16 February 2022

Sector: Industrial Metals & Mining

Technology Minerals*

Charging Ahead: Initiating with Buy, 7p Target Price

Buy

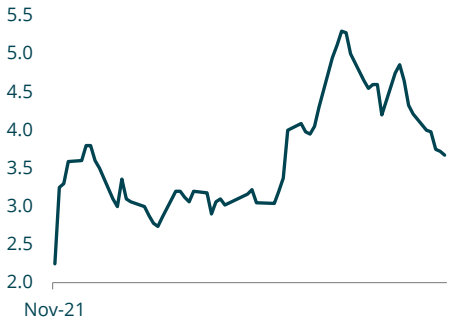
Target Price: 7p

TM1.L **Current Price: 3.7p**

- **Technology Minerals offers uniquely focused, IP protected exposure to battery recycling placing the company at the heart of the Energy Transition and Circular Economy. Operational start-up is underway which should drive rapidly rising profit and cash flow generation. Based on a twin-track NPV and P/E multiple based approach we set a target price for Technology Minerals of 7p offering 90% upside with significant further upside on delivery of proof of concept. We initiate on Technology Minerals with a Buy recommendation.**
- We forecast Technology Minerals to be profitable from next year, generating EPS of 0.26p jumping to 0.44p in 2024 and continuing to rise strongly thereafter.
- Technology Minerals holds its battery exposure through a 49% interest in Recyclus and also offers early-stage exposure to battery critical minerals mining.
- Our 7p initial target price is net of a 45% discount to our net present value (NPV) based valuation to reflect the lack of operating history and holding company structure, consistent also with a 15-16x P/E valuation on 2024 earnings dropping to 10-11x P/E on 2025 earnings. Our financial forecasts and valuations assume the complete exercise of all warrants as they are in the money and should fully fund the business.
- Technology Mineral's purpose is to provide an ethical supply of battery minerals. We believe that proof in operation of the Recyclus business should see a significantly higher share price with more to come from other potential valuation uplifts we have not yet quantified. We initiate on Technology Minerals with a Buy recommendation.

Key Data	
Market Capitalisation	£45.2m
Shares in Issue	1,212.9m
Free Float	100.0%
Average Daily Volume (k)	n/a
12 Month Trading Range	2p - 5p

Price Performance (p/share)



Source: Bloomberg

In-depth Report	✓
Forecast Change	×
Recommendation Change	×
Target Price Change	×

Analyst Details

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Financial Forecasts				
Year To: December	**2020A**	**2021E**	**2022E**	**2023E**
Sales (£m)	n/a	n/a	0.0	0.0
Adj. Operating Profit (Loss) (£m)	n/a	n/a	(1.3)	(1.3)
Adjusted PBT (£m)	n/a	n/a	(0.3)	3.9
Adjusted EPS (p)	n/a	n/a	0.0	0.3
DPS (p)	n/a	n/a	0.0	0.0
Valuation				
P/E (x)	n/a	n/a	(848.5)	13.9
EV/EBITDA (x)	n/a	n/a	(33.7)	(42.7)
Dividend Yield (%)	n/a	n/a	0.0	0.0
FCF Yield (%)	n/a	n/a	(2.4)	(2.1)
Net Cash/(Debt) (£m)	n/a	0.7	9.6	5.4

Arden Partners acts as corporate broker to this company

See page 34 for regulatory disclosure

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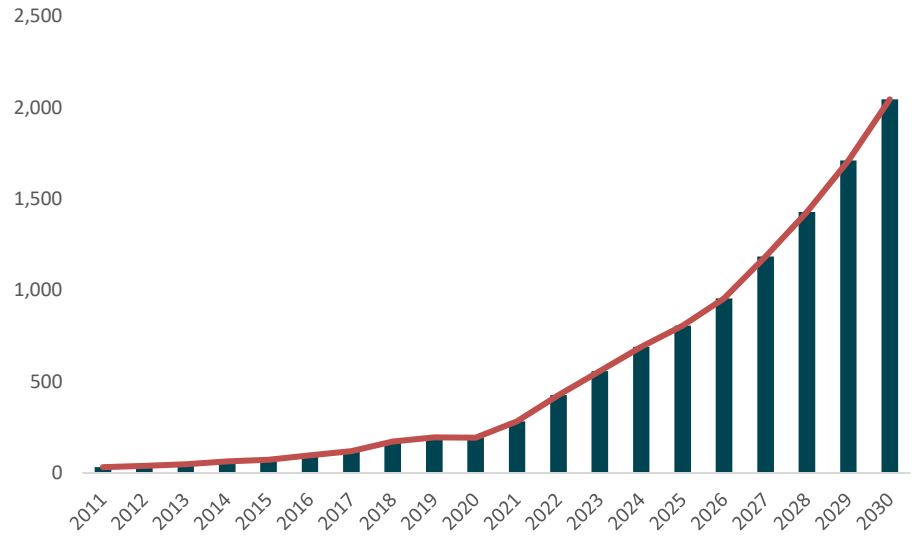
Investment thesis

Technology Minerals offers exposure to a uniquely focused, IP protected position in battery recycling which is commencing operation together with speculative exposure to battery critical minerals mining. As such, the company should benefit from the prodigious growth in battery demand driven by the Energy Transition and aligns with the Circular Economy. Based on a twin-track NPV and P/E multiple based approach we set a target price for Technology Minerals of 7p per share offering 90% upside. We believe that proof in operation of the Recyclus business should see a significantly higher price with more to come from other valuation uplifts we have not quantified. We initiate on Technology Minerals with a Buy recommendation.

Technology Minerals came to market in a Standard listing on the London Stock Exchange last November at a placing price of 2.25p per share. The shares are already trading up at 3.7p per share, giving the company a market capitalisation of £45m.

Technology Mineral's purpose is to provide an ethical supply of battery minerals. Initially focused on establishing new mining sources for battery critical minerals, management recognised the potential in urban mining via battery recycling. Lead by Executive Chairman, Robin Brundle and CEO, Alex Stanbury, management leveraged its contacts to develop unique, Intellectual Property (IP) protected processes to recycle the exponentially growing flow of End of Life (EoL) Lithium-ion (Li-ion) batteries (Figure 1) and to serve the well-established lead-acid battery market.

Figure 1: Forecast growth in Li-ion battery demand (GWh/year)



Source: Bloomberg, CSIS, Arden Research.

While batteries are ubiquitous, they are also hazardous - Li-ion batteries can burn fiercely or even explode while lead-acid batteries contain sulphuric acid - and are subject to strict regulatory control of handling, storage, and processing, providing natural barriers to entry.

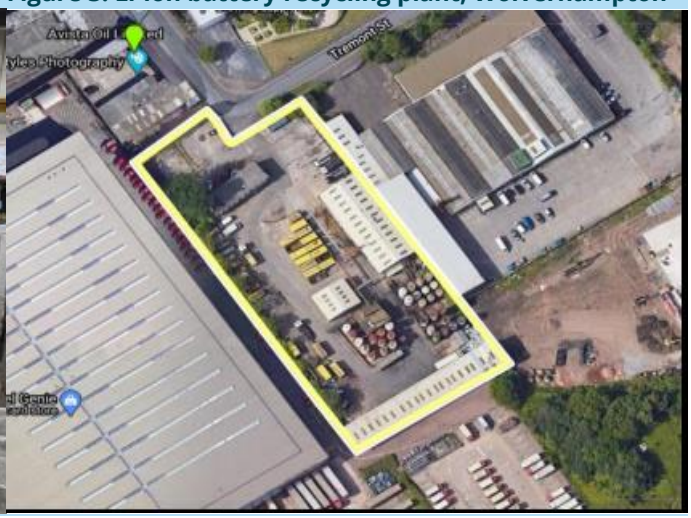
Working with Warwick University, Technology Minerals has developed a unique front-end process that can safely break open Li-ion batteries which are not suitable for repurposing, to recover the battery mineral rich 'black mass' they contain as well as other battery components. Theirs is the only process currently capable of handling all five Li-ion battery compositions simultaneously. The Group has identified a potential modular process to refine the black mass directly rather than selling it on to the large-scale refiners who currently dominate the market, thereby further enhancing margin.

Technology Minerals has developed a significantly improved process to recover the lead from EoL lead-acid batteries as well as recovering the acid for re-use as electrolyte or for the manufacture of fertiliser or gypsum, subject to the preferred economics.

Technology Minerals is in the process of commissioning its first lead-acid battery plant at Tipton and is in the final stages of completing a processing plant for Li-ion batteries at Wolverhampton (Figure 2 and Figure 3).

Figure 2: Lead-acid battery recycling plant, Tipton

Figure 3: Li-ion battery recycling plant, Wolverhampton

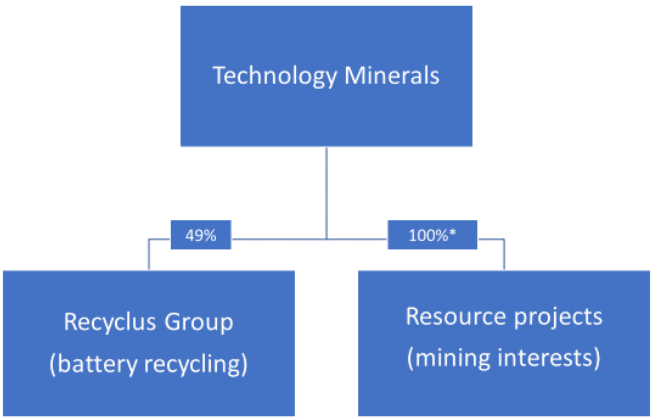


Source: Technology Minerals, Arden Research.

The group currently plans to add one plant for each battery type per annum, targeting growth in Li-ion input processing capacity from 8kte to 42kte by 2027 and for lead acid processing capacity from 16kte to 60kte. Growth options being actively pursued include processing of scrappage at the planned Li-ion battery gigafactories and commercialisation of specialist battery boxes while profit acceleration could also come from increased plant utilisation rates, subject to regulatory permit, a higher pace of plant build-out or sale of plant or other licencing of the group's IP.

Technology Minerals is a holding company which directly controls its critical mineral mining interests together with a 49% interest in Recyclus, the EoL battery reprocessing business (Figure 4).

Figure 4: Technology Minerals structure



*Source: Technology Minerals, Arden Research. *Apart from 15% interest in Oacoma with earn-in option to raise to 100%*

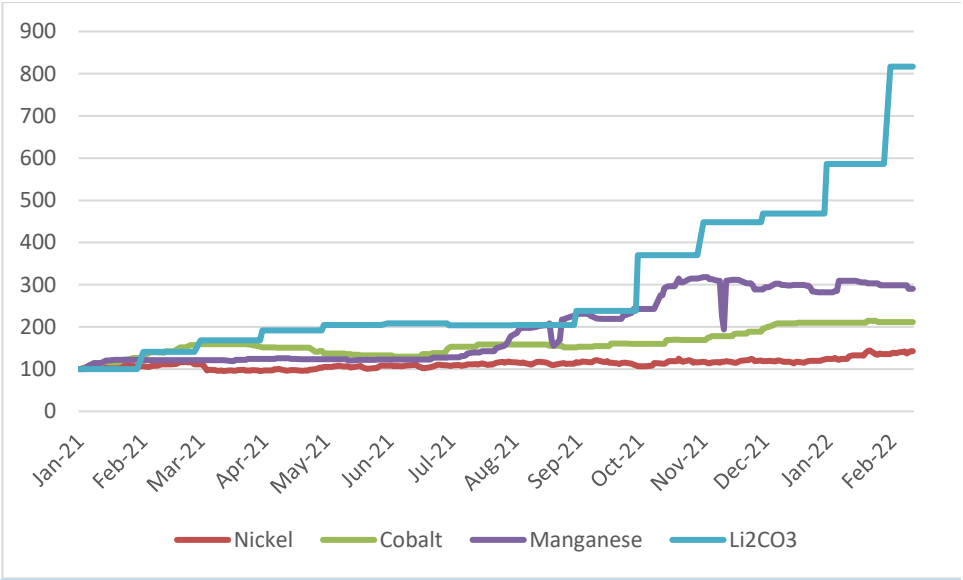
This structure preserves Recyclus' ability to navigate around taxonomy issues associated with potential government funding, university research, financing and EIS status which might be vitiated by Technology Minerals' association with mining, notwithstanding the mining target being battery critical minerals. However, that structure does mean that Recyclus will be accounted for as an associate, complicating the financial transparency of the group.

