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Metals & Mining Research

Best Undeveloped Projects

November 2021

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Cover Photo

The cover photo is OreCorp's Nyanzaga Project in Tanzania (source OreCorp)

Table of Contents

Argonaut’s Best Undeveloped Projects	4
2021 Best Undeveloped Projects.....	5
2020 Best Undeveloped Projects.....	6
Shifting commodity focus	10
The “new energy” paradigm.....	12
Implications for commodities	15
Drive to reduce carbon in its infancy.....	20
Risk and uncertainty	23
Gold has a place.....	25
Miners rushing to get set (M&A)	26
Best Undeveloped Project Key Picks.....	28
BlackEarth Minerals (BEM): Maniry Graphite Project - Expanding Maniry	28
Centaurus Metals (CTM): Jaguar Nickel Project - A Big Cat In The Green Nickel Jungle	32
De Grey Mining (DEG): Mallina Gold Project - Major Target.....	36
Firefinch (FFX): Goulamina Lithium Project - King Of The Beasts	40
Genesis (GMD): Ulysses Gold Project - Watch This Space.....	44
NexGen Energy (NXG): Rook I Uranium Project - Power Up a Low Emission Future.....	48
OreCorp (ORR): Nyanzaga Gold Project - Sleeping Giant Stirring.....	52
Pantoro (PNR): Norseman Gold Project - Backing the Field	56
Sandfire (SFR): Motheo Copper Project- Kalahari Dreaming.....	60
Special Mentions.....	64
Agrimin (AMN): Lake Mackay SOP Project - A Rigorous Approach.....	64
Auteco Minerals (AUT): Pickel Crow Gold Project - More Than Moose Pasture	66
Bardoc Gold (BDC): Bardoc Gold Project - 3Moz’s on Kal’s Doorstep	68
Base Resource (BSE): Toliara Mineral Sands Project - Home Run	70
Chalice Mining (CHN): Julimar Nickel-Copper-PGE Project - Growing Gonneville.....	72
Hot Chili (HCH): Costa Fuego Copper Project - A New Partnership Spices Things Up	74
Liontown (LTR): Kathleen Valley Lithium Project - Lithium Lion.....	76
Northern Minerals (NTU): Browns Range Rare Earth Element Project - It's Xenotime	78
Predictive Discovery (PDI): Bankan Gold Project - Burgeoning Bankan.....	80
Sovereign Metals (SVM): Kasiya Rutile Project - Kasiya, a Kingdom of Rutile	82
Disclosures	84

Metals & Mining November 2021

We had more projects to choose from in 2021 as earlier stage projects have progressed

Low cost, high margin projects remain our key focus, providing broader investor and funding appeal

Two 2020 stocks had political & regulatory issues (Myanmar coup and Alberta coal policy)

The shift in focus to “clean energy” has become entrenched, and we think we are still early in this cycle

“Old” energy is not dead; being cold and dark today is more confronting than disaster down the track

Gold still has a place

Important Disclosures:

Please refer to important disclosures for AMN, BDC, BEM, DEG, FFX, GMD, HCH, NTU, NXG, ORR, PNR and other disclosures from page 84

Argonaut’s Best Undeveloped Projects

Argonaut has completed its 2021 review of the best undeveloped metals and mining projects (BUPs) that are majority owned by ASX listed companies. This year we found it easier identifying projects to include on the main list as some earlier stage projects listed as special mentions in prior editions of BUPs advanced toward development.

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

We continue to 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 owner must have a market capitalisation less than A\$5b

Selection focus: As the title suggests, the focus of this book is on project quality, not necessarily current value, and project advancement is an important outcome to monitor in coming years. 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”.

2020 BUPs performance: Main list stocks were negatively impacted by political events in Myanmar (Bawdwin Project) and changes to coal-mining policy in Alberta (Elan Project). Excluding these, performance over the 12 month period to 31/10/21 was 13%, still well below the 46% gain in the ASX Small Resources index. Lack of exposure to earlier stage projects (excluded due to BUPs criteria) and clean energy commodities were main reasons. Special mention stock prices were up an average 37%, brought down by a high exposure to gold projects (share prices were up an average 85% excluding gold).

Top performers: On the main list OreCorp (ORR) was the top performer, up 47%. Strong special mention performers included NexGen (NXG) up 209%, Chalice (CNH) up 146%, and Centaurus (CTM) up 100%. Two of these have advanced to the main list in this edition.

Key themes: The shift in focus to “clean energy” commodities has been dramatic. While expectations over the pace of this shift are unrealistic, the trend is clearly entrenched, and we are early in this cycle in our view. Exploration, capex, and funding are increasingly being targeted at these commodities, potentially to the detriment of gold (where M&A may provide better growth opportunities). We expect costs and supply chain issues to be a focus for developers in the coming period and, as a word of caution, believe investors need to be wary of inexperienced teams and low quality projects in this environment.

2021 Best Undeveloped Projects

Based on the aforementioned criteria, a list of nine main list projects have been selected as shown in Table 1 and Table 2 below. We also list ten special mention companies which have either not reached the study phase, or do not meet all of our criteria at this point. We expect many of these projects will progress to our BUPs main list in coming years.

Table 1: Best Undeveloped Projects and Special Mentions.

Company	Project	Ticker	Commodity	Location	Market Cap A\$m	Cash A\$m	Debt A\$m	EV A\$m
Best Undeveloped Projects								
Black Earth	Maniry	BEM	Graphite	Madagascar	26	6	-	20
Centaurus	Jaguar	CTM	Nickel	Brazil	362	16	-	346
De Grey	Mallina	DEG	Gold	Australia	1,526	156	-	1,370
Firefinch	Goulamina	FFX	Lithium	Mali	601	40	4	564
Genesis	Ulysses	GMD	Gold	Australia	311	28	-	283
NexGen	Rook I	NXG	Uranium	Canada	3,895	228	-	3,667
OreCorp	Nyanzaga	ORR	Gold	Tanzania	258	67	-	190
Pantoro	Norseman	PNR	Gold	Australia	310	31	-	279
Sandfire	Motheo	SFR	Copper	Botswana	2,161	406	-	1,755

Special Mentions

Agrimin	Lack Mackay	AMN	Potash	Australia	95	3	-	92
Auteco	Pickle Crow	AUT	Gold	Canada	122	16	-	105
Bardoc Gold	Bardoc	BDC	Gold	Australia	111	11	-	101
Base	Toliara	BSE	Mineral Sands	Madagascar	353	50	-	304
Chalice	Julimar	CHN	PGE	Australia	2,389	81	-	2,308
Hot Chili	Costa Fuego	HCH	Copper	Chile	197	12	-	185
Liontown	Kathleen Valley	LTR	Lithium	Australia	3,679	26	-	3,653
Northern Minerals	Browns Range	NTU	Rare Earths	Australia	257	14	-	243
Predictive	Bankan	PDI	Gold	Guinea	280	24	-	256
Sovereign Metals	Kasiya	SVM	Rutile	Malawi	224	6	-	219

Source: Company data, FactSet, Argonaut Estimates

Note that all values are in A\$ throughout this document unless otherwise indicated

Cash and debt are generally as of 30 September 2021 unless later dated information was available

Table 2: Best Undeveloped Projects metrics and feasibility assumptions.

Company Code	Project	Country	Commodity	Project NPV (A\$m)	Disc. Rate %	IRR (%)	Capex A\$m	First Prod'n (Year)	Country Risk
BEM	Maniry	Madagascar	Graphite	196	8%	41%	93	2024	Moderate
CTM	Jaguar	Brazil	Nickel	979	9%	51%	392	2025	Moderate
DEG	Mallina	Australia	Gold	1,651	6%	37%	893	2025	Low
FFX	Goulamina	Mali	Lithium	1,260	8%	47%	259	2023	High
GMD	Ulysses	Australia	Gold	386	7%	55%	155	2023	Low
NXG	Rook I	Canada	Uranium	4,500	8%	41%	1,300	2027	Low
ORR	Nyanzaga	Tanzania	Gold	519	10%	35%	365	2024	Moderate
PNR	Norseman	Australia	Gold	286	7%	59%	73	2022	Low
SFR	Motheo	Botswana	Copper	556	7%	36%	488	2023	Low

Source: Company data, FactSet, Argonaut Estimates

Project NPV calculations are on a 100% basis

SFR IRR is stated as pre-tax; all other IRRs are post-tax

2020 Best Undeveloped Projects

Project Development

BUFs selection is based on project quality not current corporate value, so ensuing project development is an important outcome to monitor. Table 3 below highlights the progression of the projects included in our 2020 book over the last year. Key takeaways:

- Six of the eight Main List projects advanced, although Bardoc (BDC) has recently taken the decision to defer FID
- The two projects that stalled were:
 - Bawdwin (MYL) due to a coup in Myanmar, subsequent to which the project was sold by MYL to its in-country partner
 - Elan (ATU) due to a change in the coal mining policy in Alberta, and which is still subject to ongoing public review by an independently appointed body
- Special Mentions advanced their projects, although Stavely (SVY) slowed due to COVID issues in Victoria

Table 3: BUFs 2020 project progress.

Project	Status as at October 2020	Progress to date
Main List		
Abra (G1A)	BFS	Debt and equity funding completed. Mining (ByrneCut) and EPC plant construction (GRES) contracts finalised. Construction commenced. First production anticipated 1Q 2023.
Arrow/Muchea (VRX)	DFS. Mining License granted	Heritage clearance obtained. EPA referrals lodged. Independent Tech review underway to support potential debt (AMC). Detailed engineering commenced (ProjX Engineering).
Bardoc (BDC)	PFS	DFS announced March 2021. Optimisation Study announced September 2021. FID deferred (previously late 2021) due to current tight markets for materials and labour.
Bawdwin (MYL)	PFS. Awaiting Myanmar Investment Commission approval to progress to BFS.	Myanmar State of Emergency Feb 2021. Protracted suspension followed by proposed sale of Bawdwin interests for US\$30M to its local partner.
Elan (ATU)	Updated Scoping Study	1976 coal policy reinstated. PFS work paused. Alberta Coal Policy Committee established to engage publicly and make recommendations to Minister in November 2021.
Norseman (PNR)	Phase 1 DFS	PNR completed \$50M sole expenditure obligation. PNR fully funded for share of development. Approvals granted and construction underway.
Nyanzaga (ORR)	PFS	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.
Vares (ADT)	PFS	DFS released August 2021. Permitting requirements in place.
Special Mentions		
Abujar (TIE)	Feasibility studies	PFS released April 2021 and approvals secured. DFS was released 3Q 2021. Engineering (Primero) and early works underway.
Arrow (NXG)	PFS	Feasibility Study released February 2021.
Bellevue (BGL)	Advanced exploration	Stage 1 Feasibility Study February 2021 with maiden Reserve. Stage 2 Feasibility Study September 2021 based on increased Resource. Funded for development.
Cue (MGV)	Re-estimated Resources released	Exploration and additional discoveries. Resource estimate due 1Q 2022.
Dandako (OKU)	Maiden Resource estimate expected 1Q 2021	Resource announced March 2021. MRE to underpin Scoping Study. Drill programme ongoing.
Jaguar (CTM)	Maiden JORC Resource June 2020	Scoping Study released April 2021. Value-add Scoping Study released May 2021.
Julimar (CHN)	Discovery March 2020	Maiden Mineral Resource Estimate expected 4Q 2021. Scoping Study expected 1H 2022.
Kambalda Ni (MCR)	DFS March 2020	Project fully funded. Underground development ongoing.
Kasiya (SVM)	Exploration	Maiden Mineral Resource Estimate released. Scoping Study underway (DRA). Study on logistics & infrastructure completed to inform SS.
Mallina (DEG)	Exploration	Major exploration campaign and additional discoveries (Diucon and Eagle). Maiden Mineral Resource Estimate released June 2021. Scoping Study released 4Q 2021.
Stavely (SVY)	Maiden JORC Resource at Cayley Lode targeted end 1Q 2022	Ongoing drilling at Cayley Lode to inform a maiden Resource estimate and underpin a future Scoping Study.

Source: Company announcements, Argonaut

Share price and market capitalisation growth

The share prices and market capitalisations of stocks in the 2020 BUPs main list dropped 1% and increased 10% respectively over the 12 months to 31/10/20. The share prices and market capitalisations of stocks on the special mentions list increased 37% and 55% respectively over the same period. Comparatively the ASX Small Resources Index (which includes a far broader range of companies than those relevant for BUPs) and the ASX 200 were up 46% and 24% respectively.

Table 4: Best Undeveloped Projects 2020 performance.

Company	Project	Code	Commodity	Price 31/10/21	Price Change	Peak Share Price	SOI Change	Mkt Cap Change
2020 Best Undeveloped Projects								
Adriatic Metals	Vareš	ADT	Polymetallic	2.86	25%	3.33	17%	47%
Atrium Coal	Elan	ATU	Met. Coal	0.04	-84%	0.32	12%	-82%
Bardoc Gold	Bardoc	BDC	Gold	0.07	-7%	0.09	0%	-7%
Galena Mining	Abra	G1A	Lead	0.23	-4%	0.39	3%	-1%
Myanmar Metals*	Bawdwin	MYL	Silver/Lead	0.70	-4%	1.00	0%	-4%
OreCorp	Nyanzaga	ORR	Gold	0.66	47%	0.96	25%	83%
Pantoro	Norseman	PNR	Gold	0.22	13%	0.26	0%	13%
VRX Silica	Arrowsmith	VRX	Silica Sands	0.20	5%	0.40	24%	31%
<i>Simple Average</i>					-1%			10%
2020 Special Mentions								
Bellevue Gold	Bellevue	BGL	Gold	0.86	-24%	1.49	18%	-11%
Chalice Mining	Julimar	CHN	PGEs	6.67	146%	9.17	14%	181%
Centaurus Metals	Jaguar	CTM	Nickel/Copper	1.07	100%	1.17	10%	120%
De Grey Mining	Mallina	DEG	Gold	1.12	1%	1.61	10%	12%
Mincor Resources	Kambalda	MCR	Nickel/Copper	1.38	45%	1.44	12%	63%
Musgrave Minerals	Cue	MGV	Gold	0.39	-21%	0.57	13%	-11%
Nexgen Energy	Arrow	NXE	Uranium	6.90	209%	8.53	26%	291%
Oklo Resources	Dandako	OKU	Gold	0.13	-49%	0.27	0%	-49%
Sovereign Metals	Kasiya	SVM	Rutile	0.55	43%	0.77	7%	53%
Stavely Minerals	Stavely	SVY	Copper	0.46	-34%	0.95	0%	-34%
Tietto Minerals	Abujar	TIE	Gold	0.40	-12%	0.48	3%	-10%
<i>Simple Average</i>					37%			55%

Price Change: For 12 month period to 31/10/2021; * Myanmar has been suspended from trading since 1 February 2021 and has had a name change to Mallee Resources; SOI: Shares on Issue

Source: Company data, FactSet

Figure 1: Argonaut BUPs combined lists share price performance vs ASX indices.



Source: FactSet, Argonaut

After a stellar showing in our 2019 BUPs, the share prices of gold project proponents were muted in 2020

Share price performances of companies exposed to different commodities and geographies were mixed

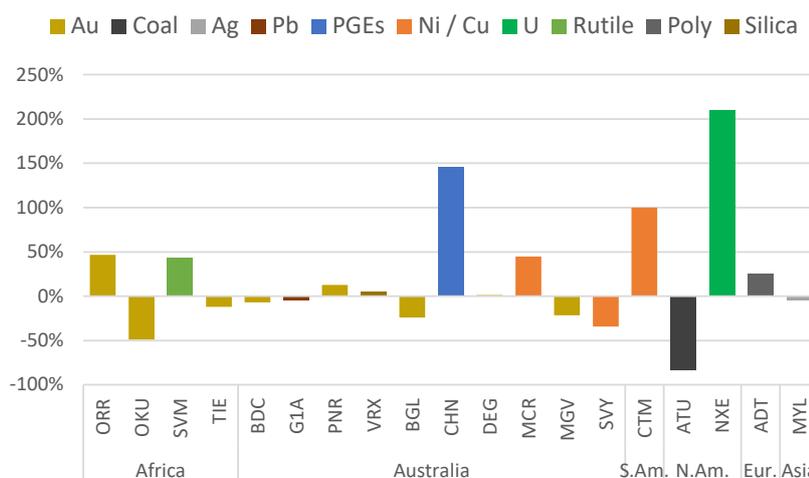
We discuss the broad range in commodity and geographic exposures in the later sections

Performance analysis of 2020 BUPs

We show performance across all projects in the 2020 BUPs, grouped by geography and split by commodity in Figure 2 below. Key takeaways:

- Gold projects did not fare well overall, with the share prices of 6 of the 8 gold projects declining over the year. This may reflect gold projects in our prior 2019 BUPs having an exceptionally strong showing; the three gold projects on our 2019 main list and the seven on our special mention list were up on average 111% and 70% respectively
- There is no compelling evidence that any region out- or under-performed, with mixed results across broad geographies. The dataset would likely need to be larger and timelines longer to draw more significant conclusions
- The performance of ORR (Tanzania) and CTM (Brazil) show that higher country risk does not necessarily hold back a project’s performance. However, when things do go wrong it can be devastating as MYL found out in Myanmar
- Supposedly lower risk jurisdictions still have risks. ATU’s project in Canada hit a regulatory hurdle. This is perhaps more a reflection of the commodity (whether coking or thermal, coal is a dirty word to most generalist investors)

Figure 2: 2020 BUPs performance by commodity and geography.



Source: Argonaut, FactSet

2021 BUPs exposures

Figure 3 and Figure 18 show, for comparison, our combined 2021 BUPs lists split by country and commodity exposure. We discuss the shifting commodity focus in the next section.

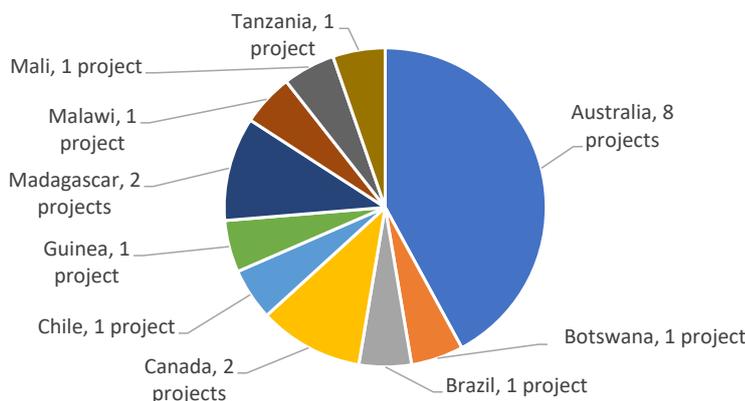
Commodities include:

- 7 gold projects
- 2 lithium and 2 copper projects
- 1 project for each of uranium, rutile, rare earths, potash, PGE’s, nickel, mineral sands, and graphite

Geographic exposure includes:

- 8 projects in Australia
- 7 projects in Africa (2 in in Madagascar, and 1 in each of Botswana, Guinea, Malawi, Mali, and Tanzania)
- 2 projects in South America (Chile and Brazil)
- 2 projects in North America (both in Canada)

Figure 3: 2021 BUPs country split.



Eight projects are in Australia, 7 in Africa, 2 in South America, and 2 in North America

Source: Argonaut

BUPs performance over time

Our BUPs selections have typically included a number of gold projects. While this may not have helped the performance of our 2020 BUPs, we believe it has contributed to BUPs outperformance over the longer term, which remains comfortably ahead of indices. We discuss our rationale for holding gold in a portfolio of assets in a later section.

Table 5: 2014 to 2020 BUPs Main List performance.

Year	Annual Performance			BUPs Mkt. Cap (%)
	BUPs	Small Res.	S&P 200	
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%
Average	21%	13%	5%	49%

The longer term share price performances of companies in our BUPs books continue to comfortably beat the indices

Source: IRESS, FactSet

Shifting commodity focus

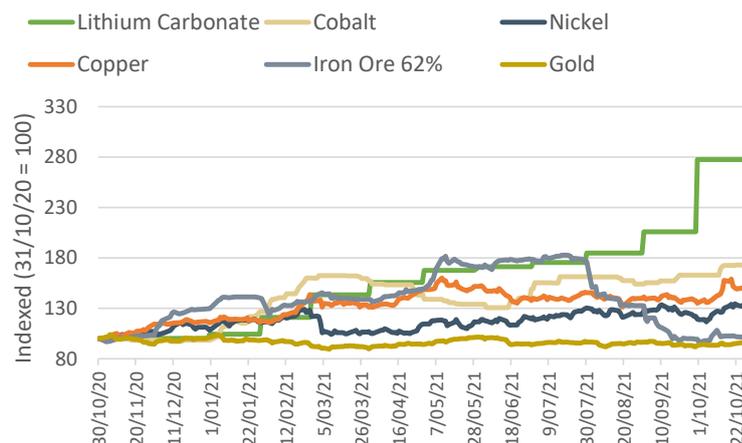
There were significant changes to commodity views and prices over our 12-month measurement period

The 12 months to end October 2021 (our measurement period) saw significant changes to commodity views and prices. As shown in Figure 4 below, gold was the laggard throughout the period, which is largely why our 2020 gold picks fared poorly. In contrast, the prices of commodities exposed to the battery thematic, like lithium, cobalt, and nickel, climbed ~200%, ~70% and ~30% respectively over the year. The latter was despite an initial negative reaction in February to news that China had developed a process to convert low-grade nickel pig iron to class one metal.

Iron ore had an interesting ride during the period, nearly doubling by mid 2021, before falling dramatically in recent months as returning supply from Brazil met softening demand from China. This muted Chinese demand has been influenced by controls on steel output, environmental concerns, COVID-related restrictions, and worries over property development in the wake of Evergrande’s slow motion demise.

Prices of commodities exposed to the battery thematic tended to fare well, iron ore had a bumpy ride, and gold was depressed

Figure 4: Commodity prices (indexed to 100 as at 31/10/20).



Source: Argonaut, FactSet (for Au, Cu, Ni, Co, & Iron Ore), S&P Capital IQ (for Lithium Carbonate Global Average)

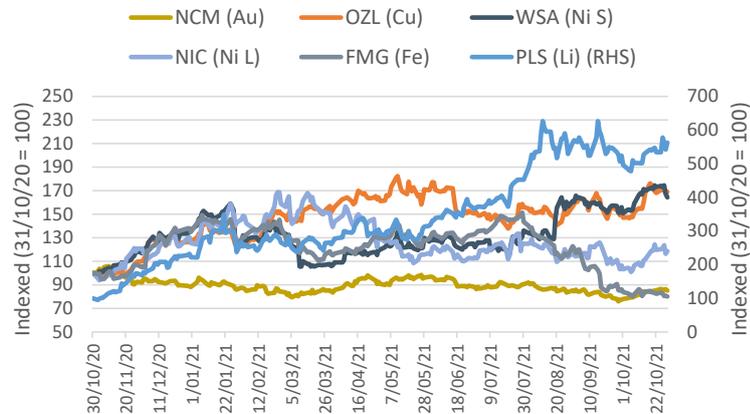
Bellwether company share price performances tended to mirror this shifting commodity thematic

Selected “bellwether” companies’ share prices largely reflected underlying commodity price performances as shown in Figure 5 overleaf. Pilbara Minerals (PLS, lithium) was the standout, up over 450%. Newcrest (NCM, gold) ended the period down ~15%, while OZ Minerals (OZL, copper) was up 69%. It is interesting to see the difference in performance between two nickel producers, with Western Areas (WSA) up 64%, compared to Nickel Mines (NIC), which was up a far less impressive 19%. As pointed out in our recent research ([“The emergence of green nickel”](#), 11 June 2021), the sulphide producers (WSA) are far more environmentally friendly than the laterite producers (NIC) which may have had a bearing on relative performance.

The share price of iron ore producer Fortescue Metals (FMG) largely tracked the iron ore share price, with more than 40% gains during the period eroded to the extent that FMG ended the period down ~20%.

Figure 5: Commodity "bellwether" share prices (indexed to 100 as at 31/10/20).

Companies like PLS (lithium), WSA (nickel) and OZL (copper) had a strong 12 months, while NCM (gold) and FMG (iron ore) were down over the year



Source: Argonaut, FactSet (all shown on LHS other than PLS)

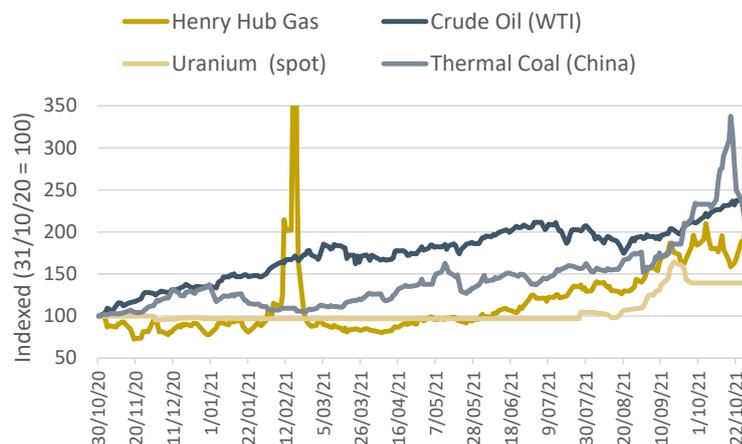
Another related dramatic move, more-so towards the end of the measurement period was in energy commodities, with supply concerns and constraints emerging at the same time most economies were being boosted by stimulus, emerging from COVID lockdowns, and moving into peak energy demand during the northern hemisphere winter. Crude oil staged a solid recovery which saw it more than double during the period, and thermal coal, despite being the most disliked commodity for its dirty credentials, climbed even more than this before pulling back in recent weeks (see Figure 6).

Energy commodities had a very strong showing, particularly toward the end of the period

Gas prices also climbed strongly and remain susceptible to price spikes (for example, the US Henry Hub price jumped dramatically in February as a severe cold snap curtailed gas supply amid processing plant outages in the central and southern parts of the US). It remains an ongoing concern for industry and consumers; for example it required recent Government intervention in the UK to get major fertilizer plants back up and running after shutting due to high energy prices. Finally, uranium has woken from years of slumber and looks likely to be a part of the energy mix in the drive to a lower emission global economy (see our recent research "[Uranium gets its fizz back](#)", 30 September 2021).

Figure 6: Energy prices (indexed to 100 as at 31/10/20).

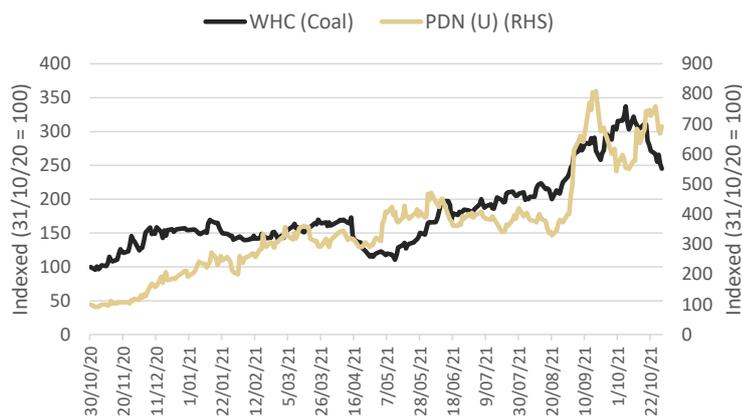
Crude oil steadily recovered, gas prices improved (although volatile), "dirty" coal had a good run, and uranium woke from years of slumber



Source: Argonaut, FactSet

If miners of battery exposed commodities were good performers over our measurement period, energy-exposed companies were exceptional. Figure 7 below shows that over the 12-month period Whitehaven Coal (WHC, thermal coal) more than doubled, while Paladin (PDN, uranium) jumped ~600%.

Figure 7: Commodity "bellwether" share prices (indexed to 100 as at 31/10/20).



Source: Argonaut, FactSet (WHC on LHS, PDN on RHS)

Having previously been knocked down by COVID, many energy-exposed companies had a very strong recovery run through the period

COP26 will continue to shine the spotlight on emissions

But switching to "clean" energy is going to be a long hard road, with the EIA forecasting "dirty" energy will remain part of the energy mix for decades under existing tech and policies

The "new energy" paradigm

The focus on reducing emissions has intensified, and will be emphasised by the 26th UN Climate Change Conference (COP26) currently underway. The key goal of COP26 is to secure global net zero emissions by 2050 via unified global action. We expect countries not showing commitment to this goal, whether fair or not, to come under increasing pressure.

Aspirational emission target reductions are more than noble undertakings; the evidence increasingly suggests the impact of climate change will require both mitigation and adaptation strategies. But it's much easier said than done, as the reality of being cold and dark today becomes more confronting than potential disaster down the track.

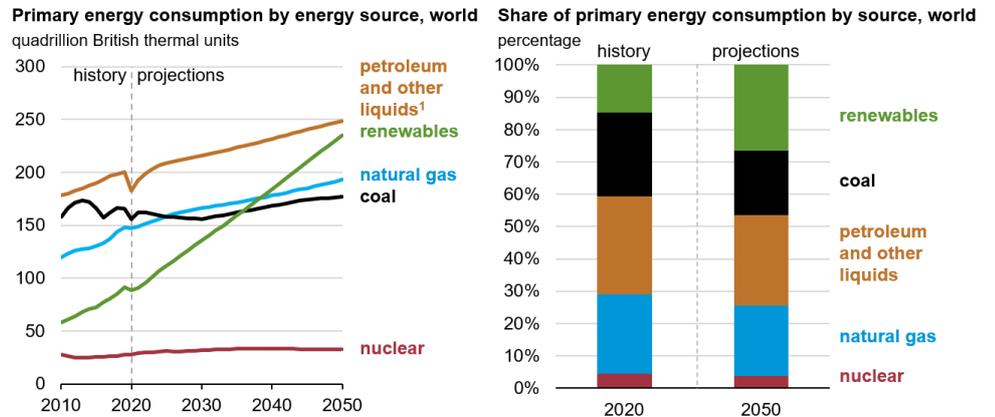
The US Energy Information Administration (EIA) recently released its International Energy Outlook 2021, projecting global energy use in its 2050 reference case to increase nearly 50% compared to 2020. This outlook, albeit under the assumption of existing policies and technologies, sees CO₂ emissions actually increasing through this period as the needs of the industrial sector (which consumes ~55% of all energy) and the transport sector (which consumes another ~25%) grow strongly.

As a result "dirty" energy remains a significant portion of the energy mix according to the EIA. Figure 8 overleaf shows that under the EIA reference case projections, renewables as a source of energy grow significantly, but that to meet expected demand coal, petroleum, and natural gas still make up a significant part of the overall energy mix.

Electricity generation, which fuels ~20% of the world's energy consumption, sees significant growth in the use of "clean" energy sources, with solar and wind contributing nearly 54% of the electricity energy mix in 2050, up from 26% in 2020 under the EIA projections. This will require an elevenfold increase in solar and a threefold increase in wind electricity power generation (see Figure 9 and Figure 10 overleaf).

Under the EIA scenario, there is dramatic growth in renewable energy

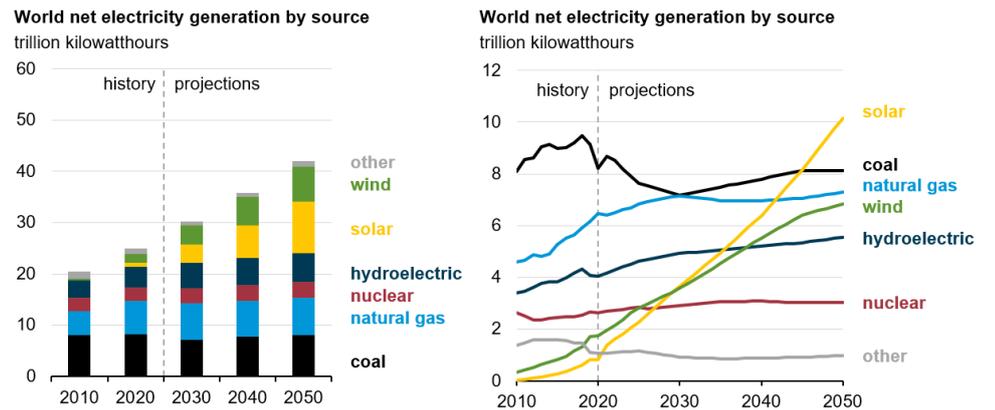
Figure 8: Primary energy consumption by source.



Source: EIA, International Energy Outlook, October 2021

This is particularly the case for electricity generation

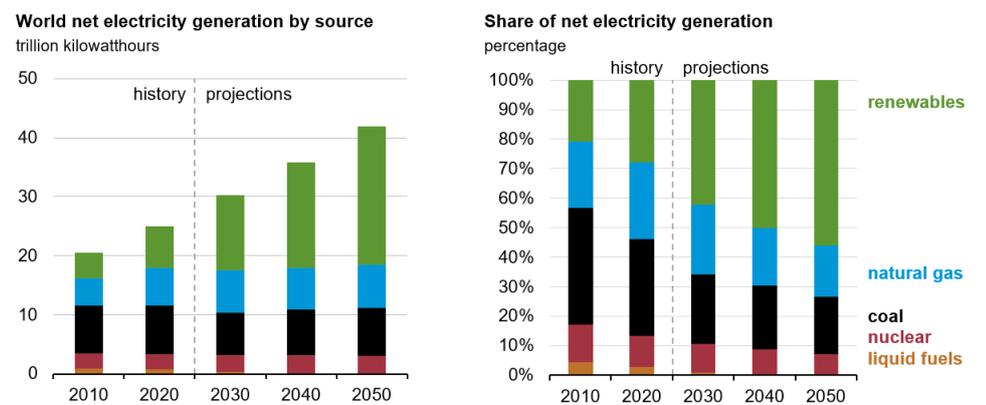
Figure 9: World net electricity generation by source.



Source: EIA, International Energy Outlook, October 2021

The EIA expects more than 50% of electricity generation will be based on renewables by 2050

Figure 10: World net electricity generation by fuel.



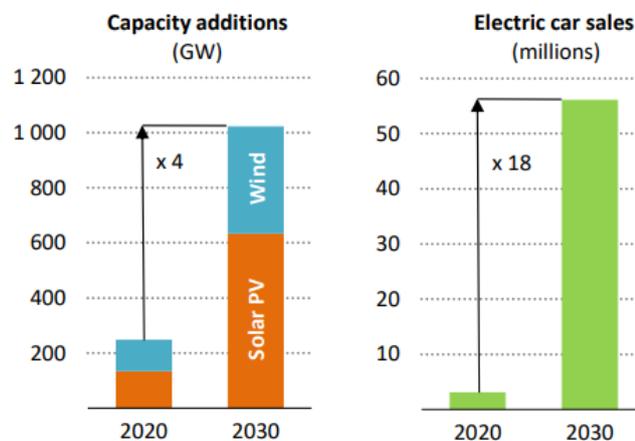
Source: EIA, International Energy Outlook, October 2021

While the EIA makes projections based on existing tech and policies, the IEA has made projections based on getting to “net zero” emissions by 2050

In stark contrast to the EIA, which provides projections based on existing policies and technologies, the International Energy Agency (IEA) published a “Net Zero by 2050” roadmap for policy makers earlier this year. The IEA notes that as the energy sector is the source of ~75% of greenhouse gas emissions (GHG’s) it holds the key to averting the worst effects of climate change, requiring a complete transformation of how the world produces, transports, and consumes energy.

