operation was projected at 230kozs in 2020. Argonaut's valuation of Perseus' interest in Block 14 is A$490M.

Attractive terms: Block 14 is fully permitted by the Sudanese Government. The granted Mining Lease has fiscal terms incorporated into it. Royalty agreement and water permits are also formally granted. Perseus owns 70% of the Sudanese joint venture company holding the Block 14 Exploitation Permit.

Argonaut sees investment in good quality African mineral assets by groups like Perseus as a crucial source of future investment returns from mining. Tenure security, fiscal stability arrangements and physical security are integral elements of successful projects from an investor point of view. Official support for development of Block 14 has a basis in legislation and shared interest, without which Perseus would not have moved.

Block 14

Background

TSX listed Orca Gold secured an agreement over Block 14 in Sudan in 2011. Following artisanal and historic mining trails, Orca discovered gold in Gulat Sufar South in channel samples in 2012 and at Wadi Doum in 2014. The Arabian Nubian Shield has a long history of gold exploitation, including recently by Centamin Plc's Sukari mine on the Egyptian side of the border. Orca advanced the Block 14 project through drilling and feasibility study phases by September 2020. In October 2021 Orca signed the final agreements with the government of Sudan necessary for commercial development of Block 14. Within a week of the agreement Sudan's military staged a coup in the country's capital. Orca's on-site activities were not directly affected although Orca was not financed at the time. Perseus acquired 15% of Orca in late January 2022, following up with a full bid one month later. Perseus is preparing for a final investment decision by October 2023.

Orca estimated open pit ore reserves of 77Mt at 1.07 g/t Au (2.6Mozs) in 2020, with a waste:ore ratio of 1.4:1.

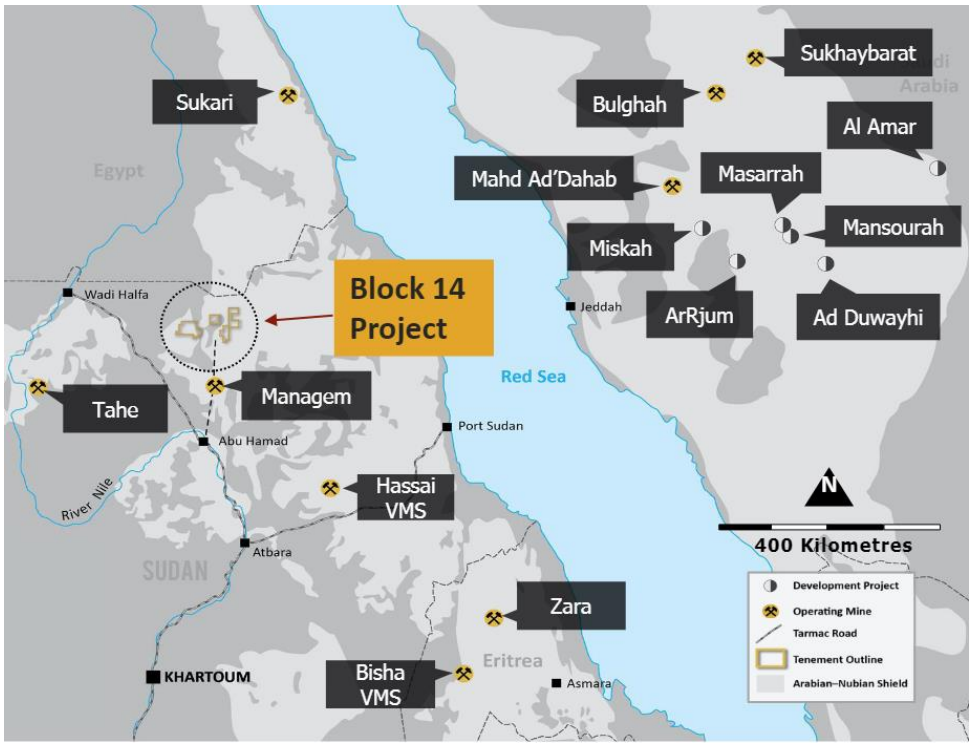
Geology and reserves

Gulat Sufar South (GSS) is the main deposit found to date in Block 14. Mineralisation occurs from surface over 1.8km of strike within volcaniclastic rocks. Orca estimated ore reserves of 77Mt at 1.07 g/t Au (2.6Mozs) in 2020 after assessing results from 89,000m of diamond core and RC drilling in 608 holes. The reserve was constrained by a pit design with a waste:ore ratio of 1.4:1. 60% of the reserve is in fresh unoxidised rocks.

Wadi Doum is 70km east of GSS. The 2020 reserve estimate is 2.6Mt at 2.36 g/t (0.2Mozs).

A 2020 feasibility study considered CIL processing at a rate of 6Mtpa over a 14 year project life

Figure 77: Block 14 location.

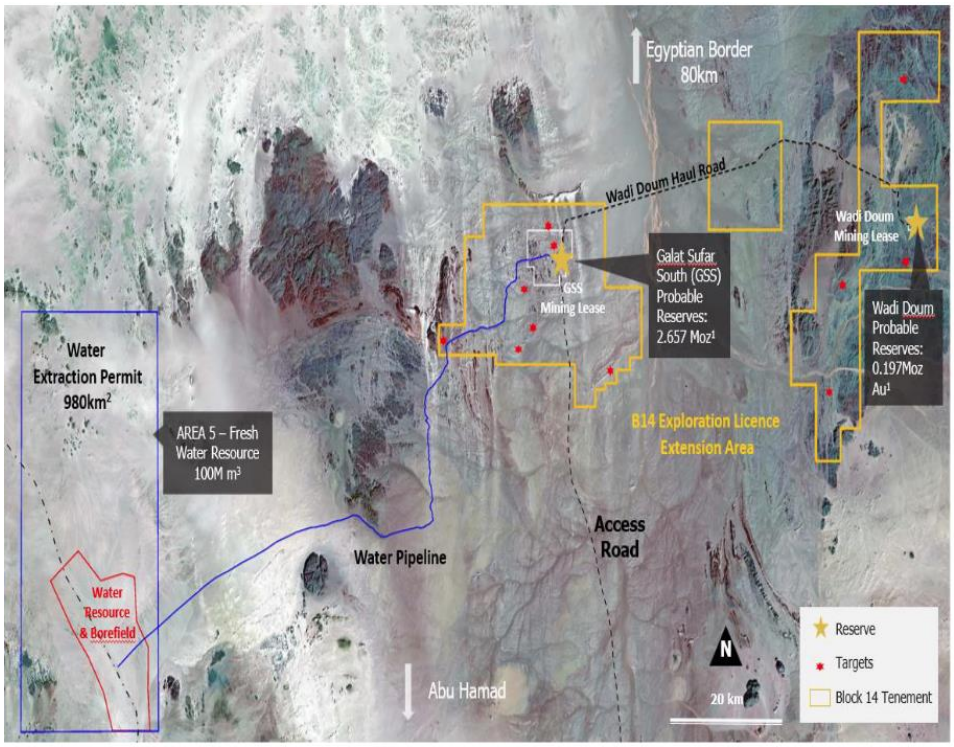


Source Perseus Mining

Mining and processing

The 2020 feasibility study contemplated development of open pit mines and CIL processing at a rate of 6Mt of ore per year, over a 14 year project life. Preferential processing of higher grades meant annual output averaging 230kozspa for the first seven years. Average metallurgical recovery of 82% was assumed.

Figure 78: Block 14 tenement and infrastructure plan.



Source: Perseus Mining

Perseus and engineering firm Lycopodium are completing front end engineering design studies

Project construction is planned to start in late 2023 leading to first gold production by late 2025

Logistics, development

Block 14 is in a relatively remote and uninhabited region, requiring recruitment of a mobile workforce. Groundwater for the project will be pumped 80km from aquifers south west of the proposed plant site. Power supply in 2020 was assumed to be on-site LNG fuelled by a third party provider. LNG to site was to come through Port Sudan. Road access to Abu Hamad from Port Sudan and Khartoum is sealed. A 180km long desert track connects Abu Hamad to the project site.

Perseus and engineering firm Lycopodium are completing front end engineering design studies for Block 14. A 100,000m drill program for infill and sterilisation at GSS began in November 2022. Subject to board approval project construction is planned to start in late 2023 leading to first gold production by late 2025.

Approvals, ownership

Mining Lease, royalty agreement and water permit are all formally granted. Fiscal terms are incorporated into the Mining Lease. Block 14 is fully permitted by the Sudanese Government. Perseus owns 70% of the Sudanese joint venture company holding the Block 14 Exploitation Permit. The Sudan Ministry of Mines holds 20% free carried and private interests hold 10%.

Figure 79. Argonaut forecast production and cost for Block 14.

Production forecasts (June year)	2024E	2025E	2026E	2027E	2028E	2029E
Block 14						
Ore processed Mt	0.0	0.0	6.0	6.0	6.0	6.0
Strip ratio w:o		0.0	1.5	1.5	1.5	1.5
Head grade g/t	0.00	0.00	1.40	1.45	1.35	1.35
Met. Recovery	0%	0%	82%	82%	82%	82%
Gold produced kozs	0	0	221	229	214	214

Costs	2024E	2025E	2026E	2027E	2028E	2029E
Block 14						
Cost per milled tonne US$	0	0	24	24	24	25
Cash costs incl. royalty US$/oz	0	0	749	735	726	754
Sustaining capital US$M	0	7	9	8	8	7
AISC US$/oz	0	0	788	771	763	788
Growth capital US$M	100	330	12	12	11	10

Source: Argonaut

Financials

In August 2020 Orca estimated the cost of building Block 14 at US$321M. In 2020, using US$1350/oz gold and a 5% discount rate, Orca estimated an after tax NPV of US$607M for the project and an internal rate of return of 33%. Presuming a higher capital cost of US$400M, Argonaut estimates an after tax net present value for Perseus' interest in Block 14 of A$500M, using a 7% real discount rate, US$1750/oz gold and 0.72 AUDUSD exchange rate. The estimated internal rate of return in our model is 27%.

Risks

Sudan's October 2021 military coup interrupted a transition to elected civilian government that started in 2018. Leader of the coup General Burhan has said the military will step back from politics in favour of civilian democracy although details remain unclear. Perseus acquired Block 14 in the aftermath of the coup, with full opportunity to assess the risks having dealt and operated successfully in Cote d'Ivoire after that country's civil war.

Figure 80. Drilling at East Zone, Gulat Sufar South.

Source: Orca Gold

Sovereign Metals (SVM)

Kasiya - Size Matters

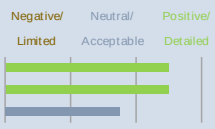
Analyst: George Ross

SPEC BUY

Current Price	$0.43
Valuation	$1.48

Ticker:	**SVM**
Sector:	**Metals & Mining**

ESG Ratings:



Key Financials

Shares on Issue (m):	**470.9**
Market Cap ($m):	**202.5**
Cash Est. ($m)	15.6
Debt Est. ($m)	0.0
Enterprise Value ($m):	**186.9**
52 wk High/Low:	**$0.79** **$0.35**
12m Av Daily Vol (m):	**0.4**

Projects	**Stage**
Kasiya Rutile Project	Scoping Study

Mineral Resource	**Mt**	**Rut(%)**	**Rut (Mt)**
Kasiya Rutile Project	1,775	1.0	18.0

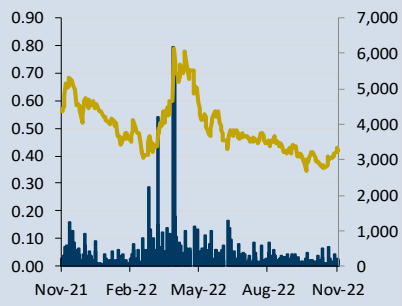
Cashflows	**2021**	**2022**
Operating Cashflow	-3.9	-10.0
Investing Cashflow	-0.3	-0.3
Financing Cashflow	9.8	21.3
Cash Balance	8.0	18.9

Directors:

Ben Stoikovich	Non-Executive Chairman
Julian Stephens	Managing Director
Ian Middlemas	Non-Executive Director
Mark Pearce	Non-Executive Director
Nigel Jones	Non-Executive Director

Substantial Shareholders:	**%**
Sprott Asset Management	9.2%

Share Price Graph and Trading Volumes



Quick Read

The giant Kasiya rutile and graphite deposit in Malawi hosts an unusual style of mineralisation which yields high quality rutile and graphite. Ore can be mined using low-cost hydraulic methods and treated with conventional dense media and flotation circuits for two valuable products. The project is serviced by heavy rail infrastructure providing ready access to ports in Mozambique.

Overview

Rutile & Graphite Coproducts: Rutile and graphite both have a role in decarbonisation of the economy.

Giant Resource: Kasiya is the world's largest rutile deposit and a globally significant graphite deposit. The 2022 Resource is defined as 1,775Mt at 1.01% recoverable rutile and 1.32% graphite (1.64% Rutile Equivalent) for 18Mt of contained rutile and 23.4Mt of graphite (>0.7% rutile cut-off).

Rescaled Scoping Study: An updated Scoping Study envisages an initial 12Mtpa operation scaling up through circuit duplication to 24Mtpa. The project could operate for many decades.

Natural Cost Advantages: The unusual style of mineralisation enables low-cost mining and processing. High quality rutile and graphite products are expected to be produced at lowest quartile operating costs.

Strong Economics: We estimate a build date NPV9 of A$1.83B, and present day NPV9 of A$1.43B assuming first production in 2027.

Addressing Two Critical Mineral Markets

The project will produce two critical mineral coproducts, rutile and graphite.

The rutile product will be recovered using a conventional dense media separation plant. Characterisation test work has confirmed the natural product is highly crystalline and with few impurities. Kasiya Rutile is regarded as a highly attractive product to both the boutique welding, and bulk pigment industries. Substitution of conventional pigment feedstocks with natural rutile in the manufacture of pigments reduces paint's carbon emission footprint by 35% (5.1 CO2e/t to 3.3t CO_2e/t).

Kasiya's flake graphite product is coarse and highly crystalline. Initial sizing tests indicate that greater than 61% of graphite flake is Large (+180µ /80 mesh) or above and 30% of Kasiya's graphite is coarser than Jumbo (+48µ/300 mesh). Kasiya's style of mineralisation is regarded comparable to SVM's Malingunde graphite deposit. Thermal purification of graphite from SVM's Malingunde deposit achieved a 99.9995 wt% product purity.

Graphite characterisation test work on Kasiya ore is underway. We expect Kasiya's product to supply all graphite market segments.

A True Giant

Rutile deposits don't get any bigger than this

An updated Kasiya Mineral Resource Estimate (MRE) was reported in April of 2022. The latest MRE confirmed Kasiya as the world's largest rutile deposit and one of the world's largest graphite deposits (Table 6).

Table 6: Kasiya April 2022 Resource. Rt = Rutile, TGC = Total Graphite Content.

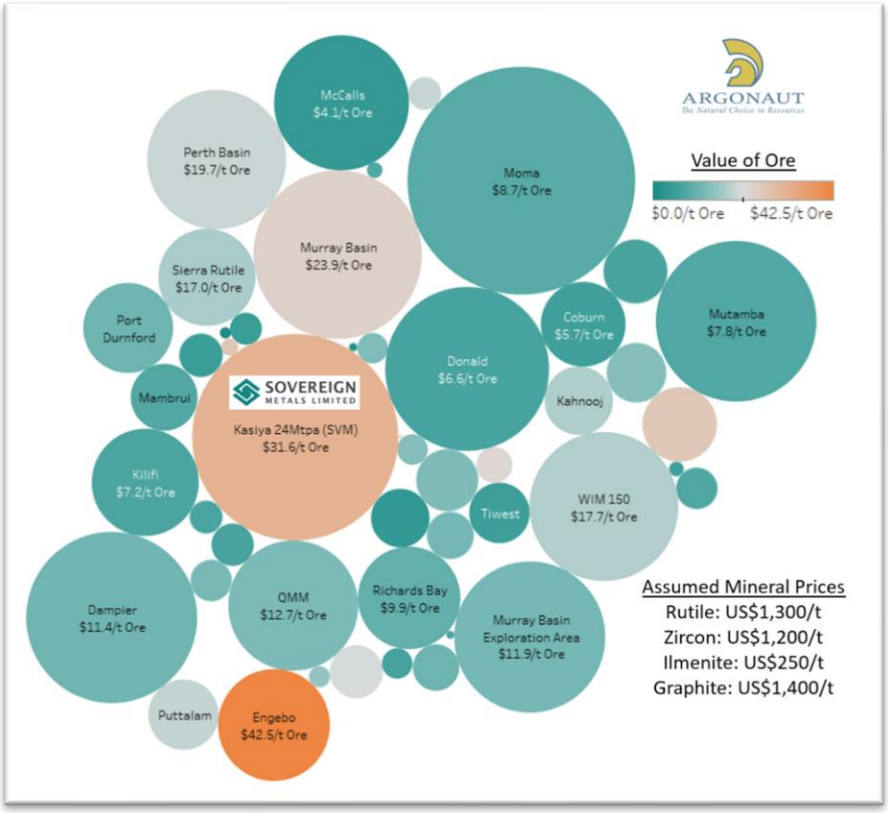
Resources	Mt	Rt (%)	Rt (Mt)	TGC (%)	TGC (Mt)
Total Resources	1,775	1.01	18	1.32	24
Measured & Indicated	662	1.05	6.9	1.43	9.5
Inferred	1,113	0.99	11.0	1.26	14.0

Source: SVM

Rutile-graphite mineralisation occurs as flat blankets, with highest rutile grades (1.2-2.0%) typically occurring in the top 3-5m from surface. Graphite mineralisation occurs extensively within the broader deposit and can be mined concurrently to rutile mineralisation.

A graphite coproduct provides additional value which makes Kasiya a standout on the world stage

Figure 81:Total Resource value of contained minerals within globally significant heavy mineral deposits. Bubbles scaled to total in ground value of Resource. Bubbles coloured by average value per tonne of ore. Minerals considered include Rutile, Zircon, Ilmenite and Graphite.



