PITT STREET RESEARCH

MTM Critical Metals

Partnering to proceed to the next level

Share Price: A$0.09

MTM Critical Metals (ASX: MTM) has a technology that could revolutionise metal refinery. Its Flash Joule Heating (FJH) technology can enhance the process of metal recovery by speeding up the process and lowering the energy inputs involved. It has been proven to have a substantially higher impact than existing methods with lower time and cost. It has been proven to help with several commodities, including lithium, rare earths, gallium and gold. In the context of Western nations seeking their own supply chains for these metals, FJH could provide a pathway that is cheaper and less time consuming than discovering new deposits.

ASX: MTM

Sector: Resources

3 December 2024

Market cap. (A$ m)	36.4
# shares outstanding (m)[1]	404.2
# shares fully diluted (m)	578.1
Market cap ful. dil. (A$ m)	50.2
Free float	100%
52-week high/low (A$)	0.12 / 0.021
Avg. 12M daily volume ('1000)	2,792.9
Website	mtmcriticalmetals.com.au

Source: Company, Pitt Street Research

[1] Including shares in Tranche 2 of the placement

A new partnership

MTM has just unveiled a partnership with Indium Corporation, one of the world's largest suppliers of refined gallium, germanium, indium and other specialist technology metals. MTM will use ultra-high value scrap metals from Indium – that is to say scrap rich in these metals. These align with US efforts to establish a secure domestic supply of critical materials. It is also the first external partnership that MTM has entered into, representing a major validation of the work the company has conducted to date.

A positive 2025 awaits

MTM heads into 2025 in positive shape. Investors should watch for positive testing results of FJH, as well as optimisation of the technology and potential collaborations with mineral deposit owners and chemical companies, as well as potential grant funding. Although American focus on critical metals has not begun with the election of the Trump administration, we expect the USA to double down on its efforts.

Peers suggest further upside

We reiterate our valuation of MTM as outlined in our initiation report at ~$63.9m or A$0.16 per share in a base case and ~$83.0m or A$0.21 per share in an optimistic (or bull case). This was using a Peer-Weighted approach, comparing companies at the stage of development that MTM is trying to reach in the immediate future (i.e. the next 12-24 months). Please see p.7 for more details on our valuation rationale and p.8 for the key risks.

Share price (A$) and avg. daily volume (k, r.h.s.)

Source: Refinitiv Eikon, Pitt Street Research

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Disclosure: Pitt Street Research directors own shares in MTM.

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Re-introduction to MTM Critical Metals (ASX: MTM) and its FJH Technology

MTM is commercialising a form of Flash Joule Heating (FJH) that it has licensed from Rice University. It applies the general principals of FJH to metal recovery from ores and wastes – particularly lithium and Rare Earth Elements (REEs).

What is Flash Joule Heating? And what is the big deal about it?

Flash Joule Heating involves the creation of thermal energy because of the collision of electrons in a conductor…done at a 'flash pace'.

FJH is just 'Joule heating' conducted at a fast place. 'Joule heating' is the phenomenon where the passing of current through an electrical conductor produces thermal energy because of the collision of electrons in the conductor. With MTM's FJH Technology, the heat is generated almost instantaneously (the 'flash' part), reaching temperatures as high as 3,000 degrees Celsius in less than a second. This rapid and intense heating can break down complex materials, making it particularly useful for extracting metals from waste streams or refractory ores. It has been validated in academic research, by independent verification and by work MTM has done – which we outlined in our initiation report (Figure 1). And crucially, it can scale-up beyond a laboratory-scale.

Figure 1: The effect of FJH

Element		Head Grade (SGS - ppm)	Leach Recovery Results (Pre FJH) (µg/L)	Leach Recovery Results (Post FJH) (µg/L)	% Change in Recovery
Rare Earth Elements (REE)	Nd - Neodymium	72	637	1,095	72
	Pr - Praseodymium	18	188	285	52
	Dy - Dysprosium	14	367	444	21
	Tb - Terbium	2	41	62	50
	TOTAL MREE	**106**	**1,233**	**1,886**	**53**
	Ce - Cerium	153	1,482	2,377	60
	Er - Erbium	8	277	350	26
	Eu - Europium	3	37	56	50
	Gd - Gadolinium	16	256	367	44
	Ho - Holmium	3	86	121	40
	La - Lanthanum	74	752	1,197	59
	Lu - Lutetium	1	65	79	22
	Sm - Samarium	15	149	232	55
	Tm - Thulium	1	44	58	31
	Y - Yttrium	81	1,346	1,961	46
	Yb - Ytterbium	7	319	381	20
	TOTAL REE	468	6,046	9,065	50
Other Elements of Interest	*Al – Aluminium (%)**	**10*	5,814,146	9,497,618	63
	Ba - Barium	978	4,777	3,499	-27
	Co - Cobalt	45	558	964	73
	Cs - Cesium	7	120	333	176
	Li - Lithium	125	3,248	4,857	50
	Ni - Nickel	102	1,214	2,412	99
	Rb - Rubidium	93	1,141	2,427	113
	Sc - Scandium	27	694	1,409	103
	Ti - Titanium	5,900	1,626	9,990	514
	V - Vanadium	205	6,052	1,320	-78

Source: Company

FJH would make metals recycling faster and more efficient.

What difference would it make? FJH would make metals recycling faster and more efficient. Existing methods are time-consuming, energy-intensive, reagent-intensive, non-selective (meaning they don't just remove the metal of interest but take out all the metals as well) and thus, expensive.