The IEA pathway calls for a new solar farm every day for the rest of this decade equivalent in size to the largest that is currently in existence, and for electric vehicles (EV’s) to go from ~5% of today’s sales to more than 60% by 2030 (see Figure 11).

Figure 11: Key clean technologies ramp up by 2030 in the net zero pathway.



Source: IEA, Net Zero by 2050, A Roadmap for the Global Energy Sector, July 2021

This requires some stark changes to energy efficiency and consumer behaviour

In the IEA case, renewables growth is dramatic, and it sees minimal energy supply from fossil fuels by 2050

In very sharp contrast to the EIA, in the net zero pathway the IEA sees by 2050:

- Global energy demand ~8% smaller than today (despite an economy twice as big and two billion more people) as a result of efficiencies and changing consumer habits
- Two thirds of energy supply from renewables
- Only one fifth of energy supply from fossil fuels (where the carbon is either embedded in the end product, or captured and stored)

Key takeaways:

- Actual sources and uses of energy by 2050 are likely to fall somewhere between the EIA’s “current policies and technologies” scenario and the EIA’s “net zero” ambitions
- Regardless, the demand for the materials needed for renewables energy generation and batteries is expected to grow exponentially in the coming decades
- The current focus on these issues is already intense, but will receive even more coverage and impetus from COP26 in the near term
- Policy commitments post COP26 are likely to be more strident and targeted than prior
- The “net zero” movement is in its infancy, and we expect the tailwinds behind “green” materials to last decades
- We expect the impetus to drive R&D and that new technologies, perhaps totally unexpected, will emerge
- To keep the lights on and affordable, and absent a dramatic breakthrough in new technology, coal and petroleum are likely to remain key components of the energy mix for some time to come

Reality will likely fall somewhere between the EIA “as-is” scenario and the IEA’s lofty “net zero” scenario – but either way the tailwinds behind “green” materials are firmly entrenched

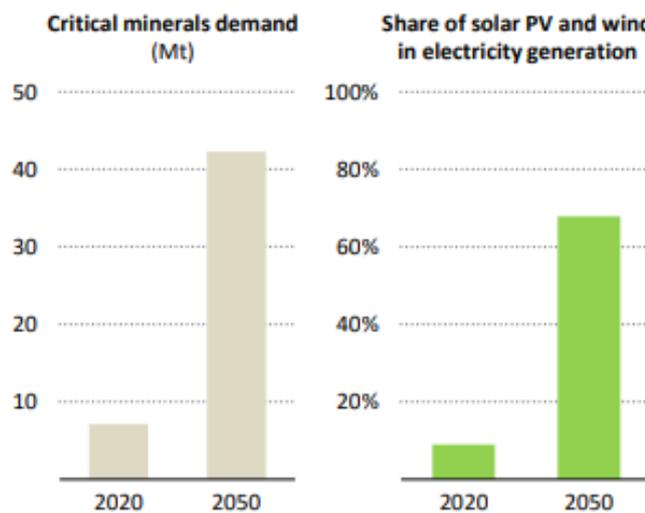
Implications for commodities

“Critical” minerals

The IEA notes that the energy transition under the “net zero” scenario will require significant quantities of critical minerals, and their supply becomes a major growth area. According to the IEA the total market size of critical minerals like copper, cobalt, manganese, and various rare earth metals (REE) grows almost sevenfold between 2020 and 2030 (see Figure 12 and Figure 13 below).

Figure 12: Global energy security indicators in the net zero pathway.

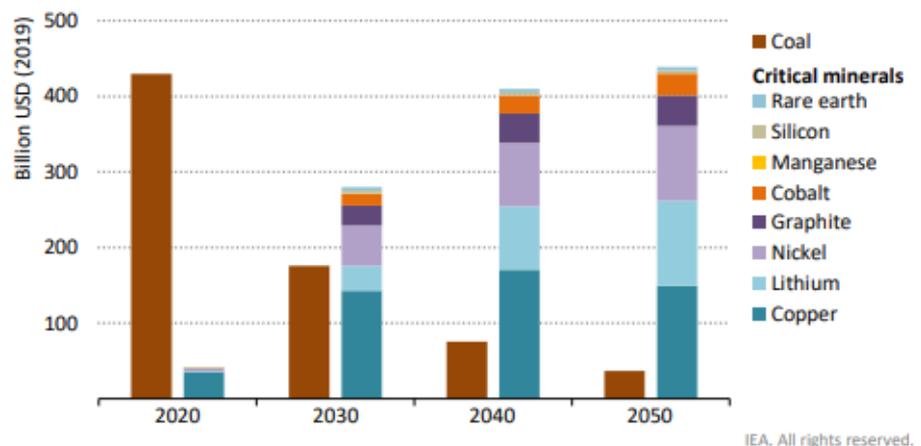
According to the IEA the total market for “critical” minerals like copper, cobalt, manganese, and REE’s grows almost sevenfold by 2030



Source: IEA, Net Zero by 2050, A Roadmap for the Global Energy Sector, July 2021

Figure 13: Global value of coal and selected critical minerals in “net zero”.

The IEA “net zero” roadmap sees coal’s use declining dramatically over the period to 2050



Source: IEA, Net Zero by 2050, A Roadmap for the Global Energy Sector, July 2021

The IMF Economic Outlook (October 2021) also discussed the clean energy transition and implications, highlighting that low GHG technologies (including renewables, EV’s, hydrogen, and carbon capture) require more metals than fossil-fuel based counterparts. It points out that if supply does not ramp up to meet demand, it could significantly impact prices, to the point where the energy transition may be derailed or delayed.

The recently released IMF Economic Outlook provides a useful list of energy transition materials, highlighting those that are well established and those that are emerging

The IMF provides a table listing energy transition metals (see Table 6), highlighting that some are well established (such as copper and nickel), while others are emerging (such as lithium and cobalt) and therefore have limited price visibility and comparatively low absolute production values.

Table 6: Key indicators for energy transition metals.

Metal	Exchange Traded	Energy Transition Usage				Production (2020, \$ billion)
		Renewable	Network	Battery	Hydrogen	
Copper	✓	✓	✓	✓		123.0
Aluminum	✓	✓	✓	✓	✓	107.0
Nickel	✓	✓		✓	✓	28.0
Zinc	✓	✓				28.0
Lead	✓	✓		✓	✓	26.0
Silver	✓	✓				13.0
Manganese	No	✓		✓	✓	25.0
Chromium	Recent	✓				19.0
Silicon	No	✓				14.0
Molybdenum	Recent	✓			✓	5.0
Cobalt	Recent			✓		4.1
Lithium	Recent			✓		1.8
Vanadium	No			✓		1.3
Graphite	No			✓		1.3

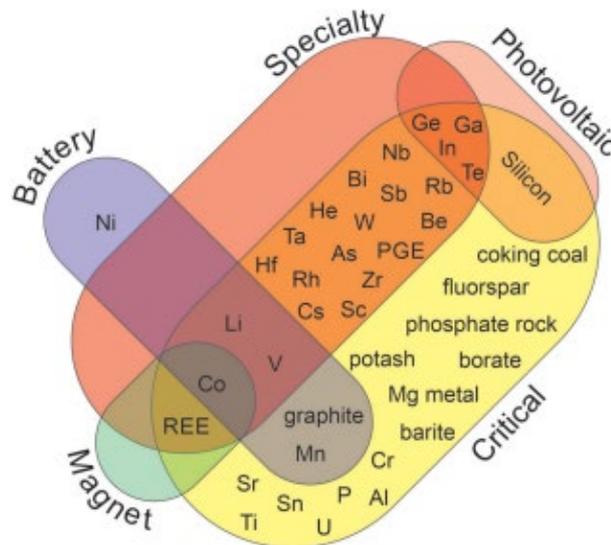
Source: IMF, from IEA (2021), World Bank (2020b), and IMF staff calculations

Note: Production is the value of refined and unrefined mining production

Expanding this list, Simandl L et al. (2021) provide a useful Venn diagram (see Figure 14) showing the overlap between various energy transition materials (“Specialty, Magnet, and PV Materials”, Geoscience Canada, Vol. 48). Counter to this diagram, nickel was recently added to the US critical minerals list due to its importance as a cathode in lithium-ion batteries. Lithium is considered both a specialty and critical material for its use in batteries, as are cobalt and REE, which are considered important for their use in magnets (EV’s and wind turbines) as well.

Figure 14: Examples of overlapping materials categories.

Other research shows the overlap between specialty, critical, battery, magnet, and PV materials



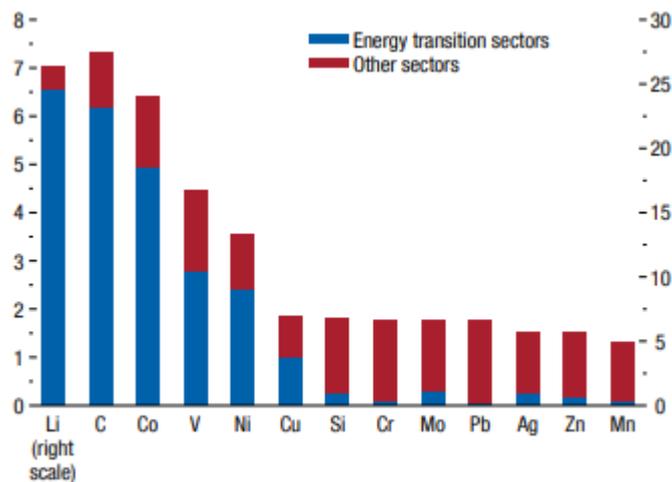
Source: Simandl L, Simandl G, Paradis S (2021); Specialty, Magnet, and PV Materials; Geoscience Canada; Vol 48; P 73-91

The IMF provides an indication of potential growth in energy transition metals into the 2030's

Given the energy transition is underway and gaining momentum, the key question is the pace of change. As indicated earlier, reality is highly unlikely to match lofty net zero aspirations given a track record of slow implementation, a need to keep the lights on in the short term, costs, and the significant adjustments and innovation required. However, sentiment is shifting rapidly, which will influence politicians and may indicate consumers will be increasingly more willing to put their wallets where their mouths are.

Based on the IEA's net zero case the IMF, in its October 2021 Economic Outlook, provide its interpretation of potential growth in demand for various materials (see Figure 15 below and Figure 16 overleaf).

Figure 15: Demand for critical energy transition metals under the IEA net zero scenario (ratios of 2030's average consumption to 2010's average consumption).



Growth is a relative measure, and it is important to look at increases in absolute terms

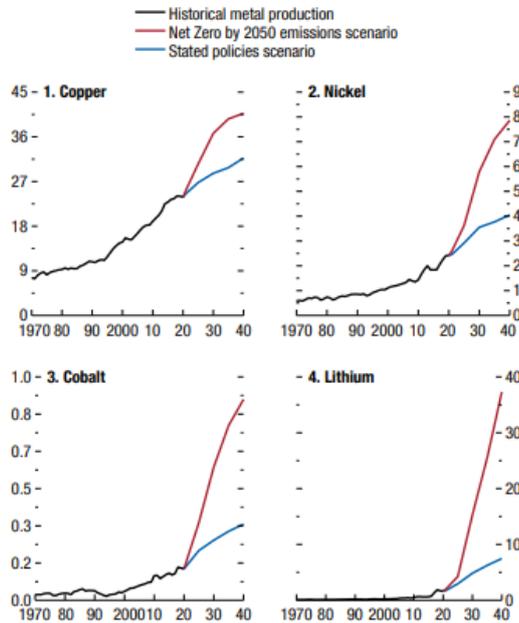
Source: IMF, from IEA (2021), Schwerhoff and Stuermer (2020), and IMF staff calculations
 Note: C = graphite; Production is the value of refined and unrefined mining production

Relative, as opposed to absolute, growth in volumes and values need to be looked at with a degree of caution for emerging materials. Some materials, while critical, will still only be required in relatively small volumes even if the percentage growth sounds impressive. Other specialty materials are not necessarily rare but may be so because they are not worth the time, effort, and cost of exploration and development, or they may simply be by-products from the production of mainstream commodities. Simandl L et al. (2021) provide evidence in their paper showing that spectacular growth in percentage terms may be less impressive when viewed in terms of tonnes (see Figure 17).

As outlined in recent research, we believe uranium will need to be a part of the energy transition

While acknowledging the well-understood issues with the disposal of nuclear waste, we are somewhat bemused by a lack of focus on nuclear technologies. Nuclear power generation helps solve the emissions problem, and although has relatively high upfront costs, on a levelised cost of electricity (LCOE) basis over the plant life it compares favourably with all other technologies economically (see our research "[Uranium gets its fizz back](#)", 30 September 2021). The perceived dangers of nuclear power are very likely overblown in most peoples' minds, while the issues with storage of radioactive material, given relatively small volumes, is not insurmountable.

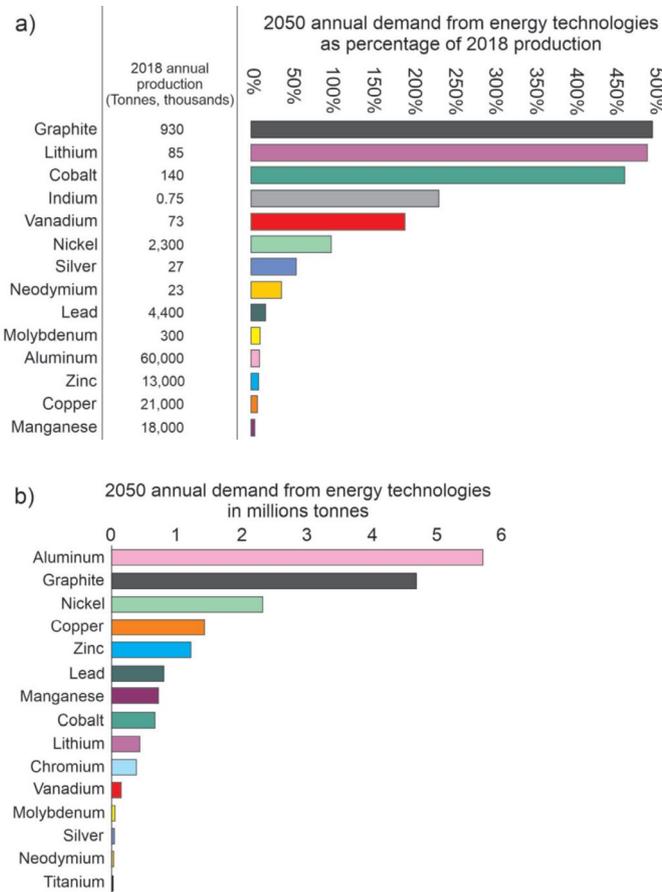
Figure 16: Historical metal production and IEA energy transition scenarios (Mt).



The demand for well-established metals like copper and nickel would grow strongly under a “net zero” scenario

Source: IMF, from IEA (2021), Schwerhoff and Stuermer (2020), US Geological Survey, and IMF staff calculations. Note: Cu and Ni refer to refined production, while Co and Li refer to mine production

Figure 17: Expected materials demands based on IEA projections (2017) for 10 energy technologies in 2050, (a) shows as a % of 2018 production (USGS), (b) shows Mt.



Demand for transition or emerging materials may exhibit dramatic growth in percentage terms in coming years, but the growth may be less impressive when viewed in absolute terms

Source: Simandl L, Simandl G, Paradis S; Specialty, Magnet, and PV Materials; Geoscience Canada; Vol 48; P 73-91

The reality of needing warmth and light today will clash with concerns over tomorrow’s climate change impact

Nevertheless, the trend towards “net zero” is firmly entrenched and we expect strongly growing demand for materials exposed to this thematic

Technological innovation and competition mean the outcomes are nowhere near certain

We see less risk in commodities that will be in high demand regardless of which tech comes to the fore

We see upside, and limited downside, for materials like copper, nickel, lithium, graphite, cobalt, and increasingly uranium

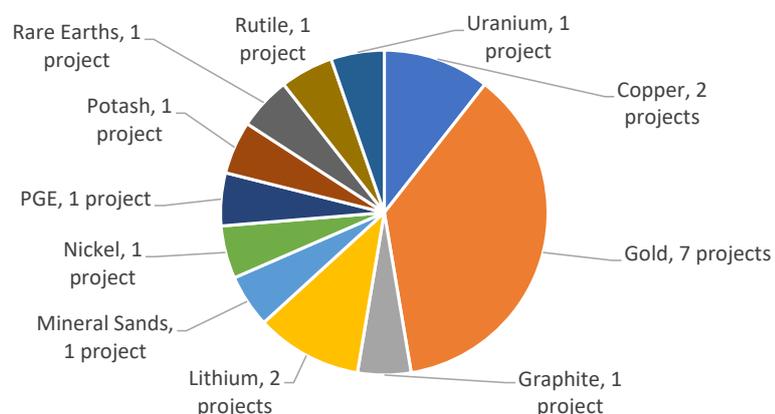
Our 2021 BUPs endeavours to capture exposure to these commodities

Key takeaways:

- Even under the EIA scenario (which assumes existing policies and technologies) there will be significant demand growth for energy transition materials
- We expect reality will fall somewhere between this and the IEA net zero by 2050 roadmap, driven by increased acceptance of climate change and its implications, and shifting voter sentiment
- We expect strong growth in demand for metals exposed to the net zero thematic, however this should be looked at in terms of both percentages and tonnes
- In this light, it is also important to consider how quickly and easily supply can respond to changes in demand
- Innovation is likely to drive changes to existing technologies, or introduce new ones, which may significantly alter the potential demand growth for certain materials
- We believe the level of infrastructure that has to be built to support new energy technologies is probably underappreciated, implying strong demand for traditional commodities
- We are more attracted to, and see less risk in commodities that:
 - Will likely be used regardless of the technology
 - Will be required for energy transition infrastructure
 - Have strong expected growth in both percentage and absolute terms
- Commodities exposed to the net zero thematic where we see limited downside risk include copper, nickel, lithium, graphite, and cobalt
- We believe uranium will get a new lease on life as nuclear reactors are reconsidered and better “sold” to the public
- Project quality is critical for smaller volume materials exposed to the net zero thematic such as REE’s

Our 2021 BUPs endeavours to provide exposure to the “net zero” commodities discussed above. Excluding gold projects, the bulk of the remainder of projects selected for inclusion in this year’s BUPs are exposed to the new energy thematic.

Figure 18: 2021 BUPs commodity split.



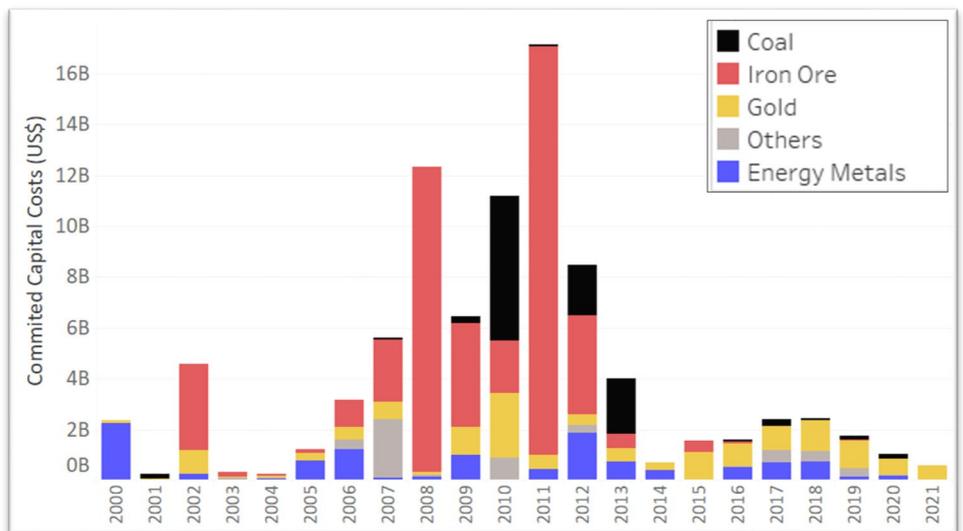
Source: Argonaut

Drive to reduce carbon in its infancy

The drive to zero carbon is in its early stages

The drive to zero carbon is in its early stages. Using data from Australia to illustrate our point, the resource development activity we see today involves a larger number of projects spread across a wider range of commodities. Iron ore does not dominate as much as during the last boom, as gold and clean energy commodities come to the fore. Figure 19 below shows committed *capital* by major commodity groupings over the last 20 years, while Figure 20 shows a *count* of committed projects by major commodity groupings. Gold has dominated in recent years in Australia.

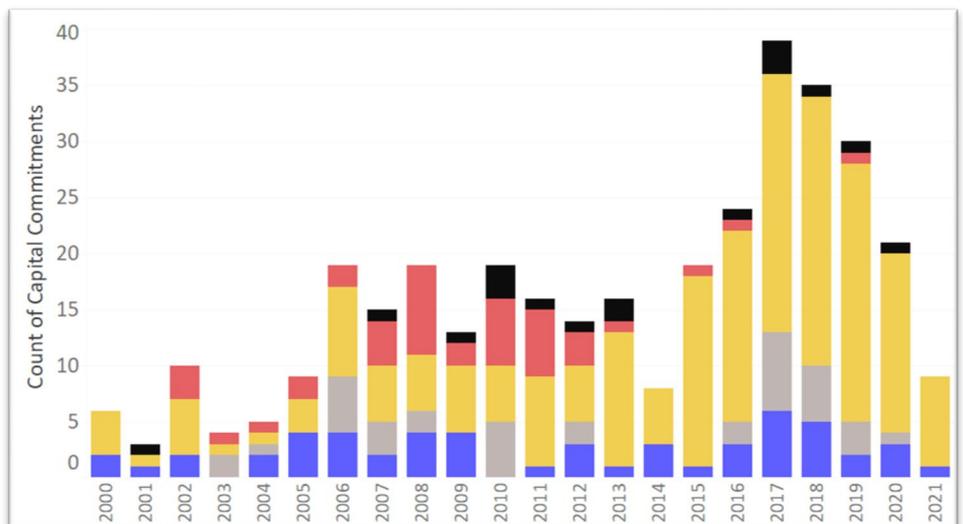
Figure 19: Committed capital costs (US\$M) by commodity grouping.



The resources boom in Australia a decade ago saw a small number of mega projects (mainly iron ore)

Source: Argonaut, from S&P Global Market Intelligence

Figure 20: Number of projects by commodity grouping.

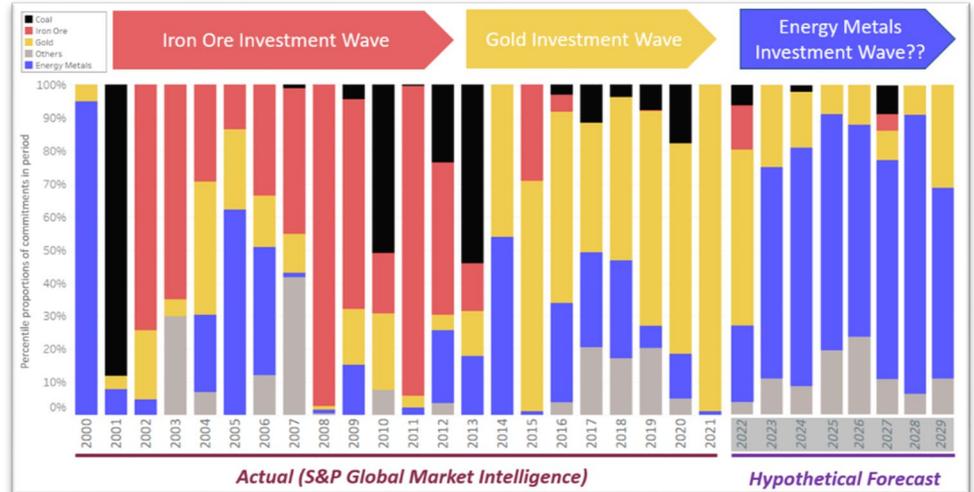


Today we are seeing a much broader range of smaller projects

Source: Argonaut, from S&P Global Market Intelligence

We show a possible scenario for the proportional number of projects by major commodity groupings in the coming decade in Figure 21. While this scenario is simply used to make a point, we have a reasonable degree of confidence in the trends.

Figure 21: Annual percentage of the number of projects by major commodity grouping, including Argonaut hypothetical scenario for the 2020's.



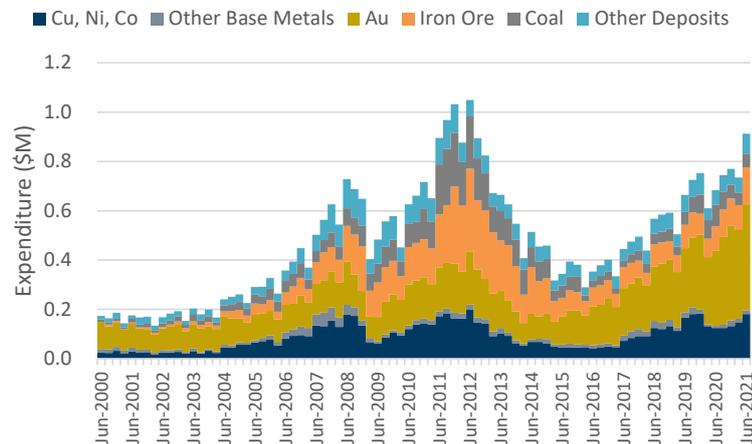
We see the next investment wave being energy metals

Source: Argonaut, historic from S&P Global Market Intelligence, hypothetical forecasts are Argonaut's and reflect a potential scenario

The changes in Australian exploration spend by commodity illustrates the changing trend. Figure 22 below shows that exploration expenditure overall has been increasing and is now close to the peak spending seen a decade ago.

The exploration expenditure trend overall remains upward

Figure 22: Quarterly exploration spend, Australia.



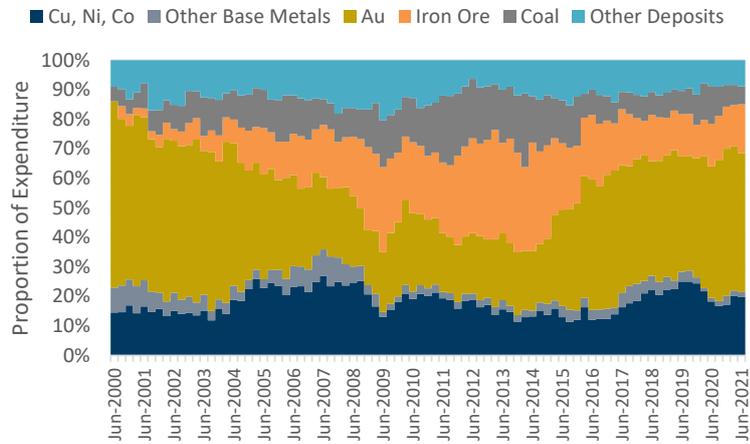
Source: Argonaut, from ABS data to June 2021

Australian exploration spending has shifted from coal and iron ore a decade ago to gold and base metals today

However, the weighting has shifted from iron ore and coal toward other commodities. In June 2011, exploration expenditure on coal and iron ore made up 47c in every \$1, whereas in the latest data it made up 22c in every \$1. By the June 2021 quarter gold made up 47c and base metals a further 22c in every \$1 spent respectively (see Figure 23).

More generally, exploration expenditure leads development capex as shown on Figure 24. This relationship implies mining-related capex will maintain its upward trend in the coming years in Australia and that, given the clean energy thrust, an increasing proportion of this capex will be allocated toward the development of materials that meet the new energy thematic.

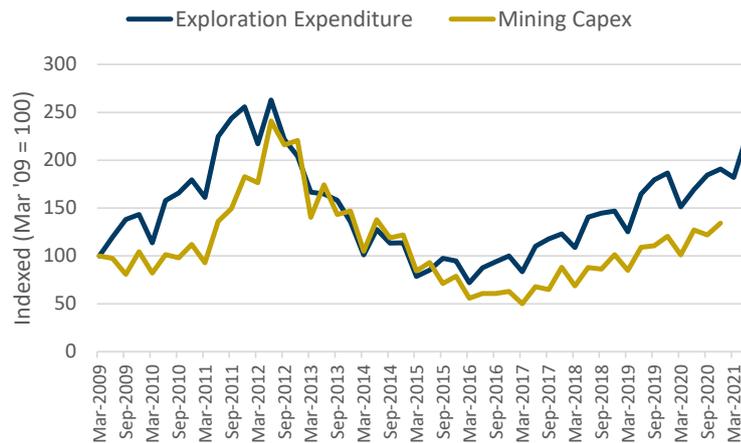
Figure 23: Proportional quarterly exploration spend, Australia.



Expenditure on gold and base metals accounts for 69c in every exploration \$1 at present

Source: Argonaut, from ABS data to June 2021

Figure 24: Exploration expenditure and mining capex, Australia.



Exploration expenditure leads development capex implying an upward trend in mining capex for a while to come

Source: Argonaut, from ABS data to June 2021

Risk and uncertainty

COVID, and the ensuing response, has created uncertainty and risk

There are important caveats to the above analysis, and they relate to numerous prevailing uncertainties. COVID has challenged politicians, central bankers, and economies around the world, and it is hard to deconstruct what the underlying recovery would look like in the absence of massive monetary and fiscal stimulus.

Inflation

Fears of inflation follow monetary policy largesse

A key current fear is inflation, with an unresolved debate between the “it’s transitory” and “it’s baked-in” crowds. Central bankers tend to favour the former, but perhaps have little choice given they are painted into an interest rate corner. With burgeoning debt levels, encouraged by historically low interest rates, any meaningful upward interest rate move could have severe financial consequences and cause the economic recovery to hit a roadblock. Further, ultra-low interest rates have stimulated growth assets (equity and property) and encouraged speculation on a now almost universal view that “the Bank’s got your back”. Central Banks appear to have added protecting stock markets to their mandates, given the positive wealth effect impact on demand.

Supply Chains

Rapid shifts in demand have severely tested logistics and supply chains in recent months

The stimulus measures have had ramifications, with rapid and large shifts in demand severely testing supply lines in recent months. Logistics and associated costs have become a headache for many industries. From a miners’ point of view, delays and costs may begin to impact the pace of project development, while producers needing to ship materials around the world are seeing the gap between FOB and CFR prices (that is, before and after freight) widening. If a CFR commodity price is up \$50/t, but the shipping costs to get it to market is also up a similar amount, gains are eroded.

Higher commodity prices

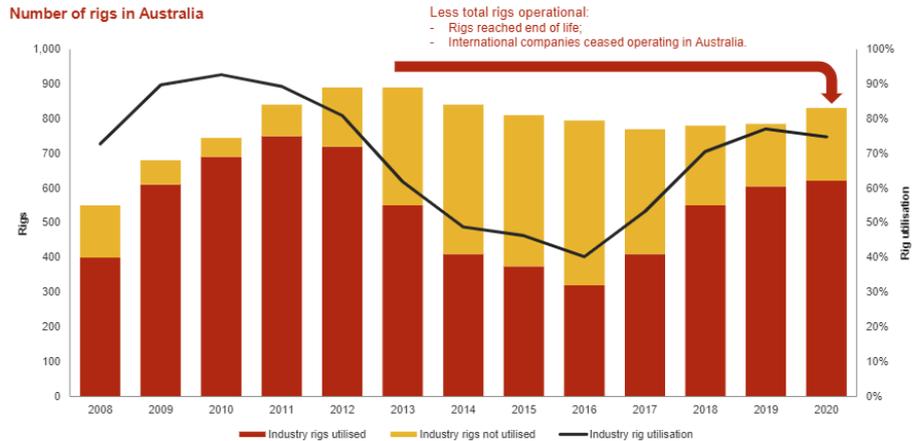
Demand-pull combined with supply issues (compounded by the environmental focus) have elevated many prices

Stimulus influenced demand pull inflation compounded by supply chain issues has resulted in higher prices across the board. In particular, there is a perfect storm in energy markets (see the sharp rise in prices in Figure 6) as the environmental push has stymied supply while demand has concurrently jumped. While this should trigger a longer-term supply response (and a realisation that switching to zero carbon energy is not like flicking a light switch), there is also a danger it reduces demand and stops the global recovery in its tracks. As the saying goes, “the cure for higher prices is ... higher prices”. In our view the transition to lower carbon, never mind zero carbon, will take decades to unfold and “dirty” sources of energy required for years to come (whether we like it or not).

Skills and other shortages

The uncertain situation is exacerbated by shortages of skills and equipment in many industries and regions. Mining is no exception, and Western Australia’s mining sector is desperate for certain skills. The Chamber of Commerce and Industry WA’s recent Business Confidence Survey found 9 in 10 resource businesses identify skills shortages as a barrier to business. The development phase requires more people than the operations phase, posing challenges for miners developing projects. It is compounded by high utilisation levels and little extra capacity for most gear. For example Driller DDH1 (ASX:DDH) provides a useful chart showing the utilisation levels of drilling rigs in Australia in Figure 25, which we expect will have got worse in 2021.

Figure 25: Rig capacity in Australian drilling market.



Shortages of skills and equipment in certain sectors have compounded the problems, potentially stretching project timelines

Source: DDH, from Australian Drilling Industry Association data

Over-exuberance

Positive sentiment, which is often evident in the valuations of explorers, could subside when the unconstrained speculative “what-if” scenario meets the reality of “when and how” as a project moves closer to development. At this point, numbers will start to factor in some of the above-mentioned risks such as costs, shortages, and timelines. We expect projects will in most cases move toward development and construction, but due to the issues highlighted above, expect timelines to be stretched, perhaps significantly. A less cautious approach to sovereign risks as miners target new commodity sources in new locations is also a growing risk. Finally, producers are also at risk if management, enticed by higher commodity prices, aggressively chase volume without paying adequate attention to margin.

The current environment could see over-exuberance amongst investors and project promoters

China uncertainty

Finally, China is a conundrum. It remains the world’s largest consumer of many materials, but its future growth and trade ties are less clear. Politically, it escapes the short election cycle which drives most western economies’ political decision making, allowing for longer-term plans to be made and executed. As the world shifts from globalisation to insularisation (a process which gained momentum under Trump), China is adjusting the levels of capitalisation, entrepreneurship, and private profit it appears comfortable with. Trade ties have soured with Australia and other western democracies, and China is making efforts to obtain the raw materials it does not have internally from other countries (for example iron ore from West Africa). Further, it appears to be flexing its geopolitical muscles more aggressively (with the South China Sea and Taiwan a hotspot), creating a further level of uncertainty. The world is likely to become more polarised in the coming years, and fence-sitting increasingly uncomfortable.