Technology Minerals' critical minerals mining interests are all early-stage ventures ranging from cobalt, lithium, copper, manganese, and nickel used in battery production together with other co-produced metals and are located across the US, Europe, and Cameroon.

The most strategic interest is the Blackbird Creek/Emperium position in the Idaho Cobalt Belt in the US which is located next to a new cobalt mine that is due to come onstream later this year and will re-establish a US domestic source of cobalt production for the first time since 1982.

The actual and anticipated growth in demand for batteries has been driving up battery mineral prices (Figure 5), particularly for lithium and many such minerals are expected to be in deficit within the next few years, holding out the prospect of further upward price pressure. That is naturally incentivising renewed interest in areas prospective for such resources.

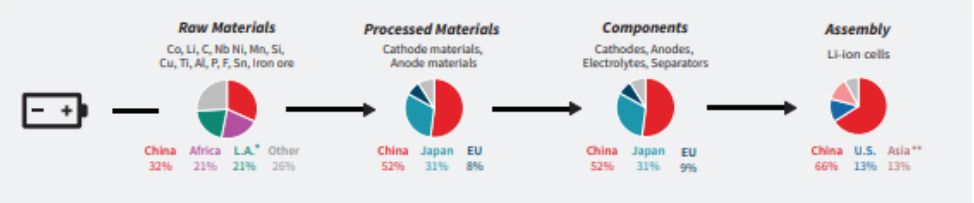
Figure 5: Battery minerals inflation (1/1/21 = 100)



Source: Bloomberg, Arden Research.

Moreover, the sources of many critical minerals for energy use are much less diversified than for hydrocarbons, sometimes concentrated in geographies that are highly problematic from an environmental and social perspective, such as cobalt in the Congo, and the control of which is heavily concentrated in Chinese hands (Figure 6). As a result, the world is increasingly waking up to a serious security of supply problem for ethically sourced battery minerals, providing a highly supportive backdrop for Technology Minerals' strategy.

Figure 6: China positioning in battery supply



Source: CSIS, Arden Research.

None of the group's mining interests have particularly significant current work obligations and the estimated annual cost to hold the licences in good stead is around £1m pa, we understand. However, Technology Minerals is keen to proceed with evaluating the projects it has with a view to future monetisation. In the first instance that is likely to involve more survey work and a limited programme of pilot hole drilling. For 2022 we estimate total cash use in the mining business at £3m, essentially option expenditure that could prove up value for future commercialisation.

Given the lack of historical data our financial forecasts contain a higher-than-normal level of uncertainty. Our estimates primarily depend on our financial forecast for Recyclus which we model separately (Figure 7).

Figure 7: Recyclus key forecasts – 100%

		2022E	2023E	2024E	2025E	2026E
Total processed	te	10,880	36,630	55,014	72,460	89,710
Revenue	GBPk	13,478	43,613	64,916	89,065	111,707
EBITDA	GBPk	2,828	14,872	22,510	33,008	42,374
EBIT	GBPk	2,403	14,022	21,235	31,308	40,249
Net profit	GBPk	1,863	10,493	16,132	24,065	31,301
FCF	GBPk	(3,225)	8,923	15,571	24,747	31,864
EBITDA margin	%	21.0%	34.1%	34.7%	37.1%	37.9%
Li-batt EBITDA	GBPk	3,182	11,814	17,331	25,893	33,384
Lead-acid EBITDA	GBPk	-355	3,058	5,179	7,115	8,990

Source: Technology Minerals, Arden Research.

Technology Minerals has 387m warrants in issue with an exercise prices of 3.375p which are in the money and which we expect will be exercised raising £13.1m and providing ample funding for the group as well as taking shares in issue to 1.6bn.

We forecast Technology Minerals to be profitable from next year, generating EPS of 0.26p jumping to 0.44p in 2024 and continuing to rise strongly thereafter (Figure 8).

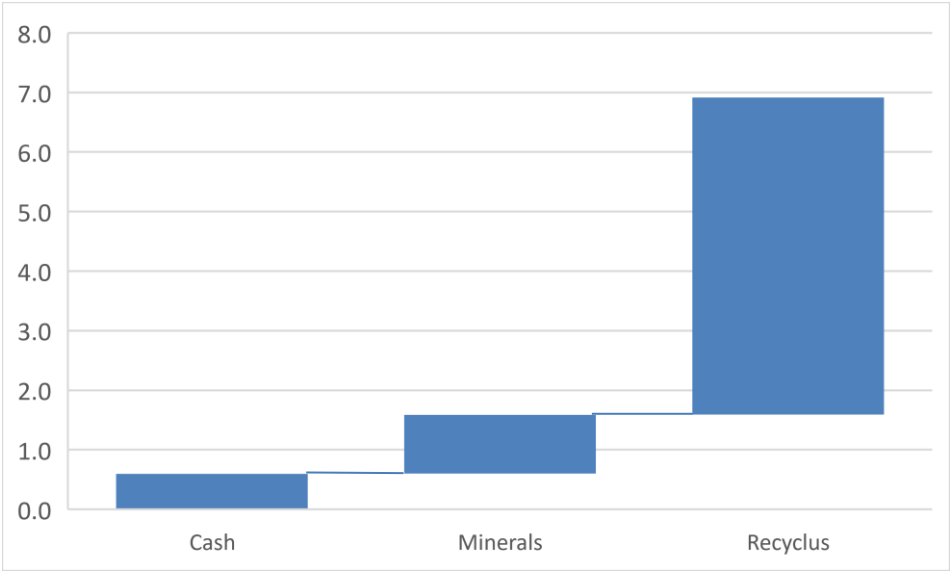
Figure 8: Technology Minerals key forecasts

		2022E	2023E	2024E	2025E	2026E
Net profit	GBPk	(61)	4,224	6,972	10,670	13,946
Basic EPS	GBp/Share	0.00	0.26	0.44	0.67	0.87
Diluted EPS	GBp/Share	0.00	0.26	0.44	0.67	0.87
Implied (increase)/ decrease in net debt	GBPk	8,882	(4,202)	(4,223)	(4,244)	(4,496)
Net debt/(cash)	GBPk	(9,596)	(5,394)	(1,171)	3,073	7,569
Total/attributable equity	GBPk	33,978	38,202	45,174	55,844	69,790

Source: Technology Minerals, Arden Research.

Based on a twin-track NPV and P/E multiple based approach we set a target price for Technology Minerals of 7p offering 90% upside (Figure 9 and Figure 10). Should the Recyclus business perform as expected the discount to NPV should fall and growth expectations could increase while greater confidence should also see the earnings multiple expand, we anticipate. Although that is likely to be a dynamic and ongoing process it is relatively easy to demonstrate value well over 10p/share.

Figure 9: NPV based target price components (GBp/share)



Source: Technology Minerals, Arden Research.

Figure 10: Technology Minerals P/E based valuation (GBp/share)

P/E multiple	2023E	2024E	2025E	2026E	2027E
10x	2.6	4.4	6.7	8.7	10.7
11x	2.9	4.8	7.3	9.6	11.8
12x	3.2	5.2	8.0	10.5	12.8
13x	3.4	5.7	8.7	11.3	13.9
14x	3.7	6.1	9.3	12.2	15.0
15x	4.0	**6.5**	10.0	13.1	16.0
16x	4.2	**7.0**	10.7	13.9	17.1
17x	4.5	7.4	11.3	14.8	18.2
18x	4.8	7.8	12.0	15.7	19.3
19x	5.0	8.3	12.7	16.6	20.3
20x	5.3	8.7	13.3	17.4	21.4

Source: Technology Minerals, Arden Research.

We believe that proof in operation of the Recyclus business should see a significantly higher share price with more to come from other valuation uplifts we have not yet quantified while institutionalisation of the investor base could add a 'Green Premium'.

Technology Minerals offers differentiated, IP protected exposure to battery processing aligning it with the Energy Transition and Circular Economy. That business is on the cusp of demonstrating its operating and financial credentials. Performance as projected, should deliver rapidly growing profit and cash flow. Although the associate ownership structure is a complication, investing in Technology Minerals is the only listed opportunity to gain focused exposure to such a business and access to the value and pace of growth that it offers. The early-stage critical mineral mining interests provide option value into the electrification narrative inherent in the Energy Transition and the upward pressure on battery minerals prices that implies. We initiate on Technology Minerals with an 7p/share target price and a Buy recommendation.

Purpose, opportunity, and strategy

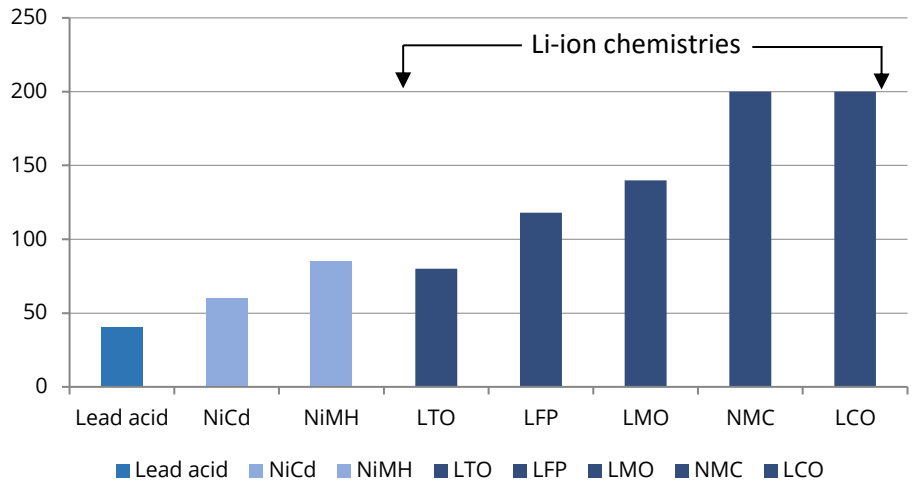
The central idea behind Technology Minerals is to provide an ethical supply of battery minerals. Initially the focus was on establishing domestic supply chains of battery minerals. However, management rapidly realised that the issue should also be tackled from the direction of urban mining being the recovery and repurposing of such minerals already embedded in EoL batteries. Technology Minerals has developed specific IP in battery reprocessing as well as building a supply chain to support the business. Process start-up has commenced and promises to be highly lucrative, particularly for Li-ion batteries where alternatives are limited.

It is widely recognised that batteries will play a central role in the Energy Transition. Transportation accounts for almost a quarter of global carbon emissions and a transition from the internal combustion engine to electric vehicles (EVs), where battery powered cars are already a viable alternative, is the obvious route.

Moreover, as the penetration of intermittent wind and solar in power generation increases so does the difficulty in maintaining electrical grid stability. Battery storage is likely to be a key component of back-up electricity supply. Besides providing a direct source of demand for new batteries, the less demanding performance characteristics for fixed installation grid back-up also provides a source of demand for repurposed batteries which no longer meet the standards required for EV use.

While there are a number of battery chemistries in current use and under development, the overwhelming preferred battery type for EV use is Li-ion based because of the high energy density compared to other types of battery (Figure 11).

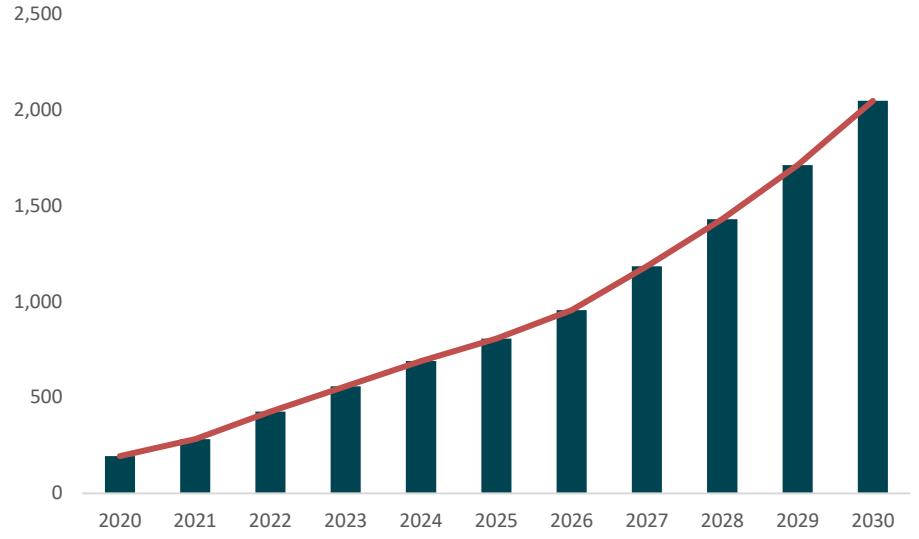
Figure 11: Battery type energy density (Wh/kg)



Source: Epec, Arden Research. LTO: Lithium Titanate, LFP: Lithium Iron Phosphate, LMO: Lithium Magnesium Oxide, NMC: Lithium Manganese Cobalt Oxide, LCO: Lithium Cobalt Oxide

Global Li-ion battery demand grew by 24% pa for the decade to 2021 and growth is projected to accelerate to 27% pa for the decade to 2030 (Figure 12).