Source: Argonaut with S&P Capital IQ, and Company Data

Rescaled Scoping Study

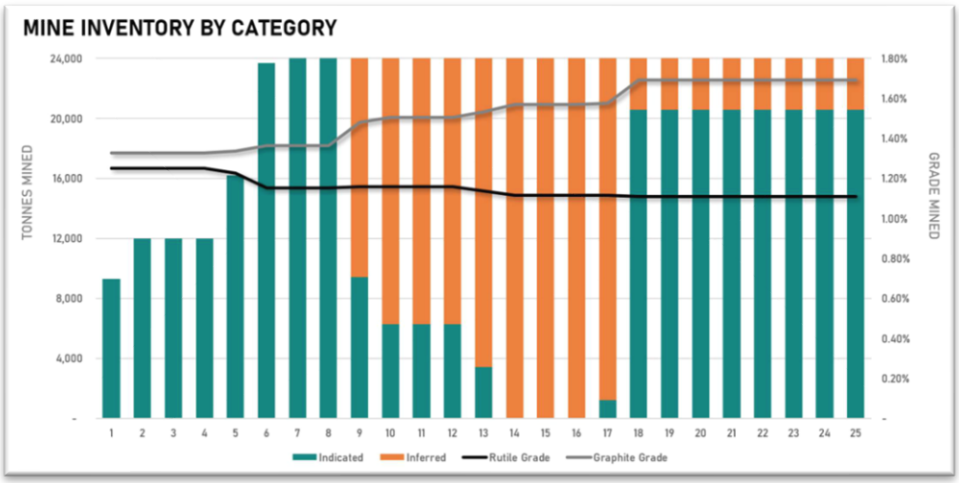
Following the April MRE update, SVM reported a revised Scoping Study that envisages an initial 12 Mtpa operation for years 1-5, producing 145kt of Rutile and 85kt of graphite per annum. Earnings from Stage 1 of the project will be used to duplicate the processing plant, increasing throughput to 24 Mtpa and capable of producing 260kt of rutile and 170kt of graphite per annum.

A bigger and better scoping study envisages a 12Mtpa operation scaling to 24Mtpa of throughput

The Study limits annual graphite production to 85ktpa per 12Mtpa of plant throughput despite head grades capable of higher output. SVM's choice to limit graphite output in the June 2022 12-24Mtpa Scoping Study was governed by the decision to reuse plant designs scoped in the December 2021 12Mtpa Scoping Study. The earlier study incorporated a lower graphite head grade into the front end DMS circuit, resulting in lower graphite grade being fed into the flotation circuit. Argonaut estimates the updated feed schedule could produce upwards of 220ktpa of graphite concentrate from the 24Mtpa operation. We expect debottlenecking of the plant will require a ~20% larger flotation circuit.

Figure 82: Scoped Kasiya plant feed head grade and applicable resource categories.

At full scale, the Project is expected to produce up to 260kt of rutile and 170kt of graphite per annum



Source: SVM

SVM's scoped mineable inventory includes Indicated (61%) and Inferred (39%) resources (Figure 82). An extensive drilling campaign is currently underway to upgrade scheduled resources to Measured and Indicated categories. The first five years of mine production will generate ore with a head grade of ~1.2% rutile and approximately 1.3% graphite. As mine life progresses, rutile grade progressively tapers to approximately 1.1%. Graphite grades increase over mine life, ultimately improving to over 1.7% by the end of production year 25 (Figure 2).

Natural Operating Cost Advantages

An unusual style of mineralisation enables unique operating cost advantages

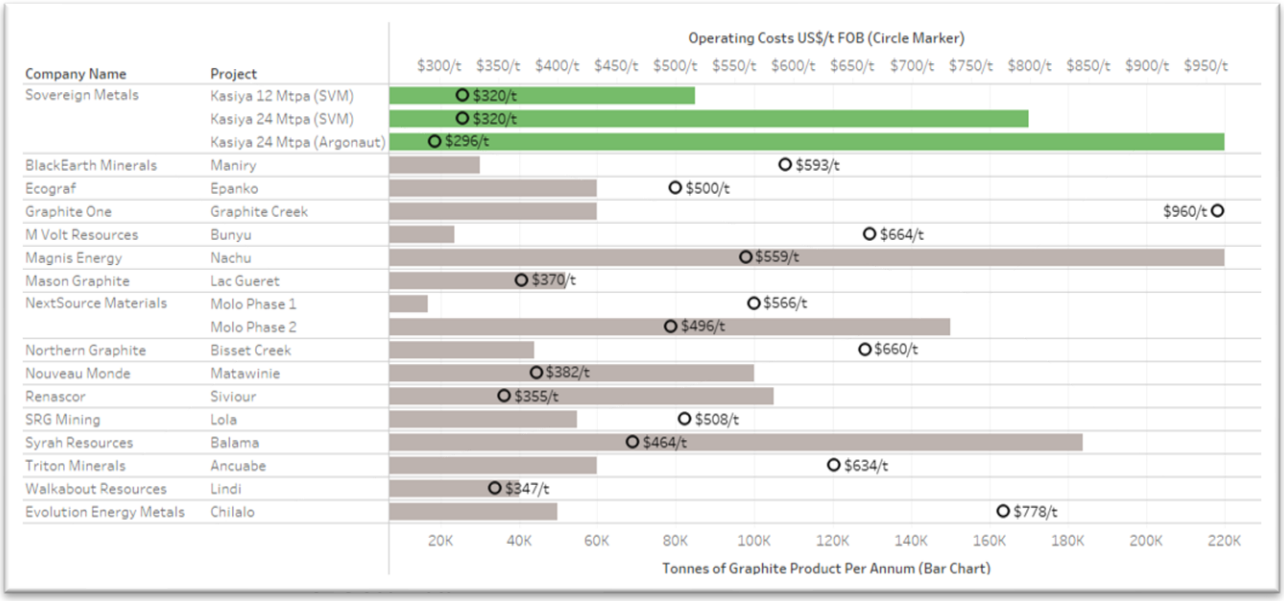
SVM's capital cost estimate for the Stage 1 (12Mtpa) plant is US$372M. Addition of a second 12Mtpa capacity (24Mtpa total) is expected to cost a further US$311M. These figures are predominantly based upon earlier costings of a single 12 Mtpa operation. Future feasibility studies will undoubtedly seek to optimise development costs through integration of circuit componentry with upgradeable capacity. We also expect graphite flotation circuits to be upscaled to maximise production from higher graphite head grades.

Lower cost graphite production than all peers

The nature of Kasiya style rutile-graphite mineralisation enables extraction via hydraulic mining. Hydraulic mining uses water to dislodge and transport unconsolidated ore as a slurry suspension along pipelines to a central processing plant. This method of mining is less energy intensive and less expensive than conventional drill and blast.

SVM reported a 10% reduction in operating costs compared with the first study, citing efficiencies of scale, deposit location and other factors. SVM quotes an all-in operating cost of US$320/t of product (rutile + graphite). Our modelling suggests Kasiya's graphite production will have lower operating costs than all global peers.

Figure 83: Comparison of graphite production and estimated operating costs (FOB) for prominent graphite developments and operations.



Source: Argonaut with SP Global Data

ESG Credentials

Kasiya has strong ESG credentials. Rutile and graphite are both considered critical minerals for decarbonisation of the economy. The substitution of conventional feedstocks by natural rutile saves energy and reduces pigment manufacturing emissions by 35%. Graphite is used as anode for many types of batteries. The transition to electric vehicles and increased utilisation of stationary battery storage is expected to drive growth in graphite demand over the coming decades.

Build date NPV9 of $1.83B, and present-day value of A$1.43B

Rutile and graphite products produced at Kasiya will have a low carbon emission footprint compared to peers. Gravity and flotation-based processing techniques are low energy intensity methods of mineral concentration, further limiting emissions. Progress rehabilitation will ensure pits are filled, and land returned to agriculture use.

Valuation

Argonaut's discounted cash flow model with a 9% discount. Our model estimates a Build Date NPV9 of A$1.83B. We assume static US$1,300/t rutile and US$1,400/t graphite prices for life of mine. The model includes 25 years of production, however, the project is likely to operate well beyond this horizon.

West African Resources (WAF)

Kiaka Gold - One Pit Wonder

John Macdonald

BUY

Current Price	$1.06
Valuation	$1.62

Ticker:	**WAF**
Sector:	**Metals & Mining**
Shares on Issue (m):	**1,021.4**
Market Cap ($m):	**1,082.7**
Cash Est. ($m)	170.9
Debt Est. ($m)	15.5
Enterprise Value ($m):	**927.3**
52 wk High/Low:	**$1.47** **$0.95**
12m Av Daily Vol (m):	**4.0**

Projects	**Stage**
Kiaka	Feasibility Study

Mineral Resource	**Mt**	**Au (g/t)**	**Au (Moz)**
Kiaka	280.0	0.9	7.7

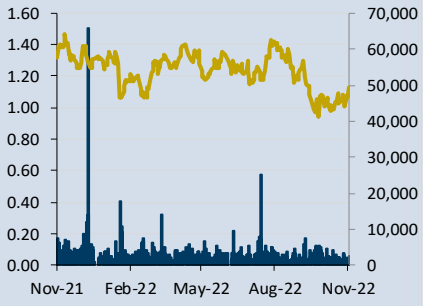
Ore Reserves	**Mt**	**Au (g/t)**	**Au (Moz)**
Kiaka	155.0	0.9	4.5

Cashflows	**2021**	**2022**
Operating Cashflow	117.8	304.9
Investing Cashflow	-109.2	-110.7
Financing Cashflow	1.3	-107.1
Cash Balance	95.0	185.0

Directors:	
Richard Hyde	Executive Chairman & CEO
Lyndon Hopkins	Executive Directpr & COO
Rod Leonard	Independent Director
Nigel Spicer	Non-Executive Director
Libby Mounsey	Non-Executive Director
Stewart Findlay	Non-Executive Director

Significant Shareholders:	**%**
Van Eck Global	13.0%
Mason Hill (incl Equinox)	4.4%
Sprott Group	3.8%

Share Price Graph and Trading Volumes



Quick Read

Kiaka is essentially a large scale, single ore zone, straight CIL gold project of the sort that gold companies generally love to develop. WAF got hold of this one at the point of development in its back yard in Burkina Faso, 2021. Construction starts early 2023.

Overview

WAF at home: West African acquired control of the Kiaka Project for US$100M in October 2021 as a ready to go proposal 45km from its operating Sanbrado gold project in Burkina Faso.

Study reboot: The Company has since re-cut the feasibility study, estimating open pit ore reserves of 155Mt at 0.9 g/t gold containing 4.5Mozs of gold. The reserve has a waste:ore ratio of 1.8:1. The main 450m deep pit is designed around a monolithic ore zone up to 400m wide.

WAF estimates the cost of building an 8.4Mtpa pit and CIL operation at US$472M. Construction is due to start in early 2023 on a track to produce first gold in mid-2025.

Upfront returns: The near surface, wide ore outline allows significant front end loading of returns. Within the mine plan Stage 1 (first 3-5 years) waste:ore is 0.6:1 and the head grade averages 1.0 g/t. Planned output in the first five years of Kiaka's operation averages 233kozspa, achieved with average material movement rate of 20Mtpa. WAF estimated an after-tax net present value for Kiaka of US$860M and an IRR of 21%, using a 5% real discount rate and US$1750/oz gold. Our model generates NPV of A$520M using a 7% discount rate, higher fuel cost assumptions and different timing to WAF's projections.

Cost control: WAF assumed low prevailing fuel and energy rates in the feasibility study and they have since surged. A cooling off, or a compensatory gold price rise is assumed for now. Security risks are ever present in Burkina Faso but we tend to view security as a secondary risk because of the measures taken by state and company to protect Sanbrado's and Kiaka's profitable operations under WAF's management. Execution risks are partly mitigated by WAF's in country presence and experience.

Life and size: With a nominal mine life of 18 years, mine and plant expansions present obvious opportunities to add value to Kiaka. WAF and Lycopodium designed the process plant to be capable of expansion to +10Mtpa through a number of minor upgrades.

West African Resources Ltd

Equities Research

Analyst: John Macdonald

Recommendation	**Buy**	**Sector**	**Metals & Mining**
Current Price	**$1.20**	**Issued Capital (M)**	**1,021**
Valuation	**$1.62**	**Market Cap (M)**	**$1,227**
			Friday, 11 November 2022

Profit & loss ($M) 31 Dec	2022E	2023E	2024E	2025E
Sales Revenue	**616**	**587**	**502**	**522**
+ Other income/forwards	0	0	0	0
+ Working capital change	0	0	0	0
- Operating costs	-233	-255	-226	-275
- Royalties	-33	-31	-27	-27
- Corporate & administration	-20	-20	-20	-20
Total Costs	**-285**	**-306**	**-272**	**-322**
EBITDA	330	281	230	200
- margin	54%	48%	46%	38%
- D&A	-101	-100	-98	-96
EBIT	**230**	**181**	**132**	**104**
+ Finance Income/Expense	0	0	-15	-13
+ Foreign exchange	2	0	0	0
Pre-Tax Profit	**232**	**181**	**117**	**91**
- Tax expense	-70	-54	-35	-37
- Minority interests	-12	-12	-11	-12
NPAT	**151**	**115**	**71**	**63**
- Impairments and other				
NPAT	**151**	**115**	**71**	**63**

Cash flow ($M)	2022E	2023E	2024E	2025E
+ Operating Cashflow	331	281	230	221
- Forwards	0	0	0	0
- VAT refund/pmt/income tax	-65	-68	-51	-54
- Change in working cap				
- Minority interests	-12	-12	-11	-12
- Interest & Other	0	0	-15	-13
Operating Activities	**254**	**201**	**153**	**142**
- Property, plant, mine devel.	-130	-201	-396	-250
- Acquisition + disposal	-63			
- Exploration	-12	0	0	0
Investment Activities	**-142**	**-201**	**-396**	**-250**
+ Borrowings	0	0	248	-69
- Dividends	0	0	0	0
+ Equity	0	0	1	0
Financing Activities	**0**	**0**	**249**	**-69**
- Exchange rate effect	1	0	0	0
Net Cash Change	**112**	**1**	**6**	**-177**

Balance sheet	2022E	2023E	2024E	2025E
Cash and gold	**310**	**311**	**317**	**140**
Other Current Assets	196	196	196	196
Total Current Assets	**506**	**507**	**513**	**336**
Property, Plant & Equip.	673	773	1071	1225
Investments/other	160	160	160	160
Tot Non-Curr. Assets	**833**	**933**	**1231**	**1385**
Total Assets	**1339**	**1440**	**1744**	**1721**
Short Term Borrowings	0	0	69	0
Other	75	152	66	66
Total Curr. Liabilities	**75**	**152**	**135**	**66**
Long Term Borrowings	20	20	199	199
Other	96	96	96	96
Total Non-Curr. Liabil.	**116**	**116**	**295**	**295**
Total Liabilities	**191**	**268**	**431**	**362**
Net Assets	**1148**	**1172**	**1313**	**1359**

Operations summary	2022E	2023E	2024E	2025E
Sanbrado gold production (kozs)	243	237	208	207
Kiaka gold production (kozs)	0	0	0	9
Total group production	**243**	**237**	**208**	**216**
Sanbrado AISC (US$/oz)	987	1074	1103	1152
Kiaka AISC (US$/oz)	0	0	0	4481
Group AISC (US$/oz)	**987**	**1074**	**1103**	**1294**
Growth capital (US$M)	45	99	241	123
CAIC (A$M)	508	480	502	618
CAIC (A$/oz)	**2089**	**2028**	**2416**	**2858**

Financial ratios		2022E	2023E	2024E	2025E
GCFPS	A¢	36.8	31.3	25.6	24.5
CFR	X	3.3	3.8	4.7	4.9
EPS	A¢	16.8	12.8	7.9	7.0
PER	X	7.2	9.4	15.2	17.2
DPS	A¢	0.0	0.0	0.0	0.0
Yield	%	0.0	0.0	0.0	0.0
Interest Cover	x	0.0	0.0	8.8	7.8
ROCE	%	28%	19%	11%	8%
ROE	%	20%	15%	9%	7%
Gearing	%	1.7%	1.7%	20.4%	14.7%

Shares	2022E	2023E	2024E	2025E
New shs issued/exerciseable	0	11	2	0
Average issue price	0.00	0.00	0.54	0.00
Ordinary Shares - End	1021	1032	1034	1034
Diluted Shares	1034	1034	1034	1034

Hedging	2022E	2023E	2024E	2025E
Hedged sales (kozs)	0	0	0	0
Hedged price (US$/oz)	0	0	0	0
Hedge +gain-loss (US$M)	0	0	0	0
Hedged %	0%	0%	0%	0%
Received price US$/oz	1833	1800	1750	1750

Valuation summary	A$M	A$/sh
90% Sanbrado after tax 7% DR	803	0.79
90% Kiaka after tax, 7% DR	517	0.51
Exploration, all sites	291	0.28
Corporate overheads	-111	-0.11
Cash & bullion	254	0.25
Debt	-15	-0.01
Tax benefit/-payable	0	0.00
Hedging	0	0.00
Equity dilution/deferred consid.	-88	-0.09
Total	**1652**	**1.62**

Directors	
Richard Hyde	Executive Chair, CEO
Lyndon Hopkins	Executive Director, COO
Rodney Leonard	Non-Exec Director
Nigel Spicer	Non-Exec Director
Elizabeth Mounsey	Non-Exec Director
Stuart Findlay	Non-Exec Director

Top Shareholders	m shares	%
Van Eck Associates Corporation	79.3	7.8
L1 Capital	56.0	5.5

Reserves & Resources Dec '21	Mt	g/t Au	Koz	Mkt cap/oz
TOTAL RESOURCE	**361.3**	**1.11**	**12,907**	**95**
Sanbrado, Toega (meas., ind., inf.)	81.3	1.98	5,164	
Kiaka (ind., inf.)	280.0	0.86	7,743	
INCLUDES TOTAL RESERVE	**181.0**	**1.07**	**6,235**	**197**
Sanbrado, Toega open pit	23.9	1.60	1,230	
Sanbrado underground	2.1	7.10	470	
Kiaka open pit	155.0	0.91	4,535	

Argonaut model Dec '21	Mt	g/t Au	Koz	Mkt cap/oz
TOTAL INVENTORY	**183.5**	**1.15**	**6793**	**181**
Sanbrado, Toega open pit & s/pile	24.4	1.52	1197	
Sanbrado underground	4.1	8.03	1061	
Kiaka open pit	155.0	0.91	4535	

Price assumptions	2022E	2023E	2025E	2025E
AUDUSD	0.72	0.73	0.73	0.73
Gold US$	1833	1800	1750	1750
Gold A$	2533	2483	2414	2414

Kiaka

Kiaka is 45km from WAF's operating Sanbrado operation

Background

Kiaka is a 2005 Randgold discovery in east-central Burkina Faso. B2Gold acquired the project in 2013, and completed extensive, unpublished feasibility study work in 2020, considering pit and CIL developments at up to 12Mtpa ore process rates. Over 190,000m of RC and diamond core drilling were completed before West African bought the project in October 2021, planning to lever off its experience at the successful Sanbrado gold project development, 45km to the north east of Kiaka. WAF completed a Kiaka feasibility study in August 2022.