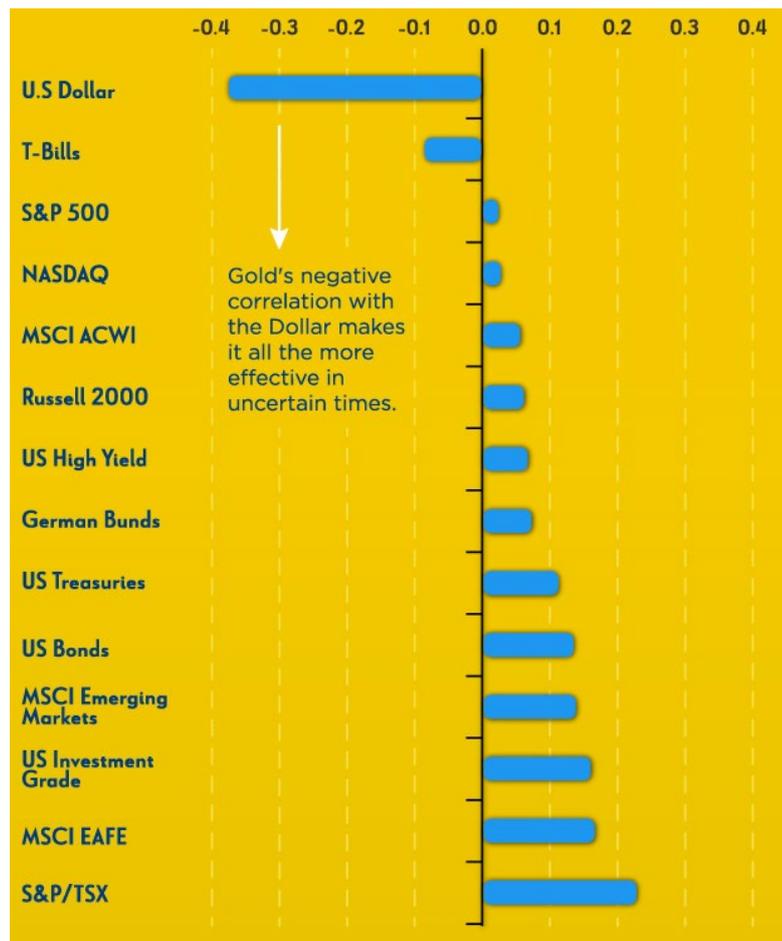
China remains a conundrum

Gold has a place

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 (see Figure 26).

Figure 26: Gold’s historical correlation with other assets.

The uncertainty and risks highlighted above cement our view that gold has a place in an investment portfolio



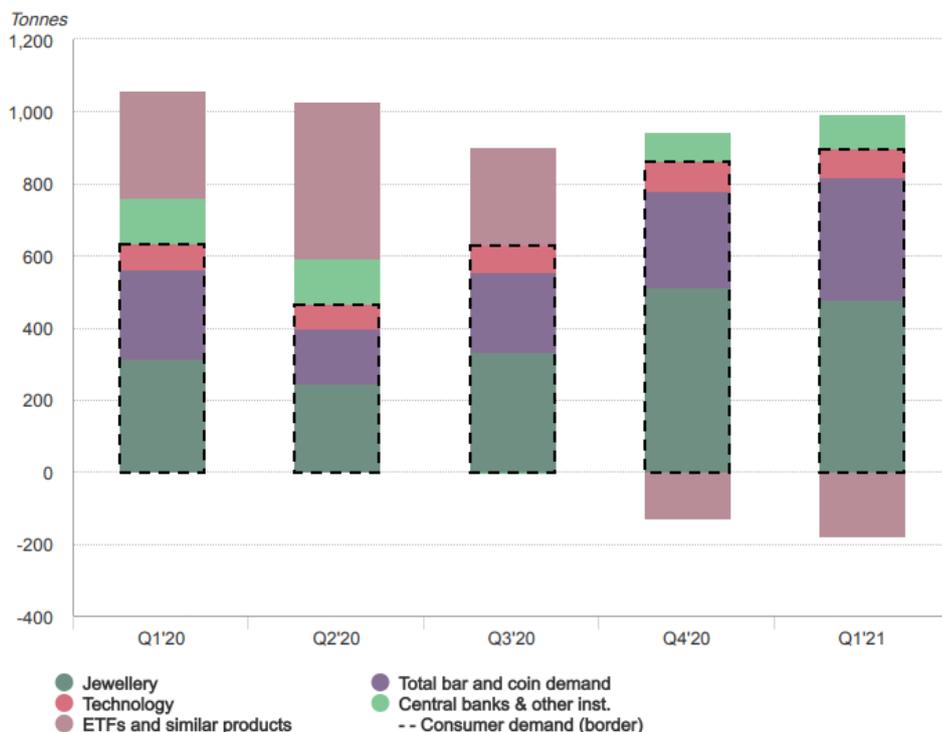
Source: Visual Capitalist, April 2021 (monthly data from Jan 1980 to Sep 2019)

Investment flows can be a significant swing factor in the demand for gold (see Figure 27), with ETF inflows and outflows impacting price. From the start of 2020, the gold price climbed 24%, coinciding with strong demand from ETF’s. This demand reversed in 4Q 2020, with ETF outflows subsequently being partly responsible for the slow downward trend in the gold price.

Investment outflows in recent quarters have coincided with a languishing gold price

It would not be surprising to see ETF inflows back into gold sometime during our measurement period for the 2021 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.

Figure 27: Gold quarterly demand by sector.



We would not be surprised to see investment inflows sometime over the next 12 months, although can't predict timing

Source: World Gold Council (data to 31 March 2021)

Miners rushing to get set (M&A)

M&A is likely to be on boardroom agendas

Acquisition is likely to be a central boardroom agenda item for many companies. There are several plays in progress, including some that will take a player or two out of the game for now. Those that have served notice of appetite for more deals include NST (portfolio management), EVN (ongoing portfolio management), IGO (thirst for battery metals) Glencore (CSA for sale again), SLR (\$360M of lazy cash) and PRU (if something comes along). One of RMS and GOR will also be back asset hunting soon. Offshore interest in ASX miners is ever present. We are at the stage of the cycle when output (and depletion) is high, and resource renewal is a priority.

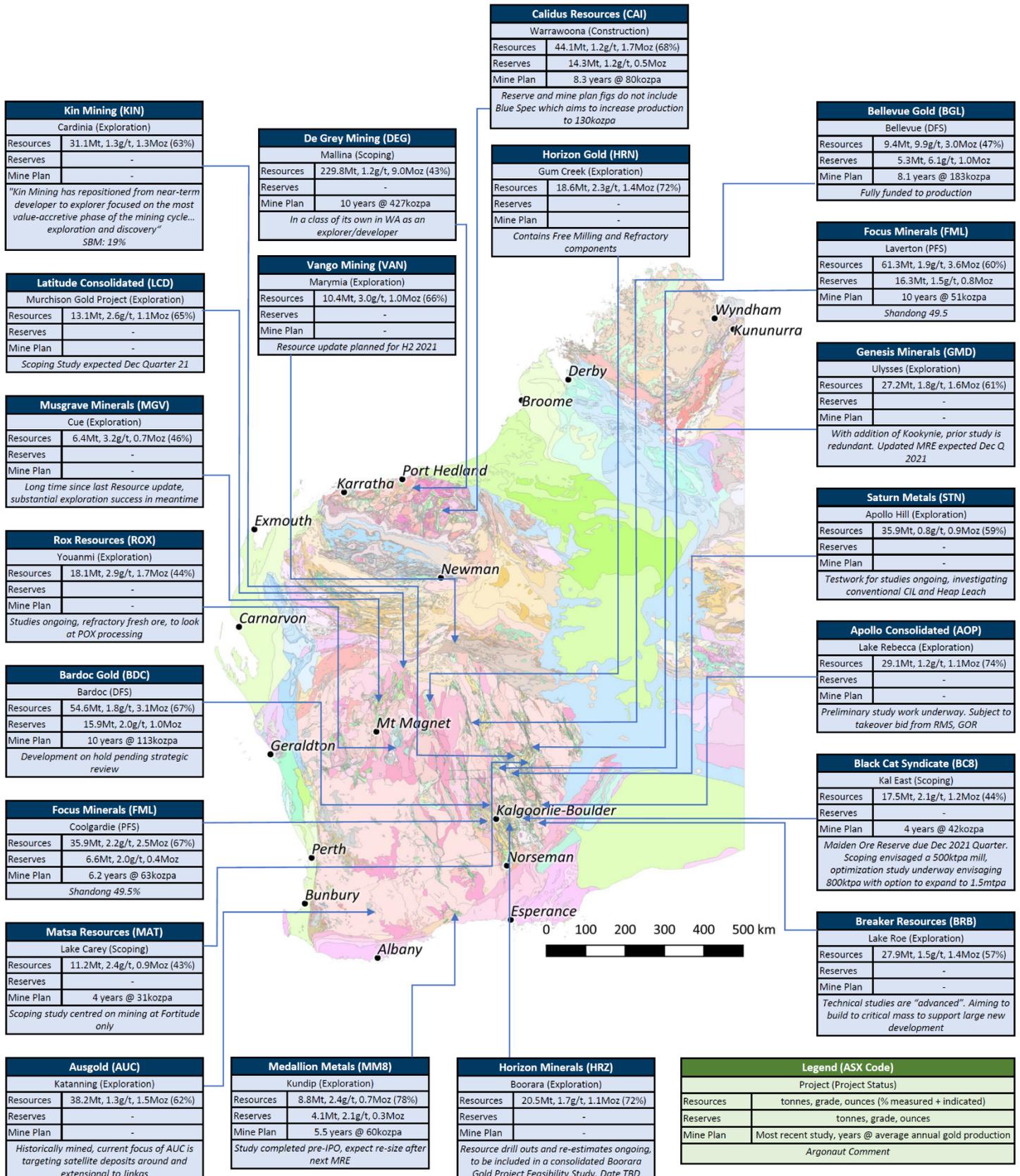
Potential targets are scattered through WA's infrastructure dense gold fields (see Figure 28). Independent Resource owners in the main corridors are under the constant watch of their mill owning neighbours. Assets of size anywhere are highly sought after. De Grey's Mallina project stands out as a target for the big six gold producers.

We expect this to play out across all commodities

Copper and nickel projects of decent size are enjoying a resurgence of interest from established players. Massive low grade projects previously considered sub-economic are off the shelf and likely to increasingly come under serious consideration by the controllers of capital.

There is a growing call to diversify supply chains of certain minerals, including lithium, graphite and rare earths. The jostling for position in the new, battery economy has led to more corporate activity, with the resource owners holding the aces.

Figure 28: Select WA gold projects with substantial Resources.



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



SPEC BUY

Current Price \$0.12
Valuation \$0.27

Ticker:	BEM		
Sector:	Metals & Mining		
Shares on Issue (m):	217.4		
Market Cap (\$m):	26.1		
Cash Est. (\$m)	5.8		
Debt Est. (\$m)	Nil		
Enterprise Value (\$m):	20.3		

52 wk High/Low:	\$0.21	\$0.04
12m Av Daily Vol (m):	2.3	

Projects	Stage		
Maniry	Scoping Study		

Mineral Resource	Mt	% TGC	kt (TGC)
Maniry	20.2	6.5	1,316.3

Cashflows	2020	2021
Operating Cashflow	-1.8	-2.3
Investing Cashflow	0.0	0.0
Financing Cashflow	1.6	7.7
Cash Balance	1.1	6.6

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

Substantial Shareholders:		
Lithium Australia NL	6.0%	

Share Price Graph and Trading Volumes



BlackEarth (BEM)

Expanding Maniry

Analyst: John Macdonald

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. Signs of primary material shortages in China suggest the supply side response from China to rising demand might be muted.

The race is on to build graphite to anode supply chains outside China, from a zero base. Natural graphite supplies are highly fragmented according to quality and specification. Maniry is an under-appreciated natural graphite play that can address market weaknesses.

Black Earth has outlined a starting 10 year resource at Maniry in Madagascar as part of a Scoping Study (released in 2019) and has since engaged with and lined up a series of arrangements with upstream participants in the expandable, refractory, and battery anode markets. Subject to final approval and completion of a feasibility study, engineering designs and costings are expected by April 2022; on track for Maniry commissioning in mid 2023.

Project Location

Overview: Maniry is located in south-west Madagascar approximately 180km south-east of Toliara and 225km north-west from Port d'Ehoala and comprises an Exploitation Permit (PE/5394) and five Exploration Permits. The project area covers a total of 142km² and is accessible by a 170km sealed road from the port of Port d'Ehoala, and 40km by dirt roads through the Ampanihy township (the local township of the project). Graphite was first discovered at Maniry in 2012.

Overview

Scoping Study: The Maniry scoping study was completed in January 2019 and considered indicated resources of 8Mt at 7.1% TGC mined at 0.9:1 waste to ore over ten years utilising conventional open pit methods. Estimated capital costs are US\$41M for stage 1 (0.5Mtpa throughput) plus US\$29M in year 4 for a stage 2 upgrade to 1.0Mtpa throughput. Key infrastructure requirements for Stage 1 include the construction of a processing plant (with complementary equipment, office and plant buildings), diesel power station, TSF, water supply / water catchment dam, accommodation village and access roads within the plant and the broader project site. Stage 2 will require increased TSF capacity (to accommodate the higher deposition rate), on site power generation, water supply and camp facilities and will require an allowance for access road upgrades. A weighted average sales price of US\$1,215/t FOB of concentrate product was used based on internal studies, generating a post-tax NPV₁₀ and IRR of US\$78.4M and 35.4% respectively.

Maniry could be commissioned in mid-2023

Ongoing works: BEM has since commenced a feasibility study which is targeted for completion late in 2021. A primary task within the study is to secure offtake agreements for +70% of the scoping study’s US\$70-100Mpa revenue target. Graphite from the Maniry Project has met specifications consistent with those required by expandable graphite, refractory and lithium-ion anode markets. Maniry products will necessarily be spread across these segments.

Development: 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 January 2022. Upon approval BEM expects to submit applications for a Global Environment Permit and receive a decision by the end of March 2022. Engineering design and final costings are scheduled for completion by April 2022. Allowance of 3 months for financing and 12 months construction would see Maniry commissioned in mid 2023. In July 2021 BEM secured the right to export 30kt of graphite concentrate through the Port d’Ehoala (formerly Fort Dauphin). Maniry is 250km by road from Port d’Ehoala, built in 2009 by Rio Tinto for exporting mineral sands, which has sufficient installed capacity to handle all planned graphite exports from southern Madagascar.

BEM uses a weighted average sale price of US\$1,215/t FOB in studies

Table 7: Key scoping study parameters.

Parameter	Units	Stage 1 and 2
Mine life (indicated ore)	years	10
Process throughput	Mt/y	0.5 Mt/y for Year 1 to 3 1.0 Mt/y for Year 4
Average feed grade	% TGC	6.3
Recovery rate for graphite	%	93
Nominal concentrate production	Kt/y	30 for Year 1 to 3 60 from Year 4 to 10

Source: BEM

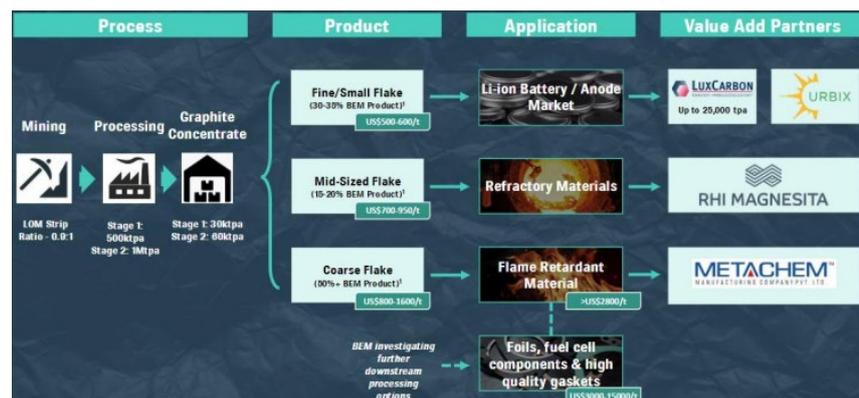
Table 8: Product revenue assumptions and other key commercial assumptions

Parameter	Units	Value
Graphite average basket price	(US\$ /t, real)	1,215
Discount Rate	%	10
Exchange Rate	AUD/USD	0.73

Source: BEM

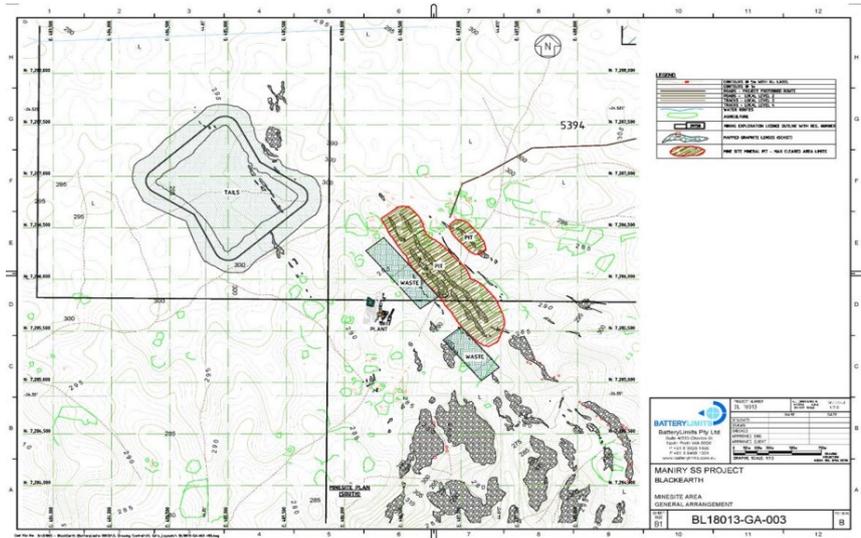
Maniry graphite meets the specs of multiple end uses

Figure 29: Maniry graphite meets the specification of multiple end uses.



Source: BEM

Figure 30: Proposed mine site layout.



Source: BEM

BEM is targeting expandable graphite as a cornerstone revenue stream

De-risking Maniry and Upside to Scoping Study

Sales bases covered: Extensive tests show efficient recovery of concentrates from Maniry that can consistently exceed specification for the full range of graphite applications. BEM is establishing a presence in expandable graphite as a cornerstone revenue stream and has separate agreements that target the deeper foundry and growing battery anode sectors.

Expandable Market: In June 2021 BEM signed a MOU with India based Metachem Manufacturing Company Pvt. Ltd (Metachem), to build a 2,000tpa expandable graphite production facility in India at an estimated cost of US\$3.5M. This agreement was formalised in October 2021 which targets first production in July 2022. The JV has also signed an offtake agreement with Austrian group Grafitbergbau Kaisersberg GmbH, providing for BEM/Metachem to sell up to 2,500tpa of expandable graphite from their proposed plant. Concentrate produced from Maniry can also be used as a feed source for the production facility.

Refractory Market: In August 2020 BEM signed a binding MOU with the world's largest supplier of high grade refractory products, Austrian based RHI Magnesita (RHIM). Under the MOU, BEM is working with RHIM to tailor-make graphite concentrate samples and products for RHIM. RHIM is testing and evaluating BEM's samples in different sizes and at different stages, providing feedback and technical advice to optimise the products. Subject to the final results of product testing, BEM intends to sell and RHIM intends to purchase graphite concentrate product from the Maniry Project.

Battery Anode Market: In February 2021 BEM signed an MOU with Urbix Inc. – a US based company developing graphite anode materials. Urbix is building a 24ktpa natural graphite purification facility in Mesa, Arizona that uses a green alternative technology to hydrofluoric acid wash. Under the MOU, BEM intends to supply graphite concentrate to Urbix when Urbix's facility is complete, on a schedule to be confirmed. BEM and Urbix further propose a JV to build a purification facility in Madagascar or Western Australia. In

February 2021, BEM agreed to buy up to 25kt of natural graphite concentrate within a three-year period from graphite concentrate trader and processor Luxcarbon GmbH, of Germany. The agreement covers BEM's commitment to Urbix, with third party concentrate known to BEM as suitable for purification. Luxcarbon also agreed to exclusively market and sell 25ktpa of product for three years from Maniry and BEM's proposed JV with Urbix. The arrangements are designed to secure BEM's marketing channels while Maniry is permitted and built.

Mine life extensions: BEM has concentrated drilling and testing on selected graphite lenses. Maniry hosts a larger set of untested graphite deposits that can potentially support any feasible expansion.

Feeding demand: Supply insecurity has set in for natural graphite, which is a critical battery component. Governments and car makers are actively encouraging new investment. Signs of primary material shortages in China suggest the supply side response from China to rising demand might be muted.

Valuation

Argonaut's analysis is based mainly on study parameters, and we derive a corporate valuation of \$0.27 per share

Argonaut has a discounted cash flow model for the Maniry Project based mainly on the development parameters set out in the scoping study. An inventory of 30Mt of graphite ore grading 6.5% is used on the assumption that deposits outside current resources will be mined. A real, after tax discount rate of 8% is used in net present value estimation. An estimate of the NPV of corporate overhead costs is included in the valuation. Future tax benefits are added back as an estimate of their present value. Maniry delivers an NPV₈ of \$120M (or 27cps).

Table 9: Valuation Summary.

Share Price Valuation (NAV)	\$M	cps
100% Maniry 8% DR after tax	196	44.1
Other prospects		
Debt		
Corporate overheads	-29	-6.5
Cash	7	1.5
Tax benefit		
Option value/equity dilution	-54	-12.0
Total	120	27.0

Source: Argonaut

SPEC BUY

Current Price \$1.01
Valuation \$1.40

Ticker: CTM
Sector: Metals & Mining

Shares on Issue (m): 358.3
Market Cap (\$m): 361.9
Cash Est. (\$m): 16.0
Debt Est. (\$m): Nil
Enterprise Value (\$m): 345.9

52 wk High/Low: \$1.17 \$0.51
12m Av Daily Vol (m): 0.9

Projects Stage
Jaguar Nickel Project Resource Development

Mineral Resource	Mt	Ni (%)	Ni (kt)
Jaguar Nickel Project	58.9	0.96%	562.6

Cashflows	2020	2021
Operating Cashflow	-3.6	-8.1
Investing Cashflow	-0.2	-1.2
Financing Cashflow	12.2	24.8
Cash Balance	9.7	24.1

Directors:

Didier Murcia	Chairman
Darren Gordon	Managing Director
Bruno Scarpelli	Executive Director
Mark Hancock	Non-Executive Director
Chris Banasik	Non-Executive Director

Substantial Shareholders:	%
Sprott Inc.	9.6%
Mccusker Holdings Pty Ltd	8.0%
Harmanis Holdings	5.2%
Dundee Corporation	5.1%

Share Price Graph and Trading Volumes



Centaurus Metals (CTM)

A Big Cat in the Green Nickel Jungle

Analyst: George Ross

Quick Read

In late May, CTM reported results from the [Jaguar Value-Add Scoping study](#). This study assessed the viability of producing a nickel sulphate product at the Company's flagship Jaguar Nickel Sulphide development project (Brazil). Jaguar's unusual style of sulphide mineralisation generates high flotation recoveries resulting in strong project economics. Our financial model for the Jaguar development generates an NPV₉ of \$979M over an initial 13 year mine life. Our modelling includes development capex of US\$294M inclusive of US\$42M in contingency. We model a C1 cost of between ~US\$3.6/lb and US\$4.3/lb over life of mine. The project will produce an average of 21ktpa of nickel in sulphate. Using a US\$16,500/t nickel metal price we estimate an average annual NPAT of A\$137M over life of mine. Excellent potential exists to extend mine life and or upscale planned production through Reserve expansion. A Resource update is scheduled for late 2021.

Key Points

Momentum building: Project momentum continues to build for development of the Jaguar nickel-sulphide deposit. May's Value-Add Scoping study for production of sulphate products has highlighted the strong economics of the project.

Resource will get bigger and better: CTM is expected to complete 60,000m of drilling during CY2021. The majority of drill metres are being directed towards Resource growth and improvement to JORC classification. We anticipate the update will increase Resource tonnage by 20%, with a corresponding increase to contained nickel metal tonnes.

Top of class carbon footprint credentials: Jaguar's production was likely to be exceptionally green. Pleasingly, our assessment has since been validated by ESG research specialists Skarn Associates who have graded CTM's Value-Add nickel production better than 97% of the market

Project Overview

In late May, CTM reported results from the Jaguar [Value-Add Scoping study](#). This study assessed the viability of producing a nickel sulphate product at the Company's flagship Jaguar Nickel Sulphide development project (Brazil). This study differed from the earlier [Base Case study](#), which was limited to a conventional mill and flotation flowsheet.

Argonaut's financial model for the Jaguar development generates an NPV₉ of \$979M over an initial 13 year mine life. We have allowed for development capex of US\$294M inclusive of US\$42M in contingency.

Ore will be sourced from eight deposits with a mix of open pit and underground mining. Approximately 35% of lower grade ore will be beneficiated with ore sorting technology prior to being blended with standard run of mine material for comminution and flotation. The flotation circuit will be optimised for recovery over grade. The resulting intermediate

Robust NPV₉ of \$979M over an initial 13 year mine life

A nickel sulphate product is expected to attract a 100% metal payability

Construction is scheduled to begin second half of CY2023

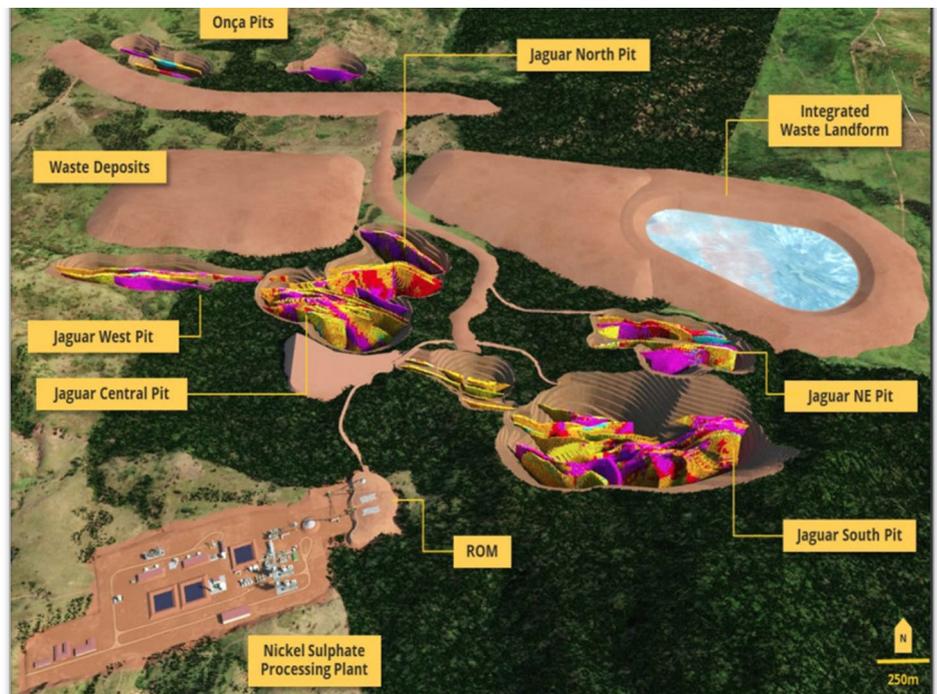
Resource likely to grow and improve

concentrate will then be fed to hydrometallurgical circuits for sulphide dissolution, metal purification and final precipitation of refined sulphates.

Under the development scenario Jaguar is expected to produce in excess of 21kt of nickel metal in purified sulphate per annum. Nickel in a sulphate product attracts a 100% (or higher) metal payability versus a 70-75% payability in sulphide concentrate.

Key environmental permitting documentation has been lodged to relevant authorities. CTM is well positioned to navigate the Brazilian environmental approval process, having done so previously. Construction is scheduled to begin in the second half of CY2023 with first production in the second half of FY2024.

Figure 31: Isometric downward view to the north of the Jaguar project deposits and proposed mine infrastructure.



Source: CTM

Resource will get bigger and better

The Jaguar global Mineral Resource Estimate (MRE) is currently reported as 58.9Mt grading 0.96% Ni for 562,600 tonnes of contained nickel metal. Approximately one third of total Resource tonnage (19.9Mt) is categorised at Indicated, with the remainder being Inferred.

CTM’s exploration team is expected to complete 60,000m of drilling during CY2021. The majority of drill metres are being directed towards Resource growth and improvement of JORC classification. An updated MRE is due for release late this year. We anticipate the update will increase Resource tonnage by ~20%, with a corresponding increase to contained nickel metal tonnes.

Top of class carbon footprint credentials

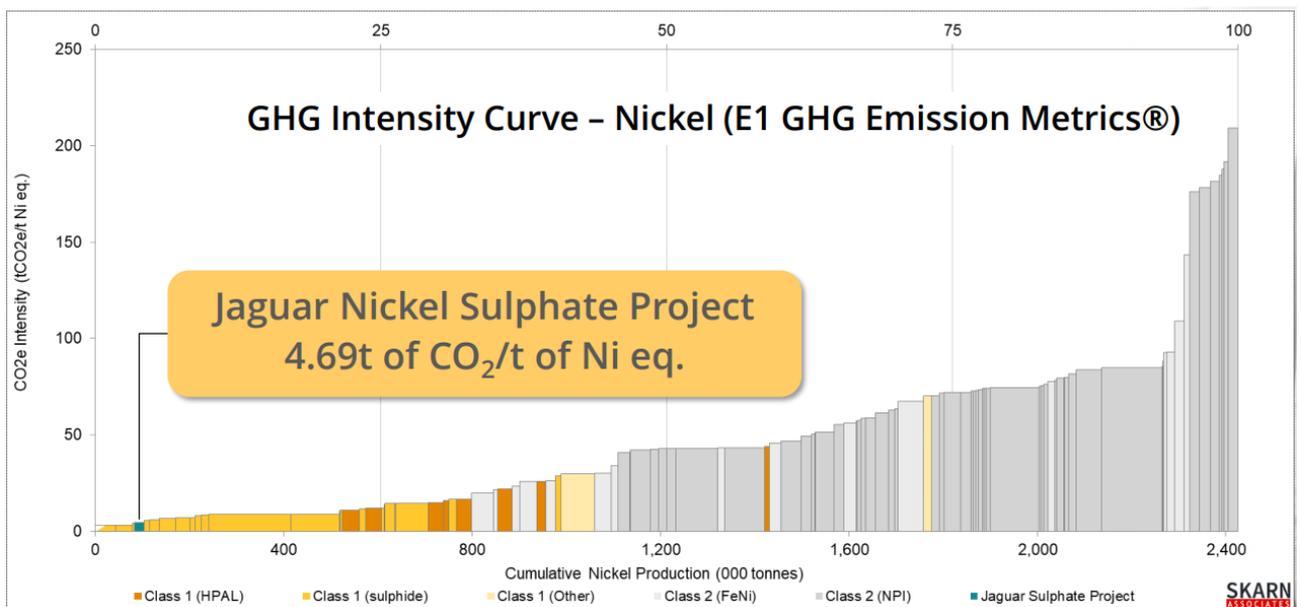
Jaguar will produce nickel product at a lower carbon footprint than 97% of global peers

In our research [The Emergence of Green Nickel](#) we examined the carbon intensity of various pathways to nickel metal and identified that Jaguar’s production was likely to be exceptionally green. Pleasingly, our assessment has since been validated by ESG research specialists Skarn Associates who have graded CTM’s Value-Add nickel production better than 97% of the market ([CTM announcement](#)).

Jaguar’s Value-Add development scenario is expected to produce nickel at a carbon cost of 4.69t of CO₂ per tonne of nickel equivalent metal. This exceptionally low emission result is a function of relatively high mined grades and utilisation of 80% renewably sourced processing power.

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

Figure 32: Greenhouse gas intensity curve for nickel production.



Source: CTM/Skarn Associates

Recommendation & Company Valuation

Argonaut maintains a SPEC BUY recommendation and a \$1.40ps valuation for CTM. Our valuation includes an aggressive 50% risk discount to reflect project maturity of feasibility study and technical risk associated with a less common processing pathway.

Table 10: Valuation summary.