Figure 12: Forecast growth in Li-ion battery demand (GWh/year)



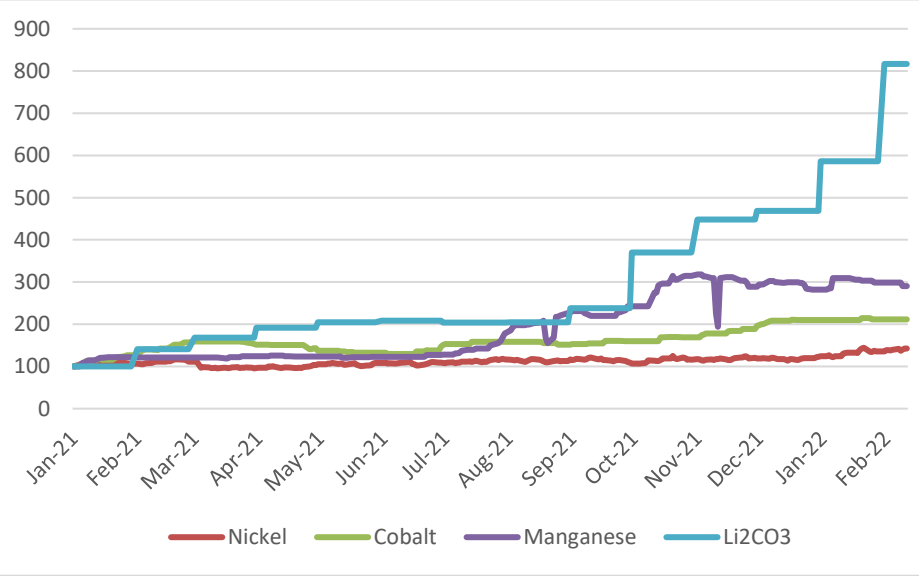
Source: Bloomberg, CSIS, Arden Research.

That requires an equivalent pace of growth in the supply of the raw and processed materials required for battery manufacture. Since batteries have a finite life, there is a concomitant growth in the volume of batteries which eventually need to be appropriately handled at the end of their lives, including repurposing.

That recovery and reuse of batteries and battery material fits squarely into the concept of the Circular Economy and its actualisation and, in our estimation, currently represents the main value in Technology Minerals, through its 49% interest in Recyclus (See Recyclus from page 15).

The actual and anticipated growth in demand for batteries has been driving up battery mineral prices (Figure 13) and many such minerals are expected to be in deficit within the next few years, holding out the prospect of further price increases. That supports both the recovery of already produced battery critical minerals and the search for new sources, to which Technology Minerals also offers exposure through its early-stage mining interests.

Figure 13: Battery minerals inflation (1/1/21 = 100)

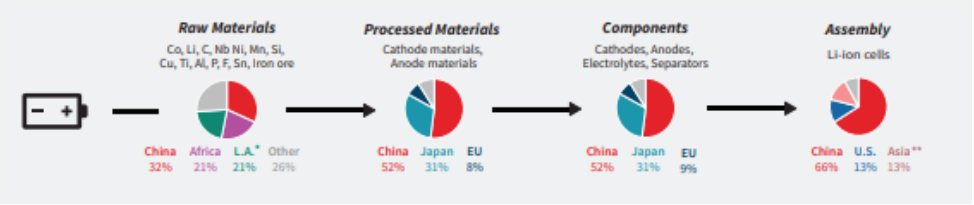


Source: Bloomberg, Arden Research.

The sources of many critical minerals for energy use are much less diversified than for hydrocarbons and sometimes concentrated in geographies that are highly problematic from an environmental and social perspective, such as cobalt in the Congo. The Congo accounts for almost 80% of the global supply of cobalt much of which comes from so called 'artisanal mining' with its attendant exploitative labour conditions and environmental degradation.

While China is a significant producer of certain battery minerals, it is not dominant. However, China is dominant in most key aspects of supply, including controlling mined output, accounting for over 60% of lithium refining and over 70% of cobalt refining as well as being the global leader in the production of each battery component, cell manufacture and final battery assembly (Figure 14).

Figure 14: China positioning in battery supply



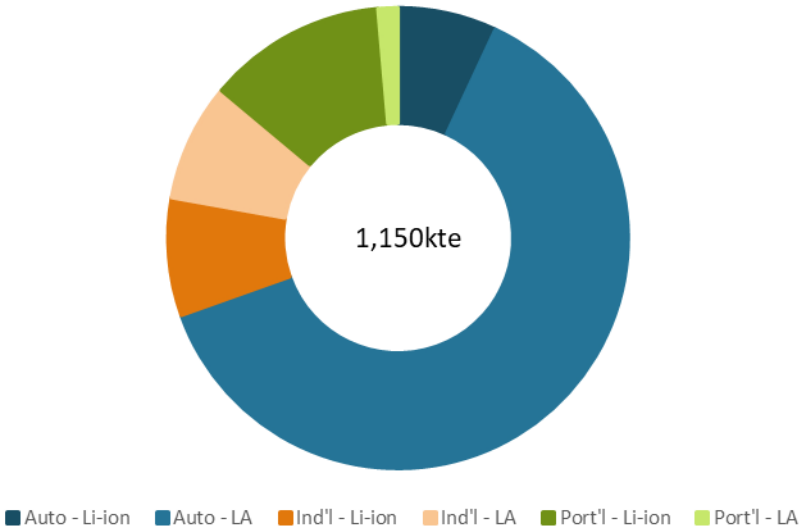
Source: CSIS, Arden Research.

That dependence and perceived national security risk, coupled with increasingly fraught relations with China, particularly with the US, has prompted formal policy responses to improve security of supply both by the US Federal Government and the EU. Together with formal EU and UK government policy supporting the Energy Transition and Circular Economy, we believe the policy background for Technology Minerals is highly favourable.

The strategy of Technology Minerals is to build out its IP protected battery processing capacity in Europe while evaluating its portfolio of early-stage critical minerals.

The current European market for Li-ion and lead-acid batteries totals 1.2mte pa of which some 72% are lead-acid and of which the automotive market consumes 70%. (Figure 15). Within automotive, Li-ion currently accounts for just 10% but that is set to grow exponentially in line with increased EV penetration.

Figure 15: European battery market split



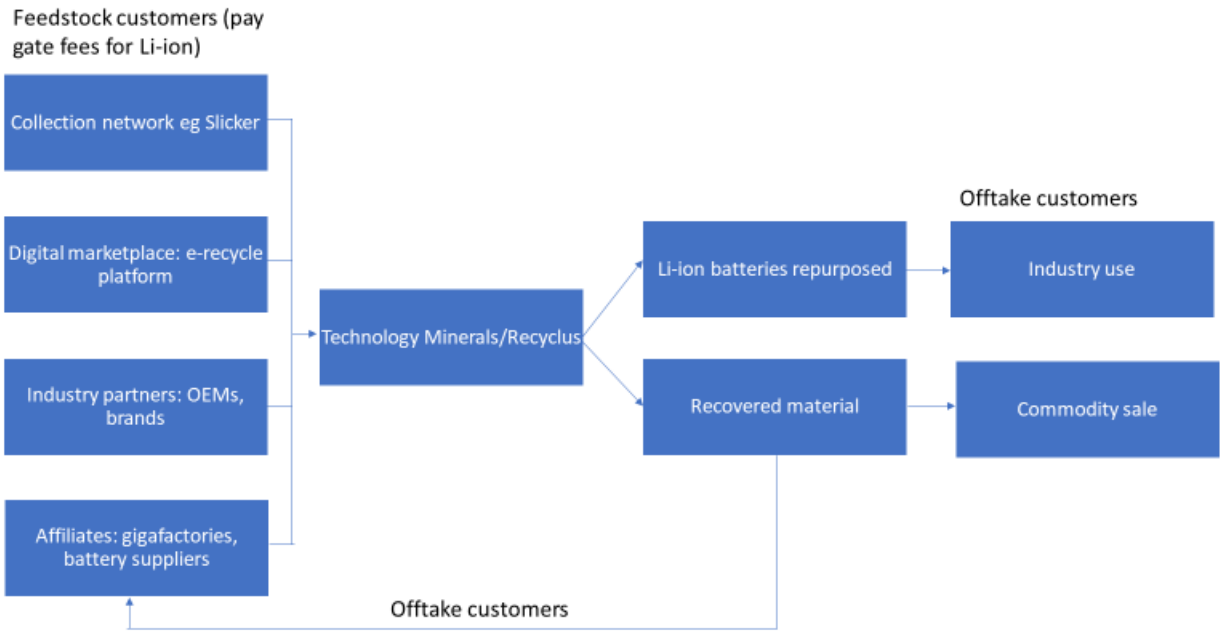
Source: Technology Minerals, Arden Research. Ind'l: industrial, Port'l: Portable

Technology Minerals is targeting growth in its processing input capacity from 8kte of li-ion capacity and 16kte of lead-acid capacity based on one plant of each type in operation

in 2022 to 42kte and 80kte respectively based on ten plants in operation by 2027 with the addition of one plant of each type each year.

The Recyclus business model is straightforward to understand (Figure 16) but to which Recyclus brings the advantages of contacts and its IP protected processes that have already allowed the development of preferred access to feedstock.

Figure 16: Battery recycling business model



Source: Technology Minerals, Arden Research.

In January, Technology Minerals signed an agreement with Slicker Recycling, one of the UK's leading hazardous waste management companies to take all the batteries which Slicker collects within its UK operations and has optionality over Europe. We understand the group is also in discussion with the promotors of various planned Li-ion gigafactories to process their scrappage. This could be a highly significant incremental source of growth which Recyclus is in a strong position to win given the flexibility inherent in its modular plants.

The economics of the Li-ion reprocessing are much more favourable than for lead-acid battery processing as the lead-acid supply chain is far more mature and the lead paste conversion to lead is straightforward via smelting. The recovered acid can also be purified for reuse as electrolyte, used in fertiliser manufacture or conversion into gypsum depending on the economics with depth in all offtake routes. The remaining plastic casing is recycled. As such, the feedstock battery supply is purchased. However, Technology Minerals' process uses much less water than is typical, producing a higher value lead paste.

Given the fire and explosion risk posed by Li-ion batteries, the much more complex process required to extract value from the black mass, the lack of maturity in the EV battery supply chain, the pace of growth in supply relative to processing capacity, and the regulatory onus on battery manufacturers to handle EoL batteries, Technology Minerals expects to be paid to take Li-ion batteries for processing by way of a substantial gate fee averaging around £1,800/te where applicable. In addition, and particularly as the volume of large EoL EV battery packs increases Technology Minerals expects to generate significant revenue from repurposing suitable units for grid storage.

There are a range of refiners who will compete for the supply of black mass and initially it will be sold into the market. However, Technology Minerals believes it has identified a new modular hydromet process which it may be able to use to process the black mass itself at a fraction of the typical £200m outlay for a black mass refining plant.

Given the proprietary nature of its technology and processes, Technology Minerals does not plan to sell or licence its systems, although this will remain under consideration and the potential value stream from licencing or sale should be enhanced on proof of concept in operation.

Initially, Technology Minerals is targeting the UK market, which is where it has now established a front-end supply chain but will also receive feedstock from Europe, given the international breadth of the Slicker network.

The group also intends to create an adjunct business through the sale of the Li-ion battery boxes it has developed.