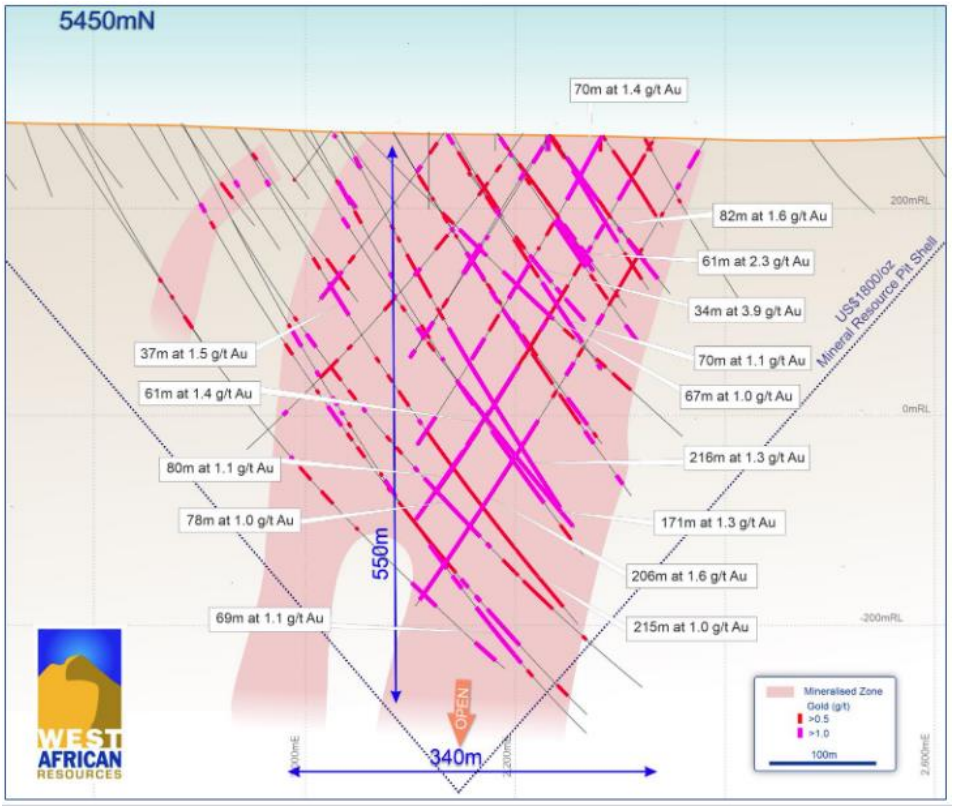
Geology and resources

Under 20m of cover, gold mineralisation is hosted by a sheared and folded sequence of mafic volcanics and volcaniclastic sediments.

Ore reserves are estimated at 155Mt at 0.94 g/t containing 4.5Mozs of gold. The waste:ore ratio is 1.8:1

The August 2022 resource is estimated at 280Mt at 0.90 g/t, containing 7.7Mozs of gold to a maximum of 650m vertical depth. Indicated resources comprise 5.9Mozs of the total. Most of the resource estimate is within a 400m wide main zone that extends over 1.5km strike.

Figure 84: Kiaka cross section.

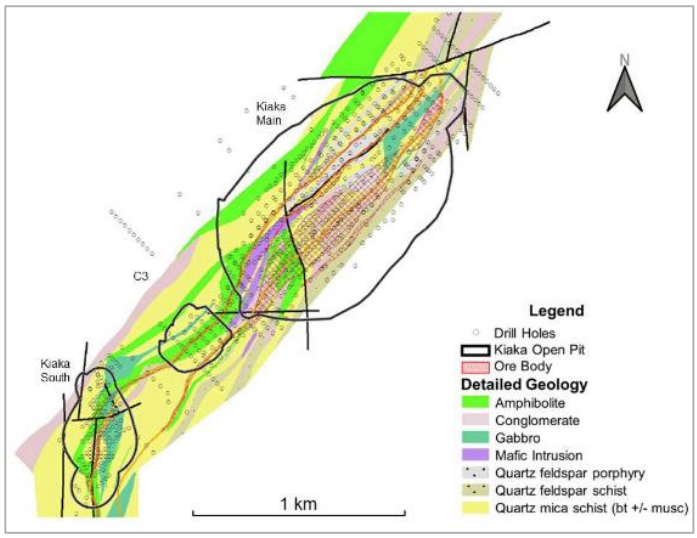


Source: West African.

Reserves

WAF estimated Kiaka pit reserves in August 2022 at 155Mt at 0.94 g/t containing 4.5Mozs of gold. The estimated waste:ore ratio is 1.8:1. The main pit design is 2000m long, 900m wide and 450m maximum depth.

Figure 85: Schematic Kiaka in plan with pit outlines and interpreted geology.



Source: West African

WAF's design throughput rate at Kiaka is 8.4Mtpa, and the initial mine life is 18.5 years.

WAF expects gold output to average 233kozs pa in the first five years of operation.

Mining and processing

WAF has selected a design throughput rate at Kiaka of 8.4Mtpa, and an initial mine life of 18.5 years. Initial control of capital expenditure and timely project delivery under the requirements of the mining licence were considerations in setting the development scale. WAF plans to keep its expansion options open through the development and early production phases. A SAG mill, ball mill and pebble crush circuit is designed to treat 8.4Mt at 8% passing 100microns. The process plant can be expanded to +10Mtpa through a number of minor upgrades which were assessed during the updated feasibility study in 2022. Metallurgical gold recovery estimated in the feasibility study is 89-91%.

Lower strip ratios (0.6:1) and higher ore head grades (1.0 g/t) are scheduled for the first 30Mt of pit mining (3-5 years). WAF expects gold output to average 233kozs pa in the first five years of operation.

Logistics, development

Access from Burkina Faso's capital Ouagadougou is via 100km sealed road and 40km of gravel roads. WAF plans to upgrade the last 20km of road to site. Power will be bought from the national electricity grid after connection to the 225kV transmission line, about 44km from Kiaka. Backup diesel generated power is included in the capital budget. Water will be drawn from the Bagre dam 7km south east of Kiaka. Project construction is planned to start in early 2023 and lead to first gold production by July 2025.

Financials

In October 2022 West African estimated the cost of building Kiaka at US$430M plus US$42M spent after the first gold pour, for a US$472M total. Pre-production capex is exempt from VAT as per the Burkina Faso Mining Code. West African intends to finance the project with internal funds and a debt facility, yet to be negotiated.

Argonaut estimates an after tax net present value for Kiaka of A$520M, using a 7% real discount rate, US$1750/oz gold and 0.72 AUDUSD exchange rate. The estimated internal rate of return in our model is 25%.

Agrimin (AMN)

Right Time, Right Place

Analyst: Ian Christie

SPEC BUY

Current Price	$0.38
Valuation	$0.95

Ticker:	**AMN**
Sector:	**Metals & Mining**

ESG Ratings:

Shares on Issue (m):		**287.4**
Market Cap ($m):		**107.8**
Cash Est. ($m)		4.4
Debt Est. ($m)		0
Enterprise Value ($m):		**103.4**
52 wk High/Low:	**$0.59**	**$0.29**
12m Av Daily Vol (m):	**0.1**	

Projects	**Stage**
Lake Mackay	Definitive Feasibility Study

Mineral Resource	**K (mg/L)**	**SOP (Mt)**
Lake Mackay	3,285	123.4

Ore Reserve	**K (mg/L)**	**SOP (Mt)**
Lake Mackay	2,815	20.0

Cashflows	**2020**	**2021**
Operating Cashflow	-1.7	-2.2
Investing Cashflow	-4.1	-5.9
Financing Cashflow	6.1	9.5
Cash Balance	5.5	6.8

Directors:	
Richard Seville	Non-Executive Chairman
Mark Savich	Executive Director & CEO
Brad Sampson	Non-Executive Director
Alec Pismiris	Non-Executive Director

Substantial Shareholders:	**%**
BCI Minerals	13.0%
Hillboi Nominees & Associates	11.6%

Share Price Graph and Trading Volumes

Quick Read

A large project with low sovereign risk and green credentials appeals in an environment where a supply shock has created major disruptions to the global fertilizer industry.

Overview

A rigorous approach: We expect AMN to reap rewards from extensive study and a patient approach. It will prove beneficial as a funding solution is sought, and help avoid problems that have plagued faster-paced peers. Lake Mackay's size sets it apart, with production of 450ktpa helping minimise unit capital and operating costs. The capital invested in control over the supply chain from mine to ship de-risks the project further.

Timing: AMN now expects the project to be shovel ready in 2023, consistent with our forecasting. This is later than originally anticipated but not an issue in our view as it has little impact on valuation (it is a 40+ year project), and will give AMN time to fine tune engineering and for current inflationary heat to abate. Having obtained offtakes for 70% of planned production, AMN is currently focused on completing FEED, working through the environmental approvals process, and negotiating a funding solution.

Fertilizer supply squeeze: With Russia and Belarus accounting for ~40% of global potash supply, sulphate of potash (SOP) prices have spiked to >US$1,000/t landed in Europe. It calls into question the DFS price assumption of US$500/t. We are unwilling to significantly change this forecast on the back of a short-term supply shock induced price spike, but think a higher longer-term price is warranted because many of the producer cost increases are structural not cyclical. We now use US$550/t instead of US$500/t.

Green credentials: The 2020 DFS claimed one of the lowest carbon footprints associated with any major macro-nutrient fertilizer product. FEED work has improved on this further, delivering an 84% renewable energy penetration rate. We believe these credentials, particularly when compared to the Mannheim process currently responsible for around half current global SOP production, are key positives.

Attraction: AMN is Australia's largest SOP project and has arguably had the most rigorous feasibility study work applied to it. We expect the renewables penetration and a sustainable end-product to appeal to ESG-focused investors, while a reliable source of potash supply is increasingly attractive in a world where geopolitical risks abound.

Valuation & recommendation

We have factored capital and operating cost escalation into our modelling (see detail in "Supply shock boosts appeal", 14/06/22). This was largely offset by a higher potash price and a lower exchange rate than previously assumed. Our positive view on the project and a valuation of $0.95 supports a SPEC BUY recommendation.

Overview

SOP is a premium specialty potassium fertilizer

Muriate of potash (MOP) is the standard source of potassium in agriculture, with a market size of ~70Mtpa, but it contains a high level of chloride. SOP, a premium specialty fertiliser that is chloride free, is applicable to chloride-intolerant crops such as fruits, vegetables and nuts. Its market is a much smaller ~7Mtpa, although constrained given around half of global supply comes from expensive and environmentally unfriendly production.

Project overview

Lake Mackay is the largest SOP-bearing salt lake in Australia, covering 3,500km^2. It is located 940km by road south of Wyndham Port in WA. AMN plans to sustainably extract brine from Lake Mackay using a network of shallow trenches which feed into a series of solar evaporation ponds. Raw potash salts will crystallise on the floor of the ponds and be collected by wet harvesters and pumped as a slurry to the processing plant located off the edge of the salt lake. The plant will refine harvested salts into high quality finished SOP fertiliser, which will then be hauled by a dedicated fleet of road trains to a purpose-built storage facility at Wyndham Port. The Company aims to produce 450ktpa SOP at steady state and has 20.0Mt of Proved and Probable SOP Reserves.

Lake Mackay is the largest SOP-bearing salt lake in Australia

Figure 86: Lake Mackay project map

Source: AMN

Valuation

The project NPV$_8$, real discount (or risk factor) of 40% that we use in our valuation will be reduced as risks associated with financial close, construction, and ramp-up are unwound. Full valuation details, discussion, and sensitivity analyses are included in our latest note.

Our project valuation risking will be reduced as milestones are successfully met

Table 7: Corporate valuation table

Item	Unrisked Value ($m)	Risk Factor	Risked Value ($m)	Risked Value / Current Shares ($)
Lake Mackay NPV	766	40%	460	1.60
Corporate Costs NPV	-46		-46	-0.16
Exploration / Other Assets	0		0	0.00
Future Equity Dilution	-147		-147	-0.51
Net Cash / (Debt) - Jun '21	7		7	0.02
Equity Valuation	579		273	0.95

Source: Argonaut (assuming majority equity capital raised prior to development at 70cps)

Ausgold (AUC)

Southwest Scale

Analyst: Royce Haese

SPEC BUY

Current Price	$0.04
Valuation	$0.11

Ticker:	**AUC**
Sector:	**Metals & Mining**
Shares on Issue (m):	**2,029.5**
Market Cap ($m):	**89.3**
Cash Est. ($m)	8.6
Debt Est. ($m)	0.0
Enterprise Value ($m):	**80.7**
52 wk High/Low:	**$0.09** **$0.04**
12m Av Daily Vol (m):	**2.6**

Projects	**Stage**
Katanning	Definitive Feasibility Study

Mineral Resource	**Mt**	**Au (g/t)**	**Au (Moz)**
Katanning	56.0	1.21	2.2

Ore Reserve	**Mt**	**Au (g/t)**	**Au (Moz)**
Katanning	32.0	1.25	1.3

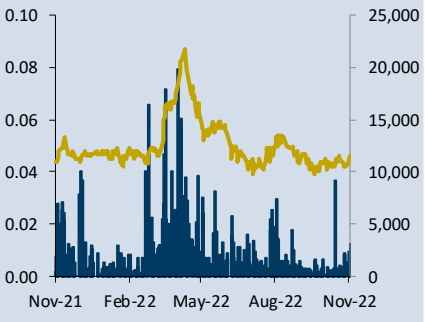
Cashflows	**2020**	**2021**
Operating Cashflow	-1.1	-1.1
Investing Cashflow	-8.8	-11.0
Financing Cashflow	16.3	15.6
Cash Balance	7.5	10.9

Directors:

Richard Lockwood	Non-Executive Chairman
Matthew Greentree	Managing Director
Denis Rakich	Executive Director
Neil Fearis	Non-Executive Director
Geoffrey Jones	Non-Executive Director
Timothy Kestell	Non-Executive Director

Substantial Shareholders:	**%**
Dundee Resources	12.5%
Jupiter Investment Management	6.2%

Share Price Graph and Trading Volumes



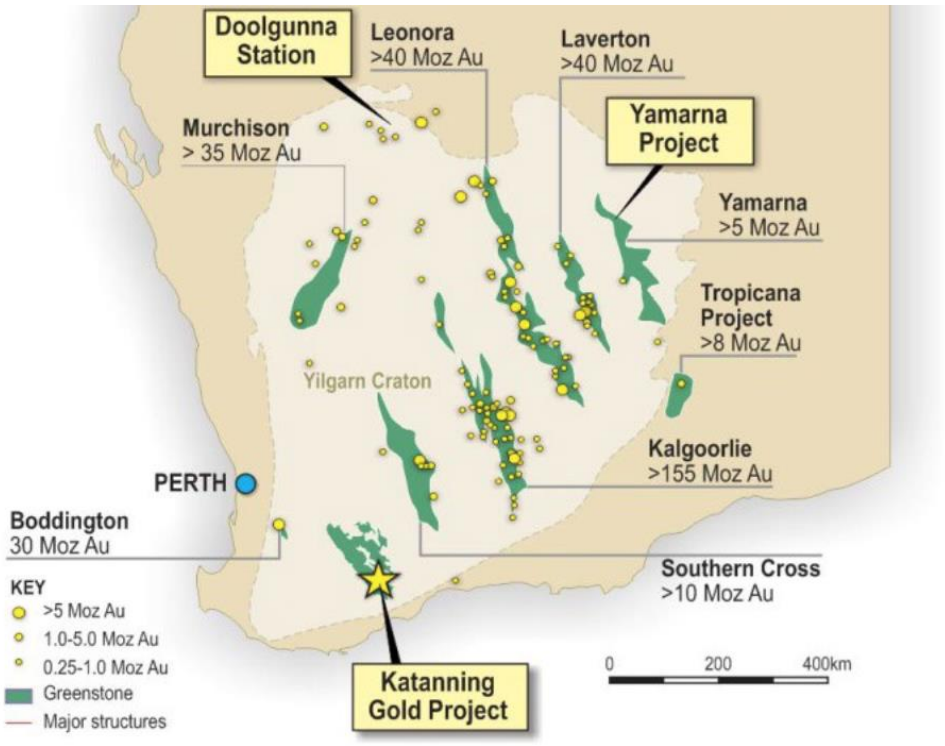
Quick Read

The Katanning Gold Project is West Australia's next mid-tier gold development story. Its August 2022 Pre-Feasibility Study defined a 1.28Moz open pit Reserve feeding a 3Mtpa processing facility for gold production averaging 105kozpa over 11 years. An average of 1.47 g/t Au head grade for the first six years will facilitate rapid payback of the project. With a very short list of projects in WA capable of delivering these sorts of numbers Katanning is in a standout position.

Overview

The Katanning Gold Project is located in the southwest of Western Australia. Due to the geographic location of the project a standalone mining and processing operation is the only viable option for Katanning.

Figure 87: Katanning Gold Project location in Western Australia



Source: Ausgold

Ausgold's land holding essentially covers the entirety of the Katanning Greenstone Belt in the south-west Yilgarn Craton. The bulk of identified mineralisation to date is hosted along ~17 km of strike of a large-scale thrust fault. With the main Resource defined over a central ~4 km of strike.