Company Valuation summary	A\$M	A\$/sh
Jaguar Project NPV9 (Risk Discounted 50%)	489	1.37
Jambreiro Project	10	0.03
Exploration, all sites	148	0.41
Corporate overheads	-18	-0.05
Cash and bullion	20	0.06
Current debt	0	0.00
Tax benefit	0	0.00
Hedging	0	0.00
Option/equity dilution	-147	-0.41
Total	502	1.40

Source: Argonaut

Centaurus Metals

Equities Research

Analyst: George Ross

Recommendation **Speculative Buy**
 Current Price **\$1.01**
 Valuation **\$1.40**

Sector **Metals & Mining**
 Issued Capital (Mshs) **358**
 Market Cap (M) **\$ 362**

Friday, 5 November 2021

Profit & loss (A\$M) 30 June	Unit	2024E	2025E	2026E	2027E
Sales Revenue	A\$M	0	319	502	502
+ Other income/forwards	A\$M	0	0	0	0
- Operating costs	A\$M	-2	-100	-156	-160
- Royalties	A\$M	0	-15	-23	-23
- Corporate & administration	A\$M	-4	-4	-4	-4
Total Costs	A\$M	-6	-118	-183	-187
EBITDA	A\$M	-6	201	319	315
- margin		0%	63%	64%	63%
- D&A	A\$M	0	-59	-85	-78
EBIT	A\$M	-6	142	234	237
+ Finance Income/Expense	A\$M	-20	-18	-6	0
PBT	A\$M	-26	124	228	237
- Tax expense	A\$M	4	-19	-34	-36
- Impairments and other	A\$M	0	0	0	0
NPAT	A\$M	-22	106	194	201

Cash flow (A\$M)	Unit	2024E	2025E	2026E	2027E
+ Revenue	A\$M	0	319	502	502
- Cash costs	A\$M	-7	-163	-252	-257
-Tax payments		3	-13	-30	-35
+ Interest & other	A\$M	-20	-18	-6	0
Operating activities	A\$M	-24	126	214	210
- Property, plant, mine devel.	A\$M	-392	-4	-33	-19
- Exploration	A\$M	-2	-2	-2	-2
- Feasibility Studies		0	0	0	0
Investment activities	A\$M	-394	-6	-35	-21
+ Borrowings	A\$M	240	0	0	0
- Dividends	A\$M	0	0	0	0
+ Equity	A\$M	164	0	0	0
Financing activities	A\$M	404	0	0	0
Cash change	A\$M	-13	120	179	188

Balance sheet (A\$M)	Unit	2024E	2025E	2026E	2027E
Cash	A\$M	182	301	481	669
Other Current Assets	A\$M	0	0	0	0
Total current assets	A\$M	182	301	481	669
Property, plant & equip.	A\$M	392	338	285	226
Investments/other	A\$M	0	0	0	0
Total non-curr. assets	A\$M	392	338	285	226
Total assets	A\$M	573	639	766	895
Trade payables	A\$M	56	21	39	35
Short term borrowings	A\$M	133	240	27	0
Other	A\$M	49	21	40	35
Total curr. liabilities	A\$M	105	42	79	70
Long term borrowings	A\$M	267	27	0	0
Other	A\$M	0	0	0	0
Total non-curr. liabil.	A\$M	267	27	0	0
Total liabilities	A\$M	372	69	79	70
Net assets	A\$M	201	570	686	825

Resource	Mt	Ni %	Cu %	Co ppm	Cont. Ni (kt)
Jaguar South (II)	18.7	0.97	0.05	206	181
Jaguar Central (II)	10.2	1.00	0.06	268	102
Jaguar North (II)	3.3	1.09	0.18	350	36
Jaguar Central North(I)	5.8	0.80	0.05	210	47
Jaguar North East (I)	8.3	0.78	0.09	253	65
Jaguar West (I)	5.7	0.80	0.04	150	45
Onca Preta (II)	3.7	1.58	0.08	536	58
Onca Rosa (I)	3.2	0.88	0.06	251	29
Total Global MRE	58.9	0.96	0.07	249	563

Financial ratios	2024E	2025E	2027E	2028E
GCFPS Diluted (Ac)	-6	34	60	59
CFR (X)	0	2	1.7	1.7
EPS Diluted (Ac)	-4	22	39	41
PER (X)	0	4	2.6	2.5
DPS (\$)	0	0	0%	0%
Yield (%)	0	0	0%	0%
Interest cover (X)	0	8	43	0
ROCE (%)	0	0	34%	29%
ROE (%)	0	0	33%	29%
Avg Gearing (%)	0	83%	17%	0%

Operations summary	2024E	2025E	2027E	2028E
Jaguar				
Ore processed (Mt)	0.0	1.7	2.7	2.7
Ni Head grade (%)	0.0	1.0	1.0	1.0
Met. Recovery (%)		80%	80%	80%
Share of Ni in Final Product (t)	0.0	13599	21415	21415
Share of Payable Ni (t)	0.0	13599	21415	21415
Cost per milled tonne (US\$/t)		64	63	65
C1 Costs (US\$/lb)	0.0	3.6	3.6	3.7
AISC (US\$/lb)		4.2	4.5	4.1
Growth capital (\$M)	0.0	4	33	19

Price assumptions	2024E	2025E	2027E	2028E
AUDUSD	0.75	0.75	0.75	0.75
Nickel (US\$/t)	16500	16500	16500	16500
Nickel (A\$/t)	22000	22000	22000	22000

Jaguar Project Valuation	A\$M	A\$/sh
Jaguar Project NPV9 AUD	979	2.73
Risk Discount (Study Maturity -35% & Technical -15%)	-489	1.37
Jaguar Project NPV9 (Risk Discounted 50%)	489	1.37

Company Valuation summary	A\$M	A\$/sh
Jaguar Project NPV9 (Risk Discounted 50%)	489	1.37
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Cash and bullion	20	0.06
Current debt	0	0.00
Tax benefit	0	0.00
Hedging	0	0.00
Option/equity dilution	-147	-0.41
Total	502	1.40

Directors, management	
Didier Murcia	Chairman
Darren Gordon	Managing Director / CEO
Bruno Scarpelli	Executive Director
Mark Hancock	Non-Executive Director
Chris Banasik	Non-Executive Director
Roger Fitzhardinge	GM - Exploration & Growth
Wayne Foote	GM - Operations
John Westdorp	Chief Financial Officer

Shares	2024E	2025E	2027E	2029E
New shs issued/exerciseable	92	0	0	0
Average issue price	1.8	0	0	0
Ordinary shares - end	492	492	492	492
Diluted shares - end	492	492	492	492



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BUY

Current Price \$1.09
Valuation \$1.64

Ticker: **DEG**
Sector: **Metals & Mining**

Shares on Issue (m): **1,406.4**
Market Cap (\$m): **1,526.0**
Cash Est. (\$m) **156.0**
Debt Est. (\$m) **Nil**
Enterprise Value (\$m): **1,370.0**

52 wk High/Low: **\$1.61 \$0.81**
12m Av Daily Vol (m): **5.8**

Projects **Stage**
Mallina Gold Project Scoping Study

Mineral Resource **Mt** **g/t Au** **Moz Au**
Mallina Gold Project 229.8 1.2 9.0

Cashflows **2020** **2021**
Operating Cashflow -17.4 -4.1
Investing Cashflow -11.0 -57.3
Financing Cashflow 55.2 104.2
Cash Balance 28.2 70.9

Directors:
Simon Lill Chairman
Glenn Jardine Managing Director
Andrew Beckwith Technical Director
Peter Hood Non-Executive Director
Eduard Eshuys Non-Executive Director
Bruce Parncutt AO Non-Executive Director

Substantial Shareholders: %
DGO Gold 14.5%
Jupiter 5.5%
Invesco 4.8%
Van Eck 4.6%

Share Price Graph and Trading Volumes



De Grey Mining (DEG)

Major Target

Analyst: John Macdonald, Royce Haese

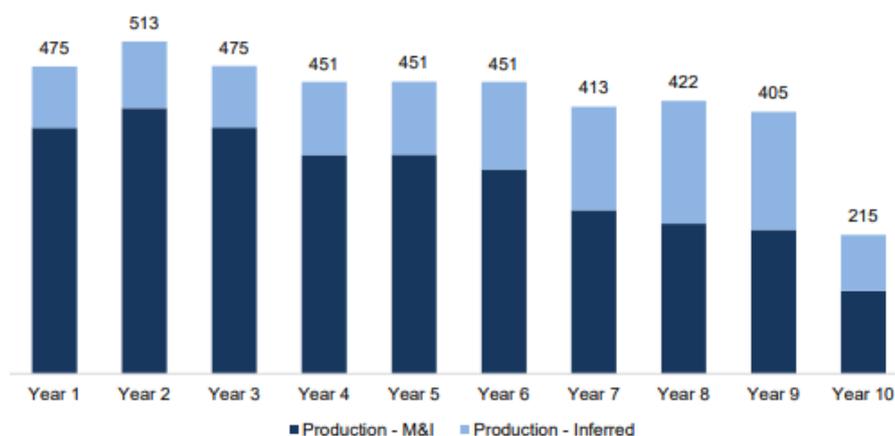
Quick Read

The Mallina Gold Project (Mallina) has grown significantly since last year's BUPs edition and exploration continues to deliver new discoveries (e.g., Diucon and Eagle). Total Mineral Resources for Mallina now stand at 230 Mt @ 1.2 g/t for 9 Moz Au. A recently completed scoping study considered a 10-year operation producing 427kozpa (average LOM), potentially placing Mallina in the hitting zone of major gold miners. An operation of this size would place Mallina in the top 5 producing Australian gold mines and top 3 global gold development projects.

Highly Positive Scoping Study

Scoping Study: The recently completed scoping study (announced September 2021) is based on the June Global Mineral Resource Estimate (MRE) of 230 Mt @ 1.2 g/t for 9 Moz Au and provides the first formal direction on potential development paths. The scoping study considered an open pit mine inventory of 100Mt at 1.4 g/t (4.6Moz contained), mined at 4.8:1 waste to ore (after \$58m pre-strip costs) over 10 years. Capital costs to establish a 10Mtpa operation are estimated at \$835m (\$893m including pre-strip), providing LOM average annual production of 427koz Au. A gold price of A\$2,400/oz was used, generating a post-tax NPV₅ and IRR of \$2B and 49% respectively.

Figure 34: Annual production projections.

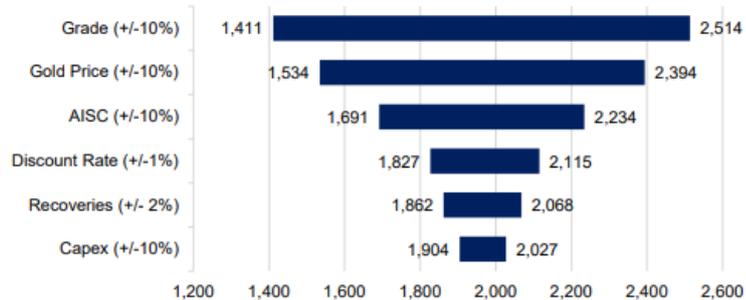


Source: DEG

Upside to scoping study: Diucon and Eagle modelling was carried out before drilling extended these deposits along strike and at depth. Definition and resource extension drilling (in progress) will test about 800koz of inferred mineralisation excluded from the plans. Thus, there exists significant potential to increase gold production rates and / or mine life.

The recently completed scoping study is based on the June MRE

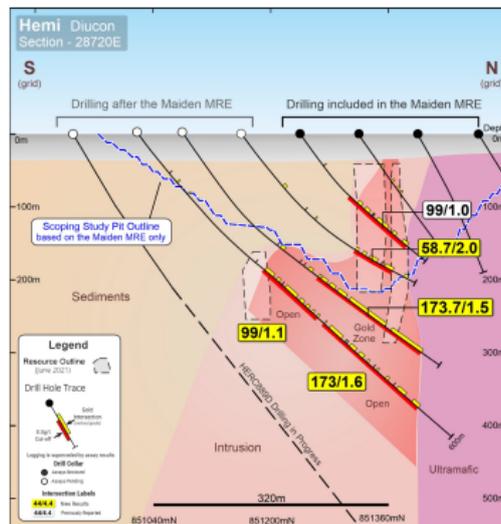
Figure 35: NPV sensitivity



Source: DEG

Figure 36: Diucon Cross Section 28720E showing extensions to mineralisation in new drilling since the MRE.

Extension drilling (in progress) has the potential to add to production and/or increase mine life



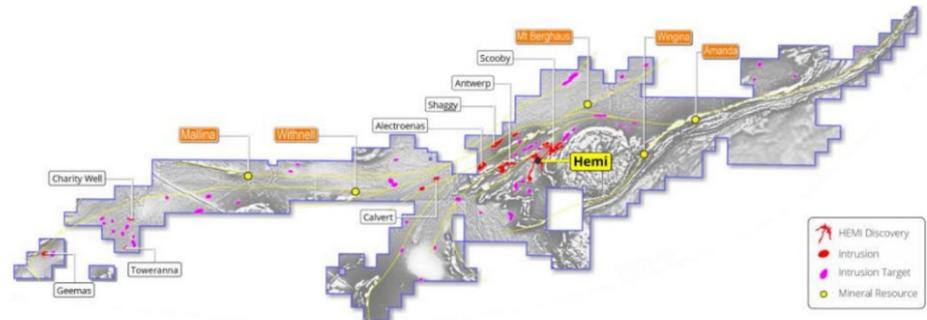
Source: DEG

Project Overview

Overview: Mallina is located ~70km south of Port Hedland in the Pilbara region of Western Australia and approximately 1,600km (17-hour drive) north of Perth. The project has an existing resource of 229.8Mt at 1.2 g/t. De Grey has 100% ownership of Mallina (except for one tenement – E47/2502 – 75%), covering an area of 1,359km². Hemi was discovered in late 2019 after intrusive-related mineralisation at the Toweranna deposit prompted the Company’s geologists to target large-scale intrusive deposits. Gold is associated with pyrite and arsenopyrite mineralisation and generally pervasive in the host rock, rather than concentrated in quartz veins. There are two sealed highways within 10km, two gas pipelines (~5km and ~20km from Hemi) and a 220kV power transmission line from Port Hedland to Karratha.

Mallina is located in the Pilbara region of Western Australia

Figure 37: Hemi Pits and Regional Pits Location Map.



Source: DEG

DEG has boasted a high rate of discovery

High rate of discovery: In June this year, De Grey announced the maiden MRE for Hemi of 192Mt @ 1.1g/t Au for 6.8Moz. The Hemi discovery added to the previously defined regional resource estimate of 37.4Mt @ 1.8g/t Au for 2.2Moz for a Total Global Mallina Gold Project Mineral Resource Estimate of 230Mt @ 1.2g/t Au for 9.0Moz. Continued exploration success will likely deliver further increases in Mineral Resources.

+450kozpa

There are a limited number of operations producing +400kozpa

De Grey / Mallina to become a target: Table 11 below shows 33 projects producing +400koz in 2020. Established, multinational producers with enterprise values (EVs) in the A\$10B-\$65B range dominate ownership of these large-scale gold mines. Newmont (5), Barrick (5), Newcrest (3), Kinross (3), Agnico/Kirkland (3) and AngloGold (2) specialise in and compete for +400kozpa projects.

Table 11: Gold projects producing >400koz in 2020.

Property	Location	Ownership (%)	Operator	2020 production	Reserves	Reserve life	Startup year
				koz	koz	years	
Nevada Operations	USA	61.5	Barrick Gold Corporation	3467	45.2	13	1965
Olimpiada	Russia	100	Public Joint Stock Company Polyus	1229	23.0	17	1996
Pueblo Viejo	Dominican Republic	60	Barrick Gold Corporation	903	10.3	13	2013
Cadia East	Australia	100	Newcrest Mining Limited	843	18.0	24	2013
Kibali	Dem. Rep. Congo	45	Barrick Gold Corporation	808	9.3	12	2013
Lihir	Papua New Guinea	100	Newcrest Mining Limited	776	22.0	30	1997
Loulo	Mali	80	Barrick Gold Corporation	680	8.4	13	2005
Boddington	Australia	100	Newmont Corporation	670	12.7	15	2009
Fosterville	Australia	100	Kirkland Lake Gold Ltd.	640	2.0	4	2005
Geita	Tanzania	100	AngloGold Ashanti Limited	623	2.3	7	2000
Fekola	Mali	80	B2Gold Corp.	623	4.2	8	2017
Canadian Malartic	Canada	50	Agnico Eagle Mines Limited	569	4.4	6	2011
Detour Lake	Canada	100	Kirkland Lake Gold Ltd.	563	15.8	22	2013
Kumtor	Kyrgyzstan	100	Centerra Gold Inc.	556	6.0	12	1997
Paracatu	Brazil	100	Kinross Gold Corporation	542	8.0	15	1987
Tarkwa	Ghana	90	Gold Fields Limited	526	6.1	12	NA
Penasquito	Mexico	100	Newmont Corporation	526	7.1	11	2009
Kupol	Russia	100	Kinross Gold Corporation	511	1.5	4	2008
Tanami	Australia	100	Newmont Corporation	495	5.9	12	1989
Ahafo	Ghana	90	Newmont Corporation	480	6.1	12	2006
KCGM	Australia	100	Northern Star Resources Limited	448	11.6	26	1985
Merian	Suriname	75	Newmont Corporation	461	5.3	12	2016
Blagodatnoye	Russia	100	Public Joint Stock Company Polyus	457	12.0	26	2010
Nataika	Russia	100	Public Joint Stock Company Polyus	456	14.0	30	2017
Sukari	Egypt	100	Centamin plc	452	5.0	10	2009
Veladero	Argentina	50	Barrick Gold Corporation	452	5.2	9	2005
Kyzyl	Kazakhstan	100	Polymetal International plc	450	10.1	31	2018
Telfer	Australia	100	Newcrest Mining Limited	393	5.9	14	2010
El Limon-Guajes	Mexico	100	Torex Gold Resources Inc.	430	1.9	5	2015
Tropicana	Australia	70	AngloGold Ashanti Limited	426	2.7	5	2013
Herradura	Mexico	100	Fresnillo plc	425	6.1	12	1997
Tasiast	Mauritania	100	Kinross Gold Corporation	407	6.3	13	2008
Essakane	Burkina Faso	90	IAMGOLD Corporation	404	3.3	9	2010

Source: S&P Global & Argonaut

There is only one close to construction gold project globally with targeted LOM gold production greater than 400kozpa; Donlin in Alaska (see Table 12 below) is operated and half owned by Barrick.

Table 12: Proposed or under construction gold mines with +230kozspa objective, October 2021.

Property	Location	Ownership %	Operator	M, I&I resource	Resource grade	Au in resource	Market cap	EV	Status	LOM Prod'n
				Mt	g/t	Mozs	A\$M	A\$M		kozspa
Donlin	Alaska	50	Barrick Gold Corporation	634	2.2	45.0	45209	56827	Construction Planned	1130
KSM	British Columbia	100	Seabridge Gold Inc.	7637	0.4	107.3	1723	1665	Prefeas/Scoping	540
Mallina	Australia	100	De Grey Mining	230	1.2	9.0	1616	1564	Scoping	427
Cote	Ontario	64.75	IAMGOLD Corporation	555	0.8	14.0	1589	1286	Construction Started	367
Blackwater	British Columbia	100	Artemis Gold Inc.	614	0.6	11.9	902	684	Construction Planned	321
Stibnite	Idaho	100	Perpetua Resources Corp.	273	1.4	12.1	412	401	Feasibility Complete	301
Livengood	Alaska	100	International Tower Hill Mines Ltd.	578	0.7	12.6	204	189	Prefeas/Scoping	294
Mt Todd	Northern Territory	100	Vista Gold Corp.	360	0.8	9.3	114	106	Feasibility Started	288
Namdini	Upper East	100	Shandong Gold Mining Co., Ltd.	194	1.1	7.0	17284	19542	Feasibility Complete	287
Windfall	Quebec	100	Osisko Mining	22	8.5	6.1	987	779	PEA complete	238
New Prosperity	British Columbia	100	Taseko Mines Limited	1011	0.4	13.2	773	1105	Feasibility	234

Source: S&P Global & Argonaut

Of 35 gold projects identified worldwide by Argonaut as capable of producing more than 400kozspa, less than a handful are operated by independent public companies. The larger the gold operation, the more likely it is to end up as part of a portfolio with sister assets. Mallina aside, there are no +400kozspa gold projects in Australia or North America, proposed or producing, other than those operated by Barrick, Newcrest, Newmont, Kirkland/Agnico, Northern Star or AngloGold Ashanti.

Argonaut believes DEG and Mallina are targets

Argonaut's View: De Grey and Mallina are targets. There are paper premiums, competitive pressures, gold bulls and unmettable growth targets galore among the Majors. Every mining company also faces the challenge of ore depletion and ore quality deterioration over time. Mallina can address many problems for the larger producers with minimum risk and management effort. That said, acquiring control of Mallina becomes not so much a question of price, but assurance of outcome. De Grey management believes it can add further value so an agreed deal is unlikely for now. However, the time will come.

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 2021. Assumptions about Mallina's future development and cash flows are based on De Grey's October 2021 scoping study, with differences in timing and price settings. A real, after-tax discount rate of 6% is used. Future tax benefits are added back as an estimate of present value.

Argonaut derives a corporate valuation of \$1.64 per share

Table 13: Valuation Summary.

Valuation summary	A\$M	A\$/sh
Mallina project 6% real after tax DR	1651	1.28
Exploration, all sites	495	0.38
Corporate overheads	-52	-0.04
Cash	71	0.06
Debt	0	0.00
Tax benefit	15	0.01
Hedging	0	0.00
Option/equity dilution	-70	-0.05
NAV	2,110	1.64

Source: Argonaut

NOT COVERED

Market Cap \$601M
Current Price \$0.64

Ticker:	FFX
Sector:	Metals & Mining
Shares on Issue (m):	938.3
Market Cap (\$m):	600.5
Cash Est. (\$m)	39.7
Debt Est. (\$m)	3.7
Enterprise Value (\$m):	564.5
52 wk High/Low:	\$0.69 \$0.14
12m Av Daily Vol (m):	6.0

Projects	Stage
Goulamina Lithium Project	DFS
Morilla Gold Mine	Operation

Goulamina Resource	Mt	Li₂O (%)	Li₂O (kt)
Indicated & Inferred	108.5	1.5	1,570.0

Cashflows	2020	2021
Operating Cashflow	-3.3	-6.1
Investing Cashflow	-2.0	-49.2
Financing Cashflow	4.0	69.4
Cash Balance	3.8	17.3

Directors:	
Alistair Cowden	Chairman
Michael Anderson	Managing Director
Mark Hepburn	Non-Executive Director
Brendan Borg	Non-Executive Director
Brett Fraser	Non-Executive Director
Bradley Gordon	Non-Executive Director

Substantial Shareholders:	%
Van Eck	5.5%

Share Price Graph and Trading Volumes



Firefinch (FFX)

King of the beasts

Analyst: George Ross

Quick Read

Firefinch's (FFX) Goulamina Lithium Project located in Southern Mali will be spun out as the foundation asset in the Leo Lithium demerger, scheduled for early 2022. Simon Hay, former CEO of lithium company Galaxy Resources, will be appointed Leo Lithium's MD in January 2022, prior to finalisation of the demerger. The initial Goulamina DFS was completed in late 2020 with an update currently underway. The project will be developed under a Joint Venture partnership with Chinese lithium giant Jiangxi Ganfeng Lithium Co with first production scheduled to commence in 2023.

Overview

Goulamina Project: The original Goulamina DFS was completed in late 2020. The project is expected to produce an average of 436kt of SC6 spodumene concentrate per annum over an initial 23 year mine life. The current DFS generates a post-tax NPV of A\$1.26B with initial capital expenditure of US\$194M. The SC6 Li₂O spodumene concentrate product will be characterised by low iron and mica impurities. First production from Goulamina is expected in 2023. Firefinch has engaged Lycopodium to update the Goulamina DFS and incorporate plant & process optimisation that's been agreed with Ganfeng to support the Final Investment Decision.

Ganfeng JV & Leo Lithium Demerger: Firefinch & Jiangxi Ganfeng Lithium Co. will jointly develop the Goulamina Project through a 50:50 Joint Venture. The JV partners have agreed on expediting the project's FID with a target of Q4 2021. The Ganfeng funding is comprised of US\$130M in equity over two instalments and by arranging up to US\$64M in debt to take the project through to production. Shareholder approval for Ganfeng's 50% acquisition of the project has been received.

Firefinch is demerging its interest in the Goulamina project into a separate ASX-listed entity, Leo Lithium. FFX shareholders will receive an in-specie distribution of shares in the new Company and also have the right to subscribe for additional shares in the entitlement offer. Prior to listing, Goulamina is expected to have reached FID and commenced engineering and preliminary works.

Resource & Reserve Upside: Drilling programs scheduled for the next two years will aim to expand and improve Resources, facilitating growth in Reserves. Enlargement of Resources/Reserves is likely to improve mine life and/or underpin enhancements to annual production through resizing of the plant.

Goulamina Lithium Project

The Goulamina project is located 150km south of Mali's capital city Bamako in the Bougouni region. FFX acquired the project in 2016 and by late 2020 had defined a Mineral Resource Estimate of 109Mt grading 1.45% Li₂O. FFX has described considerable potential to increase the size of the open pit Mineral Resources through infill and extension drilling.

Figure 38: Location of the Goulamina lithium project.



Goulamina is located within an existing mining region

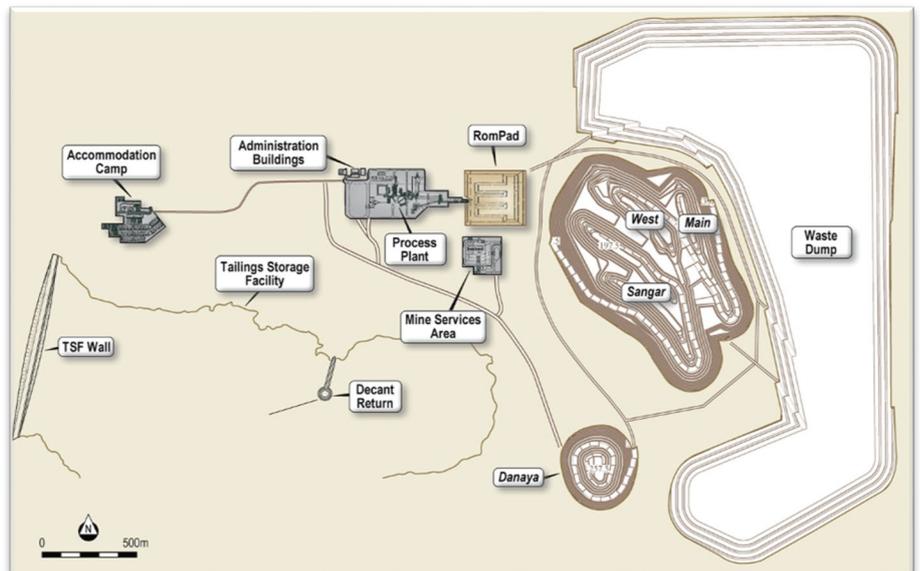
Source: FFX

Definitive Feasibility Study

The October 2020 Goulamina DFS envisages a conventional open pit mining operation with an initial 23 year mine life. Ore will be mined in four successive stages from the main pit and treated through a 2.3Mtpa flotation plant. The satellite Denaya pit will provide additional feed. The life of mine 52Mt Ore Reserve grades 1.51% Li₂O for 790Kt of contained Li₂O.

Existing DFS generates robust economics over a 23 year mine life

Figure 39: Planned Goulamina development infrastructure.



Source: FFX

During the first five years, the operation will produce an average of 436kt of SC6 per annum. Characterisation test work suggests the concentrate is low in mica, iron and other impurities. Extensive metallurgical studies indicate a probable 77% average spodumene recovery.

The final concentrate will be loaded onto trucks for transportation south to the port of Abidjan in the Ivory Coast, via a sealed national highway. The port is a deep-water facility supporting categorized and bulk commodities. Offtake has been secured with JV partner Ganfeng, who've agreed to take up to 100% of the spodumene concentrate.

Current project NPV model is based on a US\$666/t SC6 spodumene concentrate but current pricing is over US\$1,000/t

Pre-production capital costs are estimated at US\$194M. Estimated Cash Costs are US\$281/t and All-in Sustaining Cost (AISC) are US\$313/t of spodumene concentrate over the life of mine.

The project generates a post-tax NPV₈ of A\$1.26B using a flat US\$666/t SC6 spodumene concentrate price. SC6 concentrate is currently trading above \$US1000/t on a CIF China basis.

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.

A Goulamina DFS update is scheduled for release in December of 2021. The update is expected to include plans for a Phase 2 expansion, include an updated plant infrastructure design and refresh input pricing.

Ganfeng JV & Leo Lithium Demerger

Project backed by Chinese lithium giant Ganfeng

In October, FFX reported that all Chinese and Malian government regulatory approvals had been received for the FFX-Ganfeng Joint Venture. The 50/50 JV partnership will see Ganfeng contribute US\$194M in development funding, comprising US\$130M in equity funding and US\$40-64M in debt. The first tranche of Ganfeng's equity funding (US\$34M) is due following completion of conditions precedent.

The Leo Lithium demerger remains on track for the first quarter of 2022. Firefinch currently intends to seek shareholder approval for the demerger in February 2022, with completion and ASX listing late in the March Quarter, 2022. Firefinch shareholders will receive a pro-rata entitlement of shares in Leo Lithium by way of an in-specie distribution.

Seasoned West African veteran Simon Hay will take the helm of Leo Lithium

Mr Simon Hay will join Leo Lithium prior to listing on ASX in the March Quarter. Mr Hay was the former CEO of Galaxy Resources and prior to that, Head of Resource Development for Iluka Resources. Mr Hay also has deep understanding of West African mining projects, having built two mineral sands concentrators in Sierra Leone.

Resource and Reserve Upside

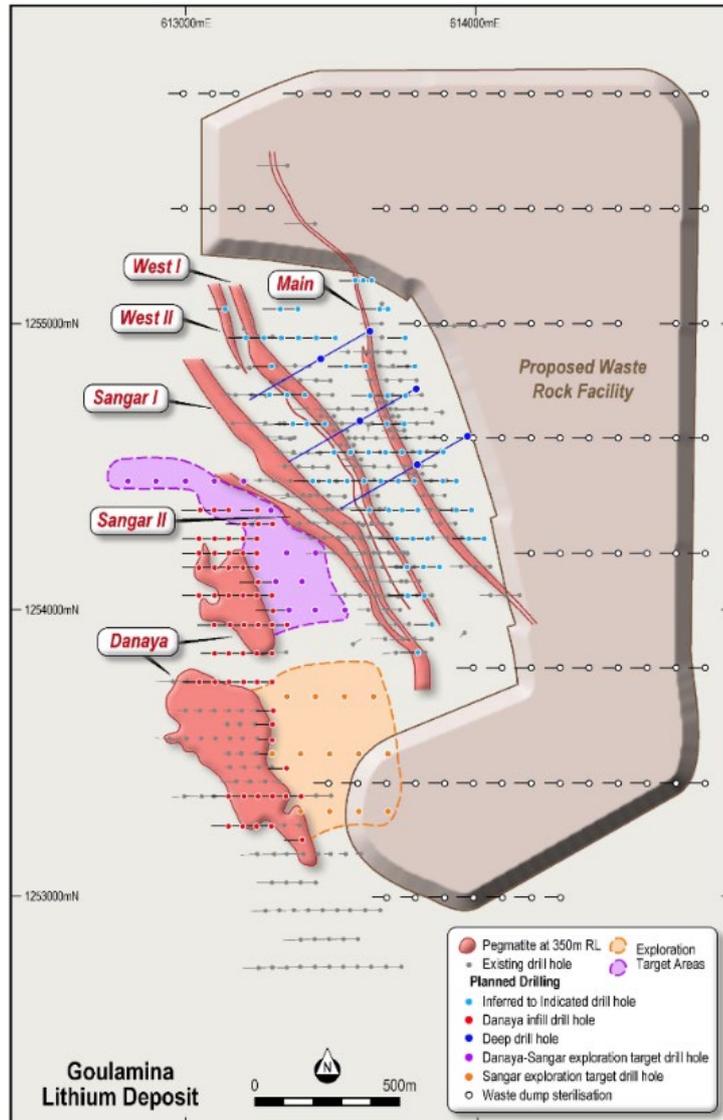
Goulamina's currently planned 23 year mine life is underpinned by a 52Mt Reserve based on a 109Mt Resource. Significant upside exists to expand the current Reserve through drill out and expansion of 43.7Mt of Inferred Resources. Meaningful growth of Measured and Indicated Resource categories will provide an opportunity to expand the scale of the currently proposed operation and/or extend mine life.

Further value upside provided by Resource and Reserve growth

Almost 50km of drilling is planned at Goulamina over the next two years. Planned drilling will include sterilisation, Resource category conversion, Resource extension and deep targeting.

Figure 40: Planned Goulamina drilling for the next two years.

50km of drilling planned over the next 24 months



Source: FFX

Project Valuation

In October 2020 FFX completed a DFS for Goulamina and reported a post-tax NPV₈ of A\$1.26B using a US\$666 per tonne >6% spodumene concentrate price. On a pre-tax basis the 2020 DFS generates an NPV₈ of \$1.7B and IRR of 55.8%.



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SPEC BUY

Current Price	\$0.15
Valuation	\$0.13
Target Price	\$0.20

Ticker: **GMD**
Sector: **Metals & Mining**

Shares on Issue (m):	2,142.8
Market Cap (\$m):	310.7
Cash Est. (\$m)	28.0
Debt Est. (\$m)	Nil
Enterprise Value (\$m):	282.7

52 wk High/Low:	\$0.18	\$0.06
12m Av Daily Vol (m):		4.0

Projects **Stage**
Ulysses Resource Development

Mineral Resource	Mt	g/t Au	Moz Au
Ulysses	27.0	1.8	1.6

Cashflows	2020	2021
Operating Cashflow	-4.7	-14.0
Investing Cashflow	-3.8	-10.9
Financing Cashflow	17.0	24.7
Cash Balance	11.1	11.0

Directors:
Tommy McKeith Non-Executive Chairman
Raleigh Finlayson Managing Director
Neville Power Non-Executive Director
Gerry Kaczmarek Non-Executive Director
Michael Bowen Non-Executive Director

Substantial Shareholders:	%
Alkane	17.6%
Paradise Investments	7.5%
Raleigh Finlayson	4.7%

Share Price Graph and Trading Volumes



Genesis (GMD)

Watch This Space

Analyst: Royce Haese

Quick Read

The Ulysses project as it currently stands represents a significant gold development prospect in the Western Australian Goldfields. With most major deposits unconstrained, and further discovery potential, the ultimate scale of this project is anyone's guess.

Overview

Success from the Beginning: Since Genesis acquired the Ulysses project in 2015, the initial 138koz Au has grown to a respectable 840koz. The bolt on acquisition of the Kookynie prospect mid 2020 added a further 414koz. Exploration success and remodelling of the Kookynie prospects has grown the total estimate to 1.6Moz as at March 2021.

A Feasibility study was originally scheduled for completion in the September 2021 Quarter. Delivery of this study will be delayed due to the scope of the project changing following exploration success.

Figure 41: Ulysses Project Resource Growth, 2016 to present.



Source: GMD

Under New Management: Raleigh Finlayson, former MD of Northern Star and Saracen, is expected to be appointed Managing Director of Genesis in March 2022, after cornerstoning a strategic funding package. The ability to attract an MD with Finlayson's credentials is a nod to the quality of the project and work completed to date. We apply a subjective 50% premium to our project valuation to account for the high profile management team's development credentials to obtain our \$0.20 target price.

Project Overview

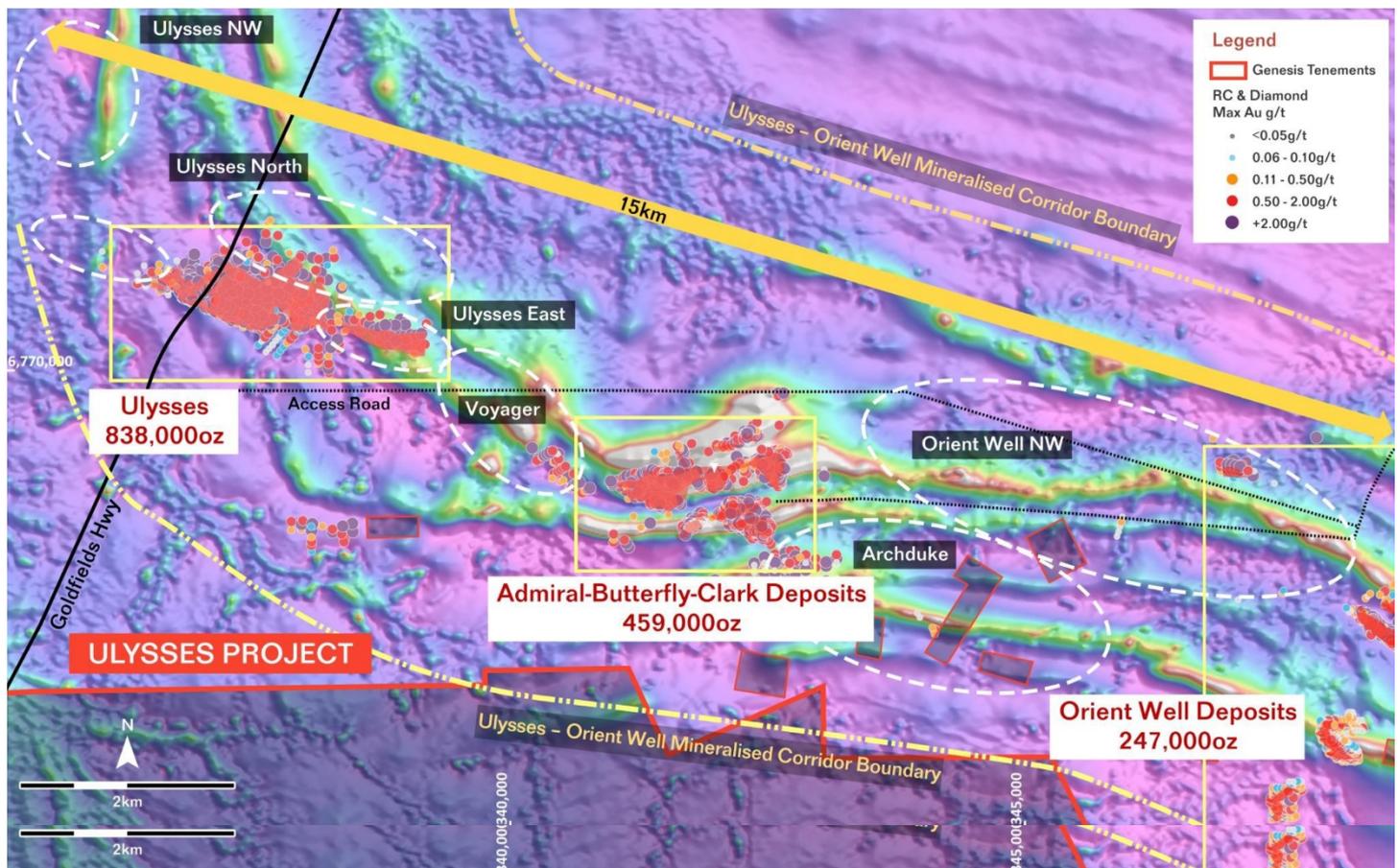
The Ulysses project is located approximately 20 km south of Leonora, Western Australia. The project is situated within the Gindalbie Terrane of the Norseman – Wiluna Greenstone Belt. The bulk of known mineralisation is hosted within a series of moderate to shallowly dipping shears in dolerite.