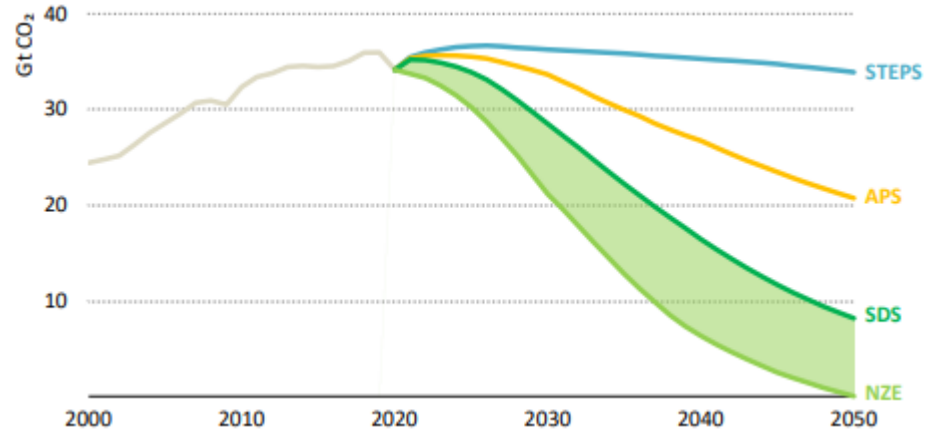
For the upstream, mining business, the strategy is to establish value through preliminary evaluation, most likely with a view to carried development or sale on proof of commercial value.

ESG

Technology Minerals' purpose is the ethical supply of battery materials. Consequently, its business raison d'être is central both to the Energy Transition and to the Circular Economy rendering it a highly investible proposition for investors into these themes braced by what look like exceptional financial prospects (see Analysis of forecasts from page 27). Given the fledgling state of the business, Technology Minerals has yet to develop fully ESG compliant reporting although it has contracted Onyen to provide baseline ESG reporting, nor does it fully meet QCA code Board requirements (see Structure management & shareholders from page 24). However, management recognise the importance of these issues to investors as formally implemented and management has committed to operating at all times under the highest ESG principles.

While there are many pathways to decarbonisation consistent with national obligations under the Paris Agreement, a core requirement to enable the Energy Transition from hydrocarbons is widespread electrification from non-greenhouse gas emitting sources. That is a process which is underway at a historically astonishing rate yet still well below the pace required to meet what the science requires (Figure 17) according to the UN Intergovernmental Panel on Climate Change (IPCC) and the underwhelming commitments made at the UN COP 26 meeting last November.

Figure 17: IEA CO2 emissions scenarios

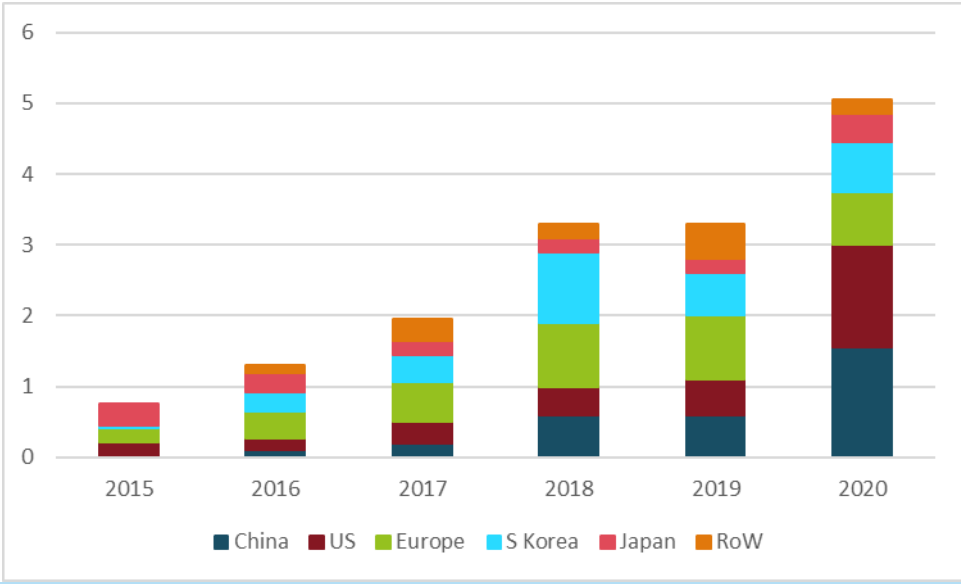


Source: IEA, Arden Research. STEPS: Stated Policies Scenario, APS: Announced Pledges Scenario, SDS: Sustainable Development Scenario, NZE: Net Zero Emissions by 2050 Scenario

Batteries fit into this transition via two main routes. Most obviously through the electrification of transportation, which accounts for just under a quarter of global carbon emissions of which 60% comes from light transport which is already highly amenable for electrification. Increasingly important is the role of batteries in the maintenance of grid stability as the penetration of wind and solar increases exponentially bringing both intermittency and reducing the inertia inherent in traditional turbine driven power generation thus increasing the difficulty of maintaining system frequency.

Power systems are highly sensitive to frequency and moving outside tolerance will lead to blackouts. For example, under its operating licence the UK National grid is required to keep frequency within 1% of the 50 Hz system frequency. Because of the cost and the continued but reducing availability of hydrocarbon-based generation, batteries are a very small but very rapidly growing part of the power supply ecosystem (Figure 18). As at the end of 2020 global battery storage stood at 17GWh with global additions of 5GWh in 2020 amounting to 3% of the total battery storage embedded in EV sales that year.

Figure 18: Grid scale battery storage addition (GW)



Source: IEA, Arden Research.

Tesla is currently marketing its modular 'Megapack' grid battery solution which has a capacity of up to 3MWh in each 23te unit, or about 60 times as much energy as the standard battery pack in its Model 3 vehicle.

Batteries were already subject to extensive regulatory control in the EU and the UK. Moreover, in December 2020 the EU proposed a significant new Regulation within the ambit of its Circular Economy Action Plan and the European Green Deal. The Regulation seeks to ensure the responsible and sustainable supply of battery raw materials in producing high quality batteries and ensure that batteries are properly collected, recycled, or repurposed so that the materials they contain feed back into the economy.

In the UK, regulation already required battery producers to improve the design of new batteries and pay for waste battery collection, treatment, recycling, and disposal which funds the payment of any applicable gate fee paid for the handling of EoL batteries.

Given that the policy thrust of the Energy Transition and the Circular Economy is similar for the UK and the EU and that continued access to the EU market for batteries and goods incorporating batteries, including cars, will require the UK to meet EU battery regulations, it seems highly likely that the demand for battery recycling capacity will increase.

Thus, Technology Minerals business is core to the Energy Transition and the Circular Economy placing it fundamentally at the heart of the 'E' in ESG.

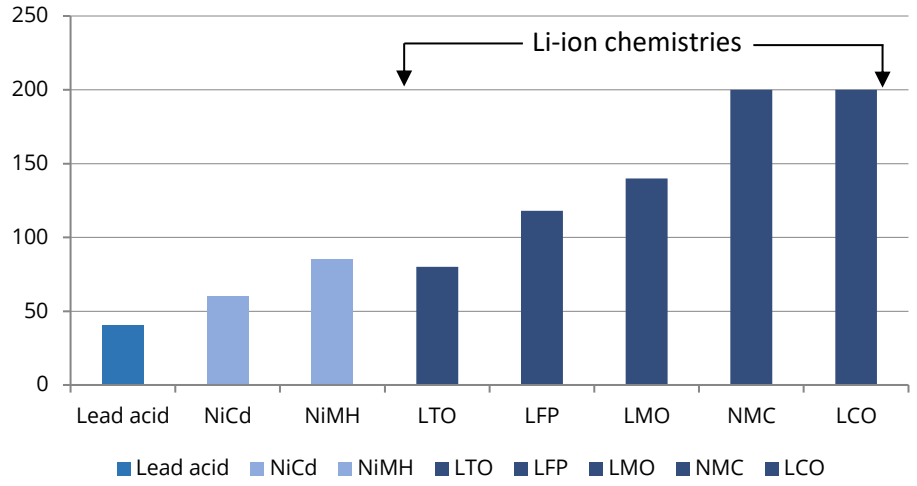
Recyclus

Recyclus is the battery reprocessing business built by the Technology Minerals management team and in which Technology Minerals holds a 49% interest. Recyclus owns specific IP in the EoL processing of both Li-ion and lead acid batteries. Process start-up at the first of the company's initial two plants in the UK is underway with a payback on investment on the first LiBatt plant expected in around 6 months. Recyclus has also built a supply chain to support its processing business and has very significant opportunities to accelerate growth in processing volumes and to enhance profitability on proof of concept in operation.

Batteries are ubiquitous, hazardous, and central to the Energy Transition. Batteries range from the miniscule to the monstrous from pacemakers to individual 3MWh electricity grid support storage battery packs.

The main types of rechargeable battery chemistry are lead-acid, as used in conventional cars and trucks, nickel-cadmium, and increasingly lithium-ion chemistry that is favoured for its high energy density, which is essential for EV usage (Figure 19).

Figure 19: Battery type energy density (Wh/kg)



Source: Epec, Arden Research. LTO: Lithium Titanate, LFP: Lithium Iron Phosphate, LMO: Lithium Magnesium Oxide, NMC: Lithium Manganese Cobalt Oxide, LCO: Lithium Cobalt Oxide

Although batteries are ubiquitous, they are also hazardous. As the name implies, lead-acid batteries contain lead and sulphuric acid while the lithium component in Li-ion batteries is extremely reactive and they can easily burn or even explode if the cells are not regulated properly, or the shell is breached. As a result of these characteristics, control over EoL handling of batteries is widely and increasingly strictly controlled by regulation, particularly in the EU and the UK. As part of a more general trend to stop the export of hazardous waste to lightly regulated, typically developing countries, EU and UK regulation has largely banned the export of waste and is increasingly forcing it to be handled domestically while original equipment manufacturers are obliged to fund schemes to handle EoL batteries.

Historically around half of depleted lead-acid batteries went to landfill while the other half was melted down in smelters to access the lead with the other materials burned off and the remaining slag landfilled. Li-Ion batteries have typically been landfilled since, prior to the advent of hybrid and battery electric vehicles (BEVs), individual Li-ion batteries were small, as found in mobile phones, laptops, hand tool power packs and other such devices. However, the battery back in a Tesla Model 3 Long Range version weighs almost half-a-tonne.

These changes have greatly increased the pressure to find better solutions to EoL battery disposal than landfill, while the high value of the material (see Figure 5) in Li-ion batteries offers a real prize for the successful commercialisation of EoL Li-ion battery processing.

Recyclus' IP

Direct EoL battery reprocessing requires the battery to be broken up safely and the constituent parts separated out for further processing and sale or disposal. While the concept is the same for lead-acid and Li-ion batteries, the differing chemistries present very different engineering and chemical challenges. Recyclus has developed IP protected processes to handle both types.

Li-ion batteries are dry with only a very small amount of liquid electrolyte. The main challenges are to handle the potential for fire and explosion, eliminate any escape of dust and to handle any hydrofluoric compounds which may be contained in the electrolyte. Li-ion batteries offer a highly valuable opportunity for repurposing into grid support where the diminished energy density is much less of an issue than it is in an electric car.

For lead-acid batteries the challenge is to have a processing system which can handle the dilute sulphuric acid used as electrolyte and minimise the use of water in processing and in the resultant lead paste where a higher liquid content increases the cost of smelting.

Recyclus has a mixture of IP secured by proprietary design, patent process and operating experience as a company and embedded in its personnel. For both battery types the key is in the hammer mill unit which breaks up the batteries for further processing and for lead-acid battery processing, a proprietary slurry management system.

Recyclus has just started commissioning its first lead-acid processing plant at Tipton (Figure 20) while start-up of its first Li-ion processing plant six miles away at Wolverhampton is imminent (Figure 21).

Figure 20: Lead-acid battery recycling plant, Tipton

Figure 21: Li-ion battery recycling plant, Wolverhampton

Source: Technology Minerals, Arden Research.