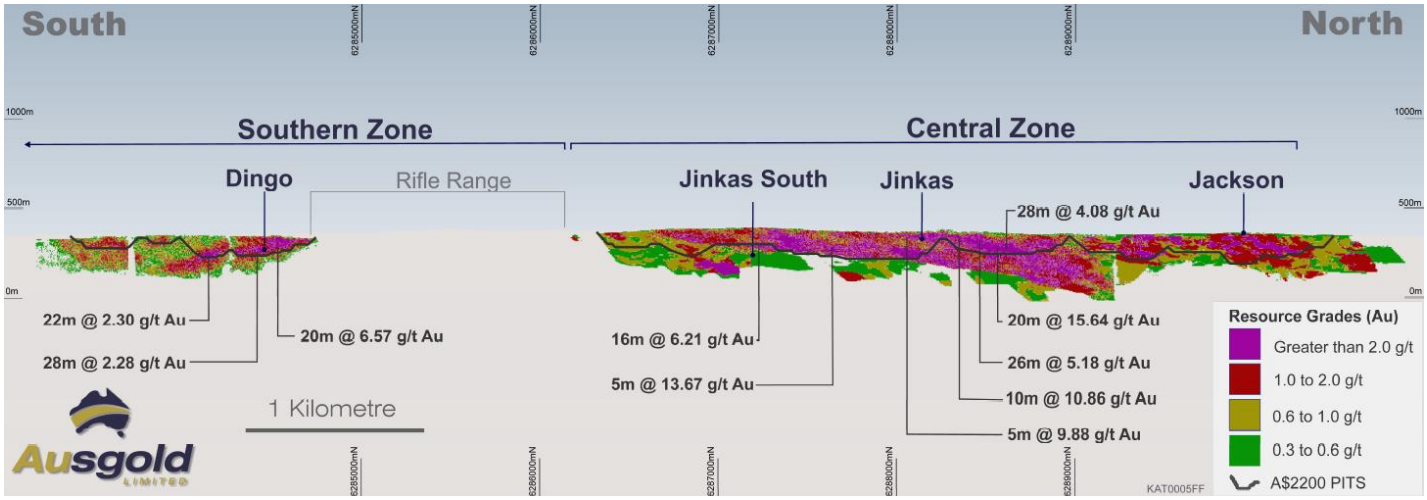
The value at Katanning is underpinned by its Resource and exploration potential. The Project holds an estimated 56Mt @ 1.2 g/t Au for 2.2Mozs. With 83% in the higher

Mineralisation geometry is well understood, significant exploration upside remains

confidence Measured and Indicated categories. Work on dissecting mineralisation controls has paid dividends, with the main Jinkas Zone are now well understood. High grade plunges extend beneath the current pit-shell which may develop into underground exploitable orebodies with further drilling. Mineralisation is open to the north and infill

drilling of Resources currently classified as Inferred may convert into Reserves which will lower the strip ratio and improve economics further.

Figure 88: KGP long section with optimised pit-shell and resource grades outlined



Source: Ausgold

Valuation

Using a 7% real, after tax, discount rate, Argonaut values the Katanning Gold Project at $330M

Argonaut has developed a mining scenario as a basis for valuation with mining parameters based on Ausgold's August study. With a DFS scheduled for Q4 2023 and factoring in 18 months for FID and build, under the current plan we can expect first gold in the second half of 2025.

Table 8: Argonaut's Ausgold Valuation Summary

Valuation summary	A$M	A$/sh
Katanning Gold Project 7% real after tax	330	0.16
Exploration	66	0.03
Corporate Overheads	-38	-0.02
Cash and bullion	11	0.01
Debt	0	0.00
Tax benefit	25	0.01
Hedging	0	0.00
Option/equity dilution	-162	-0.08
NAV	**231**	**0.11**

Source: Argonaut

A key risk is the location of the project on arable farmland ~40 km northwest of the town of Katanning, securing the farmland on which the project lies will slightly reduce this risk, but we still expect increased environmental scrutiny on project development when compared to a project in the goldfields proper.

There also remains a risk of further capex creep in the current inflationary cost environment.

AuTECO Minerals (AUT)

Mighty Pickle Crow

Analyst: Royce Haese

NOT COVERED

Current Price	$0.04
Market Cap	$87M

Ticker:	**AUT**
Sector:	**Metals & Mining**
Shares on Issue (m):	**2,067.8**
Market Cap ($m):	**86.8**
Cash Est. ($m)	11.0
Debt Est. ($m)	0.0
Enterprise Value ($m):	**75.8**
52 wk High/Low:	**$0.10** **$0.04**
12m Av Daily Vol (m):	**1.8**

Projects	**Stage**
Pickle Crow	Resource Development

Mineral Resource	**Mt**	**g/t**	**Moz Au**
Pickle Crow	8.9	7.8	2.23

Cashflows	**2021**	**2022**
Operating Cashflow	-2.5	-6.3
Investing Cashflow	-9.5	-22.0
Financing Cashflow	28.8	19.7
Cash Balance	21.8	13.6

Directors & Management:	
Ray Shorrocks	Executive Chairman
Steve Parsons	Non-Executive Director
Michael Naylor	Non-Executive Director
Darren Cooke	CEO

Substantial Shareholders:	**%**
1832 Asset Management	12.9%
Franklin Resources	6.2%
Campbell Kitchener Hume & Assoc.	5.5%
Symorgh Investments	5.2%

Share Price Graph and Trading Volumes

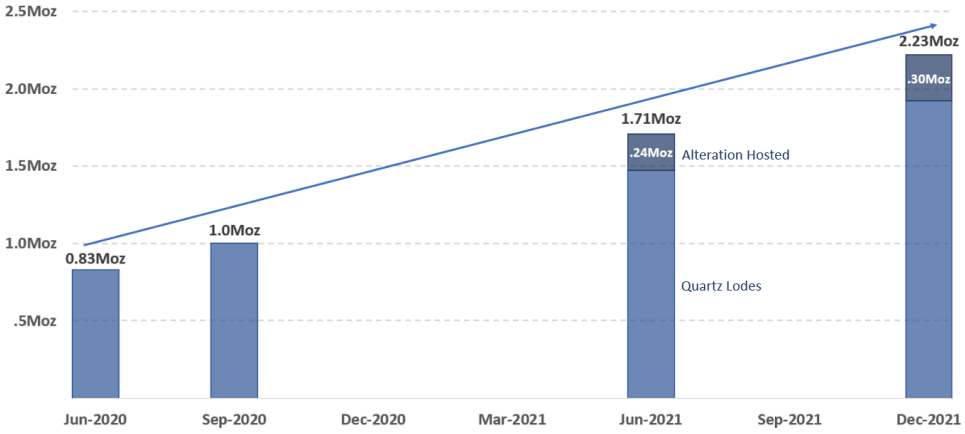
Quick Read

A historical high-grade mining centre with 2.2Mozs @ 7.8 g/t Au defined in the immediate vicinity to date. Pickle Crow has near mine plus regional upside for both shallow, bulk tonnage and narrow, high-grade, vein hosted deposits. Auteco has discovered high-grade veins adjacent Pickle Crow, and early regional results are looking promising. The Company is investigating ways to get back underground to facilitate a close spaced drill programme but with plenty of room to grow at surface we're yet to see the full potential scale of this project.

Overview

Determined for Resource Growth: Pickle Crow boasts a 2.23Moz @ 7.8 g/t Au Resource estimate, inclusive of a high-grade quartz hosted component of 1.92Moz @ 9.3 g/t Au. This represents a +30% increase in contained ounces on top of the prior 1.71Moz estimate. Resource growth was achieved on the back of a six-month, 30 km drill campaign. A follow-up campaign is currently underway.

Figure 89: Pickle Crow Resource Growth Over Time



Source: AUT

Pickle Crow is located in the Pickle Lake Greenstone Belt, Uchi Sub-province, Ontario, Canada. The Uchi Sub-Province hosts numerous multi-million ounce orebodies, most notably the Red Lake Mine (ASX:EVN), which has produced >25Moz of gold at an average grade in excess of 20 g/t Au.

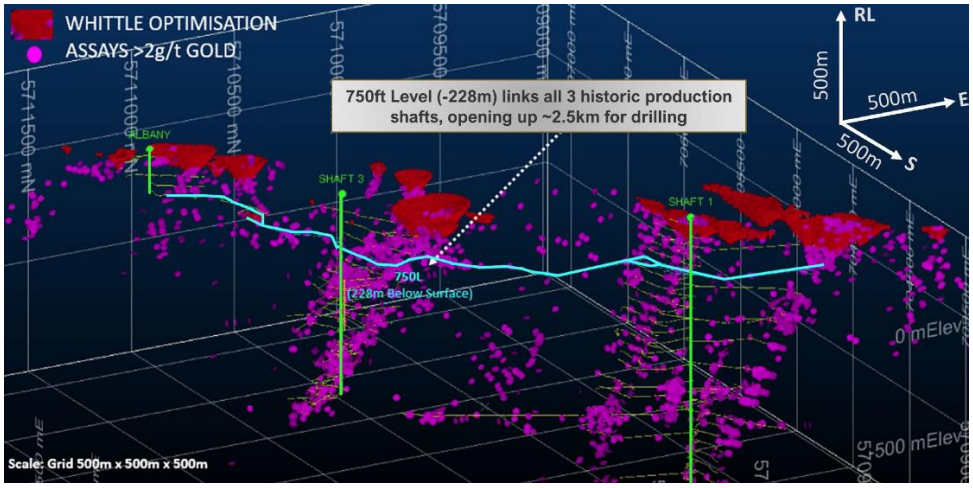
Auteco acquired the right to earn into the project from First Mining (TSX:FF) in April 2020. To date, exploration expenditure has seen AUT earn 70% of the project, AUT now has the option to pay a further C$3M to obtain a final 10%. First Mining will retain a 2% NSR with AUT having the right to buy back 1% of the NSR for US$2.5M.

Infill drilling is best done from underground platforms

Getting Underground

Strike extents and newly discovered vein systems remain open and drill testing from surface is ongoing. With the current Resource estimate entirely in the Inferred category and open at depth, further drilling will both add confidence and grow the deposit. Drilling of these targets could be completed much more rapidly and cost effectively from underground. The 750 level, 230 m below surface, spans the entire length of the current Resource and would provide an ideal drill platform. Auteco is investigating access options, with mining of open pits and declining from them, construction of a purpose-built exploration decline, and rehabilitating historical shafts the current options.

Figure 90: Pickle Crow Oblique Section with Infrastructure and Drill Hits Highlighted

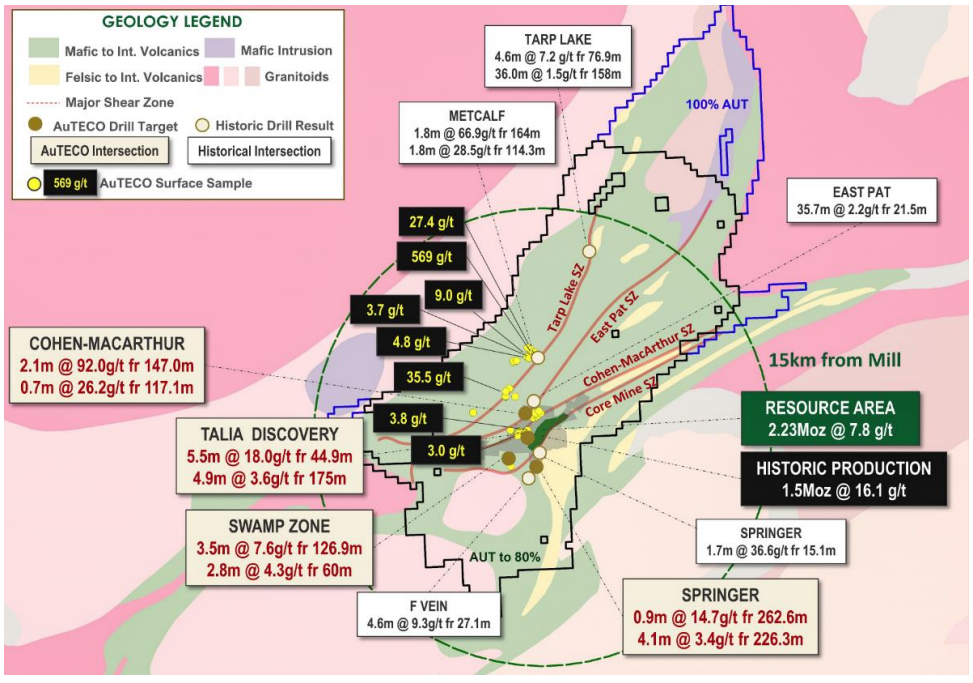


Source: AUT

Over the Canadian winter Auteco will be drill testing its regional targets.

Figure 91: Pickle Crow Regional Targets

Regionally, high-grade rock chip samples warrant follow-up



Source: AUT

BlackEarth Minerals (BEM)

Carbon Positive

Analyst: John Macdonald

SPEC BUY

Current Price	$0.10
Valuation	$0.22

Ticker:	**BEM**
Sector:	**Metals & Mining**
Shares on Issue (m):	**279.1**
Market Cap ($m):	**26.5**
Cash Est. ($m)	4.1
Debt Est. ($m)	0.0
Enterprise Value ($m):	**22.4**
52 wk High/Low:	**$0.18** **$0.07**
12m Av Daily Vol (m):	**0.7**

Projects	**Stage**
Maniry	Feasibility Study

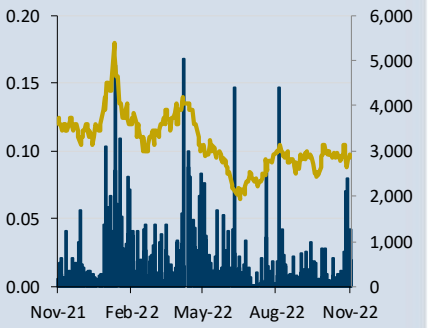
Mineral Resource	**Mt**	**% TGC**	**kt (TGC)**
Maniry	37.6	6.40%	2,405

Cashflows	**2021**	**2022**
Operating Cashflow	-2.3	-3.0
Investing Cashflow	0.0	-4.6
Financing Cashflow	7.7	6.9
Cash Balance	6.6	5.8

Directors:	
George Bauk	Non-Executive Chairman
Tom Revy	Managing Director
David Round	Executive Director
Heather Zampatti	Non-Executive Director

Significant Shareholders:	**%**
Canadian Resource Fund	5.0%
Lithium Australia	4.7%
Board & Management	6.5%

Share Price Graph and Trading Volumes



Quick Read

Supply insecurity has set in for natural graphite, which is a critical battery component raw material. Governments and car makers are actively encouraging new investment in natural graphite supplies. Maniry is an under-appreciated natural graphite play in a developing area that can help address market weaknesses.

Maniry

Background: Maniry is in south-west Madagascar approximately 180km south-east of the port of Toliara and 23 km from the regional town of Ampanihy. Graphite was first discovered at Maniry in 2012. The Razafy and Razafy Northwest graphite deposits occur in granulite facies metasediments proximal to an anorthosite intrusive body. BlackEarth has advanced the project through resource definition, scoping study and feasibility study. In November 2022 TSE listed NextSource Materials (TSE:NXT, mkt cap A$280M) is commissioning the Molo graphite project, based on deposits in a similar geologic setting, 40km north of Maniry.

Feasibility Study

The Maniry feasibility study was completed in November 2022. Ore reserves of 16Mt at 6.6% total graphitic carbon were estimated within two pit designs with an overall waste:ore ratio of 2.1:1. Development is planned in 2 stages, with the second stage dependent on market development. The capital cost estimated for the 0.5 Mtpa first stage is US$79M, and the second stage (1.0 Mtpa) capex is estimated at US$25M.

The study is based on open pit mining and processing 18.5Mt of ore at an average grade of 6.4% TGC at a rate of 1.0Mtpa. An on site flotation only concentrator is planned to produce 52ktpa 95% TGC concentrate at 90% metallurgical recovery.

Hybrid solar/battery/diesel power will be generated under contract by a third party. Diesel is the largest single operating cost. Total operating costs are estimated at US$40/t of mill feed, equivalent to US$660/t of product.

Concentrate product is expected 38% in the coarse flake range (>180 micron), 13% medium flake (150-180micron) and 48% fine flake. BlackEarth initially plans to sell Maniry graphite concentrate to battery anode manufacturers and foundry end users, and as expandable graphite. A basket price of US$1448/t is assumed in the feasibility study for the concentrate product FOB Toliara. BlackEarth assumes use of the Port of Toliara for inbound supplies and concentrate export.

At the weighted average sales price of US$1,448/t FOB of concentrate product, BlackEarth estimates a post-tax NPV_{10} of US$205M and an IRR of 29% for Maniry.

Markets: Chinese firms dominate downstream graphite processing particularly at the natural graphite purifying, spheronising and coating stages. Most natural graphite resource owners outside of China are looking to integrate downstream and capture a value lift, including BlackEarth. Some are investing in purification and spheronising facilities now, often taking on multiple layers of technical and marketing risk at once. BlackEarth plans to graduate its way into the market starting with a small scale entry to expandable (fire retardant) graphite in 2023, before establishing a graphite concentrator at Maniry, and then developing an offsite battery anode material (purification and spheronising) facility closer to markets. The Company is scoping the prospects of establishing a Battery Anode Material plant in Germany.

Maniry could be commissioned late-2024

Stand up please: Despite all the promises, tangible achievements among non-Chinese natural graphite resource owners remain thin on the ground. Downstream processing development plans and positive cash flows from any stage of operation have been slow to materialise. BlackEarth is no exception, but we continue to look for investment opportunities in the natural graphite sector that can gain a foothold in this evolving and rapidly expanding market. BlackEarth has the requisite resource quality and market development plans to be successful. BlackEarth also comes at a much lower price than most of its peers. We consider the main risks to be associated with; 1. A slower electric vehicle take-up than generally envisaged 2. Madagascan operating risks – permits, taxes, high input costs, social cohesion, 3. Chinese capacity and determination to keep a stranglehold on certain sections of the natural graphite supply chain. 4. Cost escalation, particularly associated with the cost of power delivered to site.

BEM uses a weighted average sale price of US$1,448/t FOB Toliara in studies

Timeline: Initial mine plans are within the Razafy granted Mining Licence. Rulings on applications for conversion of certain Exploration Licences to Mining Licenses are expected in 2023 pending the passing of a new mining code expected by December 2022. Upon approval BEM expects to submit applications for a Global Environment Permit and receive a decision by May 2023. Allowance of 3 months for financing and 12 months construction would see Maniry commissioned in late 2024.