Mineralisation at Ulysses is high grade, averaging 3.4 g/t Au, with shoots up to 6.4 g/t

At Ulysses itself, mineralisation is higher grade, the 840koz is estimated to grade 3.4 g/t Au on average, with an estimated 363koz at 6.4 g/t Au forming a series of higher-grade shoots.

Mineralisation at Admiral-Butterfly-Clark is lower grade, but shallow and internally consistent, which should lend itself to efficient open pit mining. The ABC complex is estimated to contain 459koz at 1.4 g/t Au. Outside Ulysses and ABC, further mineralisation is hosted at Orient Well and Puzzle to round out the current 1.6Moz estimate.

Figure 42: The Ulysses and ABC complex over regional magnetics with conceptual targets outlined.



Source: GMD

Most deposits remain open at depth, and there is potential for new discoveries throughout the project

Most deposits remain open at depth, and potential for structural repetitions and previously unrecognised mineralised zones exists throughout the project. This potential is typified by the recent Admiral Deeps and Puzzle North discoveries.

The recently discovered Puzzle North is hosted in granite, which is unusual for the area

Puzzle North lies around 800 m north of the historically mined Puzzle pit. Unlike Puzzle, which is hosted in a typical mafic greenstone, Puzzle North is hosted in a granite. Significant intersections at Puzzle North are broad and moderate grade, examples include:

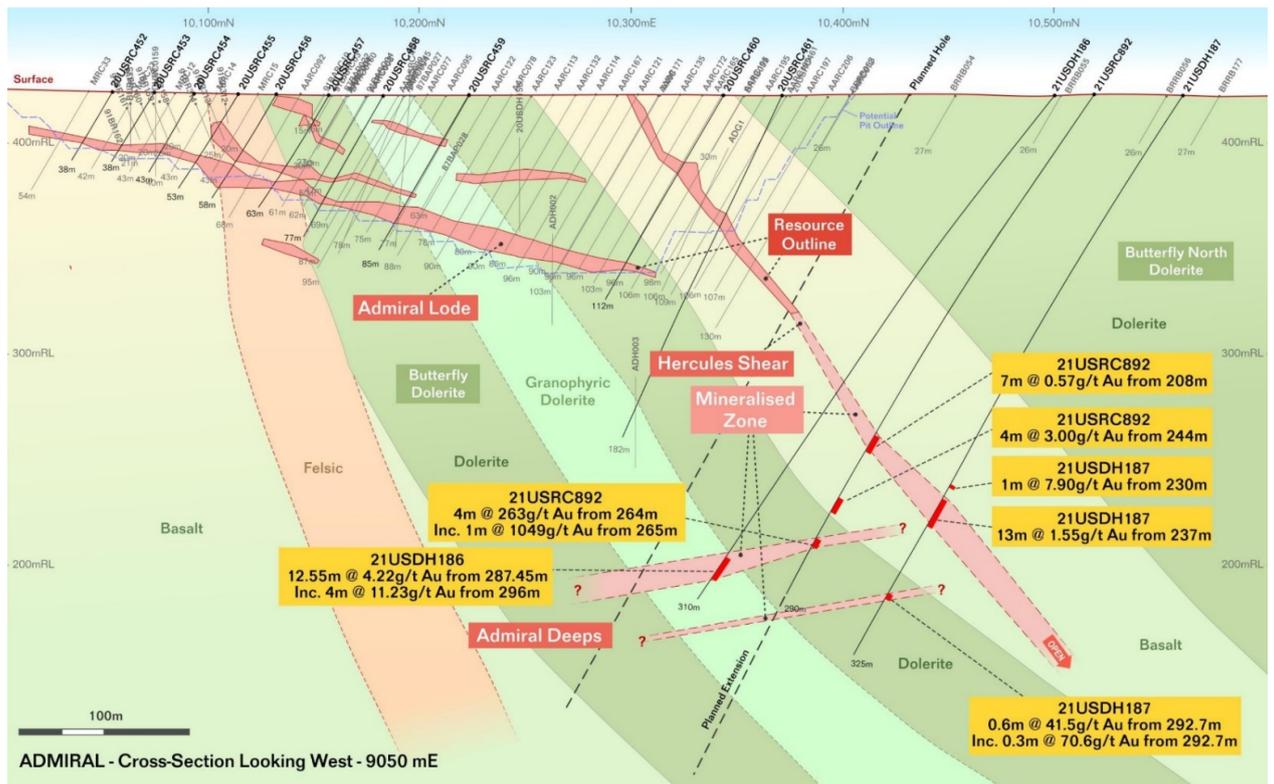
- 60 m @ 3.0 g/t Au from 106 m
- 69 m @ 2.6 g/t Au from 21 m
- 84 m @ 2.0 g/t Au from 84 m

Controls on mineralisation are poorly understood at this stage, but intercepts returned to date imply a large mineralised system. A further 6 km of granite-greenstone contact strike has yet to be tested.

6 km of prospective strike is yet to be tested

At Admiral Deeps, a deeper hole targeting the Hercules Shear Zone intersected a high-grade structure. The discovery hole reported 4 m at 263 g/t Au from 264 m, a standout intersection in the project. Follow up drilling returned 12.5 m @ 4.2 g/t Au in what is interpreted to be the same structure. Limited deep drilling has been completed beneath all Ulysses deposits.

Figure 43: Admiral cross section.



Source: GMD

Table 14: Mineral Resource Estimate Summary.

Resources	Measured and Indicated			Inferred			Total		
	Mt	g/t	kozs	Mt	g/t	kozs	Mt	g/t	kozs
Ulysses	5.1	3.4	569	2.6	3.2	269	7.7	3.4	838
ABC	4.7	1.6	238	5.6	1.2	221	10.4	1.4	459
Orient Well	4.2	1.0	136	3.1	1.1	112	7.3	1.1	247
Kookynie Other	1.2	1.1	40	0.7	1.0	23	1.9	1.0	63
Total	15.2	2.0	983	12.1	1.6	625	27.3	1.8	1608

Source: GMD

Further exploration success is expected

Next Steps

The main near-term focus for Genesis remains exploration. Genesis has an enviable track record of growth and discovery at Ulysses, and we have no reason to expect this to change. A mining study was previously scheduled for completion in the September Quarter 2021, however this has been deferred pending further exploration and transition to new management.

On our figuring, the project as it stands will be profitable and generates strong ROI. Additional discovery and growth will provide mining optionality and most likely support a higher throughput and gold production than Argonaut currently envisages.

Based on the current Resource estimate, we envisage 100kozpa mined over 8.5 years. This Resource is expected to grow

Argonaut's Mining Scenario and Valuation

Argonaut has developed a mining scenario as a basis for valuation. We reiterate that our assumptions are based on the current reported Resource Estimate and do not factor in further exploration success, e.g., no mining is assumed for Puzzle North.

We envisage a 1.7Mtpa processing facility with ore sourced from the ABC complex, Ulysses and Orient Well. Using these ore sources at a 1.7Mtpa run rate the project can currently maintain 100kozpa over a nominal 8.5 year mine life in our estimate. As the Resource base grows we anticipate the project scale will grow with it. Assumed physicals include:

Table 15: Argonaut derived assumptions used in GMD mining scenario.

Input	Unit	Value
Underground Ore Mined	Mt/grade(g/t)/kOz	4.1 / 3.8 / 510
Open Pit Ore Mined	Mt/grade(g/t)/kOz	10.6 / 1.3 / 440
Total Ore Mined	Mt/grade(g/t)/kOz	14.7 / 2.0 / 950
Mining Duration	Years	8.5
Annual Throughput	Mtpa	1.7
Pre Production Capex	A\$M	150
Metallurgical Recovery	%	90
Processing cost	\$/t	18
ABC Average Strip Ratio	waste:ore	5.3:1
Ulysses Strip Ratio	waste:ore	3.9:1
Orient Well Strip Ratio	waste:ore	4.5:1
Open Pit Mining Cost	\$/BCM moved	8.1
Gold Price	US\$ (LOM average)	1750
AUD:USD	LOM average	0.75

Source: Argonaut

Argonaut has assumed a recovery of 90% for the blended ore. GMD has not provided a recovery estimate for any Kookynie prospects at this stage, Ulysses underground has previously been reported to be 89%. When the Butterfly pit was previously mined a recovery of 92% was estimated, but reconciled numbers are not available.

Using our boiler-plate assumptions. We derive a LOM AISC of \$1,123/oz.

Using a 7% real after tax discount rate, we value the Ulysses Project at \$386M

Argonaut's project level NPV₇ is A\$386M. Our valuation is based on mining 950koz of the existing 1.6Moz Resource base, which has the potential to grow significantly. On our assumptions the Ulysses project generates an IRR of 55%.

SPEC BUY

Current Price	\$8.18
Valuation	\$9.01
Target Price	\$10.82

Ticker:	NXG.ASX		
Sector:	Metals & Mining		
Shares on Issue (m):	476.1		
Market Cap (\$m):	3,894.632		
Net Cash Est. (\$m)	228.0		
Enterprise Value (\$m):	3,666.6		

52 wk High/Low:	\$8.53	\$5.05
12m Av Daily Vol (m):	0.1	

Projects	Stage		
Arrow	Feasibility Study		

Resources	Mt	U308%	U308 (kt)
Arrow MI&I	8.2	1.9	152.9

Reserves	Mt	U308%	U308 (kt)
Arrow Probable	4.6	2.4	108

Cashflows	2020	2021
Operating Cashflow (C\$m)	-22.6	-20.8
Investing Cashflow (C\$m)	-62.6	-19.8
Financing Cashflow (C\$m)	7.2	64.8
Cash Balance (C\$m)	57.2	75.3

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

Substantial Shareholders:	%
Affiliates of CEF Holdings Limited	19.5%
Mega Uranium Ltd	4.1%

Share Price and Trading Volumes



NexGen Energy (NXG)

Powering Up a Low Emission Future

Analyst: George Ross

Quick Read

NXG's primary asset is the Rook I project, located on the south-western margin of the Athabasca basin. The high-grade Arrow deposit is hosted within stable crystalline basement, allowing exploitation through conventional underground mining methods. Our financial modelling of the proposed Rook I development has confirmed robust economic outcomes. Our financial model for the Rook I development suggests an NPV₈ of \$3.8B for an initial 11-year operation, producing up to 29Mlbs of U₃O₈ in early operational years. Rook I is a strategic asset that could transform its owner into a top tier U₃O₈ producer. We expect exploration success will yield additional value to shareholders. NXG also holds a ~50% shareholding in uranium explorer IsoEnergy, providing further exposure to discovery success.

Key Points

High Quality Mineralisation: Rook I 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% U₃O₈, including a high-grade component reported at 497Kt grading 15.9% U₃O₈.

Robust Scoping Study: The proposed underground Arrow – Rook I mine will produce upwards of ~29Mlb per annum of U₃O₈ from years 2-5, and then ~15Mlb per annum in years 6-10. The high-grade nature of the deposit results in low operating costs, and a relatively low capital intensity (capital cost per tonne of annual production).

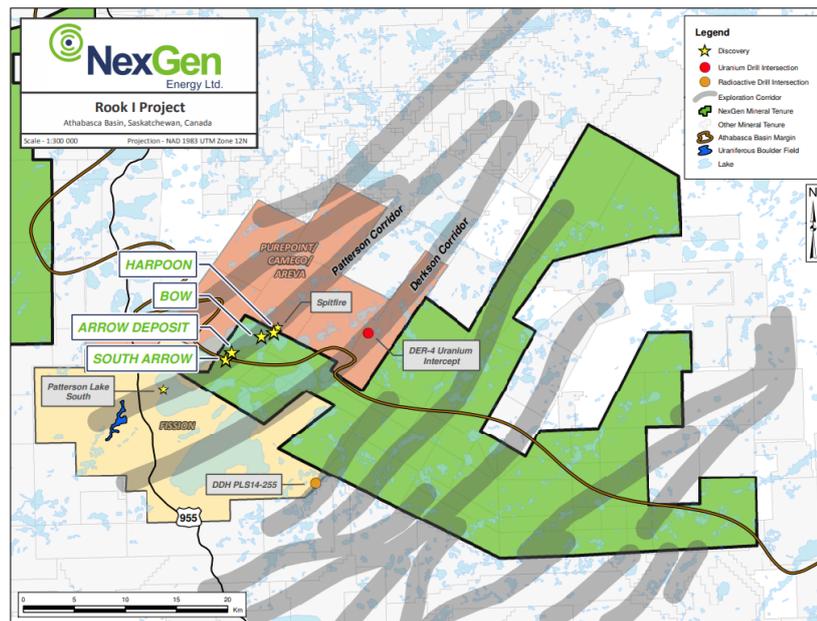
Bountiful Exploration Upside: Excellent potential for discovery remains at the Rook I project within trucking distance to the proposed Arrow processing plant. We expect the definition of new Resources to generate further shareholder value in the medium term.

IsoEnergy Exposure: NXG is a ~50.4% shareholder of Canadian listed IsoEnergy (TSX-V:ISO). 'ISO' is a uranium explorer with highly prospective tenements on the eastern margin of the Athabasca basin. This position provides NXG's shareholders with exposure to potentially high value external project discovery success.

Company background

NexGen Energy (NXG) is a Vancouver based uranium exploration and development company. NXG was listed on the TSX Venture Exchange in early 2012, with a secondary ASX listing completed in mid-2021. Rook I is NXG's flagship project and includes a portfolio of tenure within the Canadian province of Saskatchewan. The Rook I tenements were acquired from Mega Uranium Ltd. in December 2012.

Figure 44: NexGen's Rook I Athabasca Basin tenure portfolio with uranium occurrence locations and prospective structural corridors.



Source: NXG

Rook I Project Overview

The Athabasca basin is regarded as one of the world's great uranium provinces and hosts the famous McArthur River and Cigar Lake high grade mineralised systems. Unlike the forementioned deposits, NXG's defined uranium mineralisation is predominantly hosted exclusively within competent crystalline basement rocks, which are older than overlying semi-consolidated Athabasca Sandstone basin sediments.

From 2014 to 2017 NXG made successive high-grade uranium discoveries at the Arrow, South Arrow, Harpoon, Bow and Cannon prospects. Rook I mineralisation is characterised by hydrothermal uraninite veining within steeply dipping shears and faults with an average width of 60m.

Arrow Resource & Reserve

While ongoing regional exploration continues, NXG has increasingly shifted focus towards development of the Arrow deposit. Arrow hosts Measured and Indicated Resources totalling 3.75Mt grading 3.1% U₃O₈ for 256.7Mlb U₃O₈ and Inferred Resources totalling 4.4Mt grading 0.83% U₃O₈ for 80.7Mlb U₃O₈. The Measured and Indicated Resource includes a high-grade component of 497kt grading 15.9% U₃O₈.

A prized asset in a superior neighbourhood

Rook I style mineralisation is hosted within stable crystalline basement

Table 16: Rook I defined Resources & Reserves.

Resources	Mt	% U3O8	kt U3O8	Mlbs U3O8
Arrow				
Measured	2.18	4.35%	95.0	209
Indicated	1.57	1.36%	21.4	47
Inferred	4.40	0.83%	36.5	80
Total	8.15	1.87%	152.9	337
Reserves				
Arrow				
Proved	-	-	-	-
Probable	4.58	2.37%	108	239
Total	4.58	2.37%	108	239

Source: Argonaut after NXG

The grade and scale of the Arrow Resource underpins Rook I

Proposed Development

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 U₃O₈ from Mineral Reserves totalling 4.58Mt grading 2.37% U₃O₈.

Tailings to be stored in a multichambered underground storage facility

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 saturated overburden that will be temporarily artificially frozen for development. After development, a 60cm freeze wall will then isolate the shaft from the outside environment.

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.

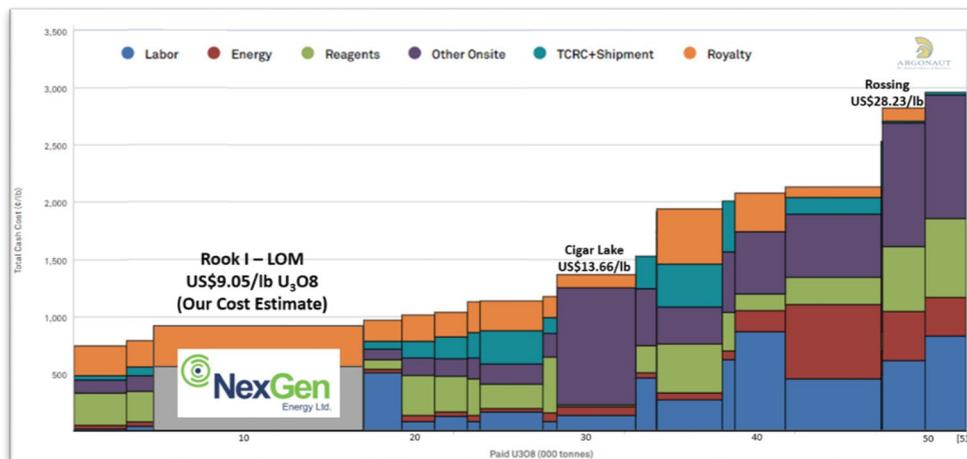
Mine design and methods have been selected to reduce worker exposure to physical hazards and radiation. The mine will utilise a high degree of equipment mechanisation and remote operating capability.

Operating Costs

We derive a 'Total Cost' of US\$9.05/lb by adding revenue royalties to our C1 costs. Figure 45 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).

Figure 45: Uranium production cost curve (per pound) for ~69% of global U3O8 plus Argonaut’s Rook I LOM cost estimate based on a \$US50/lb U3O8 price and 0.78 USD:CAD Exchange rate.

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



Source: Argonaut after S&P Global

IsoEnergy shareholding provides additional exposure to new deposit discovery

IsoEnergy Shareholding

In addition to the Rook I asset, NXG owns a ~50.4% stake in TSX-V listed IsoEnergy (TSX-V:ISO). ISO is targeting Arrow style, structurally controlled mineralisation within tenements located on the eastern side of the Athabasca Basin. The current focus for exploration is the Hurricane Zone discovery at Larocque East. As at 29/10/2021 ISO was trading at C\$4.67 with a market capitalisation equivalent to A\$495M.

Project valuation based on a US\$60/lb contract uranium price

Valuation

Argonaut’s valuation is based on a discounted post-tax cash flow model of Rook I 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 U₃O₈ price and 0.77 USD:CAD exchange rate were applied to the life of project. A risk discount of 10% has been applied to reflect the maturity of project studies and residual technical risk. Exploration represents 9% of the estimated project NPV, however could be much higher depending on exploration outcomes. Our valuation model assumes future equity raising and option proceeds of ~C\$350M and debt financing of ~C\$860M respectively. Time discounted equity dilution has been factored into our model at current pricing of NXG shares. Argonaut has a \$9.01 valuation and \$10.82 target price for NXG on a per share basis.

Table 17: Sum of parts valuation for NXG with assumed US\$60/lb U₃O₈ price.

Valuation Summary	ASM	A\$/sh
Rook I NPV(8)	4,523	9.51
Study Maturity Risk Discount -10%	-452	-0.95
Exploration	407	0.86
Corporate Overheads	-214	-0.45
Cash	228	0.48
Debt (Convertible Debentures)	-70	-0.15
ISO (50.4%) Shareholding	273	0.57
Future Option/Equity Dilution	-406	-0.85
NAV	4,873	9.01
Market Sentiment Premium 20%	975	1.80
Target Price	5847	10.82

Target price scales our valuation by 20% to account for positive uranium market sentiment

Source: Argonaut



NOT COVERED

Market Cap \$258M
Current Price \$0.65

Ticker:	ORR
Sector:	Metals & Mining
Shares on Issue (m):	396.8
Market Cap (\$m):	257.9
Cash Est. (\$m)	67.4
Debt Est. (\$m)	Nil
Enterprise Value (\$m):	190.5
52 wk High/Low:	\$0.96 \$0.50
12m Av Daily Vol (m):	0.1

Projects	Stage
Nyanzaga Project	PFS
Yarri	Exploration

Mineral Resource	Mt	g/t Au	koz Au
Nyanzaga Project	23.7	4.0	3,072.0

Cashflows	2020	2021
Operating Cashflow	-5.2	-7.0
Investing Cashflow	-5.2	-0.2
Financing Cashflow	25.1	49.8
Cash Balance	24.8	66.3

Directors:	
Craig Williams	Non-Executive Chairman
Matthew Yates	Managing Director
Mike Klessens	Non-Executive Director
Alastair Morrison	Non-Executive Director
Robert Rigo	Non-Executive Director

Substantial Shareholders:	%
Federation Mining	12.5%
AustralianSuper Pty Ltd	10.3%
Westoz Funds Management	11.0%
Rollason	9.0%
Mutual Investments	6.5%

Share Price Graph and Trading Volumes



OreCorp (ORR)

Sleeping Giant Stirring

Analyst: Royce Haese

Quick Read

In June this year, after four years of uncertainty following significant changes to Tanzanian Mining Legislation, OreCorp received Cabinet approval for its Special Mining Licence (SML) application over the Nyanzaga project in Tanzania. A critical step in the long process to develop one of the best undeveloped gold projects in Africa. A PFS was completed in 2017 outlining a robust project, with 213kozpa production over a 12-year mine life expected. DFS level studies are underway. If the current schedule is achieved Nyanzaga will be in production by the end of 2024.

Overview

Back on Track: In 2017, OreCorp completed a PFS that envisaged 213kozpa production over a 12-year mine life using a US\$1,250/oz gold price. Later that year, OreCorp completed a Resource estimate update outlining 3.1Moz Au at 4.0 g/t if reported using a 1.5 g/t Au cut-off grade. Recutting at 0.5 g/t Au increased estimated ounces to 5.2M, at a lower grade of 1.6 g/t Au. A DFS was planned to follow but progress was halted when the Tanzanian Government introduced a series of laws intended to protect Tanzania's sovereignty over its natural resources.

DFS work resumed following Tanzanian Cabinet approval of the Nyanzaga SML in June 2021. Whilst final Government approval is pending, the project advances, with rigs on the ground and a decarbonisation review underway.

Figure 46: OreCorp's Nyanzaga preliminary project timeline.

	2021				2022				2023				2024			
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Cabinet Approves SML	✓															
DFS		✓														
RAP Early Works	✓	✓														
RAP Implementation																
Project Financing																
FEED																
Engineering & Procurement																
Construction																
Commissioning																
Production																
SML Exploration	✓	✓														

Source: ORR

Project Overview

The Nyanzaga project is located in the >25Moz Lake Victoria Goldfields of Tanzania

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 47: Location of the Nyanzaga project and nearby projects.



Source: ORR

The geometry of mineralisation lends itself to efficient open-pit extraction. OreCorp estimate a waste to ore ratio of 3.7:1

Mineralisation is unconstrained at depth

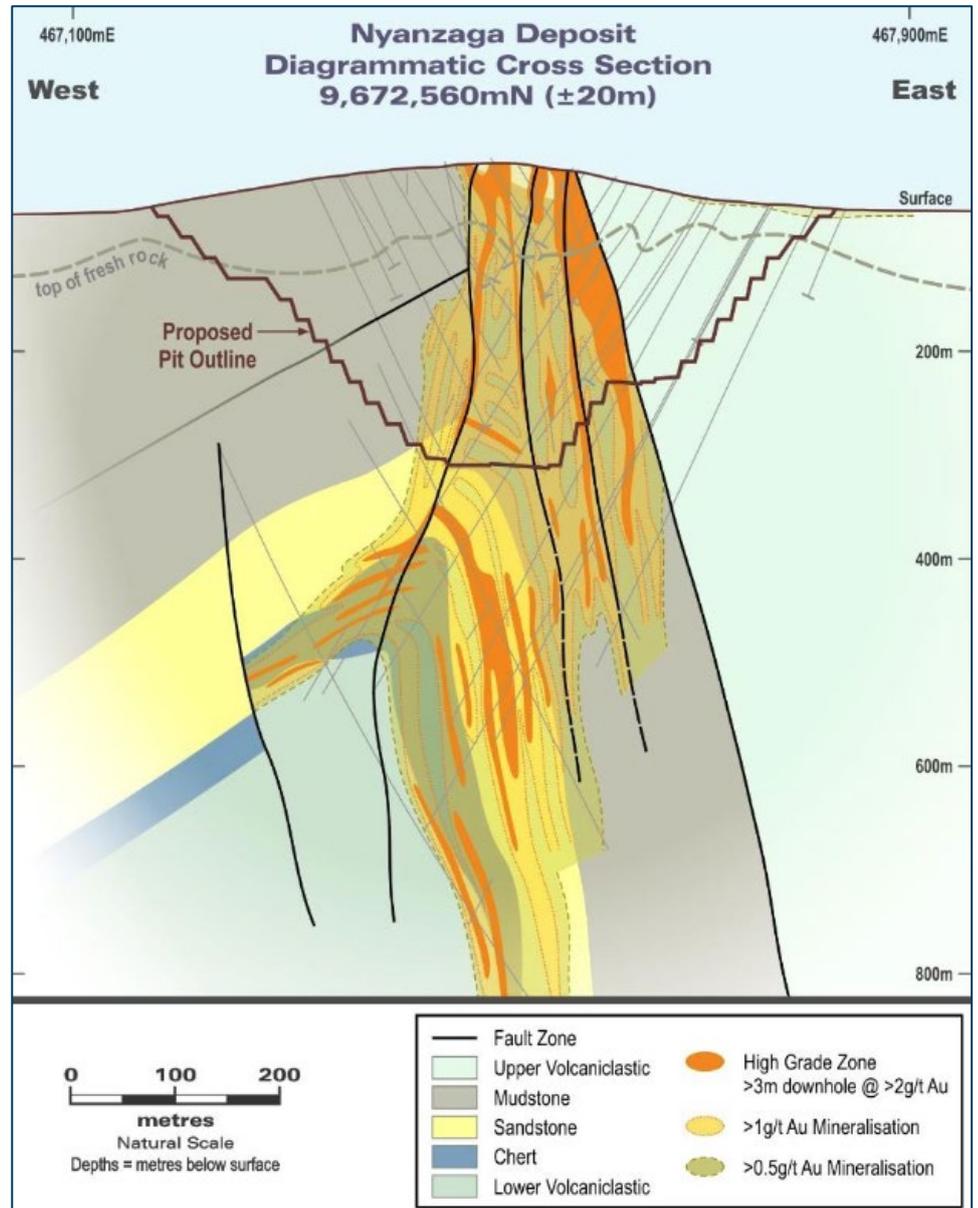
OreCorp estimate 23.7Mt @ 4.0 g/t Au for 3.1Moz at Nyanzaga...

...and an additional 220koz at the nearby Kilimani prospect

The Nyanzaga deposit is described as a hybrid orogenic gold deposit 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 internal higher grade. 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 PFS.

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. No Maiden Reserve has been declared for Nyanzaga to date. 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.

Figure 48: Nyanzaga deposit cross section.



Source: ORR

Table 18: OreCorp’s Mineral Resource Estimate.

Resources	Measured and Indicated			Inferred			Total		
	Mt	g/t	Mozs	Mt	g/t	Mozs	Mt	g/t	Mozs
Nyanzaga	20.8	4.1	2.7	2.9	4.0	0.4	23.7	4.0	3.1
Kilimani				5.6	1.2	0.2	5.6	1.2	0.2
Total	20.8	4.1	2.7	8.5	2.2	0.6	29.3	3.5	3.3

Source: ORR

Numerous regional targets have been identified through soil sampling which the Company intends to test concurrently with Nyanzaga development.

OreCorp now holds 100% ownership over Nyanzaga, prior to any Government free-carry interest

2017 to Today

Following the legislative changes in 2017 OreCorp has focussed its efforts on consolidating and simplifying ownership arrangements over Nyanzaga. At the time of the changes

Tanzania's new President has spoken publicly on her intent to re-ignite foreign investment in-country

OreCorp held a 51% JV interest in the project with its JV partner, Acacia. In 2018, OreCorp completed the JV earn-in phase and exercised its option to acquire 100% of the project, with Acacia retaining a NSR royalty over the project. In 2019, OreCorp purchased this royalty off Acacia. The only remaining obligation from OreCorp to Acacia (now Barrick) is payment of US\$8.05M upon final SML grant.

OreCorp has also worked closely with the Tanzanian Government throughout this period. Following the appointment of Samia Suluhu Hassan as Tanzanian President on the 19th of March 2021 Tanzanian government commentary on the need for foreign mining investment into Tanzania has increased. In a speech on the 5th of April the President directed the Tanzanian Revenue Authority to “stop frustrating business” and ordered a review into the regulations and taxes related to foreign investment, urging officials to “work hard to regain the trust of international business”.

More recently, President Samia Suluhu Hassan has completed a “mini cabinet reshuffle”, including appointment of a new Minister for Energy and Attorney General. This indicates in-country progress under its new leadership which will hopefully pave the way for final government approval and a Framework Agreement which will outline fiscal terms under which the Nyanzaga project will operate. If a good balance is struck this may encourage further international investment into Tanzania.

Nyanzaga has a large resource base and could support significant gold production, making it a potential take-over target for major producers

For the Nyanzaga project and OreCorp, the substantial resource base and potential future gold production potential makes it a prime take-over target for major producers. The main barrier to-date has been geopolitical uncertainty. As the project progresses towards construction this uncertainty will decrease.

Argonaut's Mining Scenario and Valuation

Argonaut has developed a mining scenario as a basis for valuation. Overall, most assumptions are in-line with those presented in OreCorp's 2017 PFS adjusted for inflation. The 2017 PFS was completed using a US\$1,250/oz gold price. The impact of the current gold price on the Nyanzaga development strategy will be factored into OreCorp's DFS and is reflected in our valuation.

The construction of a 4Mtpa CIL processing facility plus site infrastructure has been estimated by Argonaut to cost US\$95M. This factors in OreCorp's 2017 PFS estimate, inflation, and current higher global steel prices. We estimate an additional US\$213M in early site works and management costs, inclusive of mining pre-strip. This brings our total pre-production capital estimate to US\$308M.

Using other inflated opex and sustaining capex figures from OreCorp's PFS and a 10% real after-tax discount rate, we value the Nyanzaga Project at A\$519M. This valuation factors in an assumed royalty rate of 7.3% and a corporate tax rate of 30%. Factoring in an assumed 16% Tanzanian Government free-carry interest, we derive a NPV₁₀ of A\$441M, and an IRR of 33%.

The main risk to valuation remains Tanzania's fiscal policy and in-country security. We have used a discount rate of 10% to account for this risk. OreCorp is currently in negotiations with the Tanzanian Government to finalise a Framework Agreement.

SPEC BUY

Current Price \$0.22
Valuation \$0.30

Ticker:	PNR	
Sector:	Metals & Mining	
Shares on Issue (m):	1,409.0	
Market Cap (\$m):	310.0	
Cash Est. (\$m)	31.5	
Debt Est. (\$m)	Nil	
Enterprise Value (\$m):	278.5	
52 wk High/Low:	\$0.26	\$0.19
12m Av Daily Vol (m):	1.7	

Projects	Stage	
Norseman (50%)	Construction	
Halls Creek (100%)	Production	

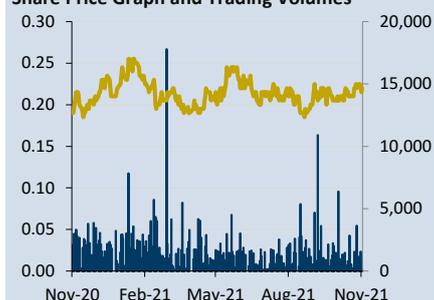
Mineral Resource	Mt	g/t Au	koz Au
Norseman (50%)	35.0	3.8	4,241.0
Halls Creek	1.6	6.5	330.0

Cashflows	2020	2021
Operating Cashflow	19.0	19.5
Investing Cashflow	-30.2	-44.5
Financing Cashflow	53.1	-6.2
Cash Balance	53.7	22.5

Directors:	
Wayne Zekulich	Non-Executive Chairman
Paul Cmrlc	Managing Director
Scott Huffadine	Executive Director
Fiona Van Maanen	Non-Executive Director
Kyle Edwards	Non-Executive Director

Substantial Shareholders:		%
Robmar Investments		14.9%
Tulla Resources		7.1%

Share Price Graph and Trading Volumes



Pantoro (PNR)

Backing the Field

Analyst: John Macdonald

Quick Read

Construction at Norseman has commenced following the receipt of regulatory approvals early October 2021. Norseman is on track for commissioning in October 2022. The Company has outlined an initial 7-year Phase 1 re-start plan producing 610koz Au LOM. The goal for PNR remains to re-establish a +100kozpa operation with ongoing resource development and exploration drilling to increase mine life. PNR's 100,000m drill program (ongoing) at Norseman has led to the addition of new ounces to its global Mineral Resource Estimate (MRE), providing potential mine life extensions.

DFS Overview

Norseman Overview: The Norseman Gold project is responsible for 5.5Mozs of past gold production, mostly from quartz veins exploited over a 10km line of lode from Mainfield through North Royal and Harlequin between 1935 and 2006 – a period in which it was Australia's only continuously operating gold field. Pantoro Ltd (operator and 50% owner) entered the Norseman joint venture in May 2019, by agreeing among other terms, to sole fund \$50M expenditure on the project (now complete). At the time of acquisition estimated resources amounted to 4.4Mozs within 35 separate deposits.

DFS: PNR has selected six mining areas within the Norseman portfolio to form part of a Phase 1 restart plan (DFS) designed around the strategy of re-establishing 1Mtpa aggregate ore stream and CIL processing facilities in short order for \$89M capital outlay.

The DFS is based on six open pit plans and 3 underground mine plans.

1. Scotia comprises a series of deposits over 2km strike, 45km south of Norseman. Scotia represents the largest estimated resource (271koz indicated and 176koz inferred) within the restart proposal. Open pit ore from Scotia will provide most of the mill feed in the first three years of operation. Pantoro drilled 158 RC holes (19,000m) at Scotia in FY20, discovering a new zone at Panda and extending the Green Lantern deposit. Drilling continued throughout FY21 resulting in the establishment of a maiden MRE for Green Lantern
2. Pantoro plans to bring the OK underground mine back into production as the principal source of underground ore prior to Scotia's underground development. A vent rise and minor dewatering will precede access to reserve blocks below existing workings. In the phase one Norseman restart, underground ore will come from OK for the first two years, providing 200-250ktpa at 5.3 g/t, at full capacity
3. Together with Scotia, planned pits at Cobbler, Slippers, Gladstone and Maybell make up total pit reserves of 4Mt at 2.7 g/t (370koz). Stockpile reserves are 4Mt at 0.8 g/t (100koz)
4. OK, Scotia and St Pats underground plans are backed by total reserves of 790kt at 5.3 g/t (135koz)

The DFS confirms modest pre-production capital and strong project cashflows

Pre-production capital costs are estimated at \$89m, including \$43m for 1.0Mtpa CIL process plant. Pantoro estimates total costs (mining, processing, administration, royalties, sustaining capital and other capital, excluding pre-production capital), will peak at A\$210m in the fourth year of operation; equivalent to the revenue from 80koz at A\$2600/oz gold price.