Full year input processing capacity is expected to be 8kte of Li-ion feedstock producing 5kte of black mass and other recovered material based on a single shift and 16kte of lead-acid feedstock producing 12kte of lead paste and other recovered material on a two-shift basis. Utilisation is initially governed by the permits issued by the Environment Agency. Given the lack of experience with the Li-ion process, the Li-ion plant is restricted to a single shift. Assuming Recyclus demonstrates its ability to operate within the parameters set by the Agency, it should be able to apply for increases in its permitted operations which would add significantly to profitability.

Given the previous experience of Technology Minerals' personnel with a preliminary version of the lead-acid process plant, commissioning of the Tipton plant is expected to be smooth. The hammer mill front-end of the Li-ion processing plant has undergone extensive testing pre-installation and management is confident that it will operate as designed however, this is a novel engineering installation with a higher degree of risk.

Accessing EoL batteries for processing is a key attribute of the Recyclus investment thesis.

Given the much longer history and whole battery smelting route available for lead-acid batteries, Recyclus expects to pay for lead-acid battery feedstock. However, given the EoL fee structure, Recyclus expects to be paid a gate fee to accept Li-ion EoL batteries for processing. This is anticipated to be around £1,800/te on average where applicable and significantly enhances the economics (See Analysis of forecasts from page 27).

Besides the fees chargeable and pricing structure to access feedstock, controlling physical supply is an important part of the Recyclus story. Last November Recyclus signed a contract with Slicker Recycling to handle the batteries Slicker accumulates as part of its business of collecting and recycling waste oil and hazardous workshop waste.

Recyclus currently plans to build an additional processing plant of each type in the UK each year, increasing total annual input processing capacity from 24kte in 2022 to 120kte by 2027 to handle the generic growth in feedstock availability. It is on this basis that we set a current TP of 7p per share (See Valuation from page 29).

However, Recyclus also has other significant options to grow value by way of additional demand linked plant construction associated with:

- Additional demand for processing capacity from the construction of gigafactories
- Increased utilisation of existing plant
- International expansion
- Sale of plant technology
- Sale of Li-ion safe handling battery boxes

None of this potential value addition is reflected in our current 7p TP.

Recyclus is in active discussion with a number of potential gigafactory construction projects in the UK and Europe. The term gigafactory was coined by Tesla to describe extremely large-scale factory units for the construction of Li-ion batteries intended for vehicle and large-scale battery storage use (see Figure 12 and Figure 18). Tesla is currently building its first such factory in Texas which is expected to have a capacity of 35GWh when fully completed. What Recyclus offers is a means of processing the inevitable scrappage produced in battery manufacture, perhaps around 4% of the total but likely to be very much higher prior to stable production being achieved. As Recyclus' technology is modular, it can be scaled to match initial scrappage rates with capacity being redirected as stable operation is achieved.

European gigafactory capacity is just beginning to come online with Northvolt in Sweden completing initial cell production and Tesla in Berlin, delayed by water permitting issues, likely to start-up later this year. The first UK gigafactory, expected to be built by Britishvolt, has yet to start construction but recently won backing from the UK government and is currently expected to start-up in 2024. Nissan is also to build a 6GWh unit in Sunderland.

We expect that the successful demonstration of Recyclus' initial Li-ion processing line will significantly enhance its commercial position vis a vis gigafactory developers.

Initial plant operation is restricted for both the Li-ion and lead-acid process lines by the Environment Agency. In particular, operation of the Li-ion line is restricted to a single shift, as there is no history of operating experience meeting the regulatory requirements around safe operations, noise, odour, emissions release, and other operating factors. Assuming the plant successfully operates within current permit limits, Technology Minerals expects that it would be granted permission to increase operating hours. We

understand the Wolverhampton site could accommodate up to three shift operation, subject to feedstock availability, which could approximately triple annual free cash flow generation from the site from the level which underpins our current financial modelling.

In the near term, Technology Minerals expects to generate net revenue from Li-ion safe-transport battery boxes which it has designed, and which are currently undergoing testing. Given the fire and explosion risk associated with Li-ion batteries, particularly multi-cell car batteries, the transport, storage, and handling of Li-ion batteries is strictly controlled under the ABTO/ABE regulations.

A battery box may sound simple but actually, such boxes are required to withstand the complete combustion of the battery content. That fire could last for 24 hours reaching an internal temperature of 2,000°C while the box must maintain an external skin temperature of not more than 100°C; these are substantial constructions (Figure 22).

Figure 22: Recyclus design Li-ion battery box

Source: Technology Minerals, Arden Research.

Since large scale Li-ion batteries are quite a recent phenomenon, battery boxes remain very much a premium product with an anticipated sales price in excess of £10,000 generating a high margin.

Technology Minerals currently plans to focus on growing processing capacity in the UK. However, given that the growth in demand for battery reprocessing is a global, and especially a European/US phenomenon, there is clearly scope to accelerate plant build out through international scaling.

Given the battery reprocessing IP which Recyclus has developed it is, of course, keen to protect it. Consequently, there is no immediate plan to licence its technologies nor to sell complete plants. However, management expects that it could realistically achieve a sales value multiples of the construction cost which would be consistent with our NPV calculations of the value of a Li-ion processing plant.

Battery critical minerals

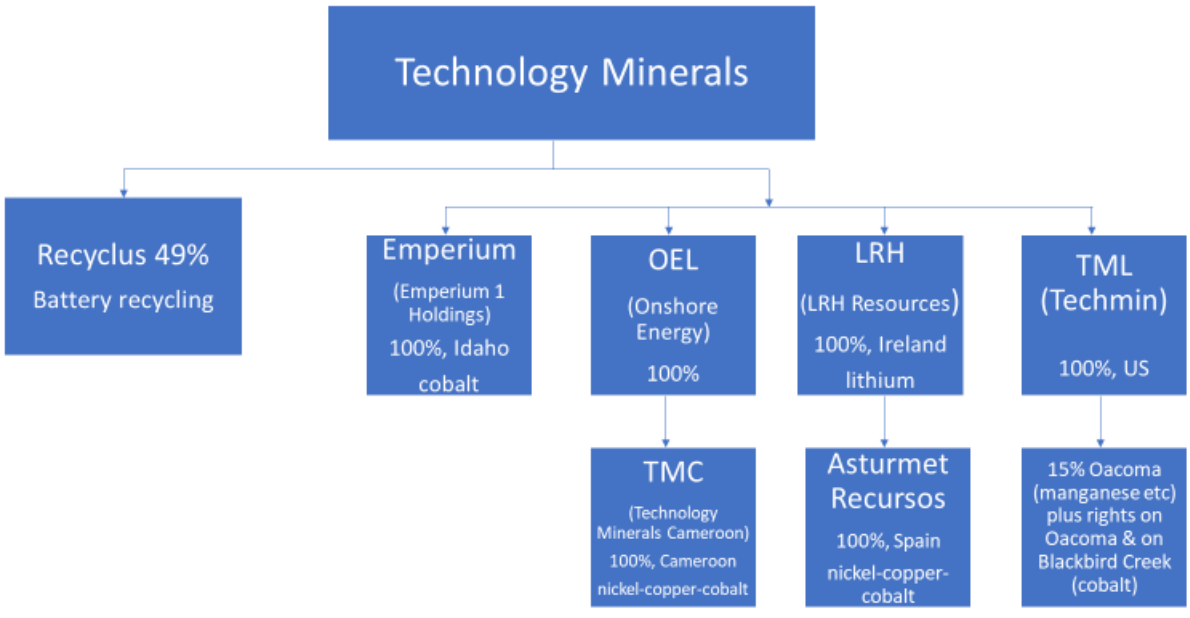
Technology Minerals holds four mining interests across the US and Europe, is applying for five cobalt-prospective licences in Cameroon and has rights over two mining interests in the US, which we expect it to exercise. The connecting characteristic of these licences is the potential development of domestic battery critical minerals resources independent of Chinese control in an ethically sensitive manner. We anticipate that successful evaluation would most likely result in the realisation of value through a sale or carried farm-in.

The initial business idea behind Technology Minerals was the development of domestic mining interests targeting the ethical supply of battery minerals. Although the current value in the investment case is, in our view, now dominated by the exceptional position in EoL battery reprocessing through its Recyclus holding, Technology Minerals' mining interests represent an option value on the booming demand for battery minerals inherent in the global de-carbonisation process. Most of these interests were identified and accessed through CEO, Alex Stanbury's direct and indirect network of interests.

Technology Minerals expects to undertake active, early-stage evaluation activities in 2022 across all its projects but with a focus on Spain and the Idaho Cobalt Belt, including exercising its rights over Blackbird Creek and also over Oacoma. We model a maximum total cash outlay in 2022 of £3m in respect of Technology Minerals' mining interests which we expect to be funded from the exercise of warrants (See Analysis of forecasts from page 27) while farm-out activity could reduce the net expenditure.

With respect to its mining interests, Figure 23 sets out the organisational structure of Technology Minerals and its current interests.

Figure 23: Technology Minerals structure



Source: Technology Minerals, Arden Research.

Figure 24 sets out the mining interests of Technology Minerals

Figure 24: Critical battery minerals interests

Name	Location	Target	Area km2	Area ha	Area acres	Held in
Asturmet	Spain	Co-Ni-Cu	461	46,100	114,000	LRH/Asturmet
Blackbird Creek	US/Idaho	Co	13	1,285	3,175	TML
Emperium	US/Idaho	Co	55	5,500	13,720	Emperium
NW Leinster Lithium	Ireland	Li	477	47,739	117,966	LRH
Oacoma	US/Dakota	Mn-Co-Ni-Cu	12	1,248	3,083	TML
Cameroon	Cameroon	Mn-Co-Ni	2,456	245,600	607,000	OEL/TMC

Source: Technology Minerals, Arden Research.

Asturmet Recursos/Spain (LRH)

LRH holds Technology Minerals' European mining interests in Europe including the Asturmet Project in Spain proximal to historic mining activity for copper-cobalt-nickel ore.

The Asturmet Project consists of seven non-surveyed exploration permits covering an area of 461km²/114k acres in Northern Spain (Figure 25) split across two groups of three licences and a single licence to the south of the eastern group. Of these permits, the St Patrick licence has been issued, two licences are undergoing final public notification and four are being prepared for public notification.

Figure 25: Asturmet Project, Spain

Source: Technology Minerals, Arden Research.

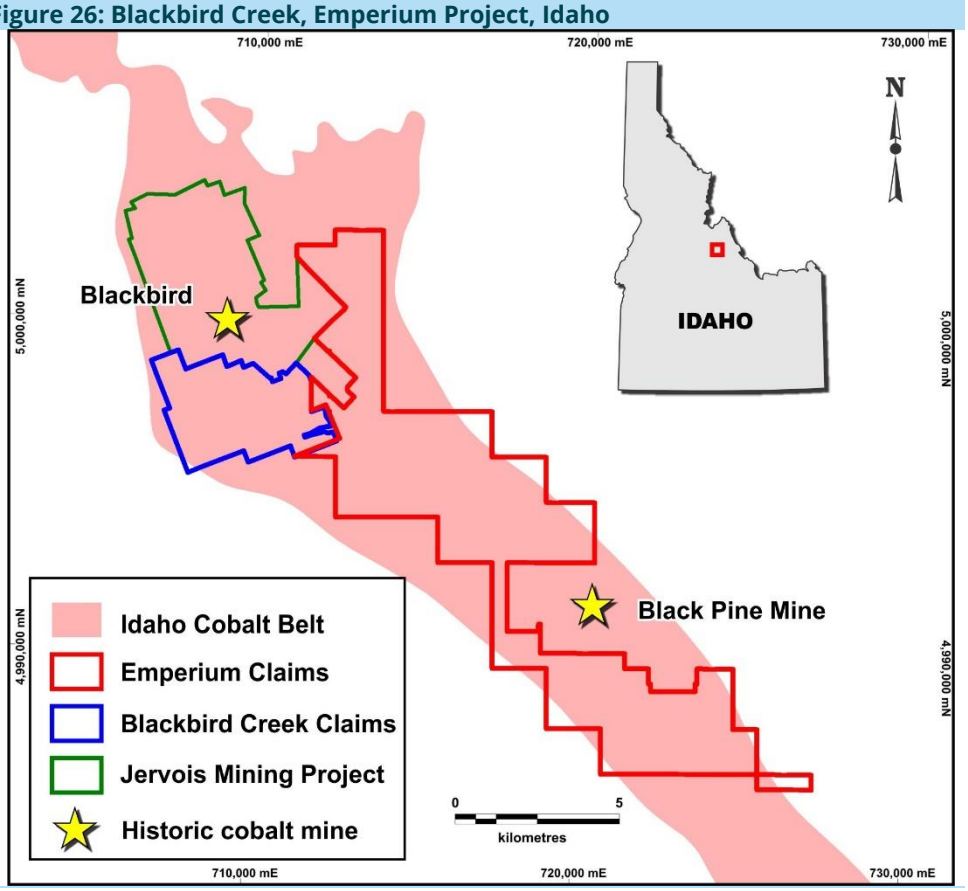
Initial work has focused on the potential in the western group around the Aramo mine which closed down in the late 1940's. Average grade quality for the Aramo mine has been reported as 12% copper, 2-3% cobalt and 2-3% nickel.