Figure 92. Maniry location map. Source BEM

Maniry graphite meets the specs of multiple end uses

Source: BEM

Chalice Mining (CHN)

Gonneville, The Jewel of Julimar

Analyst: Royce Haese

NOT COVERED

Current Price	$4.32
Market Cap	$1.6B

Ticker:	**CHN**
Sector:	**Metals & Mining**
Shares on Issue (m):	**376.3**
Market Cap ($m):	**1,625.6**
Cash Est. ($m)	115.4
Debt Est. ($m)	0.0
Enterprise Value ($m):	**1,510.2**
52 wk High/Low:	**$10.18** **$3.49**
12m Av Daily Vol (m):	**2.2**

Projects	**Stage**
Julimar (Ni-Cu-PGE)	Resource Development
Hawkestone (Ni-Cu-Co)	Exploration
South West (Ni-Cu-PGE)	Exploration
Barrabarra (Ni-Cu-PGE)	Exploration

Mineral Resource	**Mt**	**NiEq (%)**	**NiEq (kt)**
Julimar (Ni-Cu-PGE)	350.0	0.58%	2000.0

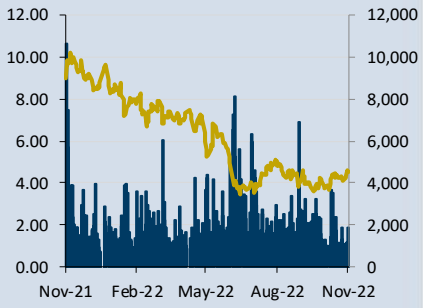
Cashflows	**2021**	**2022**
Operating Cashflow	-37.6	-61.8
Investing Cashflow	-20.3	-3.5
Financing Cashflow	112.0	96.9
Cash Balance	20.9	131.6

Directors:

Derek La Ferla	Non-Executive Chairman
Alex Dorsch	Managing Director & CEO
Morgan Ball	Non-Executive Director
Garret Dixon	Non-Executive Director
Linda Kenyon	Non-Executive Director
Stephen McIntosh	Non-Executive Director
Jo Gaines	Non-Executive Director

Substantial Shareholders:	**%**
Tim Goyder	9%
Directors & Management	2%

Share Price Graph and Trading Volumes



Quick Read

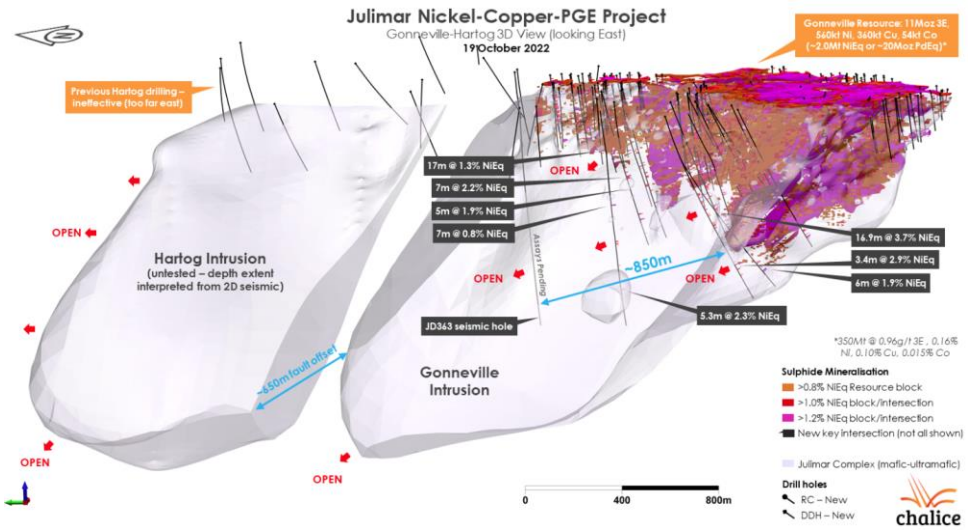
As Gonneville matures from exploration darling to developer proper, it has begun to chip away at some of the key unanswered questions surrounding the deposit. A large maiden Resource estimate has been published and updated so we have a sense of scale, and further effort has gone into determining the optimal processing pathway. Work on the processing route has been mostly behind closed doors for now, but we'll get our first look when the Gonneville scoping study is published later this year. Some steep hurdles to overcome but Gonneville still has the potential to put Australia on the PGM map, with a healthy nickel and copper kicker.

Overview

Scale and Growth: In total, Gonneville holds an estimated 350Mt at 0.77 g/t Pd (8.6Moz), 0.16 g/t Pt (1.8Moz), 0.16% Ni (560kt), 0.1% Cu (360kt). This includes a higher-grade subset containing 85Mt at 1.3 g/t Pd (3.5Moz), 0.29 g/t Pd (0.78Moz), 0.21% Ni (180kt), 0.20% Cu (170kt). The Resource remains open at depth.

Exploration in the State Forest hasn't proven as simple as hoped, but after a couple of false starts it appears that 2D seismic has identified Hartog offset of the Gonneville intrusive to the west of where was originally anticipated. Drill testing has confirmed disseminated sulphide mineralisation (assays pending) up to 1.2km north of the current Resource extent within Hartog, if the plunge in Hartog mirrors Gonneville then prospectivity should increase with depth.

Figure 93: Gonneville and Hartog Intrusion Interpretation with current Gonneville Resource Envelope Outlined



Source: CHN

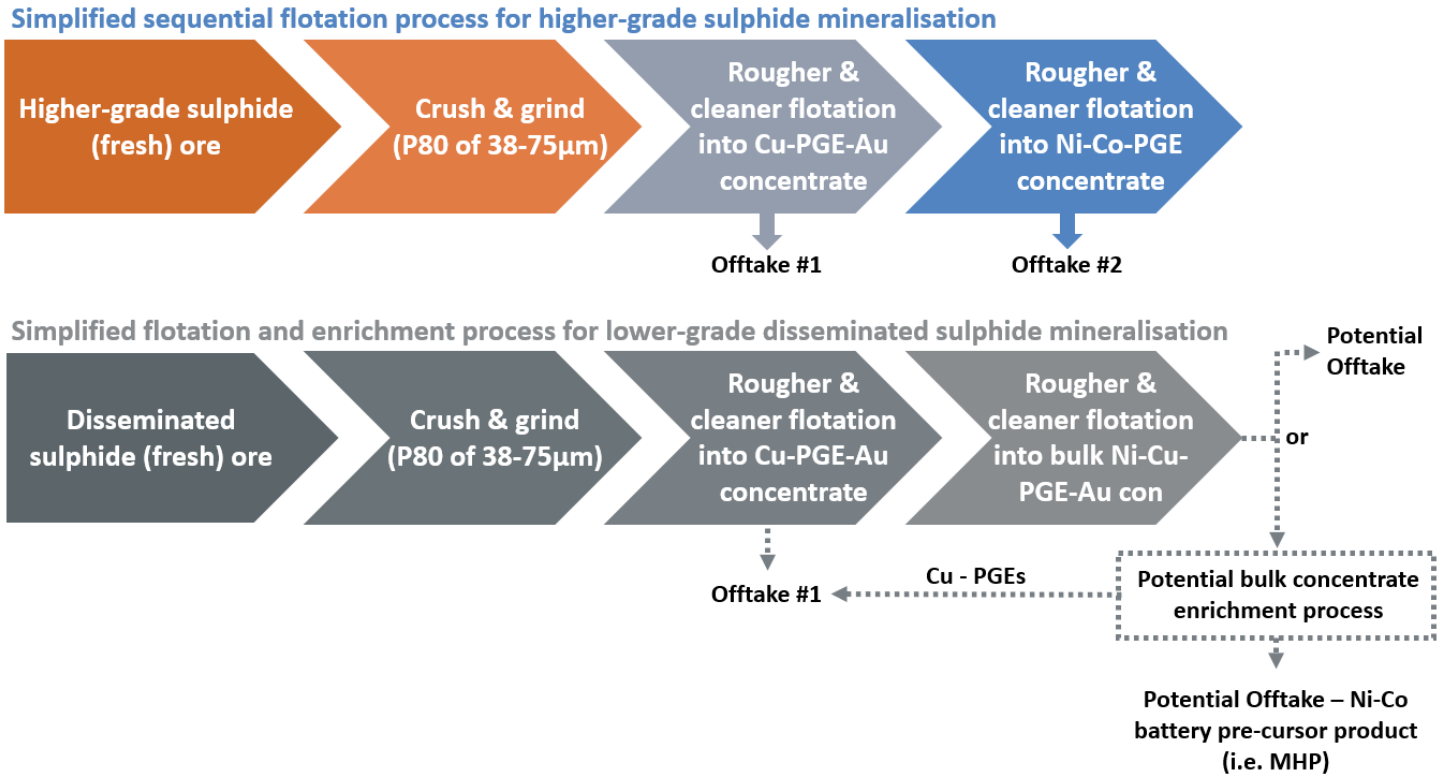
Social licence to operate is a key risk for the project

Social Considerations: Due to its location adjacent a State Forest and in farmland in the shadow of Perth, Gonneville will see increased scrutiny from stakeholders when it comes to development. Already, access to the State Forest for low impact exploration purposes has been drawn out. Social licence to operate is a key risk for the project. Strict environmental controls are already at the front of mind for Chalice during the exploration phase, and will need to be factored into any future development scenario.

Preliminary work has shown high-grade ore should report to two concentrates, more work to go on the disseminated ore

Process Route: With no comparable projects in Australia, we look to the scoping study for guidance on processing. The higher-grade mineralisation is expected to report to two concentrates, with most of the Palladium reporting to a copper concentrate, and most of the platinum into a nickel concentrate. The company is investigating bulk enrichment to upgrade a concentrate derived from the disseminated mineralisation which may include the creation of a Ni-Co battery pre-cursor product, e.g., MHP.

Figure 94: Proposed Flowsheets for Gonneville Ore



Source: CHN

Table 9: Predicted Metallurgical Recovery Ranges for Each Metal

Metal	Expected Recovery (%)
Palladium (~75%/25% into Cu/Ni con)	55-90
Platinum (~25%/75% into Cu/Ni con)	55-90
Gold (to Cu con)	30-65
Nickel (to Ni con/MHP)	40-80
Copper (to Cu con)	88-95
Cobalt (to Ni con)	40-80

Source: CHN

SPEC BUY

Current Price	$0.26
Valuation	$0.65

Ticker:	**EV1**
Sector:	**Metals & Mining**
Shares on Issue (m):	**202.5**
Market Cap ($m):	**51.6**
Cash Est. ($m)	14.5
Debt Est. ($m)	0.0
Enterprise Value ($m):	**37.1**
52 wk High/Low:	**$0.62 $0.23**
12m Av Daily Vol (m):	**0.3**

Projects	**Stage**
Chilalo	Definitive Feasibility Study

Mineral Resource	**Mt**	**% TGC**	**kt (TGC)**
Chilalo	67.3	5.40%	3,667.0

Cashflows	**2021**	**2022**
Operating Cashflow	-0.4	-5.6
Investing Cashflow	0.0	0.0
Financing Cashflow	0.0	11.2
Cash Balance	0.0	5.4

Directors:	
Trevor Benson	Non-Executive Chairman
Phil Hoskins	Managing Director
Michael Bourguignon	Executive Director
Amanda van Dyke	Non-Executive Director
Henk Ludik	Non-Executive Director
Chris Knee	CFO

Substantial Shareholders:	**%**
Marvel Gold Ltd	26.9%
Arch Sustainable Resources GPCO	21.5%

Share Price Graph and Trading Volumes

Evolution Energy Minerals (EV1)

Clean/Green Graphite

Analyst: Royce Haese

Quick Read

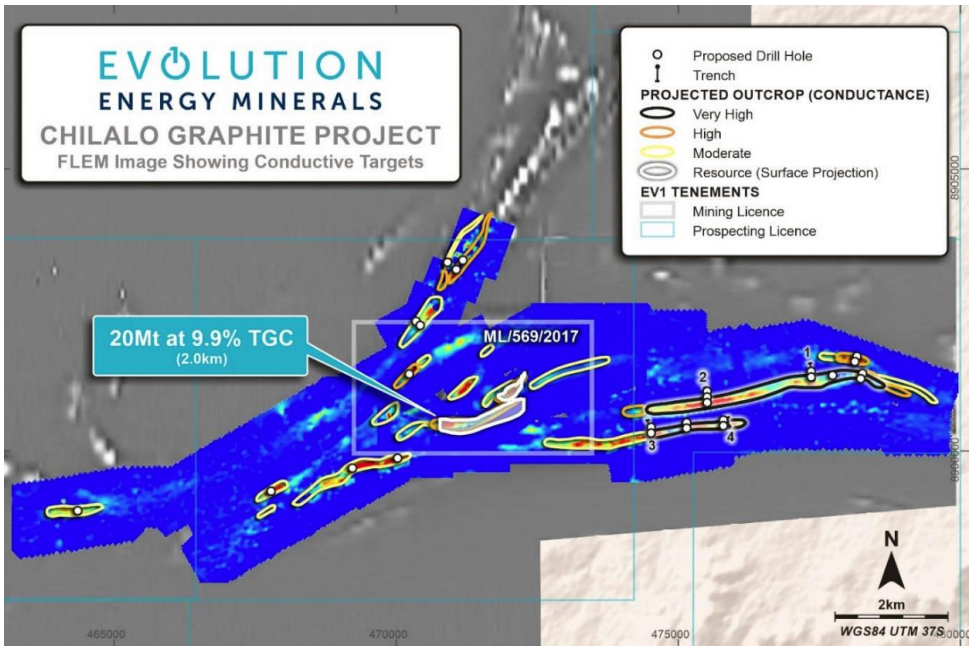
Recent work by EV1 has demonstrated a naturally clean graphite source with favourably large flake sizing in Chilalo. This may open the door to specialty end markets and associated premium sale price potential. Work to be done on qualification and securing offtakes for fines, but early signs are promising. Evolution is committed to sustainable development of Chilalo and aspires to become the world's first net zero carbon graphite miner.

Overview

The Chilalo Project is located in south-eastern Tanzania, approximately 400 km south of Dar es Salaam and 180 km west of the port city of Mtwara. While a relatively small deposit defined to date on a global scale, it is the high purity and large flake size that sets Chilalo apart from other graphite deposits.

Geophysics has proven an effective targeting tool at Chilalo, with highly conductive graphite zones readily identifiable in electromagnetic surveys. There is strong correlation between conductivity response and the existing 20Mt high-grade Resource estimate. Away from the Resource estimate, zones of equally high EM response continue, and are currently being drill tested

Figure 95: Chilalo Project FLEM Image with Conductive Targets and Planned Drilling Outlined



Source: EV1

Offtake Status and Value-Add Opportunities

EV1 has a binding offtake agreement with YXGC to supply 30ktpa of flake graphite concentrate for the first three years

In May, EV1 signed a binding offtake agreement with Yichang Xincheng Graphite Co Ltd (YXGC) to supply 30ktpa of flake graphite concentrate for the first 3 years of production. In November it signed a binding term sheet to establish a JV to assess coarse flake concentrate downstream processing optionality. A series of studies will evaluate the viability of producing value-add graphite products such as graphite foil, bi-polar plates, and seals, from a plant likely to be constructed in Europe or the Middle East under a 60:40 JV arrangement (EV1 60%).

Naturally low levels of deleterious elements should equate to high-value end use applications that may command a higher pricepoint

Preliminary geochemical analysis identified low levels of molybdenum and boron in Chilalo graphite fines concentrate. Low molybdenum is a prerequisite for anode material in high-performance batteries, and low boron is a requirement for nuclear grade graphite used in Pebble Bed Modular reactors.

EV1 is working with a US based partner to investigate thermal purification of graphite fines

No offtake has been committed to for graphite fines. Evolution Energy Minerals has been working with a yet-to-be-named US based partner to investigate thermal purification and battery performance of Chilalo derived spheronised graphite as anode material. Initial work validated the proof of concept of the thermal purification route. Thermal purification eliminates the need for usage and disposal of hydrofluoric acid during processing. With the pure Chilalo graphite concentrate used as a starting point, purification was able to achieve 99.9995% carbon purity, comfortably exceeding the requirement for most commercial uses.

Initial performance of coin cells manufactured using coated Chilalo spherical graphite have performed well. Preliminary results from cycle testing have achieved: Reversible capacity of 368 mAh/g, approaching the theoretical capacity of 372 mAh/g (Higher capacity = longer battery life), Irreversible capacity loss of <7% (loss in energy capacity on first and subsequent charges), Tap density of 0.95 (mass of spheroids that can fit within a unit of volume).

Argonaut's Mining Scenario and Valuation

Using an 8% real, after tax discount rate, we value the Chilalo Graphite Project at $238M

We've used a mining scenario as a basis for valuation loosely based on the Chilalo DFS reported early 2020. Using inputs outlined in the DFS and factoring in subsequent cost inflation, we value the Chilalo Graphite Project at (NPV_8) $238M with an IRR of 31%. We see potential for improvements on the DFS case that our model is based on, the addition of more near-surface material to the mine-plan through exploration has the potential to reduce costs in early years, add to mine life, or justify a larger build. Graphite prices are opaque and those used in our modelling are Argonaut long-term estimates, Chilalo graphite concentrate may command a premium to these prices.