The DFS confirms modest pre-production capital with strong project cashflows driven by high Mineral Resource grades and excellent metallurgical recovery utilising conventional mining and carbon in leach processing techniques. Key highlights of the Phase 1 DFS include:

- Post-tax NPV₅ and IRR of \$260m and 67% (@ \$2,600/oz Au) respectively
- 1.5-year payback period (from first production)
- Project pre-tax net cashflow of \$486 million (@ \$2,600/oz Au)
- Average production of 108,000ozpa

PNR has continued a 100,000m drill campaign over the last 12 months

Development: Over the last twelve months (LTM), PNR has continued a 100,000m drill campaign with the objective of doubling project inventory. Excellent drill results at Green Lantern (Scotia Mining Centre) culminated in a maiden MRE and Ore Reserve estimation. Drilling will continue throughout the rest of 2021 and early 2022 ahead of planned Mineral Resource and Ore Reserve upgrades in the March 2022 quarter. The LTM has also seen the deconstruction and demolition of the old Phoenix plant, the construction of 260 accommodation rooms and the completion of PNR's \$50m sole expenditure obligation. PNR recently executed a \$30m corporate finance facility, which, along with its existing cash balance and cash flows from Halls Creek, fully underwrite PNR's future construction and operational obligations at Norseman. PNR's share of pre-production construction costs are estimated at \$45m. PNR has now also received all approvals and GRES has substantially mobilised to site with work underway. With construction now underway, Norseman is on track to start commissioning in October 2022.

Figure 49: Construction of new processing plant underway at Norseman.



Source: PNR

Upside Potential & Highlights

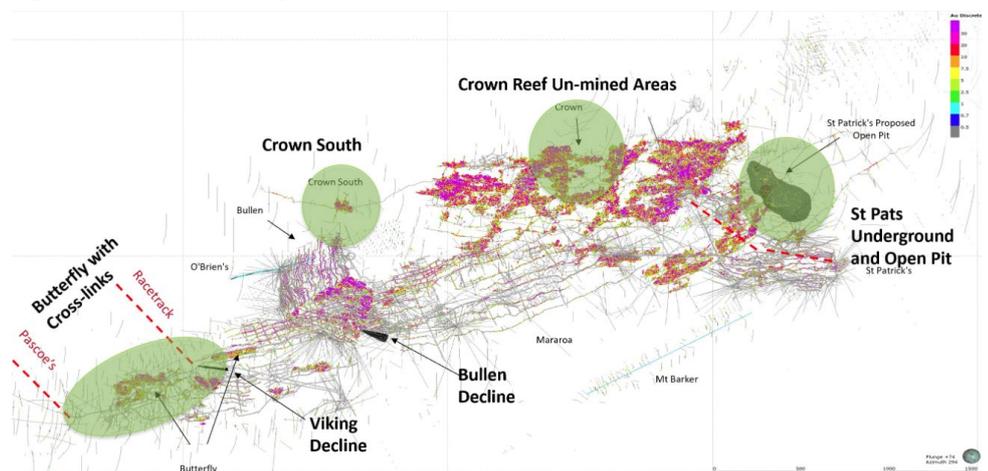
Mine life extensions: The Phase One DFS Life of Mine (LOM) plan mines and processes 5.9 Mt of ore of which 4.8 Mt is Ore Reserve and 1.1 Mt is Inferred Mineral Resources. 25% of the total Ore Reserve remains unmined and available for future production at the

end of the Phase One DFS LOM. Potential exists to expand mine life from the 100,000m drill program (ongoing). Updated MRE and Ore Reserve estimates are expected in April 2022.

Most of the value of the Norseman project lies outside of the confines of the start-up plan outlined in the DFS

Exploration potential: Most of the value of the Norseman project lies outside the confines of the start-up plan outlined in the restart feasibility study. In small company hands since 2002, Norseman is the last of Western Australia's historic, prolific gold fields to be redeveloped beyond the limits reached prior to the turn of the millennium. Mainfield has historically produced more than half of the 6Mozs produced at Norseman, from ore averaging 13 g/t. The Mainfield workings extend to a maximum depth of 670m below surface. Harlequin (800koz past production) is a 1990s discovery under lake cover that kicked off an unfinished search on the western side of the field. Pantoro intersected 8m at 67 g/t Au in July 2020 from 79m down hole at the Sailfish prospect.

Figure 50: Norseman target areas.



Source: PNR

Significant Infrastructure: There is extensive existing site infrastructure which substantially reduces the pre-production capital requirements.

Drilling continues to add ounces

Drilling continues to add ounces: A 100,000m drill campaign is underway with the objective of doubling the projects inventory. Since January, Pantoro has reported drill results from programs at Green Lantern (Scotia), Mainfield, Sailfish, Scotia Deeps, Maybelle and a new discovery in the Noganyer Formation, also near Scotia. The next phases of drilling will focus on potential additions to reserves and resources, and refining the Norseman mine plan. A maiden MRE and ore reserve at the Green Lantern deposit, part of the Scotia Mining Centre, recently added 310koz's.

Risks

Risks / flaws: Given the range of opportunities at Norseman, it's up to management to make the right choices and build a long term, profitable presence on the Norseman field. We do not expect much more than 3 or 4 years visibility, especially when Mainfield is increasingly brought into plan.

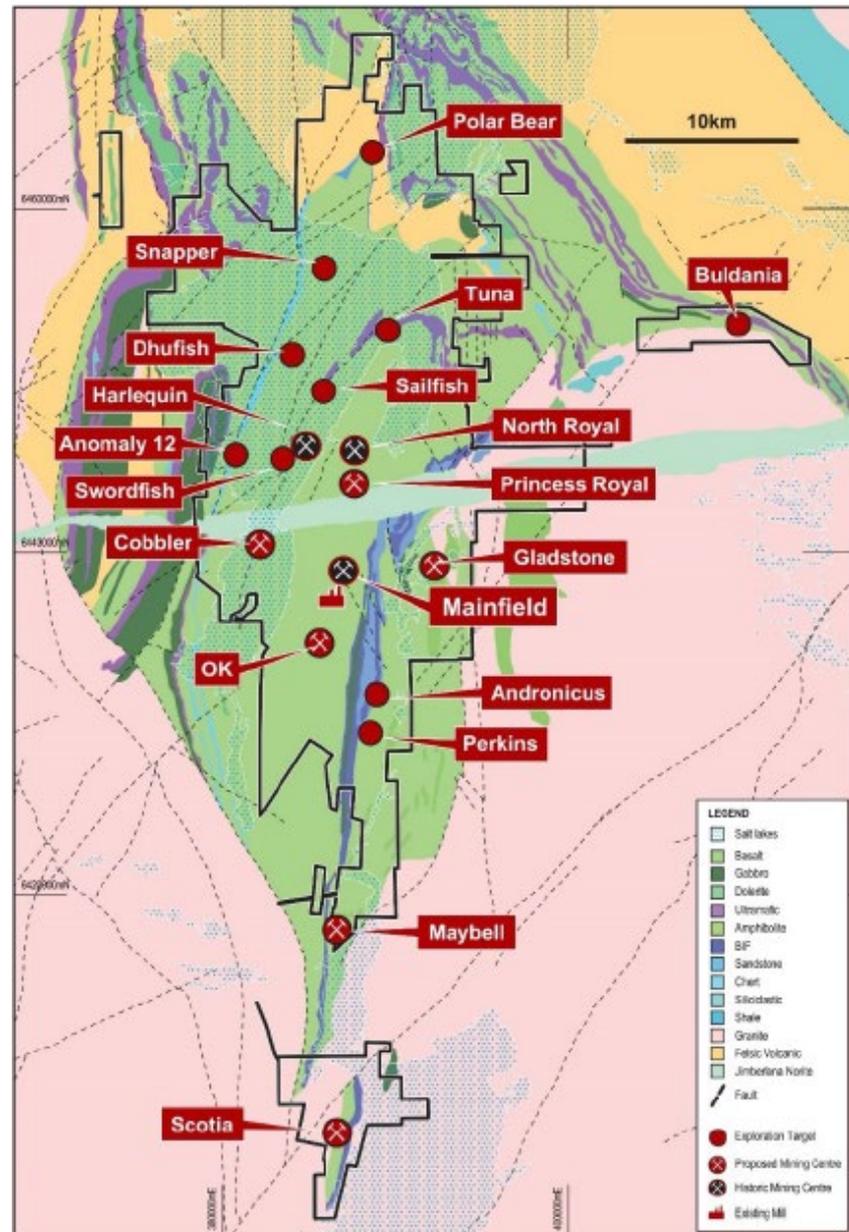
Valuation

Argonaut derives a project level valuation (100%) basis of \$286M

Argonaut values the Norseman gold project using the inventory and cost inputs set out in the October 2020 feasibility study to generate an NPV. The schedules in our model may differ from Pantoro's. The project valuation is based on the after tax NPV of modelled cash flows at a 7% real, after tax discount rate, plus a nominal estimate of the value of exploration prospects outside of the restart plan.

NPV of the restart plan plus a two year extension of underground mining activities of \$280M (100% basis) at a 7% real, after tax discount rate and our long-term gold price assumption of A\$2,350/oz (cf Pantoro's feasibility study NPV estimate of \$384M pre-tax, @ \$2,600/oz). Nominal exploration value of \$360M (100% basis) is assigned to Norseman, based on belief in the prospectivity of the field.

Figure 51: Norseman tenement outlines and targets.



Source: PNR

NOT COVERED

Market Cap \$2.2B
Current Price \$5.27

Ticker:	SFR
Sector:	Metals & Mining
Shares on Issue (m):	410.0
Market Cap (\$m):	2,160.6
Cash Est. (\$m)	405.5
Debt Est. (\$m)	Nil
Enterprise Value (\$m):	1,755.1
52 wk High/Low:	\$7.26 \$3.92
12m Av Daily Vol (m):	1.5

Projects	Stage
Motheo	Resource Development

Motheo Resources	Mt	Cu (%)	Ag (g/t)	Cu (Kt)
T3 (Ind & Inf)	53.3	0.9	12.7	48.0
A4 (Ind & Inf)	9.8	1.4	21.0	134

Cashflows	2020	2021
Operating Cashflow	272.6	470.4
Investing Cashflow	-178.8	-133.8
Financing Cashflow	-50.2	-51.0
Cash Balance	291.1	573.7

Directors:	
Derek La Ferla	Non-Executive Chairman
Karl Simich	Managing Director
Jennifer Morris	Non-Executive Director
Sally Langer	Non-Executive Director
Roric Smith	Non-Executive Director
Paul Hallmam	Non-Executive Director
John Richards	Non-Executive Director

Substantial Shareholders:	%
AustralianSuper Pty Ltd	5.5%

Share Price Graph and Trading Volumes



Sandfire (SFR)

Kalahari Dreaming

Analyst: George Ross

Quick Read

2021 has been a transformational year for Sandfire (ASX:SFR). In late September SFR announced its intention to acquire the Minas De Agua Teñidas copper mining complex in Spain for US\$1.87B. SFR's acquisition of MATSA will bridge a production gap between the closure of current flagship asset DeGrussa (Australia) and the commissioning of Motheo (Botswana). Acquisition of the MATSA operation will rescale SFR's production profile. Once Motheo is in full operation (CY2023), SFR's annual production capacity will be catapulted above 150kt of copper equivalent (CuEq). This is only slightly less than Oz Minerals (ASX:OZL) 2022 forecast production of 175kt CuEq.

While playing second fiddle to SFR's new MATSA acquisition, Motheo seems destined to become a high-quality production asset in its own right. In September SFR reported a Maiden Probable Ore Reserve for the A4 satellite Deposit. The definition of A4 has confirmed sufficient feed to underpin expansion of the 3.2Mtpa initial build to 5.2Mtpa. The 5.2Mtpa Preliminary Feasibility Study (PFS) outcomes include a total build capital expenditure of US\$366M for a pre-tax NPV₇ of US\$672M over an initial 10+ year life with a C1 net cash cost of US\$1.32/lb and IRR of 36%.

Key Points

Motheo 3.2Mtpa development underway: The Mining License for the Motheo Copper Mine was granted in July and early-stage development is now underway. SFR has awarded several key construction contracts and ordered all long lead process plant equipment.

A4 Reserve: In September SFR published a Maiden Probable Ore Reserve for the A4 deposit integrated within a 5.2Mtpa Motheo expansion scenario. Over a five-year mine life A4 is scheduled to contribute 9.7Mt of ore grading 1.2% Cu and 18g/t Ag.

A 5.2Mtpa future: Definition of the A4 Reserve underpins expansion of the initial 3.2Mtpa Motheo build, to 5.2Mtpa capacity. A Definitive Feasibility Study (DFS) for upgrade of the initial plant to 5.2Mtpa operation is scheduled for completion in Q3 of FY 2022. The initial processing plant build has been designed to accommodate upscaled capacity with relatively low additional investment (US\$20M).

Motheo Project Overview

SFR acquired the core of the Motheo Copper Project (then known as the T3 Project) through the takeover of MOD Resources in October of 2019. The regional Kalahari Copper Belt tenure position extends east from Botswana, west into Namibia.

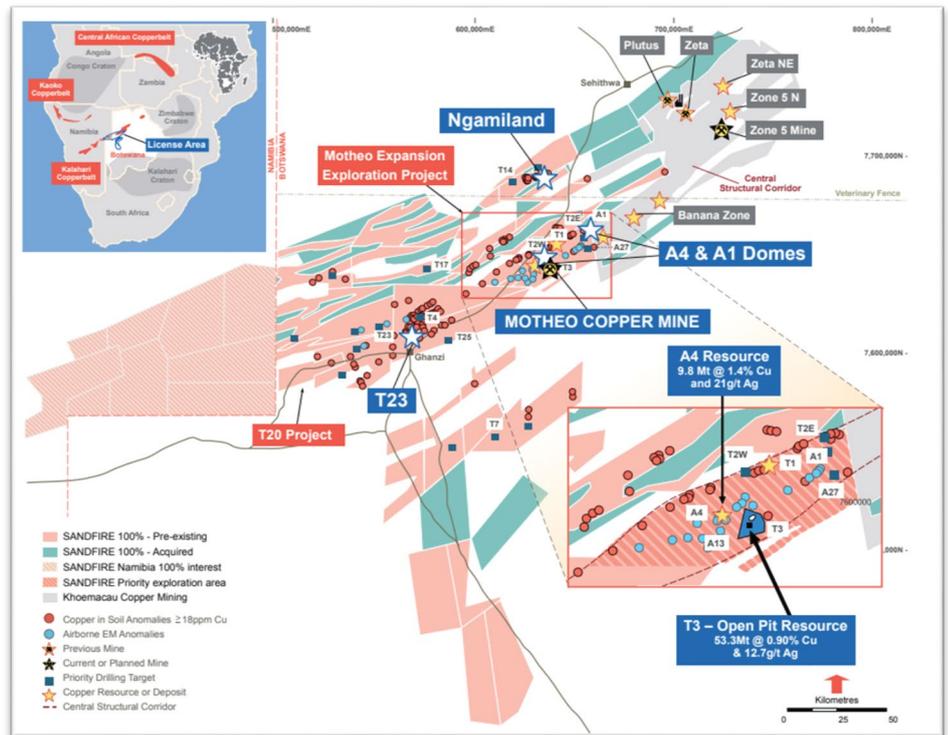
Kalahari belt copper-silver mineralisation is characterised by structural controlled sulphide mineralisation hosted within a sequence of low metamorphic grade metasediments. Sulphides are often associated with quartz-carbonate veins, or otherwise occur as fill to fragmentation zones.

A dominant position in the highly prospective Kalahari Copper Belt

The Motheo Copper Mine development is centred on the T3 Deposit (53.3Mt at 0.9% Cu & 12.7g/t Ag). T3 will be exploited via open pit mining with ore hauled to a nearby processing plant.

Figure 52: Kalahari Copperbelt tenement holding and Motheo project area.

Numerous targets likely to contribute future feed



Source: SFR

Lower tonnage ‘base case’ development a starting point for something bigger

The mine will initially be developed to handle 3.2Mtpa of throughput and will produce 30ktpa Cu and 1.2Mozpa of Ag at this scale. The DFS for the 3.2Mtpa ‘Base Case’ was completed in December 2020 and incorporated a US\$3.16/lb Cu price and \$18.5/oz Ag price. The model assumes upfront capital expenditure of US\$259M with a US\$1.65/lb C1 Cost and US\$1.84/lb AISC. At this scale the project generates a post-tax NPV₇ of US\$210M with an IRR of 25.5%.

Development of key site infrastructure is underway and SFR has awarded several key construction contracts and ordered all long lead process plant equipment. Ramp up and first production is scheduled for mid FY2023.

The Company intends to fund Motheo development through a combination of cash and at least US\$160M in debt financing. The Government of Botswana has the right to acquire a fully contributing interest in Motheo of up to 15%. However, the Botswanan Government is yet to notify of its intention regarding acquisition of an ownership stake.

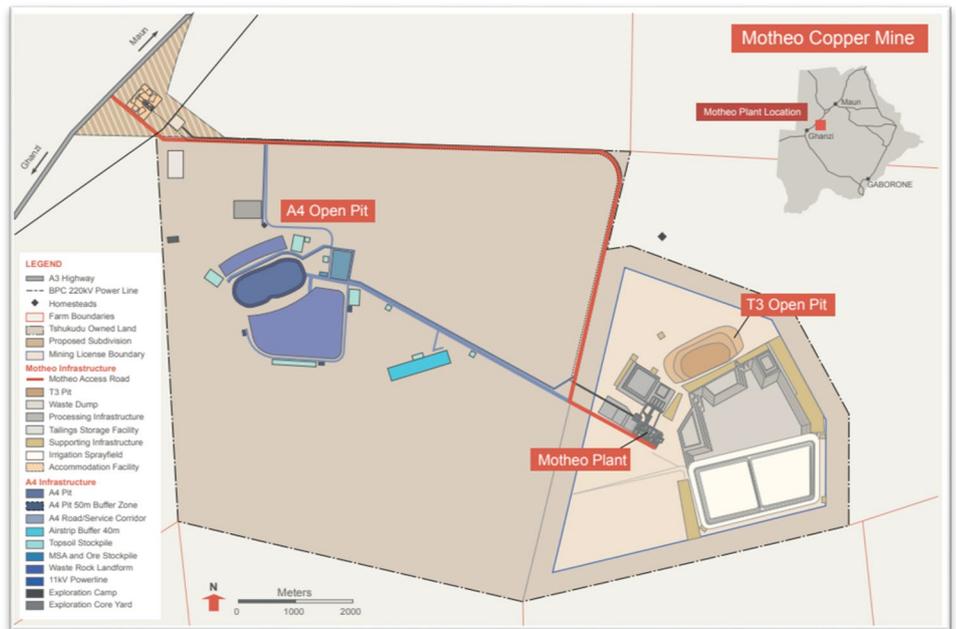
A4 Resource and Reserve

The A4 satellite deposit is located ~8km from the future site of the Motheo processing plant and is geologically similar to T3 style mineralisation. In September, SFR reported a Maiden A4 Probable Reserve of 9.7Mt grading 1.2% Cu & 18g/t Ag based on US\$3.40/lb Cu and US\$18.77/oz Ag prices. A4’s proposed open pit captures 85% of the latest A4

A4 satellite deposit a template for future project growth

Mineral Resource (9.8Mt at 1.4% Cu, 21g/t Ag). The A4 pit is expected to contribute plant feed from 2025 through to 2030, netting 105kt copper in concentrate production over the period (Figure 54).

Figure 53: Planned 5.2Mtpa Motheo Copper Mine infrastructure including A4 open pit.



Source: SFR

5.2Mtpa Motheo Confirmed

Expanded 5.2Mtpa case confirmed as the future

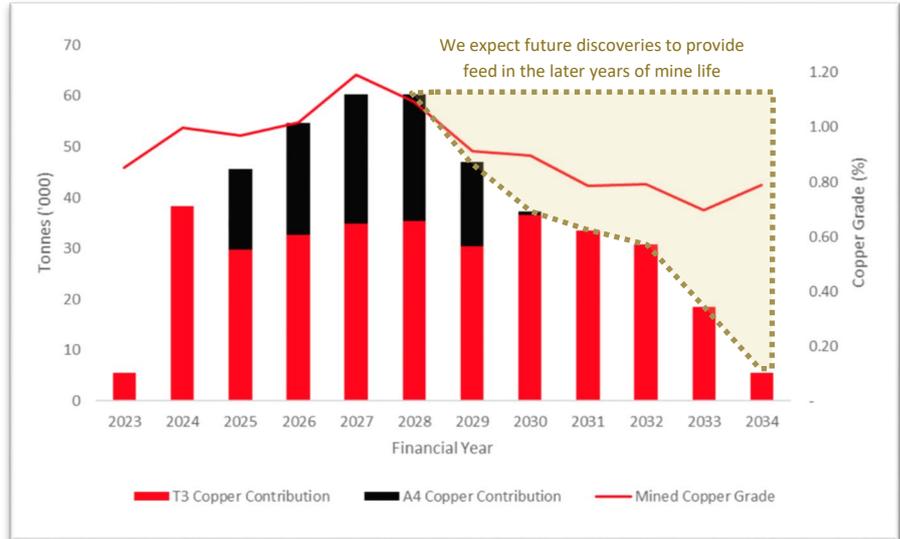
Finalisation of the A4 Resource and Reserve has confirmed sufficient feed to support the 5.2Mtpa Motheo plant expansion. Upscaling the Motheo operation from the 3.2Mtpa base case will cost an additional US\$70M. This includes development of the A4 pit, associated haul road, and expansion of the processing plant ball mill, conveyer belt and pump capacity.

The Expanded Motheo case improves SFR's post-tax NPV₇ to US\$417M, up from US\$210M. Upscaling the project results in reduction in life of mine C1 and All-In-Sustaining-Costs, being US\$1.32/lb and US\$1.56/lb respectively. At a 5.2Mtpa scale the project is expected to produce 437kt of copper over the life of mine, with an average of 50-60ktpa while dual fed from the A4 and T3 deposits (Figure 54).

We expect that additional high value satellite deposits will be identified in the coming years, and these will contribute mill feed following A4 deposit depletion. Ultimately, newly discovered deposits will supplement or displace T3 mill feed depending on grade and SFR's desired production profile. SFR control a commanding tenure ground position, ripe for discovery and we expect the Motheo mill to run for 15+ years, with feed supplied from as yet unidentified Resources.

Figure 54: Motheo Copper Project 5.2Mtpa scenario production profile.

As yet undefined satellite deposits expected to fill feed requirements in later years



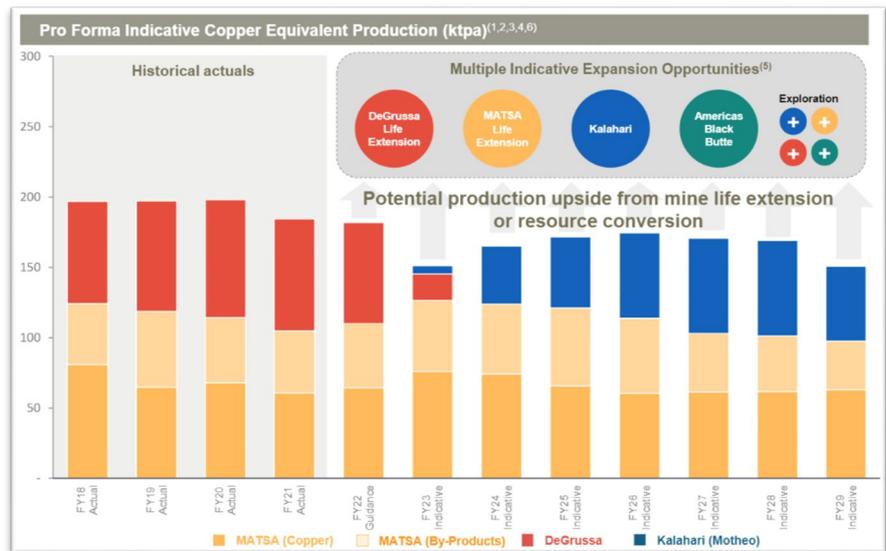
Source: SFR

Asset Valuation

SFR’s 5.2Mtpa Motheo Copper Project development scenario PFS generates a pre-tax NPV₇ of US\$672M and IRR of 36% (post-tax NPV₇ of US\$417M). Additional upside is likely to be added through new discoveries within the Kalahari tenure package. Motheo’s output will complement over 125ktpa of copper equivalent production from the recently acquired MATSA complex in Spain.

Figure 55: SFR indicative copper equivalent production through to FY29.

SFR’s 5.2Mtpa development scenario validated



Source: SFR

SPEC BUY

Current Price \$0.45
Valuation \$0.99

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

Shares on Issue (m): **211.1**
Market Cap (\$m): **95.0**
Cash Est. (\$m): **3.0**
Debt Est. (\$m): **Nil**
Enterprise Value (\$m): **92.0**

52 wk High/Low: **\$0.70** **\$0.44**
12m Av Daily Vol (m): **0.1**

Projects **Stage**
Lake Mackay **DFS**

Ore Reserve **K (mg/L)** **SOP (Mt)**
Lake Mackay **2,815.0** **20.0**

Cashflows **2020** **2021**

Operating Cashflow	-2.1	-1.7
Investing Cashflow	-9.5	-4.1
Financing Cashflow	11.1	6.1
Cash Balance	5.2	5.5

Directors:

Richard Seville	Non-Exec. Chairperson
Mark Savich	Exec. Director & CEO
Brad Sampson	NED
Alec Pismiris	NED & CoSec

Substantial Shareholders: %

AustralianSuper Pty Ltd	14.8%
Hillboi Nominees Pty Ltd & Associated Ent	12.4%

Share Price Graph and Trading Volumes



Agrimin (AMN)

A Rigorous Approach

Analyst: Ian Christie

Quick Read

Lake Mackay is the largest of the sulphate of potash (SOP) projects in WA, which has positive implications for unit capital and operating costs. Agrimin has applied a high level of rigour to its feasibility studies and will extract learnings from missteps at other faster-paced projects. This should assist as it progresses funding options and moves to FID.

Key points

Positive steps: The last six months have seen AMN release a positive independent technical review, secure a large offtake agreement, award the process plant FEED contract, and enhance its green credentials. To maintain momentum we see further offtake agreements and debt funding as key de-risking events to watch for in coming months. The environmental approvals process will likely last until mid 2022, although we see minimal risk here given the project's green credentials and WA Lead Agency status.

The numbers: DFS financials returned a post-tax NPV₈ of US\$655M and an IRR of 21% based on a flat SOP price of US\$500/t FOB. We built more conservatism into both capital and operating costs in our model to account for cost pressures and currency moves. As a result, our steady state EBITDA forecast of US\$128M is below the US\$145M envisaged in the DFS. Positively, potash prices have been climbing recently, and having control of the logistics chain from mine to delivery onto bulk carrier ships should prove advantageous.

Funding: AMN has signed a 150ktpa binding offtake agreement and is aiming to secure further offtakes for its 450ktpa steady state annual production. These are a necessary precursor to funding, which is the key risk in our view given our expectation of a significant A\$750M funding requirement to cover capex and working capital. Sale of royalty streams and/or a project level selldown are viable funding options (particularly given the Project's size, longevity, and ESG appeal), however we more simply model a ~65:35 debt and equity funding combination in our model. A debt package would be a significant de-risking event and should enable new equity to be issued at a price higher than current in our view.

BUPs inclusion: We are attracted to the diligence around project appraisal and the size of Lake Mackay, especially following the problems encountered at faster-paced projects. SOP from salt lake brines is a new industry in WA, and these attributes should help minimise the things that can go wrong, but also provide flexibility should unforeseen events occur.

Project and corporate valuation

Our unrisks project valuation for Lake Mackay is \$615M. We apply a 35% discount to derive a \$400M risks project valuation (to factor in financing, offtake, approvals, construction and ramp-up risks). Our corporate equity valuation is \$639M, or \$0.99 on fully diluted shares. We see tolerable downside risk given the thorough approach.

SOP is a premium specialty potassium fertilizer

Potash overview

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 3,500km². It has 20.0Mt of Proved and Probable SOP Reserves. The Company aims to produce 450ktpa environment-friendly SOP at steady state, be the world’s lowest cost SOP producer, have a 40-year mine life, and control logistics from mine to ship.

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

Figure 56: Lake Mackay project map.



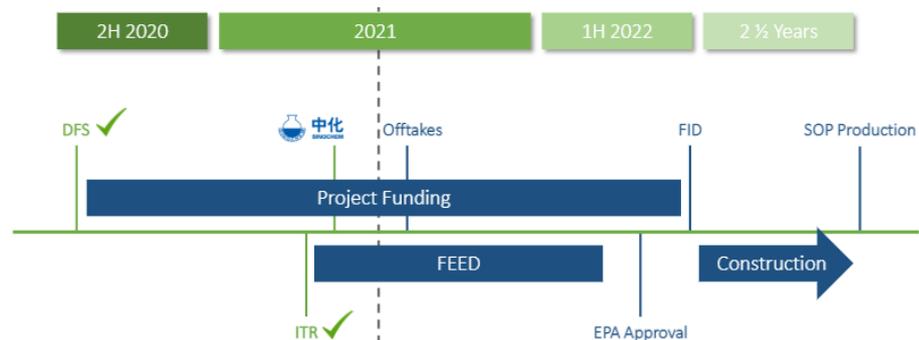
Source: AMN

Development timeline

AMN completed its DFS in July 2020, and followed it with an independent technical review in April 2021. May 2021 saw the first binding offtake and FEED commence. The environmental approvals process will extend to mid-2022, however we see further offtake agreements and debt funding as the key de-risking events to look for in coming months.

The timeline to production is lengthy due to environmental approvals, construction, and the time for salts to precipitate from brines in the ponds

Figure 57: Indicative development timeline as at July 2021.



Source: AMN

NOT COVERED

Market Cap \$122M
Current Price \$0.072

Ticker:	AUT	
Sector:	Metals & Mining	
Shares on Issue (m):	1,688.2	
Market Cap (\$m):	121.5	
Cash Est. (\$m)	16.4	
Debt Est. (\$m)	Nil	
Enterprise Value (\$m):	105.2	
52 wk High/Low:	\$0.14	\$0.07
12m Av Daily Vol (m):	2.0	

Projects	Stage	
Pickle Crow	Exploration	

Mineral Resource	Mt	g/t	Moz Au
Pickle Crow	6.6	8.1	1.7

Cashflows	2020	2021
Operating Cashflow	-0.8	-2.5
Investing Cashflow	-1.0	-9.5
Financing Cashflow	5.9	28.8
Cash Balance	4.8	21.8

Directors:	
Ray Shorrocks	Executive Chairman
Steve Parsons	Non-Executive Director
Michael Naylor	Non-Executive Director

Substantial Shareholders:		%
1832 Asset Management		9.9%
First Mining Gold Corporation		7.4%
Symorgh Investments Pty Ltd		6.1%
Campbell Kitchener Hume & Assoc.		5.6%

Share Price Graph and Trading Volumes



Auteco Minerals (AUT)

More Than Moose Pasture

Analyst: Royce Haese

Quick Read

As the Resource base at Pickle Crow grows, high-level mining studies have commenced. With 1.47Moz's @ 10.1 g/t Au forming the high-grade core of the project, plus a large amount of un-tapped near-mine and regional potential, Pickle Crow represents an enticing development opportunity in Ontario, Canada.

Overview

Rapid Resource Growth: Following the most recent update in July 2021, Pickle Crow boasts a 1.71Moz @ 8.1 g/t Au Resource estimate, inclusive of a high-grade quartz hosted component of 1.47Moz @ 10.1 g/t Au. This represented a 71% increase in contained ounces on top of the prior 1Moz estimate. Resource growth was achieved on the back of a 45 km drill campaign completed over a ten-month period. A follow-up 50 km campaign is currently underway with early results pointing towards orebody extensions and new discoveries. The next Resource update is scheduled for the December quarter, 2021.

Dual Growth Strategy: AUT also continues to work up early-stage exploration targets whilst advancing Pickle Crow. Mapping and rock chip sampling south of the Resource area has recently returned results of up to 145 g/t Au. More regionally, surface grab samples >2000 g/t Au provide attractive exploration targets. Near-mine exploration has recently identified the Carey and Tyson zones. This generative work is concurrent with Resource extension and infill drilling, with up to six diamond rigs planned to be on site at any one time.

Towards Production: Historically, the Pickle Crow camp produced 3.1 Mt of ore at an average grade of 16.1 g/t Au for 1.5 Moz. Today however, as a development proposition Pickle Crow is in the early stages. Rapid resource growth and the recent discovery of broad zones of low to moderate grade that may potentially support a larger base-load feed, has made right-sizing a processing facility difficult. Despite this, high-level development studies have commenced. AUT has flagged that drill outs will advance quicker if underground drill platforms were able to be established. Studies are assessing underground infrastructure and re-access options, with both refurbishment of existing shafts and development of a small starter pit under consideration. Pickle Crow has a processing plant rated at ~80ktpa that has never been commissioned, studies are investigating expanding this facility.

The project's rapidly expanding Resource base, location in a stable mining jurisdiction, and historical production, imply that should a development decision be made, the project will advance rapidly.

Project Valuation

Argonaut does not have a project level valuation for the Pickle Crow Project

Project

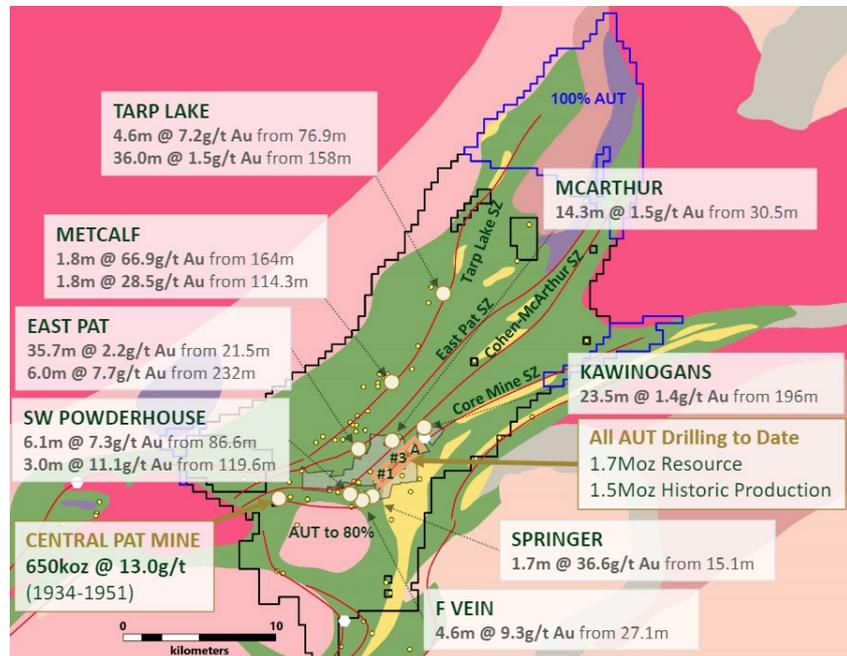
Pickle Crow is located in the Uchi Sub-province, Ontario, Canada

Auteco holds a 70% stake in the Pickle Crow project, with a right to purchase a further 10%

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.