Blackbird Creek (TML), Emperium Project/Idaho

TML has an option agreement with DG Resource Management to acquire the rights to mining claims comprising 158 contiguous lode claims covering an area of approximately 1,285ha/3,175 acres in the 'Idaho Cobalt Belt' known as the Blackbird Creek Property. Emperium holds 100% interests in 694 lode claims in the Idaho Cobalt Belt for a total licenced acreage of 55km²/13,720 acres.

The Blackbird Creek Property lies just to the south of the former Blackbird Mine, and adjacent to Technology Mineral's Emperium interests in the Idaho Cobalt Belt (Figure 26). The area is isolated and has seen only cursory exploration but benefits from a number of fully permitted drill locations.

Figure 26: Blackbird Creek, Emperium Project, Idaho



Source: Technology Minerals, Arden Research.

The Idaho Cobalt Belt is a northwest trending belt of cobalt and copper-bearing mineral deposits at least 40 miles long and up to six miles wide.

According to the US Geological Survey, Idaho represents one of two deposit locations in the US where primary cobalt production could occur. Production from the Blackbird Mine, immediately to the West of Emperium's acreage, hit a peak of 2ktepa of cobalt in 1958 before production ceased in 1982.

Australian listed Jervois Mining expects to commence production from its Idaho Cobalt Operation (ICO) in 3Q22, re-establishing primary cobalt production in the US. The ICO operation is directly north northeast of the Blackbird Mine and is believed to be exploiting an extension of that resource while it also abuts both the Blackbird Creek and Emperium acreage.

Jervois's ICO covers 1,020ha/2,520 acres and is currently expected to produce 1,915te pa of Cobalt, 2,900te pa of copper and 6,700oz pa of gold over its initial seven-year life based on a total extraction of 2.5mte of ore with an average grade of 0.55% cobalt, 0.80% copper and 0.64g/te gold.

Jervois expects project development costs of ~US$100m and based its economics on a cobalt price of US$25/lb, a copper price of US$3/lb and a gold price of US$1,750/oz. That compares with current prices of US$32/lb, US$4.6/lb, and US$1,840/oz, respectively.

Other junior minors are also seeking mineable deposits in the vicinity, testimony to the attractiveness of Technology Minerals' address in the area and the fact that only a small

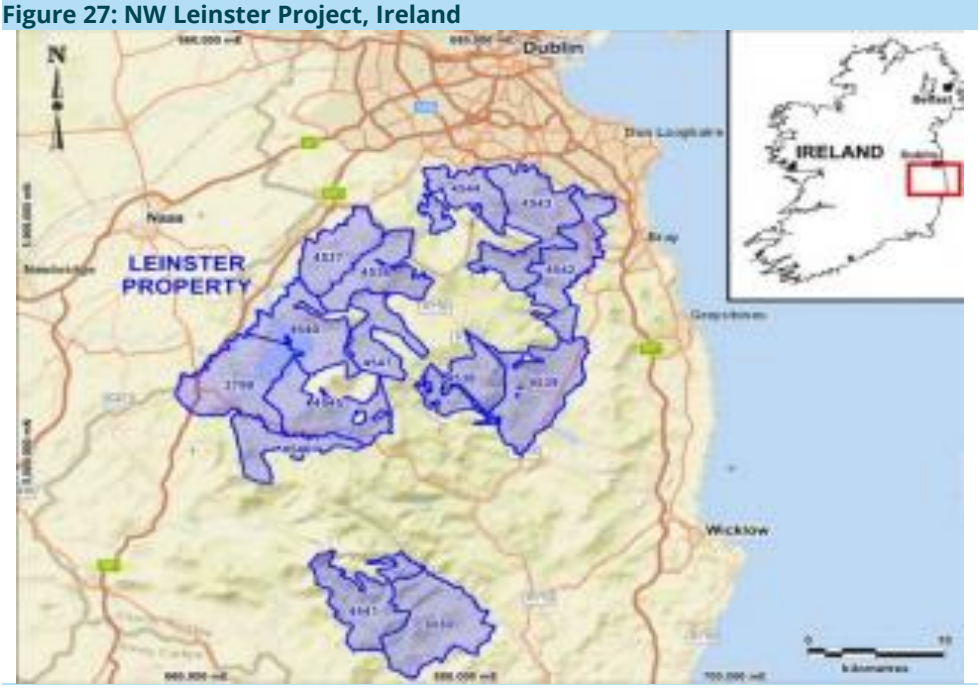
portion of the Idaho Cobalt Belt has undergone systematic, modern-day exploration to date.

NW Leinster/Ireland (LRH)

LRH holds Technology Minerals' European mining interests in Europe including a licence block comprising 15 licences in Ireland focused on lithium pegmatite.

The NW Leinster lithium project in Ireland is located over the north of the Leinster Massif in south-east Ireland (Figure 27).

Figure 27: NW Leinster Project, Ireland



Source: Technology Minerals, Arden Research.

Recent exploratory work has successfully identified new and previously unknown lithium mineralisation on the licenced block with five of seven identified potential targets proposed for further exploration work (Aghavannagh, Sorrel, Tonygarrow, Scurlocks, and Knocknaboley) including initial scout drilling. Technology Minerals believe that this has demonstrated a reasonable likelihood that lithium-bearing deposits of spodumene pegmatite may exist.

Oacoma Project/Dakota (TML)

TML owns a 15% interest in the Oacoma Project in South Dakota and has an earn-in right to acquire up to a further 85% of working interest from North American Strategic Minerals subject to the terms of an exploration agreement that is to be agreed.

The Oacoma Project comprises mineral leases over 1,248ha/3,083 acres which may be prospective for manganese, cobalt, nickel, copper, precious metals, and rare earth metals. Two field visits have taken place and assays from the last visit are pending.

Onshore Energy/Technology Minerals Cameroon (TMC) - Cameroon

TMC has five exploration licence applications pending in Cameroon covering a total area of 2,456km²/607k acres in south-eastern Cameroon (Figure 28}. These licences have received the first round of ministerial approval but final approval, which had been anticipated by YE21 has yet to be received although continues to be expected.

Figure 28: Cameroon project

Source: Technology Minerals, Arden Research.

The licences lie 35km north of the Nkamouna and Mada cobalt-nickel-manganese project in Cameroon but have undergone only cursory exploration by previous permit holders partly due to the heavy forestation. Given the limited work to date there is no third-party estimate of the geological potential.

Structure, management & shareholders

Technology Minerals plc was incorporated in June 2021 and listed on the Standard segment of the London Stock Exchange on 17 November 2021. The company is led by CEO Alex Stanbury and Executive Chairman Robin Brundle. Technology Minerals was formed as a holding company including a 49% interest in the Recyclus battery processing business so structured in order to maintain Recyclus' standing as a Circular Economy business. The group's critical minerals mining interests are generally held 100% through operating subsidiaries assembled prior to or at flotation.

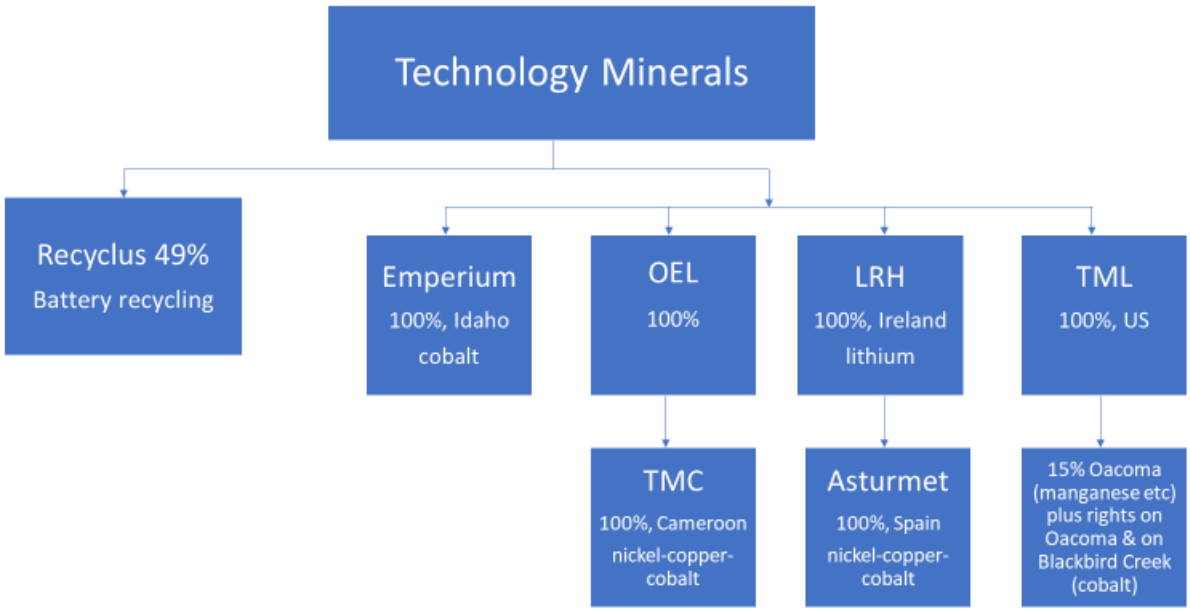
Structure

Technology Minerals plc was incorporated in the UK on 9 June 2021 and listed on the Standard segment of the London Stock Exchange on 17 November 2022.

As part of the process of bringing the underlying business together, Technology Minerals issued 786m shares on Admission in direct connection with the various battery minerals acquisitions, 306m shares on conversion of the outstanding convertible loan notes and placed 67m shares at a placing price of 2.25p, raising £1.5m in gross proceeds. In total, Technology Minerals issued 1,212m shares on Admission. In addition to the shares a total of 387m warrants were issued on a one-for-one basis mainly to the convertible note holders on conversion and to the placees. The warrants are exercisable within two years from Admission at an exercise price of 150% of the placing price, or 3.375p.

Figure 29 demonstrates the structure of the group:

Figure 29: Technology Minerals structure



Source: Technology Minerals, Arden Research.

Board and management

The Board of Technology Minerals comprises five executive directors being Executive Chairman, Robin Brundle, CEO Alex Stanbury, CFO Nigel Ruddock, COO Lester Kemp and CTO Wilson Robb. The company has three non-executive directors, being Mrs Chang Oh Turkmani, Nick Kounoupias and Philip Beard. In addition, Technology Minerals has

established an Advisory Board whose role is to advise on potential acquisitions. The Advisory Board currently comprises Nick Elmslie and Simon Griffiths.

Technology Minerals has established three Board Committees including an Audit and Risk Committee, a Remuneration Committee and an ESG Committee.

As a company with a Standard Listing, Technology Minerals is not required to comply with the provisions of the UK Corporate Governance Code. However, the Directors have decided, so far as is practicable given the group's size and nature to voluntarily adopt and comply with the QCA Corporate Governance Code.

Abbreviated biographies of the Group's Board are as follows:

Robin Brundle, Executive Chairman

Mr Brundle is a visionary and successful senior executive with a proven track record of maximising business opportunities including a significant number of successful business turnarounds – both national and international brands – covering industries including automotive, aerospace, defence, motorsport, property development and NHS. Mr Brundle is well connected with a broad range of high net-worth clients, governments, and senior directorships.

Alex Stanbury – Chief Executive Officer

Mr Stanbury is a corporate finance specialist with extensive contacts in the City. Mr Stanbury founded HASS Advisors in 2011 providing strategic advice and raising capital through private equity firms and private placements for businesses operating predominantly in the natural resources sector together with prior experience in investment banking and hedge fund management experience.