Table 10: Argonaut assumed flake size and pricing in con

Size	% ore mined %	production tpa in con	Assumed price US$/t FOB
Fine	21.0	9.8	770
Medium	21.0	9.8	1,155
Coarse	48.0	22.3	2,220
Jumbo	10.0	4.6	4,000
SUM	100.0	46.5	1,870

Source: Argonaut

Global Lithium (GL1)

Manna From Heaven

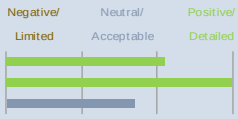
Analyst: George Ross

SPEC BUY

Current Price	$2.52
Valuation	Under Review

Ticker:	**GL1**
Sector:	**Metals & Mining**

ESG Ratings:



Key Financials

Shares on Issue (m):	**245.7**
Market Cap ($m):	**619.1**
Cash Est. ($m) [Approx Post Raise]	80.0
Debt Est. ($m)	0.0
Enterprise Value ($m):	**539.1**

52 wk High/Low:	**$2.93**	**$0.55**
12m Av Daily Vol (m):		**1.3**

Projects	**Stage**
Marble Bar (100%)	Resource Development
Manna (100%)	Resource Development

Mineral Resource	**Mt**	**Li_2O (%)**	**Li_2O (kt)**
Marble Bar (100%)	10.5	1.00%	105.0
Manna (100%)	9.9	1.14%	112.9

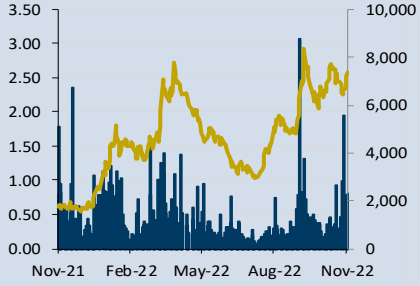
Cashflows	**2021**	**2022**
Operating Cashflow	-1.2	-9.3
Investing Cashflow	-5.0	-2.5
Financing Cashflow	9.1	41.1
Cash Balance	3.6	32.9

Directors:

Warrick Hazeldine	Non-Executive Chairman
Ron Mitchell	Managing Director
Greg Lilleyman	Non-Executive Director
Dianmin Chen	Non-Executive Director
Hayley Lawrance	Non-Executive Director

Substantial Shareholders: [Post Raise]	**%**
Suzhou Ta&A Ultra Clean Technology	9.9%
Mineral Resources	9.9%
Guo Yong Fang	6.5%
Goldenstar Energy	6.2%
Dianmin Chen	3.9%

Share Price Graph and Trading Volumes



Quick Read

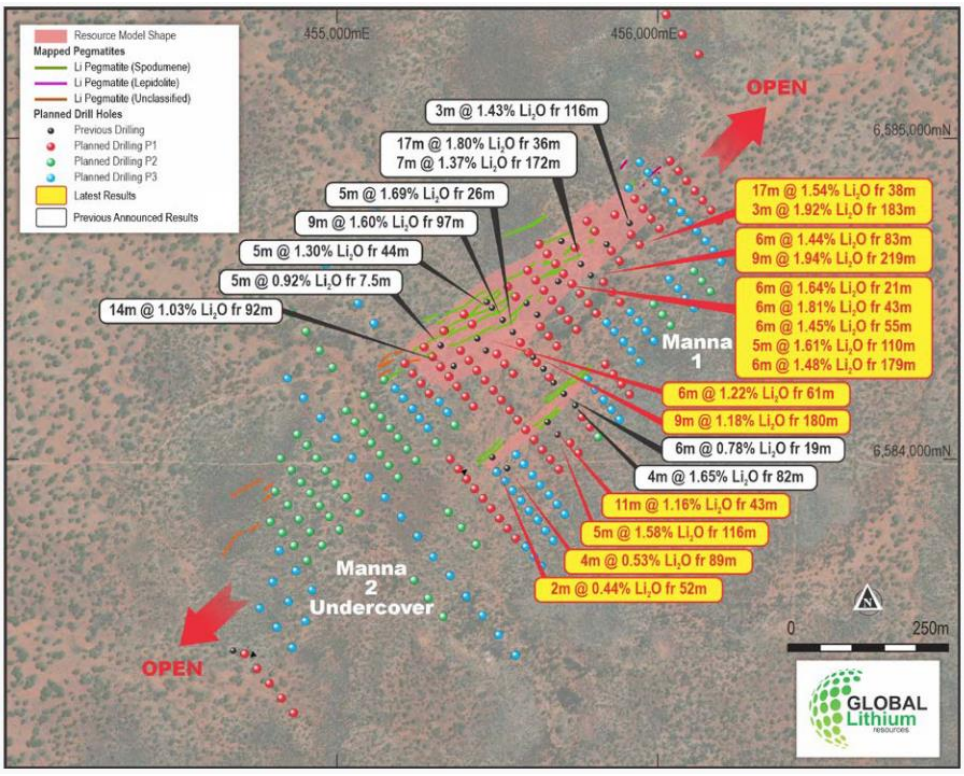
At the end of October, Global Lithium (GL1) announced it had consolidated 100% ownership of the Manna Lithium Project. Manna is located approximately 100km east of Kalgoorlie, Western Australia. An expanding Resource base and support from corporate strategic partners sets the scene for potential rapid development.

Project Overview

During February 2022, GL1 reported an initial 9.9Mt Inferred JORC compliant Resource grading 1.14% Li_2O for 113kt of contained Li_2O. At Manna, lithium bearing pegmatites outcrop over a 5km x 1.5km area, with most encountered to date being less than 5m wide. Recent deeper drilling indicates some pegmatite bodies may coalesce and widen at depth.

In September GL1 reported a third rig had been mobilised to Manna to assist with 20,000m of RC and 4,000m of diamond drilling. We expect the 2022 drilling program to yield a major increase to Resource tonnage (25-35Mt) and contained Li_2O units.

Figure 96: Mapped pegmatites at the Manna Lithium Project. Drilling results shown.

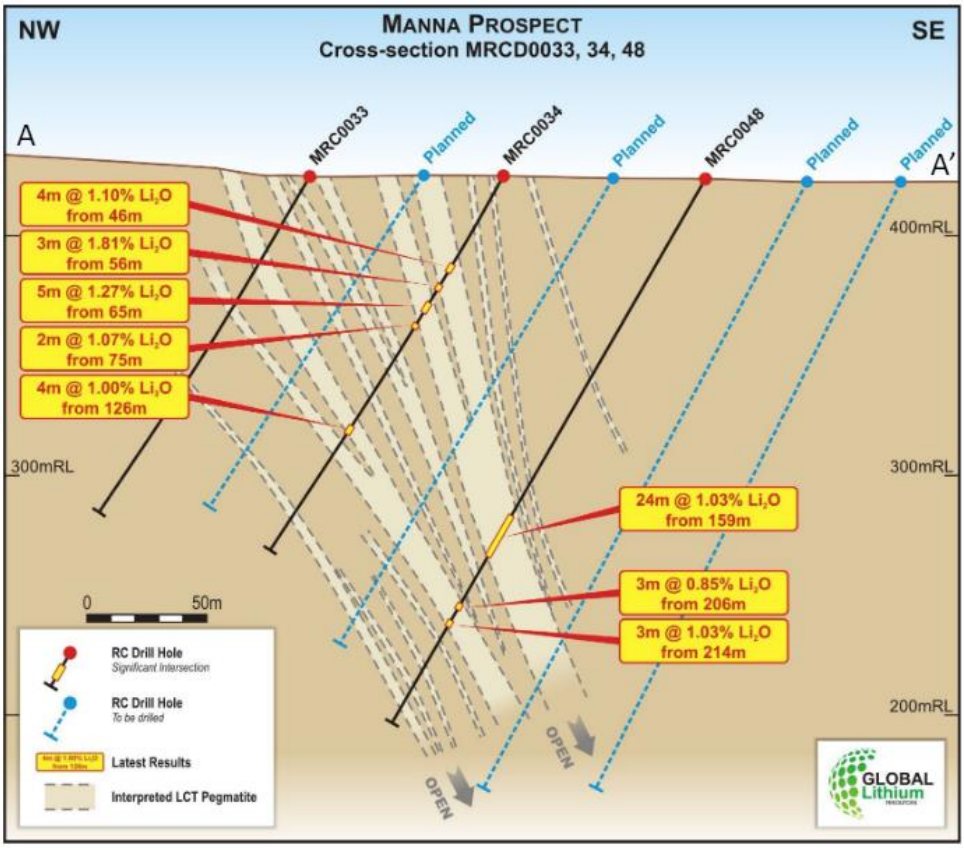


Source: GL1

Concurrent to aggressive drilling, GL1 is advancing technical, environmental and heritage work programmes. Successful completion of these may enable rapid feasibility studies, permitting and project development.

Figure 97: Recent section through the MLP with significant drill hole intercepts and interpreted pegmatite geology. Note the thicker convergent pegmatites at depth.

Recent drilling appears to indicate lithium pegmatite bodies are beginning to merge at depth



Source: GL1

Strategic Partnership and Investors

Strategic partners could expediate Manna and other opportunities

GL1 has fostered relationships with several global significant partners: Lithium hydroxide producer Yibin Tianyi, Diversified miner Mineral Resource Ltd & Korean EV battery cell manufacturer SK On. Partners of this calibre could enable GL1 to accelerate development of the Manna project whilst simultaneously exploring complimentary business opportunities.

Project Valuation

Our discounted cashflow model for the Manna Project generates a build date NPV7 of A$1,002M and present day NPV7 of A$843. Our model assumes development from FY2025 with operational ramp up from late FY2026. The model assumes a 20Mt Reserve grading 1.1% Li_2O and a 6.7:1 waste to ore strip ratio (including pre-strip). Ore is processed through a 2.1Mtpa capacity flotation plant with assumed 65% spodumene recovery. At nameplate throughput and recovery, the operation would produce 238kt of SC6 equivalent concentrate per annum over an initial 10-year mine life.

NOT COVERED

Current Price	$0.04
Market Cap	$167M

Ticker:		**IXR**
Sector:		**Metals & Mining**
Shares on Issue (m):		**3,872.6**
Market Cap ($m):		**166.5**
Cash Est. ($m)		22.9
Debt Est. ($m)		0.0
Enterprise Value ($m):		**143.6**
52 wk High/Low:	**$0.09**	**$0.04**
12m Av Daily Vol (m):		**24.7**

Projects	**Stage**
Makuutu (51%*)	Scoping Study

Mineral Resource	**Mt**	**TREO (ppm)**
Makuutu (51%*)	5.3	640.0

Cashflows	**2021**	**2022**
Operating Cashflow	-1.3	-3.6
Investing Cashflow	-4.1	-10.6
Financing Cashflow	15.7	29.9
Cash Balance	11.1	26.8

Directors:	
Trevor Benson	Chairman
Tim Harrison	Managing Director
Max McGarvie	Non-Executive Director
Jill Kelley	Non-Executive Director

Significant Shareholders:	**%**
BNP Paribas	4.9%
Bilal Ahmad	4.4%

Share Price Graph and Trading Volumes

Ionic Rare Earths (IXR)

Clays for Days

Analyst: Royce Haese

Quick Read

The Makuutu Rare Earths Project in Uganda is the largest and most advanced Ionic Adsorption Clay hosted RE deposit ex China, a potential significant supply of critical and strategic minerals with decarbonisation and defence applications. The Project is big and getting bigger, it is currently estimated to host 532Mt at 640ppm Total Rare Earth Oxide, with an exploration target based on reconnaissance RAB drilling up to double that again. We expect the updated study based on a larger Resource due imminently to eclipse the financials outlined in the April 2021 Scoping Study: Pre-production capex ~US$89M, post-tax NPV8 A$428M, post-tax IRR 38%.

Overview

Makuutu is located in the south of Uganda, approximately 80 km east of the capital city, Kampala. It is accessible via all-weather roads that connect it to a major highway and rail line that links Kampala and the Kenyan Port of Mombasa to the east.

Figure 98: Makuutu Project Location

Source: IXR

There are four hydroelectric power plants located within 65 km of the project area, with total installed generating capacity of approximately 810MW, providing an abundant supply of cheap/green/stable power to the Project.

Ionic Rare Earths hold 51% of the project which will increase to 60% upon completion of Feasibility level studies, it also has pre-emptive rights to acquire the remaining 40% of the project.

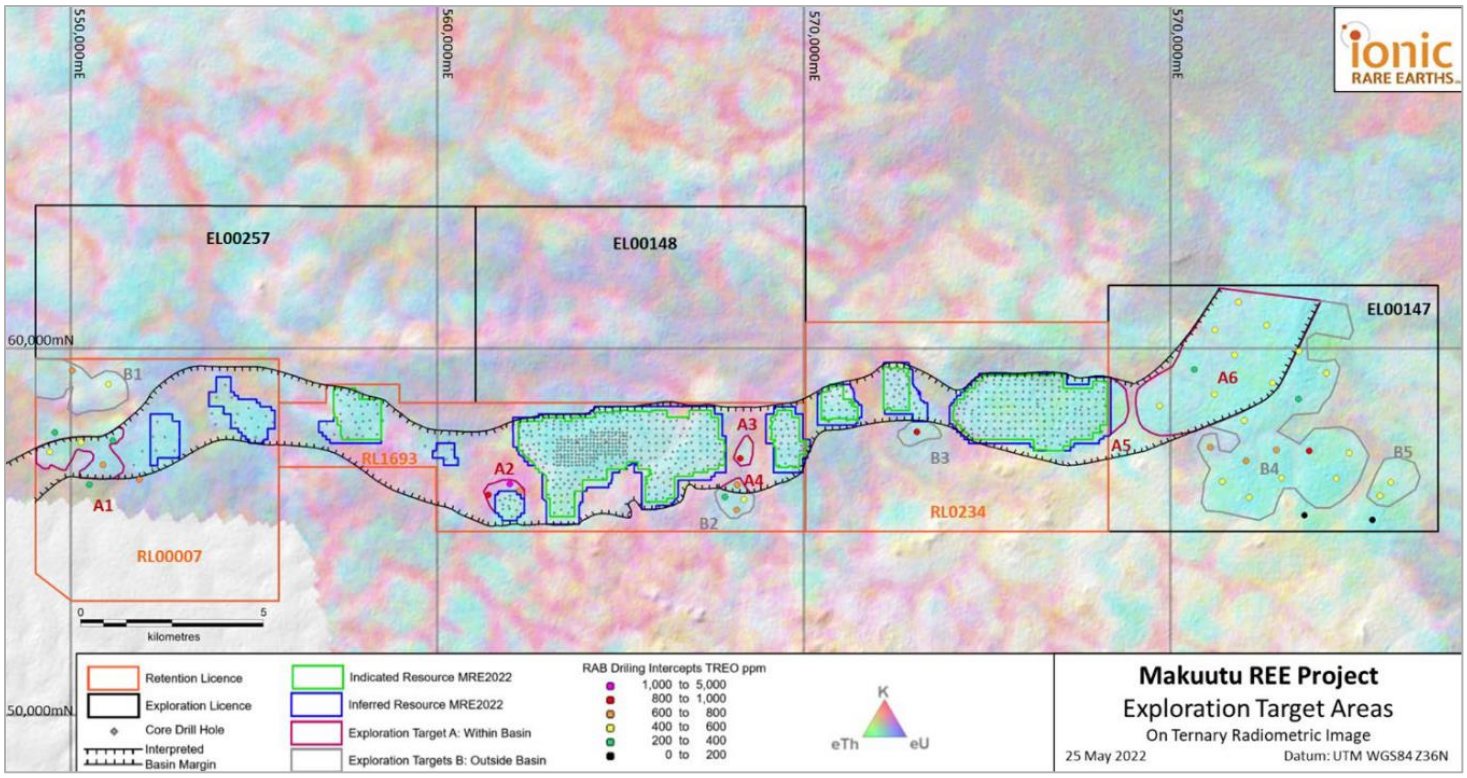
At much lower grades than hard rock REE deposits the west is more accustomed to, the geometry and chemistry of ionic adsorption clay REE deposits allow for more simple and efficient mining and processing. Makuutu is a broadly flat, near-surface deposit hosted in

Low opex development is afforded by simple mining and processing

clays. Low strip mining of mostly unconsolidated material requires no crushing or milling prior to processing. Processing itself is via in-situ leaching using acid followed by REE separation, this produces a mixed high-grade RE oxide or carbonate precipitate, grading >90% TREO that can be used as a feedstock directly into a Rare Earth separation plant.

The deposit has been defined over a strike of 37 km. It is currently estimated to host 532Mt at 640ppm Total Rare Earth Oxide, with 25% heavy rare earth oxides and 34% critical rare earth oxides. Reconnaissance RAB drilling has demonstrated potential to further increase the scale of the deposit.

Figure 99: Makuutu REE deposit by Resource category with exploration targets outlined



Source: IXR

On the Scoping study metrics, at start-up IXR plans to produce ~800tpa REO equivalent up to ~3800tpa REO equivalent by year 11. The 11-year LOM outlined in the study was based off a smaller Resource. It is likely that Makuutu will support a larger development.

IXR plans to be in production by 2024

Figure 100: IXR Planned Road Map to Production

Activity	2022	2023				2024	
	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Funding Agreements							
Mining Licence Application							
Final Investment Decision							
Site Early Works							
Construction							
Mining Commences							
Commissioning							
Plant Production							

Source: IXR

Lunnon Metals (LM8)

A Kambalda Pedigree

Analyst: George Ross

SPEC BUY

Current Price	$0.78
Valuation	$1.25

Ticker:	**LM8**
Sector:	**Metals & Mining**
Shares on Issue (m):	**195.0**
Market Cap ($m):	**151.3**
Cash Est. ($m)	27.5
Debt Est. ($m)	0.0
Enterprise Value ($m):	**123.8**
52 wk High/Low:	**$1.25** **$0.34**
12m Av Daily Vol (m):	**0.2**

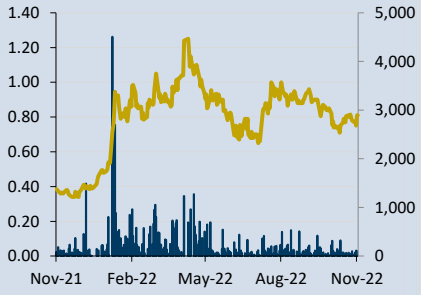
Projects	**Stage**
Kambalda	Resource Development

Cashflows	**2021**	**2022**
Operating Cashflow	-2.0	-5.9
Investing Cashflow	-0.1	-3.7
Financing Cashflow	15.3	28.4
Cash Balance	14.0	32.9

Directors:	
Liam Twigger	Non-Executive Chairman
Edmund Ainscough	Managing Director
Ian Junk	Non-Executive Director
Deborah Lord	Non-Executive Director
Ashley Mcdonald	Non-Executive Director

Substantial Shareholders:	**%**
St Ives Gold Mining	34.0%
Bolong Investment Management	9.4%

Share Price Graph and Trading Volumes



Quick Read

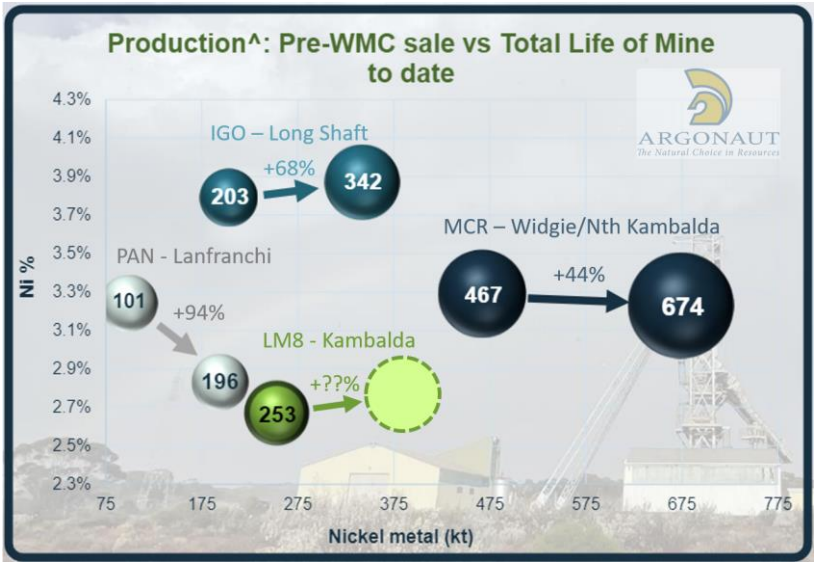
LM8's Kambalda nic kel assets within existing mining licenses provides the company with a rapid pathway to development. Conversion of unmined mineralisation into Resources and early discovery success underlines the quality of LM8's ground position.