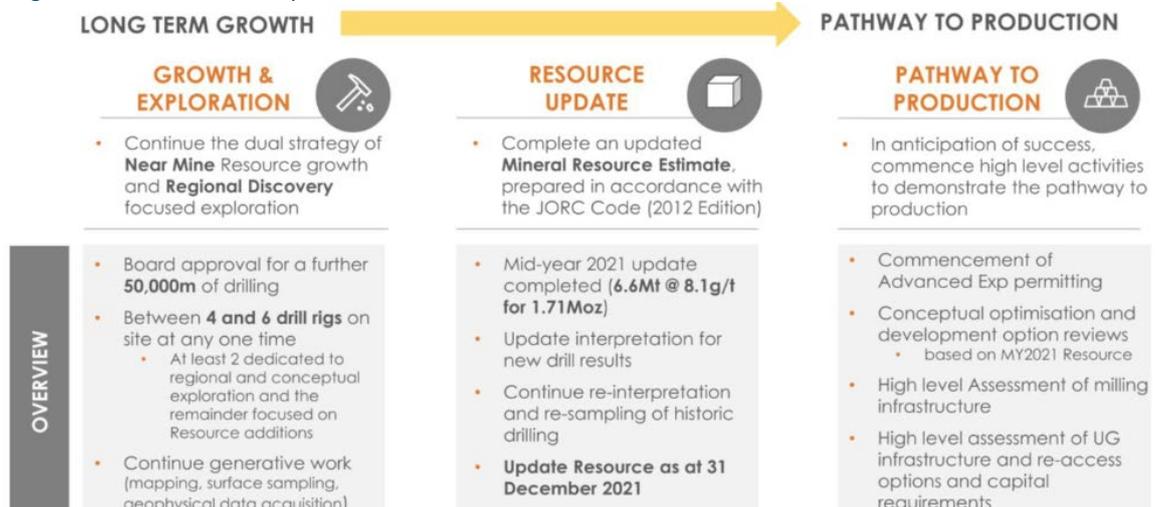
Auteco acquired the right to earn into the project from First Mining (TSX:FF) in April 2020. To date, exploration expenditure has seen AUT earn 70% of the project, AUT now has the option to pay a further C\$3M to obtain a final 10%. First Mining will retain a 2%NSR with AUT having the right to buy back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

Figure 58: Map of project area with historical drill hits on regional targets.



Source: AUT

Figure 59: Planned development activities.



Source: AUT

SPEC BUY

Current Price \$0.064
Valuation \$0.090

Ticker:	BDC	
Sector:	Metals & Mining	
Shares on Issue (m):	1,736.0	
Market Cap (\$m):	111.1	
Cash Est. (\$m)	10.6	
Debt Est. (\$m)	Nil	
Enterprise Value (\$m):	100.5	
52 wk High/Low:	\$0.09	\$0.04
12m Av Daily Vol (m):	2.7	

Projects	Stage	
Bardoc Gold Project	DFS & Optimisation	
South Woodie Woodie	Exploration	

Mineral Resource	Mt	g/t Au	Moz Au
Bardoc Gold Project	54.6	1.8	3.1

Cashflows	2020	2021
Operating Cashflow	-9.0	-20.2
Investing Cashflow	5.4	-1.2
Financing Cashflow	14.3	22.4
Cash Balance	11.9	12.9

Directors:	
Tony Leibowitz	Non-Executive Chairman
Neil Biddle	Executive Director
John Young	Non-Executive Director
Robert Johnston	Non-Executive Director
Peter Buttigig	Non-Executive Director

Top Shareholders:		%
Peter Buttigieg		4.5%
Neil Biddle		2.2%
John Young		2.3%
Tony Leibowitz		1.9%
Alex Jordan		1.3%

Share Price Graph and Trading Volumes



Bardoc Gold (BDC)

3Moz's on Kal's Doorstep

Analyst: Royce Haese

Quick Read

The Bardoc Gold project represents an enviable land-holding with a large Resource base in close proximity to WA's gold mining capital, Kalgoorlie. Recent cost inflation has seen the Bardoc Board place development on hold, and a strategic review is currently underway. Exploration upside remains both regionally and beneath planned underground developments. As a standalone project Bardoc made sense, albeit with slimmer margins than originally anticipated, on the back of cost pressures.

Overview

On Your Marks...: The Bardoc Gold project was born from the merger between Spitfire Materials and Excelsior Gold in October 2018. This merger saw the consolidation of approximately 200 km² of land holdings to the north of Kalgoorlie along the Bardoc Tectonic Zone. At the time of the merger the Bardoc Gold Project had a combined Mineral Resource estimate of 2.1Moz Au. Through regional exploration and step-out drilling Bardoc grew this Resource base to the 3.1Moz the project holds today.

...Get Set...: With the assumed critical mass required to warrant stand-alone development achieved, the study process began. A PFS was completed in March 2020, envisaging a 1.8mtpa processing facility and LOM capex of A\$354M. A well credentialed development team was assembled, and an offtake with favourable terms was negotiated for the concentrate produced from Aphrodite's refractory ore. On the back of rising costs of steel and other inputs, and a labour shortage compounded by increased iron ore production in WA's north and strict COVID-related border controls restricting workforce mobility, by the time a development decision was in reach LOM capex estimate had increased to A\$491M.

...No: Citing the rapidly escalating cost environment in the WA resources sector and a tightening labour market, the Bardoc Board elected to defer the Final Investment Decision in late September 2021, opting to complete a strategic review. The review aims to consider alternate pathways to unlock the value of the Bardoc Gold Project.

Inherent Value: We maintain our view that the Bardoc Gold project retains its inherent value. The optimisation study represents a 'warts and all' view of the state of the development environment in Western Australia. The way forward for Bardoc is unclear, but the value in 3Mozs of gold on the doorstep of Kalgoorlie should not be overlooked.

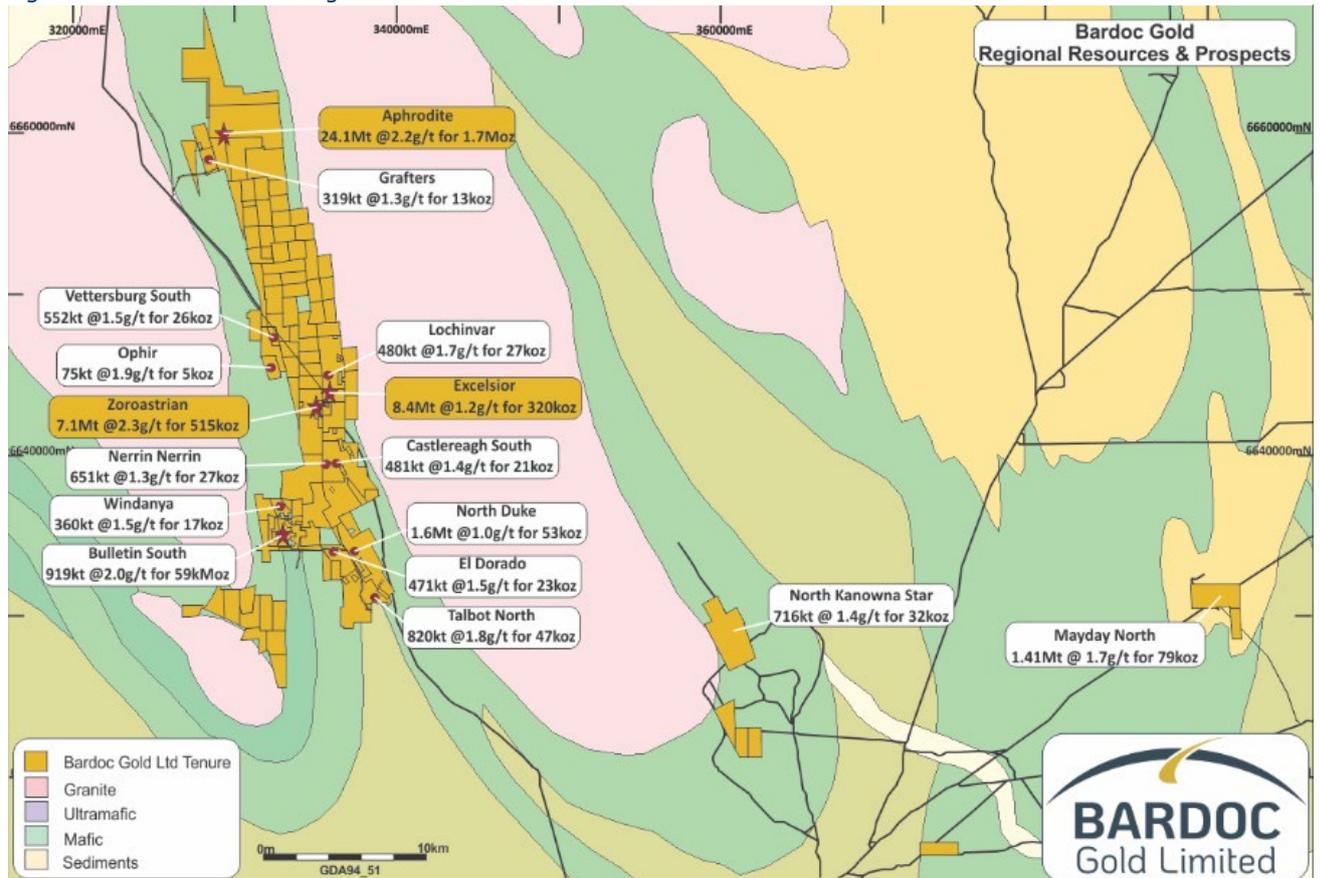
Project Valuation

Inputs used in our model for the Bardoc Gold Project are generally in-line with Bardoc's most recent Optimisation Study, to factor in development uncertainty, we apply a 10% discount rate to our Bardoc Gold Project NPV. We derive a post-tax NPV₁₀ for the Bardoc Gold project of A\$188M. On our figures, the Project generates a post-tax IRR of 29%.

Bardoc Gold Project

Bardoc’s planned production profile saw peak gold production of 159koz, and sustained production >140kozpa over three years, with the theory that exploration success could backfill and sustain this profile. This profile would rank the Bardoc Project as one of the top 25 gold mines by production in Australia.

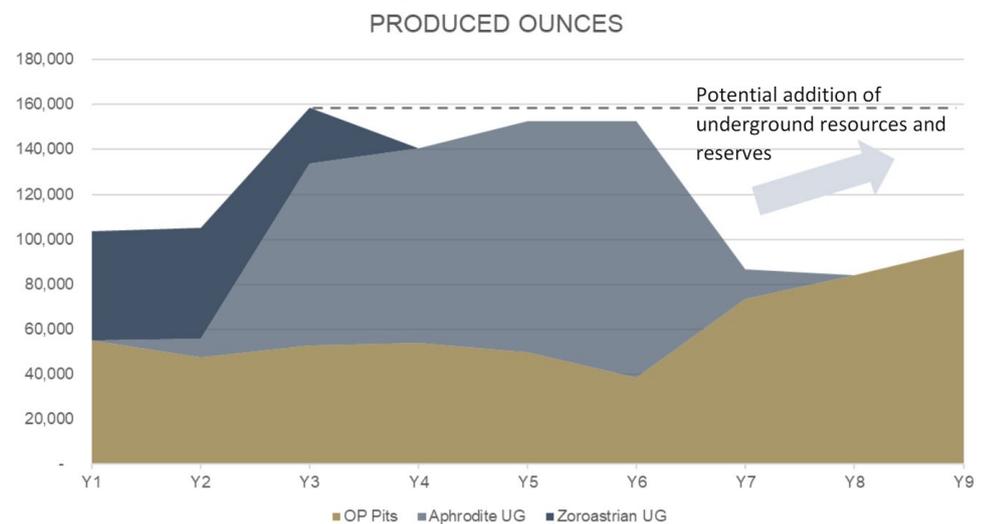
Figure 60: Bardoc land holding and Resource estimates.



Source: BDC

Figure 61: Bardoc’s planned annual gold production by ore-source.

Bardoc’s planned annual production peaked at 159koz



Source: BDC

NOT COVERED

Market Cap \$353M
Current Price \$0.30

Ticker: **BSE**
Sector: **Metals & Mining**

Shares on Issue (m): **1,178.0**
Market Cap (\$m): **353.4**
Cash Est. (\$m) **49.6**
Debt Est. (\$m) **Nil**
Enterprise Value (\$m): **303.8**

52 wk High/Low: **\$0.33 \$0.24**
12m Av Daily Vol (m): **0.8**

Projects **Stage**
Toliara Enhanced DFS

Mineral Resource	Mt	% HM	HM (Mt)
Toliara	2580.0	4.3	111.0

Cashflows	2020	2021
Operating Cashflow	157.4	86.4
Investing Cashflow	-49.7	-32.9
Financing Cashflow	78.3	-184.8
Cash Balance	236.1	86.5

Directors:

Keith Spence	Non-Executive Chair
Tim Carstens	Managing Director
Colin Bwye	Executive Director
Malcolm Macpherson	Non-Executive Director
Mike Stirzaker	Non-Executive Director
Diane Radley	Non-Executive Director
Janine Herzig	Non-Executive Director

Substantial Shareholders:

	%
Pacific Road Capital	26.4%
Sustainable Capital Limited	23.5%
Regal Funds Management	10.6%
FIL Limited	9.7%
UBS Group AG	5.6%
Credit Suisse Holdings (Australia) Limited	5.5%

Share Price Graph and Trading Volumes



Base Resources (BSE)

Home Run

Analyst: John Macdonald

Quick Read

Toliara is a world class mineral sands project underpinned by the large, high-grade, ilmenite rich, Ranobe deposit. Ranobe hosts a Resource of 2,580Mt @ 4.3% Heavy Mineral (HM) and a Reserve of 904Mt @ 6.1% HM. BSE acquired Toliara in 2018 for US\$92m and has completed a concept study, PFS, DFS and enhanced DFS. Toliara stands out due to its size (and potential long mine life), expansion potential, technical simplicity, scope for operational scale up and expected competitive positioning in the sector.

Overview

Current Status & Next Steps: In November 2019, the Government of Madagascar (GOM) suspended on-the-ground activity at Toliara while discussions relating to the fiscal terms applying to the project took place. Activity remains suspended with discussions between BSE and the GOM ongoing. Pre-development workstreams including FEED, selection of preferred tenderers for key construction packages and prospective lenders due diligence has continued in the background. Once fiscal terms are agreed and on the ground activities are permitted to resume, it is estimated that there will be approximately 11 months' work to complete prior to FID including community engagement, permitting and environmental approvals, financing, obtaining LGIM eligibility certification, land acquisition and the completion of major construction contracts.

DFS: The initial DFS was completed in December 2019 which defined the project's scope, detailed how the project would be implemented, and confirmed a requisite business case for future investment. DFS outcomes were broadly consistent with the PFS (released March 2019), delivering a post-tax / pre-debt (real) NPV₁₀ of US\$652m and IRR of 21.4% (measured at FID) with estimated average annual production of 780kt of ilmenite, 53kt of zircon and 7kt of rutile over a 33-year life (underpinned by a Reserve of 586Mt @ 6.5% HM). The DFS assumed construction would commence late 2020 (FID September 2020) at a cost of US\$442 million with first production late 2022. Mining was to be broken into two stages: 12.6Mtpa in Stage 1, increasing to 18.6Mtpa in Stage 2 (requiring additional capex of US\$69m). Given on the ground activities were suspended in 2019, this was all delayed.

DFS2: The enhanced DFS (DFS2) released in September 2021 redefined the project scope to further enhance value by increasing the scale of Stage 2 (from a mining rate of 18.6Mtpa to 25Mtpa), optimising the life of mine plan and associated production rates, and utilising updated pricing assumptions. The scaled-up Stage 2 was underpinned by a significant increase (c.45%) to the Ranobe Ore Reserve estimate (announced at time of DFS2). Stage 1 capex cost, to establish a 12.5Mtpa mining processing operation, increased from the previous DFS by 18% to US\$520m, primarily due to cost escalation. Stage 2 capex cost also increased to US\$137m (from US\$69m) due to the scale up of the operations. FID is now expected in Q4 2022. Despite the increased capital requirements, project economics are superior under the enhanced DFS, delivering an increased post-tax / pre-debt (real) NPV₁₀ of US\$1.0b (measured at FID) with increased average LOM production

The enhanced DFS redefined the project scope and enhanced value by increasing the scale of Stage 2

of 960kt ilmenite, 66kt zircon and 8kt rutile. As in the initial DFS, mining will be implemented in 2 stages utilising D11 bulldozers feeding into a DMU to deliver 12.8Mtpa to the Wet Concentrator Plant (WCP) in Stage 1 (~4 years) before increasing to 25Mtpa with the addition of a second DMU and WCP for the remainder of the mine life (Stage 2). The WCP will remove slimes and concentrate the valuable HMs with a number of gravity separation steps while rejecting most of the non-valuable, lighter minerals. The HM concentrate will then be processed in the mineral separation plant (MSP), cleaning and separating the rutile, ilmenite and zircon minerals into finished products. The products will then be transported to a purpose built export facility for shipping to customers. End products are used in the production of white pigment for paint, plastics and paper as well as for ceramics and metallurgy.

Project Overview

The Ranobe mineral sands deposit is located in south west Madagascar, 45km north of the regional port town of Toliara, 18km inland and approximately 640km southwest of Antananarivo, the capital of Madagascar. The deposit lies on a 125.4km² ML. The deposit comprises a single continuous body of mineralisation approximately 20km long, 1.5 to 4.5km wide and 3m to 60m in thickness and situated immediately west of a prominent north-south escarpment with HM mineralisation (including ilmenite, rutile and zircon) extending from surface.

Figure 62: Toliara Location.



Source: BSE

Table 19: DFS Highlights.

	Unit	DFS2	DFS
NPV ₁₀ (discount rate of 10%, post tax, real)	US\$ millions	1,008	652
IRR	%	23.8	21.4
Initial (Stage 1) capex	US\$ millions	520	442
Construction period (Stage 1)	Months	27	26
Stage 2 capex	US\$ millions	137	69
Construction period (Stage 2)	Months	21	12
Capital payback period (Stage 1 + 2)	Years	4.5	4.3
Life of mine	Years	38	33
LOM operating costs + royalty	US\$/t ore mined	3.78	4.31
LOM operating costs + royalty	(A) US\$/t produced	88	94
LOM revenue	(B) US\$/t produced	306	295
LOM cash margin	(B-A) US\$/t produced	218	201
LOM revenue : cost of sales ratio	(B/A) Ratio : 1	3.5	3.2
LOM free cash flow	US\$ millions	5,922	3,692

Source: BSE

The project is located in south west Madagascar

NOT COVERED

Market Cap \$2.3B
Current Price \$6.77

Ticker: CHN
Sector: Metals & Mining

Shares on Issue (m): 352.9
Market Cap (\$m): 2,389.4
Cash Est. (\$m) 81.3
Debt Est. (\$m) Nil
Enterprise Value (\$m): 2,308.0

52 wk High/Low: \$9.17 \$2.91
12m Av Daily Vol (m): 2.1

Projects **Stage**
Julimar (Ni-Cu-PGE) Exploration
Pyramid Hill Gold Project* Exploration
Hawkestone (Ni-Cu-Co) Exploration

Cashflows **2020** **2021**
Operating Cashflow -10.2 -37.6
Investing Cashflow 8.7 -20.3
Financing Cashflow 28.4 112.0
Cash Balance 45.7 20.9

Directors:
Tim Goyder Non-Executive Chairman
Derek La Ferla Non-Executive Chairman
Alex Dorsch Managing Director
Morgan Ball Non-Executive Director
Garret Dixon Non-Executive Director
Linda Kenyon Non-Executive Director
Stephen McIntosh Non-Executive Director

Substantial Shareholders: %
Tim Goyder 10.8%

Share Price Graph and Trading Volumes



Chalice Mining (CHN)

Growing Gonneville

Analyst: Royce Haese

Quick Read

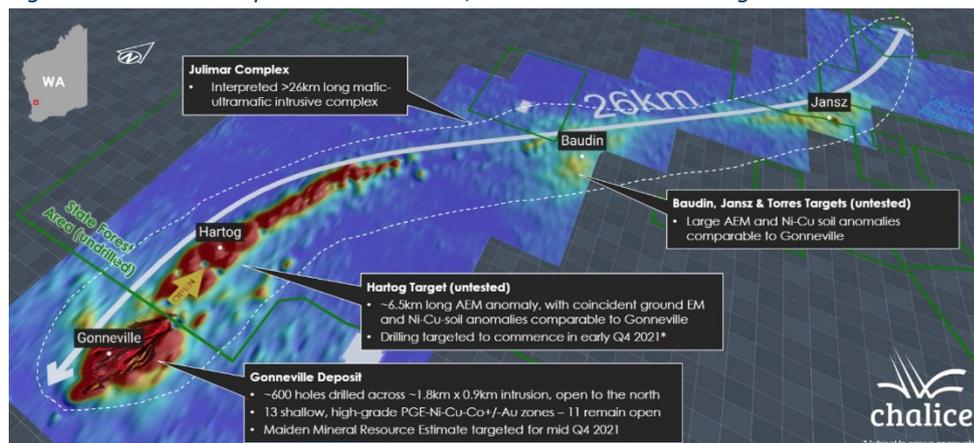
Chalice's Gonneville represents one of the most significant exploration successes in recent history. The discovery of a unique ore system in a terrane not previously recognised as mineralised is a rare thing. With a maiden MRE imminent and study work ongoing key questions remain unanswered. Although early stage, Gonneville and Julimar more broadly, has the potential to position Australia as a globally significant Palladium producer.

Overview

Rapid Growth: Since reporting the discovery hole in March 2020, Chalice has completed >160 km of drilling at Gonneville. The deposit has now been defined over ~1.9 km of strike and ~0.9 km width, the bulk of the deposit has been drilled to ~200 m vertical, mostly on 40 by 40 m spacings, and mineralisation tagged up to ~800 m depth. A Maiden MRE is expected imminently with a Scoping Study to follow.

Drilling has been constrained to privately held farmland to date, with the deposit open to the north where farmland abuts the Julimar State Forest. Geophysical signatures and soil sampling indicates that mineralisation continues into the forest, along 26 km of strike dubbed the Julimar Complex.

Figure 63: Julimar Complex EM anomalism, State Forest outlined in green.



Source: CHN

Key Questions: We expect the maiden MRE will demonstrate a significant discovery. Key questions remaining pertain to the ultimate level of activity allowed within the State Forest, and potential/cost of beneficiation of the ore, especially the lower grade disseminated ore where early test-work has shown poor recoveries.

Project Valuation

Argonaut does not have a project level valuation for the Julimar Project

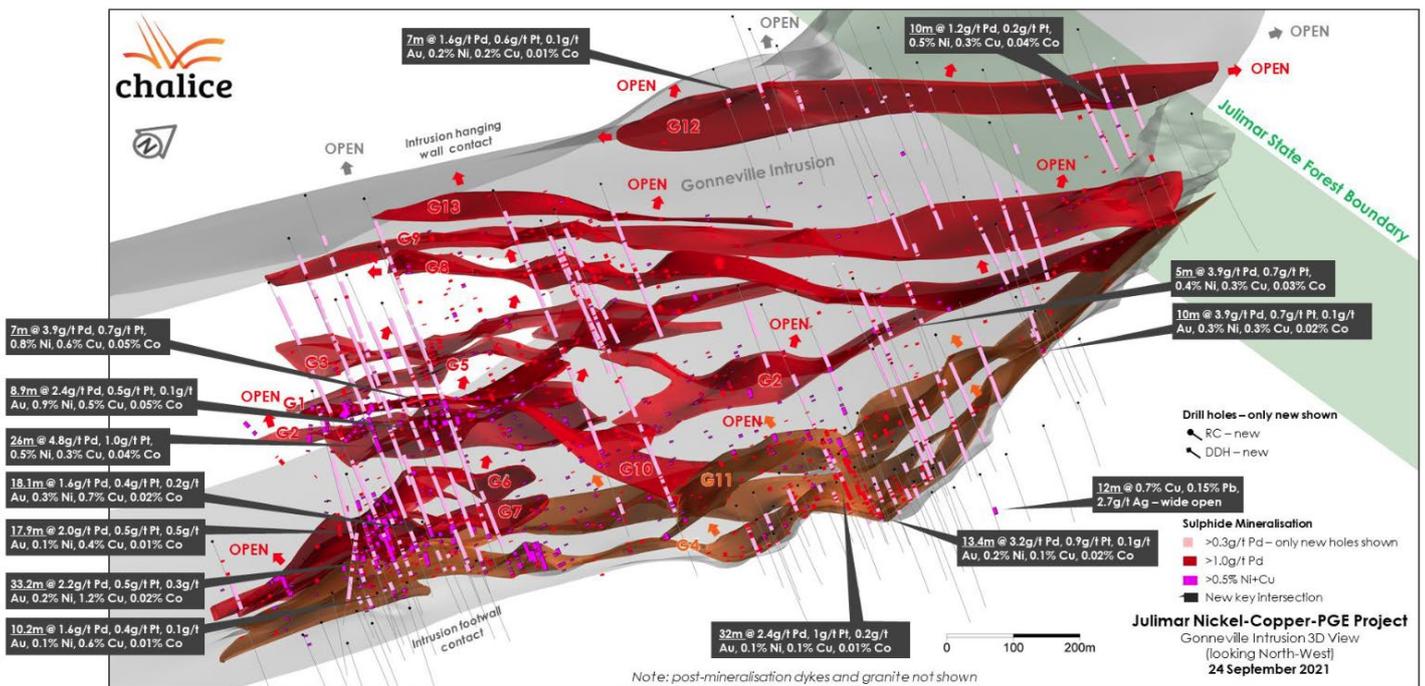
Project

Julimar is located approximately 70 km north-east of Perth.

Chalice’s Julimar Project is located approximately 70 km north-east of Perth. At Gonnevile, mineralisation is hosted in a series of lodes internal to the Gonnevile intrusion. 13 lodes have been identified to date, PGE’s in these lodes have a strong base-metal affinity, with mineralisation in the basal G4 and G11 lodes closely associated with copper, and a strong nickel association in the remainder.

There is also a large component of mineralisation reported within the mafic host rocks outside of these main lodes, described as disseminated. The deposit is crosscut by a series of barren dolerite dykes.

Figure 64: Oblique view facing north-west, down plunge of the Gonnevile Intrusion



Source: CHN

Preliminary metallurgical testwork has shown that two commercially attractive concentrates can be generated.

Preliminary metallurgical testwork has shown that two commercially attractive concentrates can be generated from the high-grade Gonnevile ore. A copper and a nickel concentrate.

Table 20: Recovery to concentrate for high-grade zones using conventional flotation

Metal	Expected Recovery (%)
Copper (to Cu-PGE-Au con)	80-90
Nickel & Cobalt (to Ni-Co-PGE con)	60-75
Palladium (to both cons)	75-85
Platinum (to both cons)	65-75
Gold (to Cu-PGE-Au con)	35-75

Source: CHN

There is also a mineralised oxide component at Gonnevile. Leach tests have demonstrated good recovery of Pd-Au into solution, however metal recovery from this solution has not been attempted as yet.

SPEC BUY

Current Price \$0.045
Valuation \$0.055

Ticker:	HCH		
Sector:	Metals & Mining		
Shares on Issue (m):	4,376.3		
Market Cap (\$m):	196.9		
Cash Est. (\$m)	12.1		
Debt Est. (\$m)	Nil		
Enterprise Value (\$m):	184.9		
52 wk High/Low:	\$0.05	\$0.03	
12m Av Daily Vol (m):	13.6		
Projects	Stage		
Costa Fuego	Scoping		
Mineral Resource	Mt	CuEq %	CuEq (Mt)
Costa Fuego	724.0	0.48	3.5
Cashflows A\$M	2020	2021	
Operating Cashflow	-2.6	-3.6	
Investing Cashflow	-17.0	-25.3	
Financing Cashflow	24.6	26.4	
Cash Balance	6.3	3.6	
Directors:			
Murray Black	Non-Executive Chairman		
Christian Easterday	Managing Director		
Dr Allan Trench	Non-Executive Director		
Roberto de Andraca Adriasola	Non-Executive Director		
Randall Nickson	Non-Executive Director		
Mark Jamieson	Non-Executive Director		
Substantial Shareholders:	%		
Glencore	8.6%		
Murray Edward Black	7.1%		

Hot Chili (HCH)

A New Partnership Spices Things Up

Analyst: George Ross

Quick Read

Things are shifting pace at HCH's Chilean Costa Fuego project. Exploration, Resource expansion and development studies are moving forward and we have big expectations for an updated Resource to be released in late 2021 and the Costa Fuego PFS due in the third quarter of 2022. Later this year, HCH is expected to list on the TSX Venture Exchange. It is hoped that direct exposure to the North American market will realise better value for the Project. In August, HCH welcomed Swiss mining giant Glencore to the share register through a private placement. The arrival of Glencore as a strategic partner provides credibility for Costa Fuego as a viable development asset.

Costa Fuego Overview

HCH's Costa Fuego Copper Project is located in the Atacama region of Chile, approximately 50km inland from the oceanside township of Huasco and 20km south of inland city Vallenar (Figure 65).

Costa Fuego includes Resources, advanced deposits and early phase drilling targets. JORC compliant Mineral Resources totalling 724M at 0.46% CuEq are reported for the Cortadera and Productora areas. San Antonio and Valentina were the site of historic underground mining for ore exceeding 1% copper. Both Cortadera North and Santiago Z are highly significant soil geochemical anomalies with geological similarities to Cortadera. See Figure 65 for deposit locations and summary information.

In September HCH confirmed Productora will be the site for a central processing plant. It is envisaged that ore will be transported 14km from Cortadera to the plant via a low operating cost rope conveyor system. We expect the Costa Fuego plant will be sized to process between 16-20Mt of ore per annum. At this scale we expect Costa Fuego will produce in excess of 65kt of copper equivalent metal in concentrate per annum.

Glencore Validation Adds Value

In August, global resources house Glencore acquired a strategic 9.99% stake in HCH for \$14.4M. Part of the deal will include offtake for over 60% of Costa Fuego's first eight years of production. Glencore's entry onto the HCH share register will undoubtedly improve the development prospects for Costa Fuego, whilst also signalling to the market that the project is viable. Glencore will bring 'big company' engineering and financing capability to Costa Fuego that would otherwise be absent.

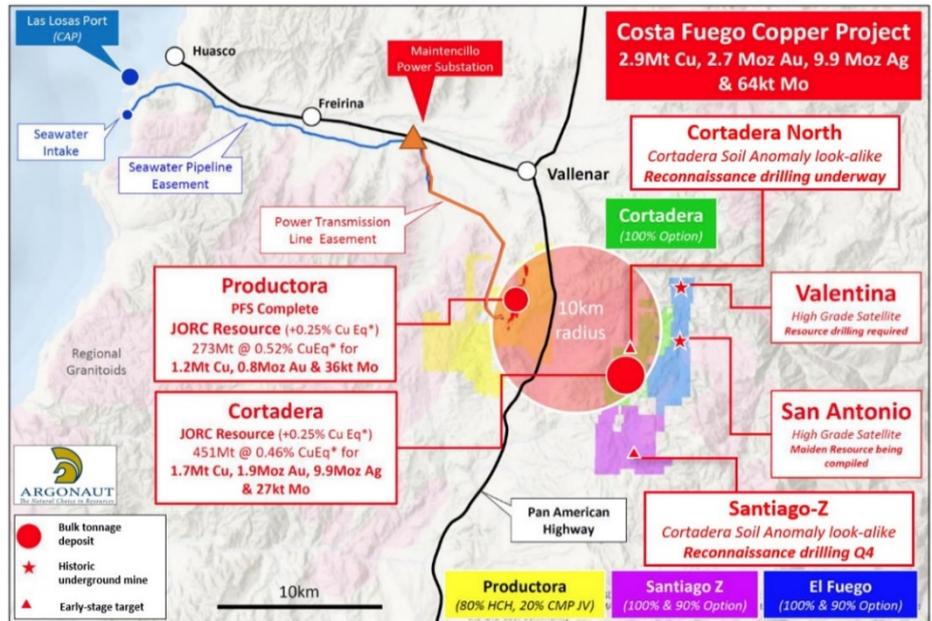
Project Valuation

Our asset valuation is based on a US\$72 transactional value for contained copper equivalent metal within current Resources. On this basis we ascribe Costa Fuego with a A\$429M project value.

Share Price Graph and Trading Volumes



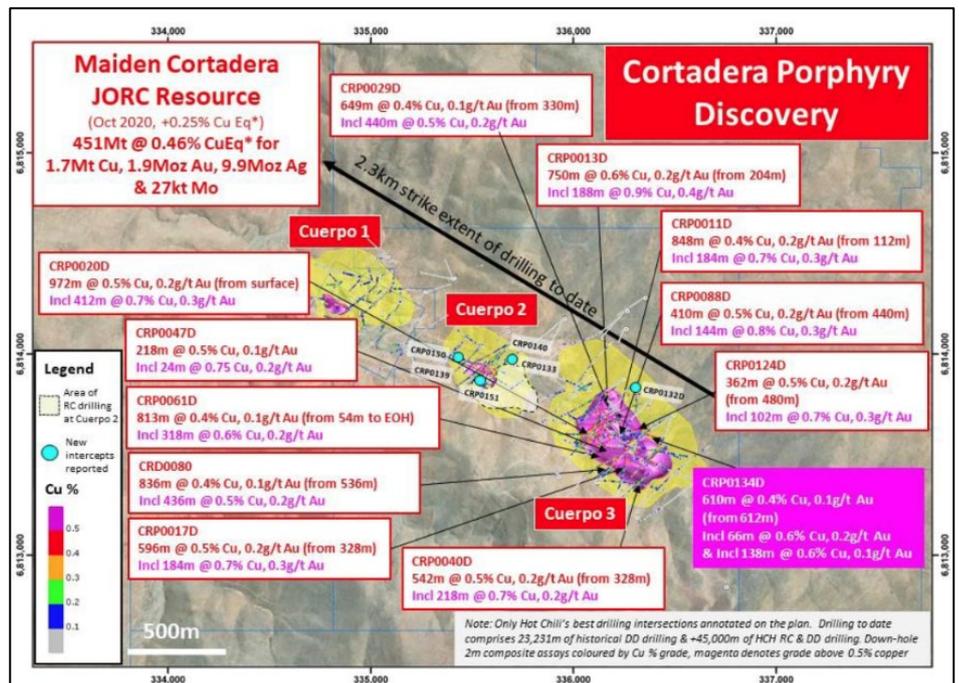
Figure 65: Costa Fuego Copper Project location map.



A coastal range location ensures supply of water and access to port facilities

Source: HCH

Figure 66: Cortadera porphyry system with better drill intercepts.