Nigel Ruddock, Chief Financial Officer

Mr Ruddock is an accountant and insolvency specialist who has spent over 30 years helping underperforming businesses to restructure and return to profitability including extensive automotive experience while at Grant Thornton where he became Chairman of the UK business.

Lester Kemp, Chief Operating Officer

Mr Kemp has extensive international mining experience including working with various junior resource companies operating through Africa/Europe and Scandinavia. Mr Kemp was founder of Mantle Diamonds and is the co-founder of Arabian Nubian Resources.

Wilson Robb, Chief Technical Officer

Mr Robb has 30 years' experience in mineral exploration and the resources sector with a current focus on gold in Africa, battery metals in Spain and Ireland and base-metals in Africa, Ireland, Spain, and Scotland. Mr Wilson is a co-founder of Arum which is a global exploration service provider to the international mining industry.

Chang Oh Turkmani – Non-Executive Director

Mrs Turkmani is a respected multilingual businesswoman with expensive experience across a wide range of industries. Mrs Turkmani is a qualified lawyer in the US and an adjunct professor of law at Georgetown University Law Centre. Mrs Turkmani is MD and Principal of Washington DC based Mega company which trades in raw materials.

Nicholas Kounoupias – Non-Executive Director

Mr Kounoupias is an experienced solicitor specialising in intellectual property law and has worked in almost all sectors that are underpinned by IP laws. Mr Kounoupias is Chief Counsel for Anti-Copying in Design (ACID) and established a specialist consultancy in 2016 to help businesses identify, manage, and protect their IP.

Philip Beard – Non-Executive Director

Mr Beard has launched companies around the world, managed and leveraged global brands and delivered extraordinary commercial results. Mr Beard was a founding

partner of Air Miles, a Director of the successful London Olympic and Paralympic bid team and a CEO of the O2 and of Queens Park Rangers FC.

Nick Elmslie – Advisory Board Member

Mr Elmslie is a former CEO of BP's global Petrochemicals Business and is a seasoned Non-Executive Director with extensive experience in renewable fuels, biotech, construction chemicals and plastics recycling.

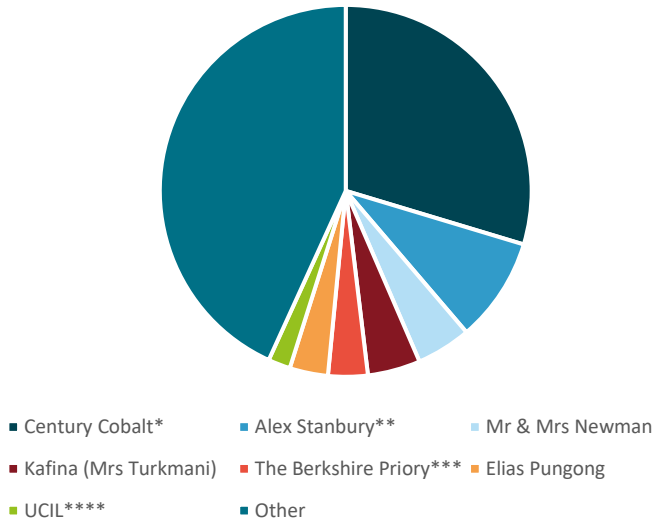
Simon Griffiths – Advisory Board Member

Mr Griffiths is a highly qualified consulting economic geologist with over 30 years of mineral exploration experience having worked on major projects and mining operations spanning a wide variety of natural resources including the discovery of world-class mineral deposits. Mr Griffiths is a non-executive director of SunMirror AG, Senior Technical Advisor to Nevada Exploration Inc., Technical Advisor to Northern Shield Resources Inc. and owner of a geochemical focused consulting company working with multiple clients whose projects span Africa, Europe and North America.

Shareholders

A public shareholder register has yet to be established reflecting the ownership of Technology Minerals since its floatation. However, Figure 30 reflects the position as disclosed in the Prospectus. Century Cobalt was the vendor of the Emperium assets to Technology Minerals and Mr Stanbury holds a 23.47% interest in the company with Mr Kemp holding an 0.77% interest. Management ownership of Technology Minerals totals 15%, mainly in respect of Mr Stanbury indirectly through his interest in Century Cobalt and Mrs Turkmani as trustee of a family trust.

Figure 30: Shareholders



*Source: Technology Minerals, Arden Research. *Excludes Alex Stanbury's holding, ** Indirect interest via Century Cobalt, ***Indirect interest via UCIL, ****Excludes The Berkshire Priory's holding.*

Analysis of forecasts

Given the lack of historical data our financial forecasts contain a higher-than-normal level of uncertainty. Our estimates primarily depend on our financial forecast for Recyclus which we model separately, and which is central to our valuation (see Valuation from page 29). We assume Recyclus will be treated as a non-consolidated associate and reported below operating profit on a net basis. As the share price is significantly above the warrant exercise value, we model the warrants to be fully exercised this year raising £13.1m and providing ample funding for Technology Minerals without the need for any dividend payment from Recyclus to finance the business. On that basis we forecast Technology Minerals to be profitable from next year, generating EPS of 0.26p jumping to 0.44p in 2024 and continuing to rise strongly thereafter.

We forecast Recyclus on the basis that one new processing train for each of Li-ion and lead-acid batteries is added each year, in line with company guidance for a combined annual investment of £4.3m. Utilisation rates on material processed are 5.0kte pa for Li-ion and 12.3kte for lead-acid batteries. For Li-ion we assume 30% of processed volume attracts an average gate fee £1,800/te with an average ~0.8ktepa repurposed for other uses and £1,075/te for the value of processed materials through 2024 rising to £1,375/te in 2026, most of which is black mass. For the lead-acid process we assume a sale price of £1,100/te.

Given the gate fee revenue and margin addition on repurposed sales, we model the gross margin of the Li-ion operation at 85% compared to 25% for the lead-acid process. We expect plant operating costs to be marginally higher for the Li-ion process but both around the £1.3m pa mark. On that basis we forecast Recyclus to be profitable this year and strongly free cash flow (FCF) positive from next year (Figure 31) providing significant scope for dividend distribution up to Technology Minerals in proportion to its 49% holding in the business.

Figure 31: Recyclus key forecasts – 100%

		2022E	2023E	2024E	2025E	2026E
Total processed	te	10,880	36,630	55,014	72,460	89,710
Revenue	GBPk	13,478	43,613	64,916	89,065	111,707
EBITDA	GBPk	2,828	14,872	22,510	33,008	42,374
EBIT	GBPk	2,403	14,022	21,235	31,308	40,249
net profit	GBPk	1,863	10,493	16,132	24,065	31,301
FCF	GBPk	(3,225)	8,923	15,571	24,747	31,864
EBITDA margin	%	21.0%	34.1%	34.7%	37.1%	37.9%
Li-batt EBITDA	GBPk	3,182	11,814	17,331	25,893	33,384
Lead-acid EBITDA	GBPk	-355	3,058	5,179	7,115	8,990

Source: Technology Minerals, Arden Research.

For Technology Minerals at the group level, we forecast nominal administrative expenditure of £1.25m pa with nominal annual critical minerals mining investment of £3m, most of which is discretionary and would be subject to funding availability.

Technology Minerals has 387m of outstanding warrants which are exercisable at 3.375p and must be exercised by 17 November 2023. Given that the warrants are in the money, we model them all to be exercised this year generating net funding to Technology Minerals to the value of £13.1m. In practice, the pace of exercise may be more measured, but we anticipate that warrant exercise should fully fund Technology Minerals group level administration costs and battery minerals exploration activities until such time as Recyclus begins to pay out dividends. In the event the warrants were not exercised or not exercised in sufficient quantity, Technology Minerals may need to source additional funding.

According to the Prospectus, Technology Minerals had extended loan financing to Recyclus of around £3m of which payment is due to commence this year and should also provide a source of funding to the group.

A concomitant of our assumption on warrants is that shares in issue will increase from 1,213m currently to 1,600m and this is the figure we use for all our per share calculations.

On that basis we forecast Technology Minerals to report a net loss of £0.1m in 2022 but to be generating a rapidly growing flow of profits thereafter (Figure 32 and see Financial Statements at page 33).

Figure 32: Technology Minerals key forecasts

		2022E	2023E	2024E	2025E	2026E
Net profit	GBPk	(61)	4,224	6,972	10,670	13,946
Basic EPS	GBPk/Share	0.00	0.26	0.44	0.67	0.87
Diluted EPS	GBp/Share	0.00	0.26	0.44	0.67	0.87
Implied (increase)/ decrease in net debt	GBPk	8,882	(4,202)	(4,223)	(4,244)	(4,496)
Net debt/(cash)	GBPk	(9,596)	(5,394)	(1,171)	3,073	7,569
Total/attributable equity	GBPk	33,978	38,202	45,174	55,844	69,790

Source: Technology Minerals, Arden Research.

Figure 32 also demonstrates the impact of the warrant exercise on the financial position of Technology Minerals and the very strong cash position the company should enjoy, subject to the warrants being exercised. We do not expect the net cash outflow from 2023-26 to prove realistic both because it does not allow for the receipt of any dividend from Recyclus (Figure 31) and because the investment into the battery minerals business may be more dynamic than we model.

We forecast total attributable equity at the end of 2021 at £21m and net cash at £0.7m which sets the base for our outer year forecasts. These should be regarded as nominal figures as they are based on the pro-forma balance sheet published in the Prospectus.

Technology Minerals does not intend to declare a dividend in the short term as its objective is the achievement of substantial capital growth and we are not forecasting the payment of a dividend. However, given the free cash flow generation apparent in Recyclus, payment of a dividend from the mid-2020s becomes a possibility, if not a probability.

For full details of our forecasts see Financial Statements at page 33.

Valuation

We expect Technology Minerals' exposure to differentiated, IP protected battery processing to be the focus of investor interest with the critical minerals mining exposure providing option upside. Based on a twin-track NPV and P/E multiple based approach we set a target price for Technology Minerals of 7p offering 90% upside. We believe that proof in operation of the Recyclus business should see a significantly higher price with more to come from other valuation uplifts we have not yet quantified. We initiate on Technology Minerals with a Buy recommendation.

Given the near-term start-up of profit and cash generation in Recyclus together with its strong growth pathway, we expect this to be the focus of investor interest in the Technology Minerals story, pending more visibility of the value in the critical minerals business.

We approach valuation from two directions which are mutually reinforcing. First, through a cash flow based NPV assessment of the Recyclus business and second through a P/E multiple based approach to Technology Minerals as a group.

On that basis we set a current Target Price of 7p/share offering 90% upside. Should the Recyclus business perform as expected the discount to NPV should fall and growth expectations could increase while greater confidence should also see the earnings multiple expand, we anticipate. Although that is likely to be a dynamic and ongoing process it is relatively easy to demonstrate value well above 10p/share. These valuations do not include upside from monetisation of the multiple other routes by which Recyclus' value could be enhanced (Recyclus from page 15) nor do they include any 'Green Premium' that might become applicable as and when the institutional shareholder base becomes properly established.

Based on Recyclus adding one Li-ion and one lead-acid processing plant per annum, in line with company guidance, we forecast free cash flow generation from the business through 2030 totalling ~£270m (Figure 33).

Figure 33: Recyclus nominal free cash flow – 100% (GBPm)

2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
(3.2)	8.9	15.6	24.7	31.9	39.4	45.2	50.5	57.2

Source: Technology Minerals, Arden Research.

Using a conservative 12% discount rate and a minimal growth rate of 2% thereafter, we generate a discounted value of £130m for the explicit forecast period and £186m for terminal value. That gives a total NPV based value for Recyclus of £316m on a 100% basis of which Technology Minerals' share is £155m or 9.7p per share.

Given the lack of history of actual plant operations and the business model assumptions underpinning our cash flow forecasts we risk this value by an initial 45% resulting in a current net valuation for Technology Minerals' share of £85m or 5.3p per share.

One might argue for an additional discount in Technology Minerals to reflect the associate nature of the investment, but our terminal growth rate assumption also looks quite penal, given the potential growth in demand for battery recycling capacity. Figure 34 demonstrates the sensitivity of the embedded value of Recyclus to Technology Minerals on varying the discounts applied to the NPV calculation and the terminal growth rate used in the NPV calculation. It shows that over a wide range of reasonable to conservative assumptions an embedded price of over 5p/share or significantly higher is eminently justifiable. As a sense check, at this level the Recyclus business would be trading on a P/E of under 11x 2024 earnings.