Project Overview

Background: Lunnon Metal's controls the Silver Lake-Fisher and Foster-Baker areas, which we term collectively as the 'Kambalda Package'. The tenement holdings are located immediately east, and 20km south-east of BHP's Kambalda Nickel Concentrator. Kambalda style komatiitic nickel mineralisation is famous for its tenor, continuity and attractive FeMgO ratio. LM8s projects include four ex-WMC mines that were closed in the 1980's and 1990's following production of 253kt of nickel metal. In late 2001 the mines were sold by Western Mining Corporation (WMC) to Gold Fields Ltd as part of the St Ives Gold Mine package. As the new owners were gold focussed, little to no nickel exploration was completed following the transaction. LM8's founders were able to obtain the nickel rights for this previously productive, under-explored ground.

History Repeating: LM8's value proposition is quite simple: WMC left significant tonnes of metal in the ground when it shuttered and sold up its WA nickel assets. This is evidenced by the production achieved by IGO, MCR and PAN at each of their former WMC operations (Figure 101). If other operations have increased production output by 44-98%, logic would suggest this could be repeated for LM8's Silver Lake, Fisher, Foster and Jan mines.

Figure 101: Production yielded from assets by new owners as compared with WMC production.



Source: Argonaut after LM8

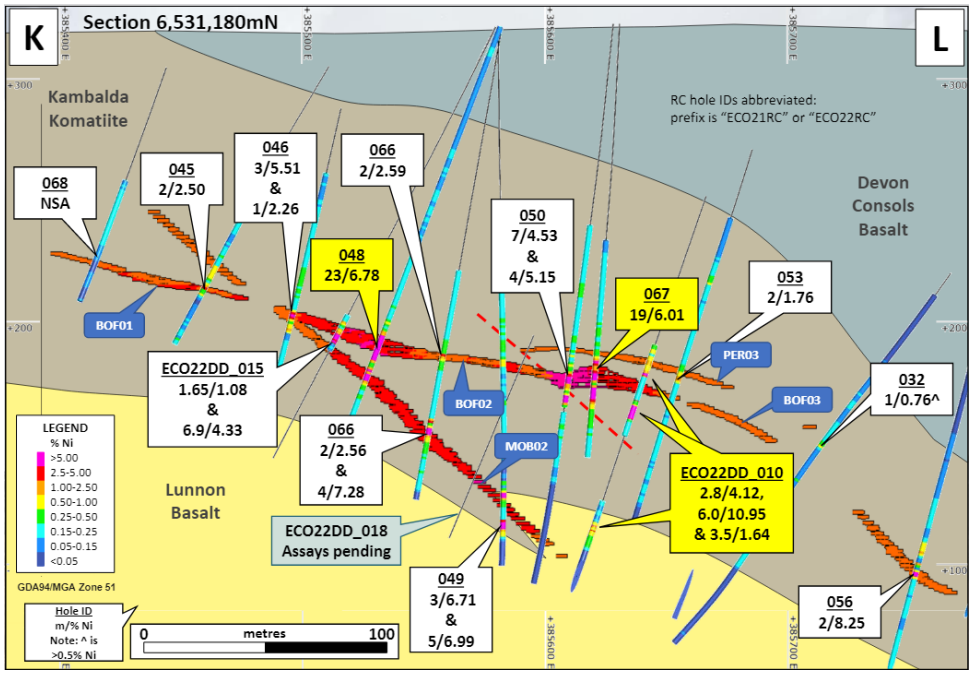
Early success with the Baker discovery

Baker Rises: The discovery of Baker provided quick vindication for LM8's theory that WMC had left valuable tonnes of nickel in the ground. In June, LM8 announced an initial Baker Resource, reported as 568kt grading 2.8% Ni for 15.8kt of contained nickel metal. Since this initial MRE, focus has switched to JORC Resource category improvement through a programme of 20m x 20m infill drilling.

Drilling subsequent to the MRE has identified zones of increased grade and width associated with the intersection between the main shoot and cross-cutting structures. These plunging elongate ellipses have returned intervals including 23m at 6.8% Ni and 19m at 6.0% Ni.

Targeted mining of high-grade intersection zones should provide strong early revenues

Figure 102: Baker section with June MRE a recent high-grade drilling.



Source: LM8

These high tenor zones are expected to hold a disproportionate amount of the deposits metal due to their grade and high density. Higher grade areas are expected to generate better metallurgical recoveries and ultra-high-grade material could by-pass flotation processing and be used as direct smelter feed. Geotechnical studies are currently underway to design decline access from a nearby disused gold mining pit. Quick and inexpensive development of Baker could provide early rapid cash flows for LM8.

Resource Inventory Growth Potential: In the first 12 months following IPO, LM8's global resource inventory increased 65% to 2.2Mt at 2.9% Ni for 64kt of nickel metal. We anticipate the newly acquired Silver Lake - Fisher Project will yield significant Resources from remnant mineralisation at old mines and new discoveries. In a recent presentation LM8 highlighted the similarities of the coarsely drilled Silver Lake hanging wall and Baker. 3D seismic will also be used to target potential komatiite channels south from the historical Fisher and the McLeay Moran mines. Another discovery like Baker would really take the cake.

Patriot Battery Metals (TSXV:PMET)

Electric Corvette

Analyst: George Ross

NOT COVERED

Current Price	C$5.00
Market Cap	C$442M

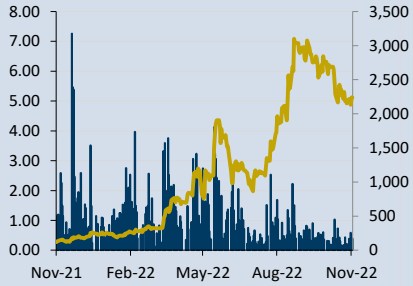
Ticker:	**TSXV: PMET**
Sector:	**Metals & Mining**
Shares on Issue (m):	**88.3**
Market Cap (C$m):	**441.6**
Cash Est. (C$m)	33.0
Debt Est. (C$m)	0.0
Enterprise Value (C$m):	**408.6**
52 wk High/Low:	**$7.08** **$0.27**
12m Av Daily Vol (m):	**0.5**

Projects	**Stage**
Corvette	Exploration
Freeman Creek	Exploration

Cashflows	**2021**	**2022**
Operating Cashflow	-0.5	-3.1
Investing Cashflow	-0.8	-7.4
Financing Cashflow	1.2	22.1
Cash Balance	0.1	11.7

Directors:	
Ken Brinsden	Non-Executive Chairman
Blair Way	CEO, President & Director
Dusan Berka	Director & CFO
Jon Christian Evensen	Director
Brian Jennings	Director

Share Price Graph and Trading Volumes



Quick Read

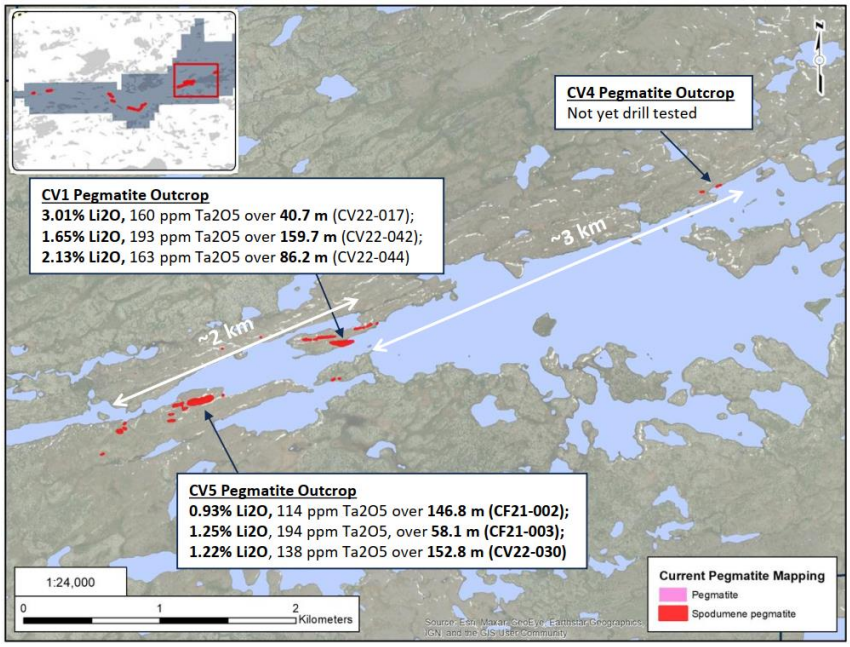
All evidence indicates that PMET's initial Corvette MRE scheduled for Q1 2023 will be of a scale that is globally significant within the hard rock lithium space. The CV Lithium Trend was discovered in 2017, although not drilled tested until late 2021. At the CV5 prospect, mineralisation has now been intersected in holes over 2,200m of strike length. PMET has begun its journey towards definition and development of one of the world's best hard rock Resources. The Company lodged its prospectus for ASX listing in November 2022.

Project Overview

Patriot Battery Metal's Corvette Lithium Property extends across 214 square kilometres within the James Bay Region, Quebec. To date, in excess of 70 lithium pegmatite outcrops have been identified across the tenure portfolio.

The project's largest outcrop, CV5, became the focus exploration drilling in 2022. CV5 is located approximately 15km south from an all-weather regional access road and powerlines. The mineralised pegmatite outcrops and is submerged under a shallow lake. Precedents exist for diversion of water courses for mining in Quebec and the Mining Act specifically provides for it. Drilling completed to date indicates mineralisation extends from the CV5 outcrop northwest 2,200km to the CV1 area. Mineralisation remains open to both the east and west.

Figure 103: CV1, CV5 and CV4 areas with outcrop maps.



Source: PMET

Approximately 80 drill holes (24,000m) have been completed to date with better drilling results encountered to date including:

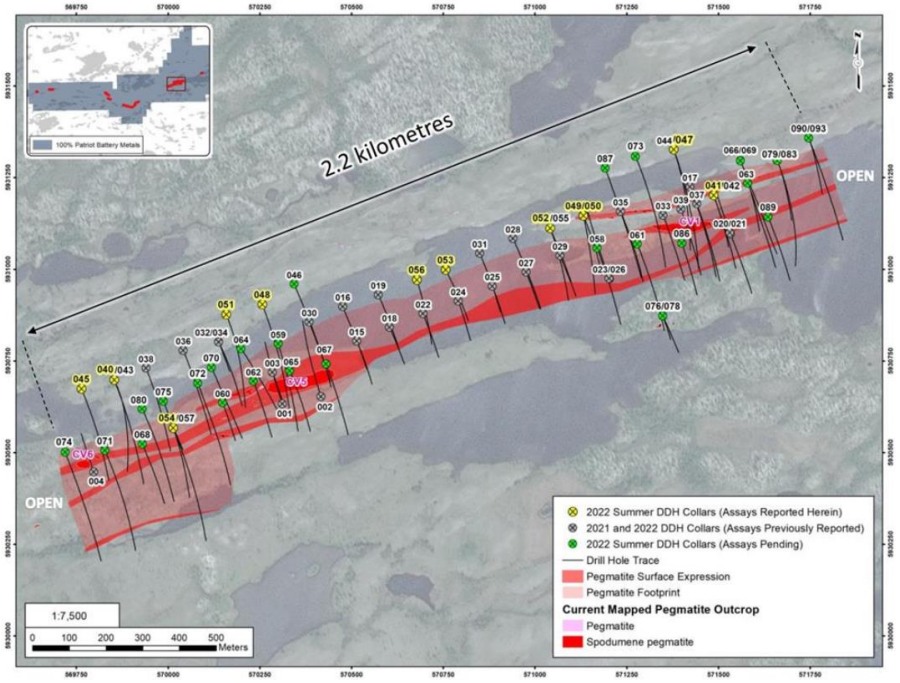
High grade lithium results over long intervals

- 160m at 1.65% Li_2O (inc. 9m at 4.12% Li_2O)
- 152m at 1.22% Li_2O (inc. 66m at 1.51% Li_2O)
- 105m at 0.97% Li_2O (inc. 60m at 1.52% Li_2O)
- 86m at 2.13% Li_2O (inc. 18m at 3.07% Li_2O)

Lithium mineralisation is associated with coarse spodumene crystals which have been observed up to 1m in length. Preliminary Heavy Liquid Separation tests on drill core crushed to -9.5mm achieved a +6% Li_2O spodumene concentrate with recoveries exceeding 70% and an Fe_2O_3 content of ~0.65%. These results indicate a dense media separation (DMS) plant is likely to be viable for processing of ore. DMS circuits are typically cheaper to build and operate compared to flotation.

Figure 104: Drilling at the CV1, CV5 & CV6 prospect areas with near surface spodumene pegmatite expression.

Drilled over 2,200m strike extent and still open



Source: PMET

The Journey Begins

We think effective navigation of Quebec's regulatory environment will be key to success

This is just the beginning of the Corvette story. Drilling completed to date appears likely to yield a major Resource with attractive metallurgical characteristics. The project is served by excellent infrastructure and will be able to tap into hydroelectric power. PMET is convinced the Quebec regulatory environment can be navigated effectively permit development. Entry of ex-Pilbara Minerals (ASX:PLS) boss Ken Brinsden as Non-Exec Chairman has provided a boost to PMET's profile and credibility of becoming a future developer.

Predictive Discovery (PDI)

Banking on Bankan

Analyst: Royce Haese

SPEC BUY

Current Price	$0.18
Valuation	$0.36

Ticker:	**PDI**
Sector:	**Metals & Mining**
Shares on Issue (m):	**1,708.7**
Market Cap ($m):	**299.0**
Cash Est. ($m)	49.9
Debt Est. ($m)	0.0
Enterprise Value ($m):	**249.1**
52 wk High/Low:	**$0.28** **$0.15**
12m Av Daily Vol (m):	**1.8**

Projects	**Stage**
Bankan	Resource Development

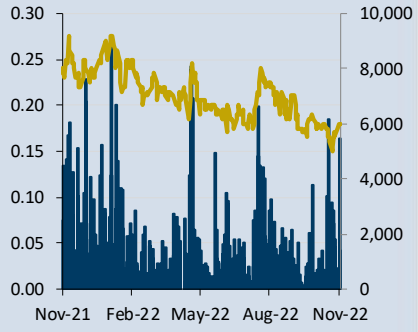
Mineral Resource	**Mt**	**g/t Au**	**Moz Au**
NE Nankan	72.3	1.7	3.9
Bankan Ck	7.2	1.4	0.3

Cashflows	**2021**	**2022**
Operating Cashflow	-14.3	-23.0
Investing Cashflow	-0.3	-0.7
Financing Cashflow	28.7	43.1
Cash Balance	22.7	42.0

Directors:	
Simon Jackson	Non-Executive Chairman
Andrew Pardey	Managing Director
Steven Michael	Non-Executive Director
Sandra Bates	Non-Executive Director

Substantial Shareholders:	**%**
Blackrock Group	7.1%
Capital DI Limited	6.5%

Share Price Graph and Trading Volumes



Quick Read

Bankan in Guinea is one of the most rapidly growing gold projects worldwide. From a standing start in April 2020, it now has 4.2Mozs at 1.6 g/t estimated over two deposits. NE Bankan's high-grade tongue is open at depth, and if regional targets flesh out then Bankan has the potential to be a camp-scale play. Stakeholder engagement and environmental studies are progressing alongside exploration as the project builds towards mining studies next year.

Overview

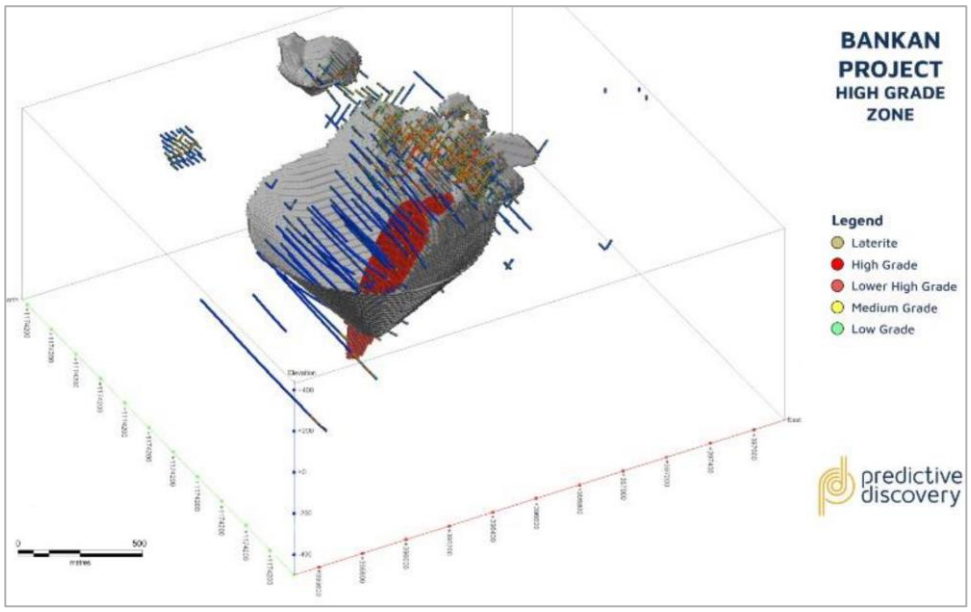
Risk/Reward: Not without its risks, following a coup d'état in September 2021, we're expecting a multi-year transition back to civilian rule. In-country, for explorers and miners it appears business as usual. The NE Bankan deposit is located in the outer buffer zone of the Upper Niger National Park. There is precedence for mining in this area however under the Guinean Mining Act, Predictive is unable to apply for a mining licence/exclusion from the National Park until both environmental and mining studies have been completed, ~end of 2023.