Ongoing positive Cortadera drilling results indicate a large mineralised system

Source: HCH

Figure 67: High grade core from Cortadera hole CRP00134D at 528m depth.



Source: HCH

NOT COVERED

Market Cap \$3.7B
Current Price \$1.93

Ticker:	LTR	
Sector:	Metals & Mining	
Shares on Issue (m):	1,911.2	
Market Cap (\$m):	3,679.0	
Cash Est. (\$m):	26.0	
Debt Est. (\$m):	Nil	
Enterprise Value (\$m):	3,653.0	
52 wk High/Low:	\$1.94	\$0.22
12m Av Daily Vol (m):	5.9	

Projects	Stage	
Kathleen Valley	Updated PFS	

Mineral Resource	Mt	Li2O%
Kathleen Valley	156.0	1.4

Cashflows	2020	2021
Operating Cashflow	-15.8	-8.2
Investing Cashflow	-0.1	1.4
Financing Cashflow	17.8	14.1
Cash Balance	5.3	12.5

Directors:	
Timothy Goyder	Chairman
Antonio Ottaviano	Managing Director
David Richards	Non-Executive Director
Craig Williams	Non-Executive Director
Anthony Cipriano	Non-Executive Director
Steven Chadwick	Non-Executive Director

Substantial Shareholders:	%
Timothy Goyder	17.2%

Share Price Graph and Trading Volumes



Liontown (LTR)

Lithium Lion

Quick Read

With a Mineral Resource of 156Mt at 1.4% Li₂O (4th largest hard rock lithium resource globally), Liontown's (ASX:LTR) 100% owned Kathleen Valley (KV) is one of the best undeveloped lithium projects. An updated pre-feasibility study (Updated PFS) into establishing a 2Mtpa mining operation to produce an average 350ktpa Spodumene Concentrate (grading 6% Li₂O) (SC6) for 40 years was completed in October 2020. Project economics under the Updated PFS are robust with a post-tax NPV₈ of A\$1.12b, a post-tax IRR of 37% and a capital payback of 3 years (from production). A subsequent scoping study into the potential to produce Lithium Hydroxide or Lithium Sulphate was also completed and a Definitive Feasibility Study (DFS) is underway and on track for completion in Q4 2021.

Overview

Updated PFS: The October 2020 Updated PFS outlined a 40-year operation with forecasted steady state production of 350ktpa SC6 and 430tpa of 30% Tantalum Concentrate with first production scheduled for Q2 2024. Estimated pre-production CAPEX is A\$325m (including contingency), generating 37% post-tax IRR (49% higher than the 2019 PFS) and NPV₈ of A\$1.12b (121% higher than the 2019 PFS) at a forecast SC6 price of US\$739/t. The financial and operational outcomes demonstrated in the Updated PFS have been significantly enhanced compared to the previous PFS with the inclusion of a larger MRE, an enhanced flow sheet (inclusion of a Tantalum circuit) and optimised open pit and underground mine plans providing early access to higher-grade material.

Downstream Scoping Study (DSS): The DSS was completed in parallel with the Updated PFS and considered the further refining of SC6 on-site to produce either Lithium Hydroxide (LH) or Lithium Sulphate (LS). The DSS delivered superior financial returns to the Updated PFS including a post-tax NPV₈ of A\$4.8b and A\$3.2b (post-tax IRR of 41% and 35%) for the production of LH and LS respectively, albeit with meaningfully higher CAPEX estimates (A\$1.1b and A\$0.9b for the downstream production of LH and LS respectively). A downstream processing PFS is advancing.

Going Forward: A Definitive Feasibility Study (DFS) is underway (building on the Updated PFS) with key considerations including mine schedule optimisation to improve grade / recovery, throughput increases (2+ Mt), final concentration / grade optimisation and an accelerated design schedule to meet the growing lithium market. LTR has identified a number of improvements and enhancements as part of its DFS works including an increase in the indicated category of the Mineral Resource, sustaining capital savings as well as the simplification of the process flowsheet to facilitate throughput increases and future growth. The DFS is on track for completion in Q4 2021 with a FID expected Q2 2022. In parallel with the DFS, LTR is currently seeking to secure near-term off-take arrangements, advance project funding strategies and place orders for critical long-lead items.

Table 21: Timeline to Development (under Updated PFS)

Activity	Time
DFS	Q4 2021
FID / FEED	Q2 2022
Early Works / Design	Q3 2022
Construction Complete	Q4 2023
Commissioning	Q1 2024
Production	Q2 2024

LTR have scheduled first production for Q2 2024

Source: LTR

Project Overview

The 100%-owned KV Lithium-Tantalum Project is located in the North Eastern Goldfields of Western Australia, approximately 400km north of Kalgoorlie. KV is proximal to well-established transport and energy infrastructure and numerous major Nickel and Gold Mines. KV currently stands as the 4th largest hard rock lithium resource globally. LTR acquired the project in 2017 and has since drilled 461 RC and diamond core holes for a total of 89,066m and undertaken various studies to assess project development viability.

The project is located 400km north of Kalgoorlie

Figure 68: Location of Kathleen Valley.



Source: LTR

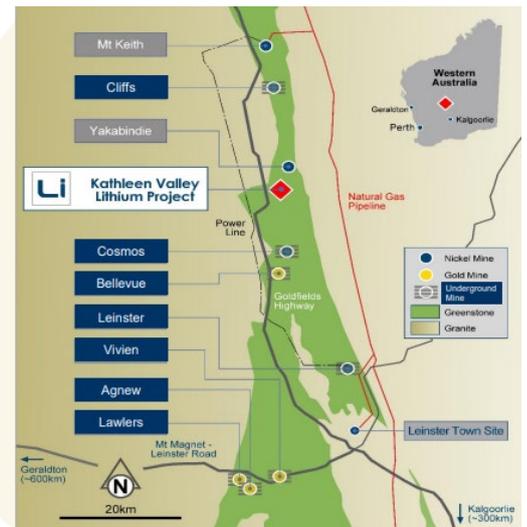
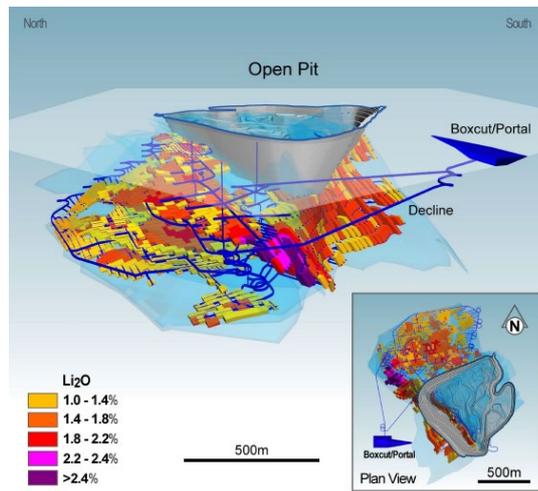
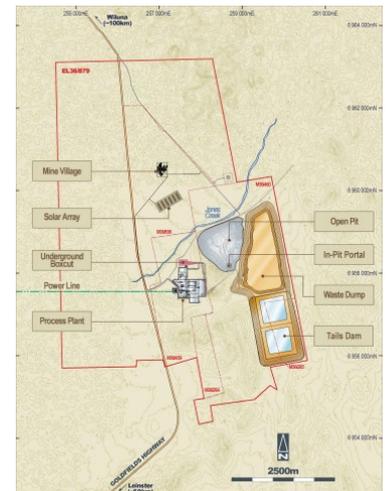


Figure 69: Proposed Mine Design and Site Layout.

Proposed Mine Design and layout under the Updated PFS



Source: LTR



NOT COVERED

Market Cap \$257M
Current Price \$0.053

Ticker:	NTU		
Sector:	Metals & Mining		
Shares on Issue (m):	4,851.9		
Market Cap (\$m):	257.1		
Cash Est. (\$m)	14.3		
Debt Est. (\$m)	Nil		
Enterprise Value (\$m):	242.8		
52 wk High/Low:	\$0.07	\$0.03	
12m Av Daily Vol (m):	9.2		
Projects	Stage		
Browns Range	FS Underway		
Mineral Resource	Mt	kg/t Dy203	kg/t Tb407
Browns Range	9.2	0.57	0.09
Cashflows	2020	2021	
Operating Cashflow	-31.8	-0.9	
Investing Cashflow	-15.8	-7.6	
Financing Cashflow	46.2	21.8	
Cash Balance	6.7	19.9	
Directors:			
Colin McCavana	Non-Executive Chairman		
Adrian Griffin	Non-Executive Director		
Ming Lu	Non-Executive Director		
Bin Cai	Non-Executive Director		
Liangbing Yu	Non-Executive Director		
Substantial Shareholders:	%		
Vastness Investments	7.7%		
Africa Changcheng Mining	5.2%		
Yongquan He	5.2%		

Share Price Graph and Trading Volumes



Northern Minerals (NTU)

It's Xenotime

Analyst: John Macdonald

Quick Read

Everyone outside China thinks it's a good idea to diversify supplies of dysprosium and terbium. Browns Range is one of very few projects worldwide that can oblige. The current feasibility study is working with a tailwind in product prices.

Overview

Northern Minerals (NTU) is progressing a feasibility study into the Browns Range heavy rare earths (dysprosium and terbium) project in Western Australia.

Dysprosium, and the Browns Range by-product terbium, are critical components of high powered permanent magnets. Accelerating demand for electric vehicles and wind turbines have pushed up prices in 2021. Western efforts to circumvent the historical concentration of primary dysprosium and terbium supplies in China, are ongoing.

Estimated ore resources at Browns Range are 9.2Mt at 0.57 kg/t Dy₂O₃ and 0.09 kg/t Tb₄O₇, in seven separate deposits and a stockpile. Browns Range has uniquely high dysprosium and terbium grades due to the presence of the ore mineral xenotime, which is seldom found in commercial concentrations elsewhere. Exploration drilling to extend resources is ongoing, with \$10M exploration expenditure planned in FY22.

A Browns Range DFS was completed in early 2015, considering plans to mine and treat 600kt of ore per year, to produce 280,000kg of dysprosium oxide per year in a mixed rare earth carbonate (for sale). The process flowsheet comprised a beneficiation plant and a hydrometallurgical plant. The estimated cost of construction was A\$330M. Following a year of discussions with potential offtake partners and financiers, NTU opted to build a pilot processing plant on site at Browns Range, at one tenth the capacity of the DFS plans.

Northern Minerals commissioned the pilot facility in May 2018. To the end of June 2021 NTU had produced 10,000kg of dysprosium oxide and 1,200kg of terbium oxide in rare earth carbonates. Total net costs (capital and operating) incurred by the pilot plant exercise were about A\$110M to the end of June 2021. A final, successful processing campaign incorporating ore sorting was completed in the September 2021 quarter. The practical, technical and marketing experiences gained in the three year pilot exercise are to inform a new feasibility study to be completed in 2022.

Marketing and execution

Browns Range's dysprosium and terbium are essential within efficient electric motor componentry. Current concentration of supply in China has increasingly been raised as a risk to non-Chinese economies, particularly since 2020 in response to increasing Chinese mercantile confrontation. NTU's potential strategic value has attracted Chinese shareholders, although management maintains shareholders will be best served by NTU forming part of supply chains independent to China.

Browns Range's dysprosium and terbium are essential to efficient electric motors

Because of the concentration of supply and upstream processing capacity in China, price and volume information on dysprosium usage come exclusively from Chinese sources. NTU believes that 2,500-3,000 tonnes of Dy₂O₃ are consumed annually, and that prices in late October 2021 had edged up to US\$400/kg (US\$400,000/t) for separated DY2O3 FOB China. The rise puts prices at their highest point since the aftermath of the 2011 price spike related to the China-Japan trade dispute. NTU believes pressures on primary dysprosium supplies in China are increasing, via depletion and domestic environmental controls.

Lynas Rare Earths reported in October 2021 that demand for rare earths in the magnet sector continues to be very strong and that Lynas' customers expect it to further accelerate in 2022. (Lynas' main permanent magnet products contain neodymium + praseodymium or NdPr, and dysprosium and terbium are minor by-products).

Table 22: Dy and Tb price indications as at 22 October 2021

	Dy Oxide China Domestic Price (VAT excluded)							
	Q1 FY21	Q2 FY21	Q3 FY21	Q4 FY21	Q1 FY22	Jul	Aug	Sep
USD/kg	227	235	340	350	353	341	361	358
Base 100	100	104	150	154	156	150	159	158

	Tb Oxide China Domestic Price (VAT excluded)							
	Q1 FY21	Q2 FY21	Q3 FY21	Q4 FY21	Q1 FY22	Jul	Aug	Sep
USD/kg	608	751	1222	989	1070	963	1130	1118
Base 100	100	124	201	163	176	158	186	184

The market is opaque, however demand for rare earths is reported to be strong

Source: Lynas Rare Earths

A risk to Browns Range's development is the lack of developed upstream processing options independent from China. NTU is working with potential partners to secure viable new separation and magnet manufacturing supply chains.

Northern Minerals' pilot plant exercise at Browns Range has cleansed a lot of the technical risks from the full scale proposal. Among other lessons, the hydrometallurgical circuit will probably be placed in an urban setting with access to specialist technical services. Ore sorting worked well as a means of reducing the back end plant size for a given output. The substantial capacity of the pilot plant and the duration of its operation provide confidence that NTU, its employees and consultants are capable of planning and delivering.

The pilot plant exercise has helped de-risk the project and will inform further feasibility in 2022

Figure 70: Browns Range project location and pilot plant



Source: NTU

SPEC BUY

Current Price \$0.21
Valuation \$0.23

Ticker: PDI
Sector: Metals & Mining

Shares on Issue (m): 1,364.1
Market Cap (\$m): 279.6
Cash Est. (\$m): 23.9
Debt Est. (\$m): Nil
Enterprise Value (\$m): 255.8

52 wk High/Low: \$0.26 \$0.06
12m Av Daily Vol (m): 5.7

Projects **Stage**
Bankan Resource Development
Bongou Exploration

Mineral Resource **Mt** **g/t Au** **Moz Au**
Bankan 72.8 1.6 3.6
Bongou 2.2 2.6 0.2

Cashflows **2020** **2021**
Operating Cashflow -4.0 -14.3
Investing Cashflow 0.0 -0.3
Financing Cashflow 11.4 28.7
Cash Balance 8.6 22.7

Directors:
Simon Jackson Non-Executive Chairman
Andrew Pardey Chief Executive Officer
Paul Roberts Technical Director
Steven Michael Non-Executive Director

Substantial Shareholders: %
Capital DI Limited 11.0%
Van Eck 5.0%
Franklin Templeton 5.0%
Lowell Resources Fund 4.0%

Share Price Graph and Trading Volumes



Predictive Discovery (PDI)

Burgeoning Bankan

Analyst: Royce Haese

Quick Read

Predictive Discovery and its Bankan Project in Guinea has had its share of ups and downs over the past twelve months. Early drill results showed the makings of a solid deposit, but grade increasing at depth defining a high-grade core has taken the project to the next level. A coup d'état briefly halted positive momentum, but this was quickly overshadowed by a maiden Mineral Resource Estimate that vastly exceeded expectations. It seems the lofty MRE also caught the attention of environmental activists who subsequently pointed out that the project is within the outer buffer zone of a national park. The current resource base is vast, and just a starting point for the Project. With the possibility of additional discoveries, Bankan has the potential to grow into a world-class project, but it may be a bumpy ride.

Overview

Off to a Cracking Pace: In slightly over a year since the first diamond drillhole was completed at NE Bankan, the project is shaping up to be a significant deposit in terms of scale and potential economics. The MRE, totalling 72.8Mt @ 1.56 g/t Au for 3.6Moz, substantially exceeded Argonaut's order of magnitude estimate. Of this total, 3.3Moz's comes from NE Bankan with Bankan Creek contributing the balance. All estimates are in the Inferred category. The estimate has been reported using a 0.5g/t cut-off grade and is constrained to a US\$1800/oz pit shell.

Argonaut Mining Scenario: Argonaut has put together a mining scenario as a basis for valuation. Due to the early nature of the project assumptions are boilerplate, and are likely to change, e.g. discovery of additional ounces would likely justify a larger processing facility and increased development. Based on what has been defined to date we assume a mining inventory of 34Mt @ 1.7 g/t Au for 1.8Moz (~55% of Inferred NE Bankan estimate) and annual production throughput to 4Mtpa. We presume pre-production capex of US\$260M, gold recovery of 93%, and a strip ratio of 5:1 mining a 350 m deep pit. We derive an assumed after-tax NPV₁₀ for the NE Bankan project of A\$416M.

Bumpy Ride: Political and environmental factors have impeded what has been substantial technical success at Bankan. With no sitting government in Guinea, the fiscal terms under which the project will operate are unknown and will likely remain unknown for some time. Exploration activities should continue unfettered although there is a chance of delays in granting of any further approvals required. At this stage we assume a 15% government free-carry interest in the project, 6% total royalties and a 30% tax on profits. The project is not without its risks, but the potential prize is substantial.

Project Valuation

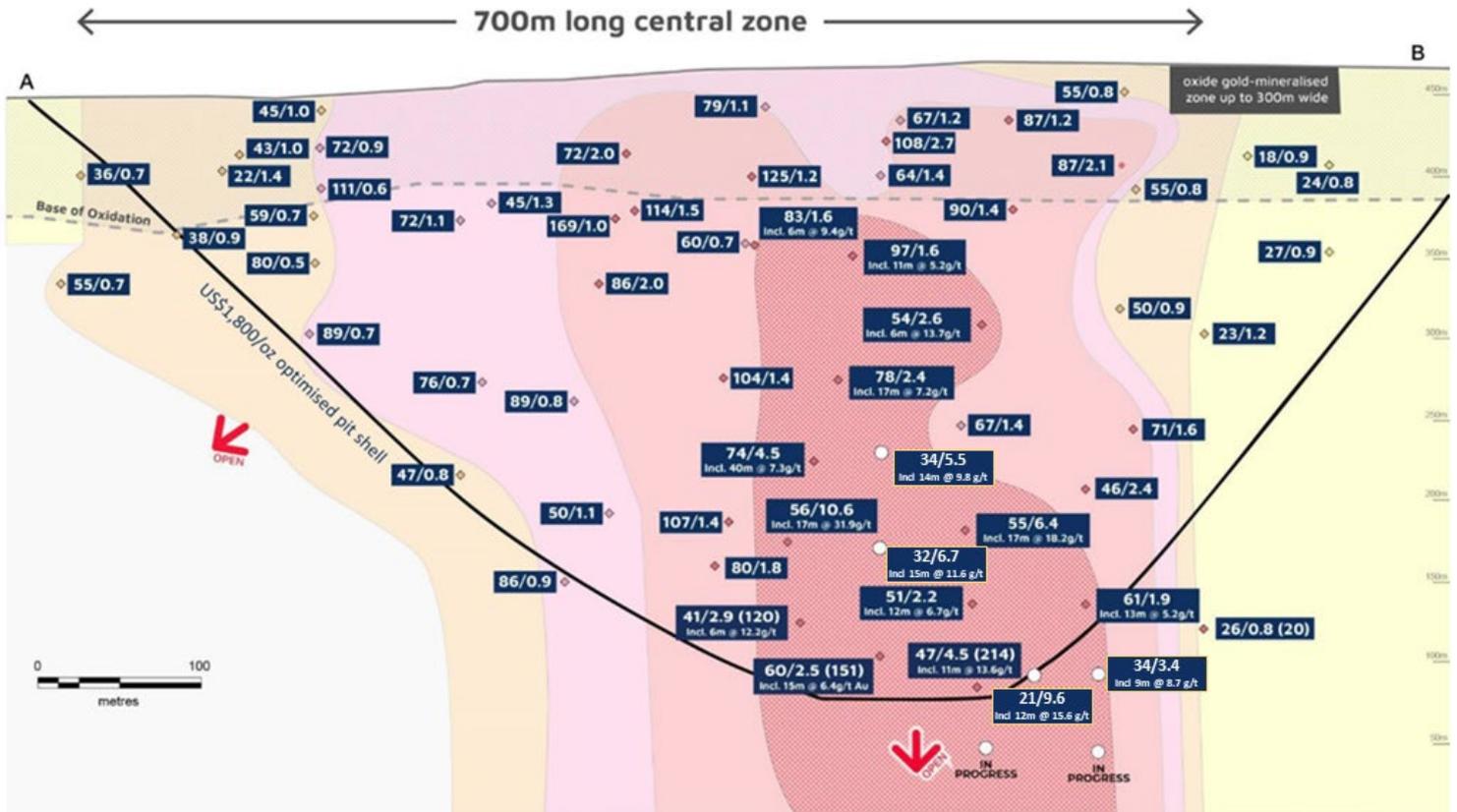
We derive an assumed after-tax NPV₁₀ for the NE Bankan project of A\$416M.

Bankan

Our Bankan valuation represents a snapshot at the start of a story for the Bankan Project, with substantial exploration upside

Our project level valuation and Bankan Mining scenario is a snapshot at the start of the story for the Bankan Project. The NE Bankan deposit still has room to grow at depth, with more recent results supportive of the high-grade core and drilling in progress to extend it.

Figure 71: Bankan NE long section with aggregate down-hole results reported.



- * Projected to a vertical plane orientated NNW.
 - * Results legend: 70/1.0 (70) = 70m (aggregate true widths within the gold mineralised envelope) with length weighted average grade of 1.0g/t Au. Aggregate true width x grade in brackets.
 - * Intercept values shown = aggregate of true width reported intercepts (0.25g/t Au cutoff grade) excluding intercepts averaging <0.5g/t Au.
 - * The holes plotted are RC/DD and DD holes drilled from west to east. The majority of gold intercepts in the upper weathered (oxidised) surface layer were obtained in east to west drilling from which true widths cannot be estimated. In addition gold intercepts in the weathered zone extend over a greater lateral width than the gold mineralised envelope in fresh rock.
- Note: Long section sourced from PDI ann. 30/09/21. Subsequent reported drill results added to figure by Argonaut (outlined in yellow)

Source: Argonaut after PDI

Numerous regional targets have been identified, with early success demonstrated

The nearby Bankan Creek deposit is smaller scale but also remains open with the bulk of recent attention focussed on NE Bankan.

Further afield, regional auger programmes and compilation plus review of detailed geophysical datasets has defined a number of priority targets along a major NNW structural trend. Predictive continues to test these targets, with recent results including a standout 28 m @ 12.1 g/t Au from 22 m, 1.5 km SW of NE Bankan hinting that further discoveries are a matter of when not if.

Whilst as a project Bankan is in its infancy, early signs point to the discovery of a significant gold field, which all going well should support a long-life, high-production project.

NOT COVERED

Market Cap \$224M
Current Price \$0.53

Ticker: SVM
Sector: Metals & Mining

Shares on Issue (m): 423.4
Market Cap (\$m): 224.4
Cash Est. (\$m): 5.9
Debt Est. (\$m): Nil
Enterprise Value (\$m): 218.5

52 wk High/Low: \$0.77 \$0.36
12m Av Daily Vol (m): 0.3

Projects Stage
Kasiya Rutile Project Resource Development

Mineral Resource Mt Rut (%) Rut (Mt)
Kasiya Rutile Project 644.0 1.0 6.5

Cashflows 2020 2021
Operating Cashflow -4.1 -3.9
Investing Cashflow -0.1 -0.3
Financing Cashflow 2.3 9.8
Cash Balance 2.4 8.0

Directors:
Ian Middlemas Chairman
Julian Stephens Managing Director
Ben Stoikovich Non-Executive Director
Mark Pearce Non-Executive Director

Substantial Shareholders: %
Sprott 10.2%

Share Price Graph and Trading Volumes



Sovereign Metals (SVM)

Kasiya, A Kingdom of Rutile

Analyst: George Ross

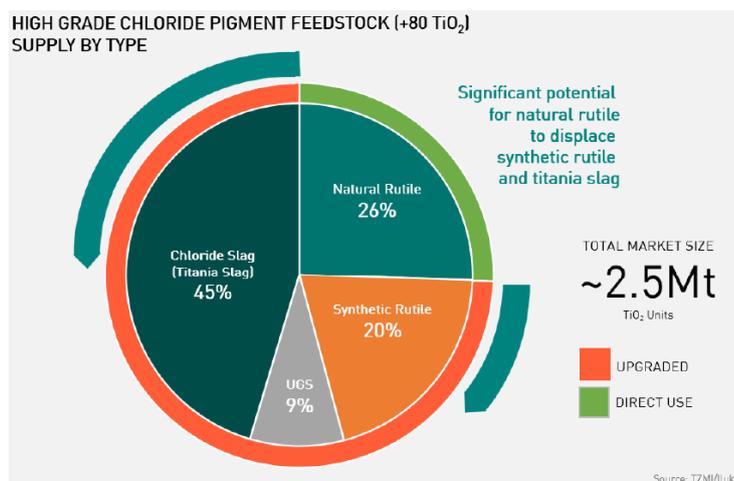
Quick Read

Sovereign Metals (SVM) continues to progress its Kasiya Rutile Project located in Malawi. Despite Kasiya's Maiden Resource Estimate only covering 49km² of the defined 114km² mineralised footprint, the deposit already ranks as one of the world's largest rutile deposits. An updated Resource is scheduled for release by the end of the year. Rutile contains a high percentage of critical metal titanium, and is primarily used for pigments and welding applications. Kasiya is supported by excellent road, rail and port infrastructure with ample logistical capacity. A forthcoming Scoping Study is targeted for the end of 2021.

Key Points

Rutile a Critical Raw Material: Rutile is a heavy mineral that is traditionally mined as a coproduct from ilmenite or zircon dominated heavy mineral sands projects. Coarse, high-purity, natural rutile can be used directly for industrial applications like pigment feedstock and welding electrodes. Natural rutile is expected to displace more expensive and carbon intensive competitor products such as Ilmenite, chloride slag and synthetic rutile in the pigment market (Figure 72). Natural rutile is also the purest natural form of titanium dioxide (TiO₂) and is a preferred feedstock for production of titanium metal. The market size for TiO₂ market feedstock is over 7.4Mtpa. High quality rutile (>95% purity) is currently selling above >US\$1,500/t into the medium term pigment contract market.

Figure 72: Proportional breakdown of high chloride pigment feedstocks.

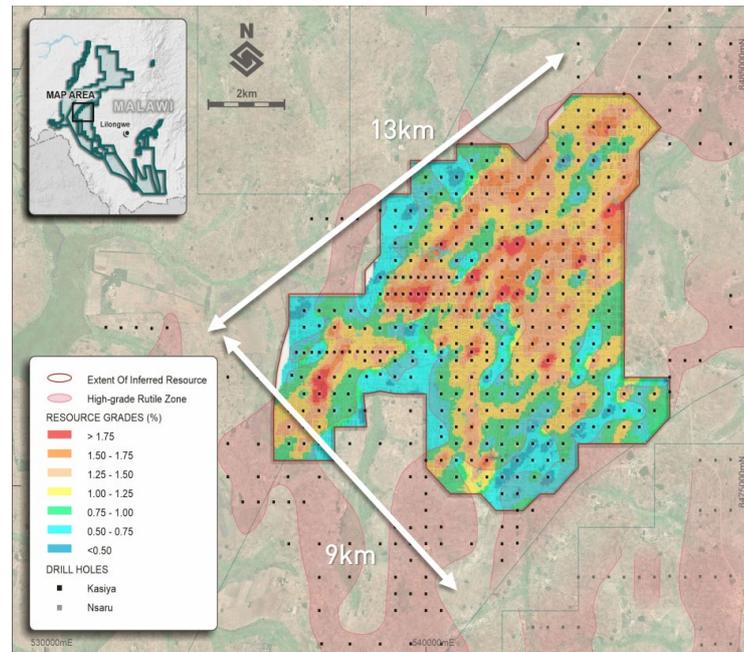


Source: SVM

Deposit & Maiden Resource: Kasiya is an unusual deposit due to the fact that economic concentrations of rutile result from lateritic weathering of the host rock. In March 2021 SVM announced discovery of a second rutile field referred to as Nsaruru immediately south of Kasiya. The maiden Kasiya Resource released in June is reported as 644Mt at 1.01% rutile, including a high grade component of 137Mt at 1.41% rutile. The majority of the

high grade material occurs within ~5m from surface. This is scaled comparably to Iluka’s Sierra Rutile project which has a resource of 739Mt at 1.1% rutile (based on recoverable rutile). An updated Resource scheduled for the end of 2021 is expected to confirm Kasiya as the world’s largest economic accumulation of rutile.

Figure 73: Maiden Kasiya Resource.



Source: SVM

Kasiya is expected to be the world’s largest rutile deposit

Natural rutile can replace other heavy minerals in many applications and resulting in lifetime product carbon emission reductions

Abundant roads, rail and port capacity

Product Superiority: Metallurgical testing completed on over 1 tonne of Kasiya ore has proven a simple dense media separation processing flowsheet for production of a premium rutile product. Kasiya rutile concentrate is well regarded due to large grain size (d50 = 145 micron), high grade and low deleterious elements. Processing will also generate a coarse grain graphite product that is expected to reduce C1 net costs.

ESG positive: The Company’s primary environmental advantage comes from natural rutile being a high grade titanium mineral. The preparation and processing of competing industrial feedstocks require a large input of energy and generate high volumes of carbon emissions.

Blessed with infrastructure: SVM has highlighted the value of the Nacala Logistics Corridor (NLC) which passes within 25km of Sovereign’s licence areas. This includes a recently refurbished 912km railway that was designed to transport coal from mines in western Mozambique to the port of Nacala via Malawi. It’s controlled by Vale and Mitsui. Access to the railway would significantly reduce upfront capital costs for the project. The close proximity to Lilongwe, Malawi’s capital, also provides access to a large workforce, major power sub-stations and water.

Scoping study: SVM’s Kasiya scoping study is due late 2021.

Project Valuation

Argonaut maintains no project valuation for Kasiya.

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Agrimin (AMN): Argonaut acts as Financial Adviser to AMN and receives fees commensurate with that service.

Bardoc Gold (BDC): Argonaut is acting as Financial Adviser to manage a formal process for the Bardoc Gold Project and will receive fees commensurate with this service.

BlackEarth Minerals (BEM): Argonaut acted as Lead Manager to the Placement to raise \$4.9M in April 2021 and received fees commensurate with this service.

De Grey Mining (DEG): Argonaut Securities Pty Limited acted as Joint Lead Manager & Joint Bookrunner and Argonaut PCF Limited acted as Joint Underwriter to the \$125M Placement announced 20 October 2021 and received fees commensurate with these services.

Firefinch Ltd (FFX): Argonaut PCF is acting as Corporate Adviser in relation to the ~\$50M debt funding process and is receiving fees commensurate with this service.

Genesis Minerals (GMD): Argonaut acted as Joint Financial Adviser in respect of the Placement to raise up to \$16M announced in September 2021 and will receive 3,750,000 GMD shares for this service. Argonaut acted as Lead Manager in respect of the Placement that raised \$10M in April 2021 and received fees commensurate with these services. Argonaut holds or controls 1,150,574 GMD shares.

Hot Chili (HCH): Argonaut participated in the Placement to raise \$25.6M in November 2020 and received fees commensurate with this service. Argonaut holds or controls 4,675,000 HCH Options exercisable at \$0.025 on or before 20 May 2022.

NexGen Energy (NXG): Argonaut acted as Financial Advisor and Broker to NXG's ASX listing in July 2021 and received fees commensurate with these services. Argonaut holds 17,892 NXG shares.

Northern Minerals (NTU): Argonaut holds or controls 1,844,391 NTU shares.

OreCorp (ORR): Argonaut acted as Co Lead Manager in respect of the Placement to raise \$56M in June 2021 and received fees commensurate with this service.

Pantoro (PNR): Argonaut holds or controls 416,667 PNR Shares, 5M PNR Options exercisable at \$0.15 and 5M Options exercisable at \$0.20 on or before 31 March 2022.

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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 5 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)	M&A Advisory
	<ul style="list-style-type: none"> › 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 	<ul style="list-style-type: none"> › 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	Special Situations
	<ul style="list-style-type: none"> › 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 	<ul style="list-style-type: none"> › 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



 <p>Gold Road</p> <p>\$166,000,000</p> <p>20% Share Raid and Takeover Bid for Apollo</p> <p>Financial Advisor Announced</p>	 <p>Westgold Resources</p> <p>\$133,000,000</p> <p>Takeover Bid for Gascoyne Resources</p> <p>Financial Advisor Announced</p>	 <p>De Grey Mining</p> <p>\$259,400,000</p> <p>Placements & Sell Down</p> <p>Joint Lead Manager & Underwriter 2020 - 2021</p>	 <p>AIC Mines</p> <p>\$40,000,000</p> <p>Priority & General Offer</p> <p>Joint Lead Manager 2021</p>	 <p>Global Lithium</p> <p>\$23,600,000</p> <p>Initial Public Offering & Placement</p> <p>Lead Manager 2021</p>
 <p>Genesis Minerals</p> <p>\$60,300,000</p> <p>Placements & Entitlement Offers</p> <p>Joint Financial Advisor & Lead Manager 2018 - 2021</p>	 <p>Red 5</p> <p>US\$19,500,000</p> <p>Sale of Siana Assets plus 3.25% royalty</p> <p>Financial Advisor 2021</p>	 <p>Develop Global</p> <p>\$18,400,000</p> <p>Placements & Entitlement Offer</p> <p>Underwriter & Joint Lead Manager 2021</p>	 <p>Aquila Resources</p> <p>\$60,000,000</p> <p>Sale of Gravenhage Manganese</p> <p>Financial Advisor 2021</p>	 <p>Medallion Metals</p> <p>\$12,500,000</p> <p>Initial Public Offering</p> <p>Underwriter & Lead Manager 2021</p>
 <p>Ore Corp</p> <p>\$56,000,000</p> <p>Placement</p> <p>Co-Lead Manager 2021</p>	 <p>Calidus Resources Limited</p> <p>\$110,000,000</p> <p>Project Finance</p> <p>Financial Advisor 2021</p>	 <p>St George Mining</p> <p>\$33,600,000</p> <p>Placements</p> <p>Lead Manager 2016 - 2021</p>	 <p>Capricorn Metals</p> <p>\$145,800,000</p> <p>Placements, Sell Down & ANREO</p> <p>Lead Manager & Underwriter 2019 - 2020</p>	 <p>Pantoro</p> <p>\$98,000,000</p> <p>Placements</p> <p>Joint Lead Manager 2019 - 2020</p>
 <p>Apollo Consolidated Limited</p> <p>\$16,000,000</p> <p>Placements</p> <p>Joint Lead Manager 2019-2020</p>	 <p>Catalyst Metals</p> <p>\$27,500,000 + \$18,000,000</p> <p>Acquisition of Henty Gold Mine and Placement</p> <p>Joint Financial Advisor & Lead Manager 2020</p>	 <p>Bellevue Gold</p> <p>\$26,500,000</p> <p>Placement</p> <p>Co-Manager 2020</p>	 <p>CuDeco Limited</p> <p>Undisclosed</p> <p>Receiver Advice & Sale</p> <p>Financial Advisor to the Receivers & Managers 2020</p>	 <p>Merdeka Copper Gold</p> <p>US\$61,500,000</p> <p>Non Pre-emptive Share Issue</p> <p>Joint Lead Manager 2019</p>

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