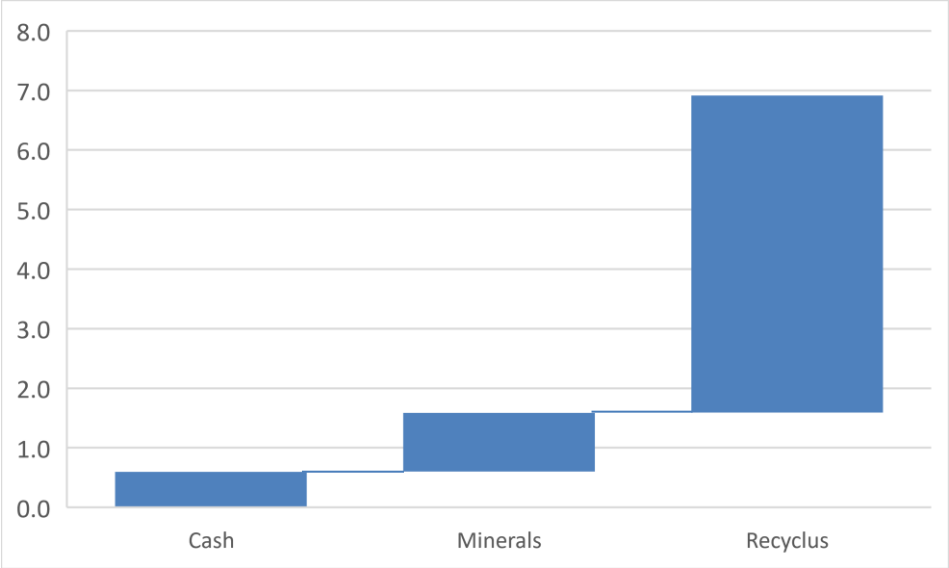
Figure 34: Recyclus value sensitivity (GBP/share net to Technology Minerals)

	Discount to NPV →				
Terminal growth rate ↓	**20%**	**30%**	**40%**	**50%**	**60%**
0%	6.9	6.0	5.2	4.3	3.5
2%	7.8	6.8	5.8	4.8	3.9
4%	9.0	7.9	6.8	5.6	4.5
6%	11.1	9.7	8.4	7.0	5.6
8%	15.3	13.4	11.5	9.6	7.7

Source: Technology Minerals, Arden Research.

Assuming that the warrants all convert there will be approximately 0.6p/share of cash on the balance sheet at end FY22, we estimate, which together with a nominal value for the mineral assets of the £15.8m, based on the disclosed acquisition price in the Prospectus, and 5.3p/share for the embedded value of Recyclus, we derive a Target Price of 7p/share (Figure 35).

Figure 35: NPV based target price components (GBp/share)



Source: Technology Minerals, Arden Research.

In terms of corporate valuation comparatives, there are 12 members of the European Battery Recycling association of whom only two are public, Veolia and Umicore. The market capitalisations of Veolia and Umicore are EUR22.2bn and EUR8.0bn respectively. Besides being in a different category of scale, for both companies, battery recycling is a marginal business and neither has Recyclus' IP, ROACE or growth rate. Those companies trade on consensus forward P/Es of 20x (Veolia) and 15x (Umicore). The forward P/E range of public Western European waste management businesses mainly engaged in collection and recycling is 9-20x with an average of 13x. We believe that with a ROACE roughly double that of the leading industry players and growing extremely rapidly, Technology Minerals should be able to achieve a rating at least towards the upper end of valuation, once markets become comfortable with financial delivery and subject to the discount reflecting group structure. We note that the current average UK industrials P/E is 19x.

Initially we believe Technology Minerals should be able to achieve a 15-16x multiple of its 2024 earnings which values the business at 6.5p-7.0p based on a 1,600m share count (Figure 36).

Figure 36: Technology Minerals P/E based valuation (GBp/share)

P/E multiple	2023E	2024E	2025E	2026E	2027E
10x	2.6	4.4	6.7	8.7	10.7
11x	2.9	4.8	7.3	9.6	11.8
12x	3.2	5.2	8.0	10.5	12.8
13x	3.4	5.7	8.7	11.3	13.9
14x	3.7	6.1	9.3	12.2	15.0
15x	4.0	**6.5**	10.0	13.1	16.0
16x	4.2	**7.0**	10.7	13.9	17.1
17x	4.5	7.4	11.3	14.8	18.2
18x	4.8	7.8	12.0	15.7	19.3
19x	5.0	8.3	12.7	16.6	20.3
20x	5.3	8.7	13.3	17.4	21.4

Source: Technology Minerals, Arden Research.

As for our NPV approach, we would expect the shares to trade on a higher multiple assuming the business performs in line with our modelling which, as Figure 36 demonstrates, offers very material future upside.

Combining the two approaches we set a target price of 7p per share offering 90% upside and implying a market capitalisation of £112m, after allowing for the warrant exercise.

Given the associate ownership structure of Technology Minerals' interest in Recyclus and the lack of an established dividend policy in Recyclus, our valuation lacks support from a corporate cash flow-based approach such as EV/EBITDA or debt adjusted cash flow. Once a dividend payment record from Recyclus to Technology Minerals has been established, or better still, from an investor perspective, that Technology Minerals were able to consolidate Recyclus, valuation could also be directly supported on group cash flow-based metrics.

Similarly, Technology Minerals does not propose to pay a dividend in the short term so there is no dividend support to our valuation. However, full pay-up of the share of Recyclus' free cash flow to Technology Minerals would suggest a significant prospective FCF yield, even at our 7p target price (Figure 37).

Figure 37: Nominal* FCF yield (%)

	2022E	2023E	2024E	2025E	2026E
Current price	-9.9%	0.2%	5.7%	13.4%	19.3%
Target price	-5.2%	0.1%	3.0%	7.0%	10.1%

*Source: Technology Minerals, Arden Research. *Technology Minerals' share of Recyclus FCF*

Technology Minerals offers differentiated, IP protected exposure to battery processing aligning it with the Energy Transition and Circular Economy. That business is on the cusp of demonstrating its operating and financial credentials. Performance as projected, should deliver rapidly growing profit and cash flow. Although the associate ownership structure is a complication, investing in Technology Minerals is the only listed opportunity to gain focused exposure to such a business and access to the value and pace of growth it offers. The early-stage critical mineral mining interests provide option value into the electrification narrative inherent in the Energy Transition and the upward pressure on battery minerals prices that implies.

Based on a twin-track NPV and P/E multiple based approach we set a target price for Technology Minerals of 7p offering 90% upside. We believe that proof in operation of the Recyclus business should see a significantly higher price with more to come from other valuation uplifts we have not yet quantified. We initiate on Technology Minerals with a Buy recommendation.

Risks

Having recently come to market, Technology Minerals published an extensive list of risk factors in its Admission document. Of these, around half relate to its critical minerals mining exposure. In our view, the current investment interest is likely to be focused on the Recyclus business hence it is those related risks that are likely to be of most interest to investors together with the lack of operating and financial history.

In our view the most important area of risk for Technology Minerals is the performance of the Recyclus business and how that translates back into the group. Within this area there are three main issues. First, the actual operating performance of the Li-ion and lead-acid processing plants, particularly the former given the more advantageous economics relative to the lead-acid processing business and the higher degree of novelty in its design. Second, the extent to which the business model conforms to management expectations, particularly with respect to feedstock availability, the gate fees receivable or the feedstock cost payable and the value of the processed output, which is in turn tied to global materials prices. In the longer-term, changes in battery chemistry or competition in the EoL battery market could pressurise returns. Finally, the ownership structure in which Technology Minerals holds a 49% non-controlling interest in Recyclus may reduce financial transparency, raises the possibility of a conflict of interest and could complicate access to cashflow generated in Recyclus at the group level. Thus, even though we model Recyclus to be free cash flow generative from this year, the funding of Technology Minerals is likely to be highly dependent on warrant receipts and the structure may reduce access to bank financing for Technology Minerals.

Members of the Recyclus team have previously run similar technology to that now in use for lead-acid battery processing but since improved and management are confident that start-up at the Tipton plant should be smooth. The hammer mill is the key novel part of the Li-ion process and has been carefully designed and extensively pre-tested while the other separation components and filtration processes are industry standard which should reduce, but not eliminate the risk of smooth operation on start-up. We believe that demonstration of sustained successful operation of the Li-ion plant is likely to be a key factor in de-risking the potential value in the stock. Technology Minerals via Recyclus has put in place an extensive contract structure to ensure feedstock supply on known terms and for the sale of the materials produced. Mr Brundle and Mr Stanbury serve on the Boards of Technology Minerals and Recyclus while Mr Stanbury holds a material stake in Technology Minerals (see Structure, management & shareholders from page 24) all of which should facilitate a smooth interface between the companies.

Directed at battery critical minerals, Technology Minerals is exposed to all the typical risks associated with early-stage mining projects where any commercial value or formal resource estimate has yet to be ascertained. Technology Minerals has limited formal work obligations so the pace of evaluation is at the company's discretion and should be matched to funding availability. The cost of holding he licences which have been awarded in good standing is ~£1m in 2022. Our modelling assumes that the 84m of contingent share issuance related to the acquisition of the Cameroon licences has lapsed as the licences were not awarded by the end of 2021.

As the constituent companies of the Technology Minerals group were only assembled prior to listing, the company has no operating or financial history and to date only a pro-forma balance sheet has been published. As a result, our financial forecasts are subject to an unusually high level of uncertainty and may be subject to significant revision as Technology Minerals develops an operating and financial track record.

Financial Statements

Figure 38: Summary financial statements (£k)				
Year to December	**2021E**	**2022E**	**2023E**	**2024E**
P&L				
Revenue	n/a	0	0	0
Cost of sales	n/a	0	0	0
Gross profit	**n/a**	**0**	**0**	**0**
Operating costs	n/a	(1,250)	(1,250)	(1,250)
Operating Profit/(Loss)	**n/a**	**(1,250)**	**(1,250)**	**(1,250)**
Net finance (charge)/income	n/a	48	27	6
Recyclus, net	n/a	913	5,141	7,905
Profit/(Loss) before taxation	**n/a**	**(289)**	**3,918**	**6,661**
Taxation (charge)/credit	n/a	228	306	311
Net Profit/(Loss)	**n/a**	**(61)**	**4,224**	**6,972**
Attributable Profit/(Loss)	**n/a**	**(61)**	**4,224**	**6,972**
Basic Reported EPS (GPp/share)	**n/a**	**0.00**	**0.26**	**0.44**
Diluted Reported EPS (GBp/share)	**n/a**	**0.00**	**0.26**	**0.44**
Cash flow				
Reported operating profit	n/a	(1,250)	(1,250)	(1,250)
Depreciation	n/a	0	0	0
Dividends received	n/a	0	0	0
Movement in working capital	n/a	0	0	0
Cash generated from operations	**n/a**	**(1,250)**	**(1,250)**	**(1,250)**
Income tax (paid)/received	n/a	0	0	0
Net cash inflow from operating activities	**n/a**	**(1,250)**	**(1,250)**	**(1,250)**
Purchase of PP&E	n/a	(3,000)	(3,000)	(3,000)
Other investment	n/a	0	0	0
Net cash invested (exc interest receipt)	**n/a**	**(3,000)**	**(3,000)**	**(3,000)**
Net cash finance costs	n/a	71	48	27
Dividends paid	n/a	0	0	0
Total net equity issuance	n/a	13,061	0	0
Net cash equity delta	n/a	13,132	48	27
Implied (increase)/decrease in net debt	**n/a**	**8,882**	**(4,202)**	**(4,223)**
Balance sheet				
Non-current assets	**19,416**	**23,329**	**31,470**	**42,375**
Net assets	**20,978**	**33,978**	**38,202**	**45,174**
Total equity	**20,978**	**33,978**	**38,202**	**45,174**
Book net debt/(cash)	**(714)**	**(9,596)**	**(5,394)**	**(1,171)**

Source: Technology Minerals, Arden Research

See page 34 for regulatory disclosure

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