In our view the size of the prize is worth the risk. The scale, grade, geometry and consistency of mineralisation at NE Bankan defined to date is ticking all our boxes. With further anomalies and geophysics targets flagged along ~35 km strike of prospective tenure, the potential for major new discoveries is high. With eight rigs actively drilling on site at the moment, if Predictive gets onto another discovery it will be defined rapidly.

Argonaut Mining Scenario and Valuation: We model a combined open-pit and underground mining scenario as a basis for valuation. We assume 1.8Moz in open-pit inventory and 800kozs of gold mined from underground commencing year-five. Due to the early nature of the project assumptions are boilerplate and are likely to change. We assume pre-production capex of US$260M. Expansion and underground development capex is funded from cashflow in our assumptions. We assume annual processing throughput of 4Mtpa at start-up, expanding to 5Mtpa as the underground comes online. At our assumed mined grades (which increase with depth), gold output increases over LOM to peak at 350kozpa as high-grade pit material is mined alongside underground ore. We assume 93% of gold recovered, a strip ratio on the pit component of 5:1 and a 350 m deep pit. We derive a real, after tax NPV_{10} for the NE Bankan project of $742M with an IRR of 38%.

Factored into our NPV estimate, we assume a 30% corporate tax rate and 6% in royalties. The above NPV does not include a government free carry interest, we expect the project to operate with the Guinean government holding a 15% free carried interest.

Figure 105: NE Bankan Oblique View with High-Grade Tongue in Pit Shell



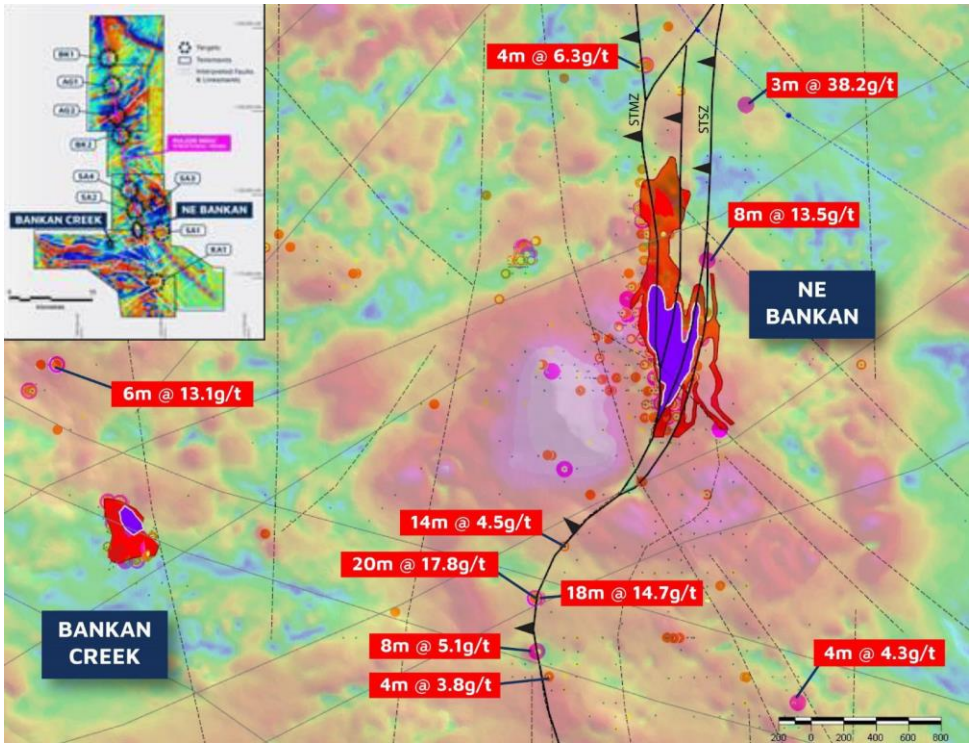
Source: PDI

The geometry of mineralisation should also lend itself to efficient mining

Simple Project: The geometry of mineralisation should also lend itself to efficient mining. Broader/lower grade mineralisation at surface narrows to a ~20-30m thick high-grade tongue at depth. A small-scale grade control RC programme has confirmed good mineralisation continuity within the oxide zone. Metallurgical test work completed to date has confirmed NE Bankan ore as free-milling, with average recovery of 92.8% demonstrated.

Away from NE Bankan, auger and aircore results warrant follow-up

Figure 106: NE Bankan Resource outline with Nearby Exploration Results Outlined



Source: PDI

NOT COVERED

Current Price	$0.35
Market Cap	$73M

Ticker:	**TMT**
Sector:	**Metals & Mining**
Shares on Issue (m):	**209.8**
Market Cap ($m):	**73.4**
Cash Est. ($m)	15.1
Debt Est. ($m)	0.0
Enterprise Value ($m):	**58.3**
52 wk High/Low:	**$0.60** **$0.28**
12m Av Daily Vol (m):	**0.3**

Projects	**Stage**
MTMP	Completed Feasibility

Mineral Reserve	**Mt**	**%V_2O_5**	**V_2O_5 (t)**
MTMP	44.0	0.89	392

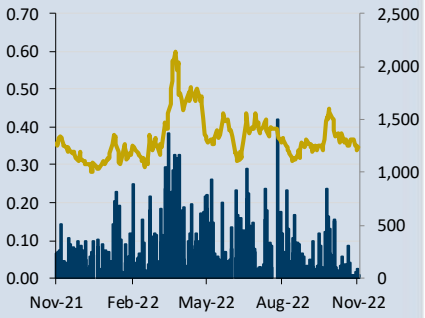
Cashflows	**2021**	**2022**
Operating Cashflow	-1.0	-0.6
Investing Cashflow	-5.2	-7.0
Financing Cashflow	8.6	20.6
Cash Balance	5.6	18.6

Directors:

Michael Fry	Non-Executive Chairman
Ian Prentice	Managing Director
Carmen Letton	Non-Executive Director
Jacqueline Murray	Non-Executive Director

Substantial Shareholders:	**%**
Resource Capital Fund	17.2%
Board & Management	8.8%

Share Price Graph and Trading Volumes



Technology Metals (TMT)

MTMP vanadium – Mission Critical

John Macdonald

Quick Read

Development of the MTMP's high quality vanadiferous titanomagnetite deposits in Western Australia would expand and stabilise vanadium supplies that are forecast to come under strain due to battery demand.

Overview

VRFB adventure: The Murchison Technology Metals Project (MTMP) aims to capitalise on growing vanadium demand driven by the energy storage advantages of vanadium redox flow batteries (VRFBs).

Critical: Current vanadium suppliers are concentrated in China and Russia. The US DOI and the European Commission have each placed vanadium on their critical minerals lists. Wood Mackenzie expects VRFB installations to grow 9% pa through to 2031, requiring a trebling of raw vanadium supplies in the interim.

Study done: TMT's August 2022 feasibility studies conclude the MTMP can be brought on to supply about 5% of the current world market for vanadium pentoxide (V_2O_5) for a capital cost of $600M. The Company is closing on environmental approval ahead of the start of a financing drive.

The MTMP has relatively high-grade reserves (44Mt at 0.89% V_2O_5) of titanomagnetite ore in proximity to energy infrastructure. Importantly for titanomagnetite resources, a high proportion of reserves is unoxidised relatively close to surface. TMT estimates an 8% discount rate, pre-tax NPV of A$940M and an internal rate of return of 23%, assuming US$10.50/lb V_2O_5 and US$250/t ilmenite. The starting project life is 25 years.

Double act: TMT and Australian Vanadium Ltd (AVL) are independently pursuing vanadium project developments that are geographically and technically intertwined. Both projects are post feasibility and pre-funding.

Downstream potential: In collaboration with Australian Government backed FBICRC (Future Battery Industries Cooperative Research Centre) and Chinese electrolyte supplier LE System Co., TMT is studying the feasibility of producing vanadium electrolyte in Australia from vanadium pentoxide feedstock. Vanadium electrolyte is raw material for VRFBs.

Risks: The main risks are associated with project funding and specialty metal market uncertainty. TMT signed a non-binding MOU with Tata Steel in October 2022 as a precursor to offtake discussions.

MTMP

Technology Metals Australia Limited (TMT) was incorporated May 2016. The Company's focus has been on the Murchison Technology Metals Project, 40 km south east of Meekatharra, in the mid-west of Western Australia. Vanadium and ilmenite mineralisation occurs in titanomagnetite at the base of a layered mafic intrusion.

TMT updated a 2019 feasibility study in August 2022, based on plans to mine and process 46Mt open pit ore reserves and produce 13ktpa V_2O_5 flake for sale to steel and vanadium redox battery manufacturers over 25 years. The updated study included reserves on two non-contiguous tenement blocks, 15km apart, at Gabanintha and Yarabubba. Together Gabanintha and Yarrabubba form the Murchison Technology Metals Project (MTMP). TMT's August 2022 estimate of pre-production capital cost was $600M.

TMT is studying the feasibility of producing vanadium electrolyte in Australia from vanadium pentoxide feedstock. Vanadium electrolyte is raw material for VRFBs

The MTMP brackets Australian Vanadium Ltd (AVL) and its Australian Vanadium Project (AVP) which is based on the same unit in the mafic intrusion between Gabanintha and Yarrabubba. In April 2022 AVL completed-feasibility studies of the AVP, estimating 31Mt open pit ore reserves and production of 11ktpa V_2O_5 flake, to be developed at a cost of $600M.

AVL and TMT have remained independent, pursuing development streams with common technical elements, and separate marketing and financing strategies. As of November 2022 neither company is funded or priced to reflect fair value for development, with EVs of $100M (AVL, $24M net cash) and $60M (TMT, $15M net cash) respectively. For the purposes of this report we choose to focus on TMT, as the cheaper entry, and recognise that ideally the two projects will be exploited as one.

MTMP vanadium occurs within titano-magnetite; a vanadium bearing ore mineral for which there are commercially established extraction processes (magnetic separation, roasting of the magnetite concentrate at 1200°C, leaching and re-precipitation followed by de-ammoniation and calcination to form a vanadium pentoxide powder). TMT tested a 14t bulk sample as part of the 2020 FS, recovering 77% of the V_2O_5 in ore to 99.5% pure V2O5 flake powder. In 2022 TMT introduced an ilmenite recovery circuit to processing plans.

APA (APA:ASX) is preparing licences, initial engineering design and other early work associated with building a gas spur line to Gabanintha. APA started building the Northern Goldfields Interconnect (NGI) pipeline from Geraldton to Leinster in May 2022, which will bring the line to within 150km of the proposed MTMP plant site.

Categorised a critical mineral and a battery metal by the US DOI and European Commission, (80%) of vanadium is used in steel alloys. Consumption in vanadium redox flow batteries was about 5% of the total market in 2022. VRFBs are relatively long lifespan and safe energy storage options where energy density is not important. Future VRFB driven vanadium consumption growth is a key incentive behind MTMP's development. China (60%), Russia (20%) and South Africa (10%) are currently the main primary vanadium producers, each predominantly from titanomagnetite deposit types. Russian supply disruption and falling Chinese steel consumption affected vanadium prices in turn during 2022.

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Important Disclosures

Ausgold (AUC): Argonaut acted as Lead Manager to the Placement to raise $16M in March 2022 and received fees commensurate with this service. Argonaut holds or controls 10M options exercisable at $0.06 expiring 31 March 2025.
Berkeley Energia (BKY): Argonaut acted as Sole Broker in relation to a block trade sell down of 186.8M shares in April 2022 and received fees commensurate with this service.
BlackEarth Minerals (BEM): Argonaut acted as Lead Manager to the Placement to raise $6.8M in January 2022 and received fees commensurate with this service.
Centaurus Metals (CTM): Argonaut acted as Joint Lead Manager in respect of the Placement to raise $75M in January 2022 and received fees commensurate with this service. Argonaut holds or controls 161,638 CTM shares.
De Grey Mining (DEG): Argonaut Securities Pty Limited acted as Joint Lead Manager & Joint Bookrunner to the $130M Placement announced on 5 October 2022 and received fees commensurate with these services. Argonaut holds or controls 95,000 DEG shares.
Evolution Energy Minerals (EV1): Argonaut participated in the Placement to raise approximately up to $10M in August 2022 and received fees commensurate with this service.
Global Lithium (GL1): Argonaut Securities Pty Ltd is acting as Global Coordinator, Joint Lead Manager and Joint Bookrunner and Argonaut PCF Limited is acting as Underwriter in respect of the Placement to raise $121.5M announced on 25 October 2022 and will receive fees commensurate with this service. Argonaut acted as Joint Lead Manager in respect of the Placement to raise $29.9M in March 2022 and received fees commensurate with these services. Argonaut acted as Financial Adviser to GL1 with respect to the December 2021 acquisition of the 80% interest in the Manna Lithium Project from Breaker Resources and received fees commensurate with this service. Argonaut holds or controls 5,506,886 shares and 4,493,114 GL1 options exercisable at $0.30 expiring 10 May 2025.
Lunnon Metals (LM8): Argonaut acted as Joint Lead Manager in the Placement to raise $30M in April 2022 and received fees commensurate with this service. The Chair of Lunnon Metals Ltd (LM8), Mr Liam Twigger also holds roles with the Argonaut Group: Deputy Chair of Argonaut Limited and Executive Director, Corporate Finance. Mr Twigger is not involved in the creation of research material on LM8 in any way. The views expressed in LM8 research material accurately reflect the relevant analyst's personal views about LM8.
NexGen Energy (NXG): Argonaut holds 17,892 NXG shares.
OreCorp (ORR): Argonaut acted as Joint Lead Manager in respect of the process to demerge OreCorp's West Australian assets announced in January 2022 and will receive fees commensurate with this service.
Predictive (PDI): Argonaut acted as Joint Lead Manager to the Placement to raise $50M in May 2022 and received fees commensurate with this service.

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Argonaut Overview

Argonaut is a full service advisory, stockbroking & research and investment house

- Located in Perth, Western Australia a regional centre for metals & mining and energy industries.
- Technically driven and focused on Metals & Mining, Energy, Agricultural and businesses that service the natural resource sector along with selected industrial companies with market capitalisations of A$50 million to A$5 billion.
- Led by an experienced executive team with deep industry knowledge, who have previously held senior executive roles at leading international investment banks and securities houses.
- Recognised, in our target markets, as a trusted advisor with a strong track record of success.
- Provider of high quality integrated services across the full capital spectrum - from senior debt to ordinary equity.
- Team includes 4 geologists, a mining engineer and a metallurgist

Argonaut is focused on providing clients with high quality integrated services across the full capital spectrum and entire company life cycle

Corporate Finance Activities

Capital Markets (Equity & Debt)

- Focused on providing independent advice and customised capital raising services across the full spectrum of equity and debt products
- Significant cross border expertise and proven execution capabilities
- Extensive global relationships with leading equity and debt providers and specialist financiers
- Strong ECM, Project Finance and Structured Debt capabilities with Argonaut leading and/or participating in raisings totalling more than $10 billion since 2009
- Member of ASX
- Rule 15a-6 Foreign Broker-Dealer arrangement in US, Canadian International Dealer Exemption

M&A Advisory

- Focused on providing trusted, unbiased advice to private and public companies and boards
- Specialist resources, agribusiness and resources services M&A advisor, most active in Australia for the sector
- Delivering dedicated senior-level attention relative to larger investment banking firms
- Ability to think creatively and successfully execute challenging transactions
- Considerable cross-border experience and expertise
- Advised on M&A transactions in excess of $6.0 billion since 2009

Market Activities

Stockbroking & Research

- Deep knowledge and detailed research coverage in target markets
- Strong emerging company and mid market presence with expertise in natural resource companies and related service businesses
- Focused on institutional, corporate and high net worth investors
- Strong institutional investor access and distribution capability across Australia and Asia. Increasing penetration in UK/Europe
- Active company road show and site visitation programme
- On-going after market support for corporate ECM clients
- Licensed in Australia, USA & Canada

Special Situations

- Provision of non-standard financing solutions across the entire capital spectrum
- Flexible financing solutions ranging from non-standard loans and bridge facilities to ordinary equity
- Funding for exercise of options provided to company executives. Argonaut can advance against options giving corporates early access to the proceeds from the exercising of options
- Strong relationships with other special situation investors, providing the capability to complete transactions ranging in size from $1 million to in excess of $100 million
- Leveraging upon Argonaut's strong advisory and equity market expertise

Australasia's Leading Resources Financial Advisor

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The Natural Choice in Resources

Global Lithium	De Grey	Bardoc Gold	Minotaur Exploration	Northern Star
$164,900,000	**$389,400,000**	**$157,000,000**	**$120,000,000**	**$44,500,000**
Initial Public Offering & Placements	Placements & Sell Down	Takeover Defence, Scheme of Arrangement & Demerger	Takeover Defence, Scheme of Arrangement & Demerger	Sale of Paulsens & Western Tanami Gold Operations
Lead & Joint Lead Manager 2021 - 2022	*Joint Lead Manager & Joint Underwriter* 2020 - 2022	*Financial Advisor* 2022	*Financial Advisor* 2022	*Financial Advisor* 2022

Centaurus	Global Lithium	AIC Mines	Oman Investment Authority	Lunnon Metals
$75,000,000	**$73,000,000**	**$43,000,000**	**$65,400,000**	**$30,000,000**
Placement	Acquisition of the Manna Lithium Project	Takeover Bid for Demetallica	Block Trade of OIA's 41.9% stake in Berkeley Energia	Placement
Joint Lead Manager 2022	*Financial Advisor* 2021 - 2022	*Financial Advisor* Announced	*Sole Broker* 2022	*Joint Lead Manager* 2022

Predictive Discovery	Ausgold	Azure Minerals	Demetallica	Kin Mining
$55,000,000	**$16,600,000**	**$20,000,000**	**$15,000,000**	**$20,400,000**
Placement	Placement	Sale of Mexican Asset Portfolio	Initial Public Offering	Placement & Entitlement Offer
Joint Lead Manager 2022	*Lead Manager* 2022	*Financial Advisor* 2022	*Joint Lead Manager* 2022	*Joint Lead Manager* 2022

AIC Mines	Pantoro	K2Fly	Solstice Minerals	Minjar Gold
$40,000,000	**$171,500,000**	**$13,450,000**	**$12,000,000**	**$54,100,000**
Priority & General Offer	Placements	Placements	Initial Public Offering	Sale of Golden Dragon & Fields Find Gold projects
Joint Lead Manager 2021	*Joint Lead Manager* 2019 - 2022	*Lead Manager* 2021 - 2022	*Joint Lead Manager* 2022	*Financial Advisor* 2022

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