Which commodities could FJH work for?

FJH could make a difference with respect to Lithium, REEs (Rare Earth Elements) and Galluim.

There are three target commodities: Lithium, REEs and Gallium. In respect of each of these, demand is expected to grow exponentially in the years ahead, and metals recycling can play a key role in ensuring demand can be met.

In respect of lithium, FJH is crucial because it can improve the energy-intensive 'calcination' step in lithium extraction[1]. Even more impressively, the technology has shown potential to dramatically streamline the extraction process by reducing the number of steps required to recover lithium from spodumene concentrate. Earlier in 2024, FJH was shown to produce a saleable product—lithium chloride—directly from raw concentrate in a single step[2]. This breakthrough holds significant commercial promise. If scalable, it could revolutionise the current methods of lithium refining and disrupt the industry.

For rare earths, MTM's technology potentially cuts out a lot of the issues in trying to identify, mine and process rare earth deposits. So far as processing mined rare earths ores is concerned, FJH could potentially improve the processing by removing the need for the 'acid bake/roasting' step where rare earth phosphates are converted to rare earth sulphates. It is necessary in this process to have a high temperature, for higher temperatures improve recovery values compared to leaching. It dehydroxylates the clays and liberates the REE minerals, allowing access for the acid to solubilise the REEs[3]. But FJH technology has the potential to achieve even better results, but faster. As demonstrated in Figure 2 back on page 7, FJH improves the acid leachability of REEs by over 50% and other critical metals by 50-514% when compared to conventional acid leach methods.

Turning to Gallium, Atomic No. 31, MTM recently announced a breakthrough in gallium recovery from semiconductor scrap using its FJH Technology[4]. It is a highly valuable metal with a supply chain currently dominated by China. This presents a significant commercial opportunity. The ability for Western countries to 'onshore' high-value gallium production from waste streams offers a commercially compelling advantage for MTM. Gallium's ultra-high price, strategic importance, and the relatively small volumes needed for viable operations make it an attractive prospect for establishing a dedicated recovery plant quickly

Gold is another commodity where FJH could make a difference. Gold processing is typically done in smelters and incinerators using methods that are expensive, time-consuming, crude to the environment through direct emissions and toxic by-products, and often unregulated. FJH's technology applies direct electrical energy under a chlorine gas atmosphere, thus vaporising metals from e-waste and recovering them in a single step without using toxic acids or non-selective.

[1] See the MTM announcement dated 9 July 2024 headlined '*Positive lithium extraction results from Flash Joule Heating*'
[2] See the MTM announcement dated 21 August 2024 and headlined '*Flash Joule Heating converts spodumene to lithium chloride*'
[3] https://www.tandfonline.com/doi/full/10.1080/19392699.2023.2269094
[4] See the MTM announcement dated 27 August 2024 '*Gallium recovered from semiconductor waste using FJH tech*'

MTM is partnering with Indium

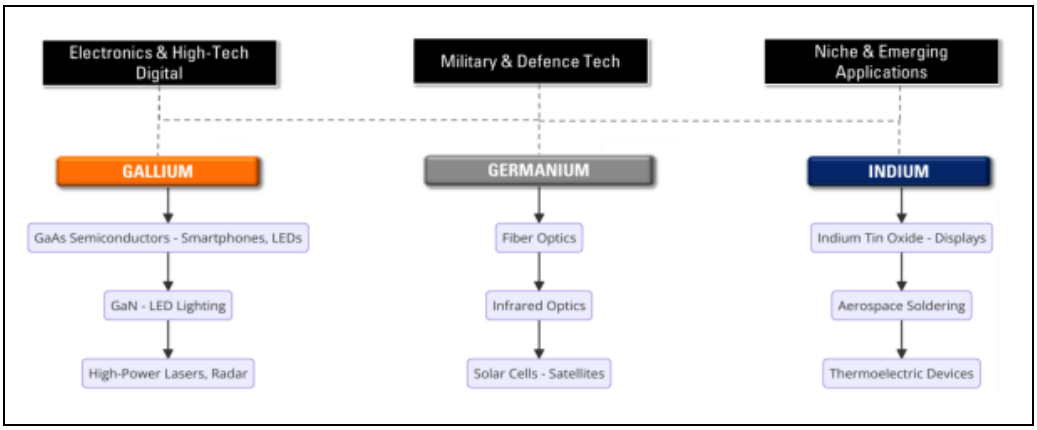
(Indium is one of the Western world's leading suppliers of refined gallium, germanium, indium and other specialty technology metals.

MTM has unveiled a strategic collaboration with Indium Corporation (Indium), which is one of the Western world's leading suppliers of refined gallium, germanium, indium and other specialty technology metals. MTM will process scrap materials rich in gallium, germanium, indium and tin provided by Indium. By 'rich', this means metal containing up to 20% (200,000 ppm) indium, 15% (150,000 ppm) gallium and 18% germanium (180,000 ppm). Although it is only a non-binding Memorandum of Understanding (MoU) at this stage, it will be the first external partnership MTM has secured, thus marking a major valuation of the company's work to date and the potential of its technology.

Creating a new metals supply chain

The aim of this collaboration is to create a US-based processing solution using MTM's FJH to recover the aforementioned metals from scrap sources. This initiative aligns with US efforts to establish a secure domestic supply of critical materials. Gallium, germanium, indium are all critical metals that are used in electronics, high-tech applications and advanced military technologies (Figure 2).

Figure 2: Drivers of demand for Gallium, Germanium and Indium.



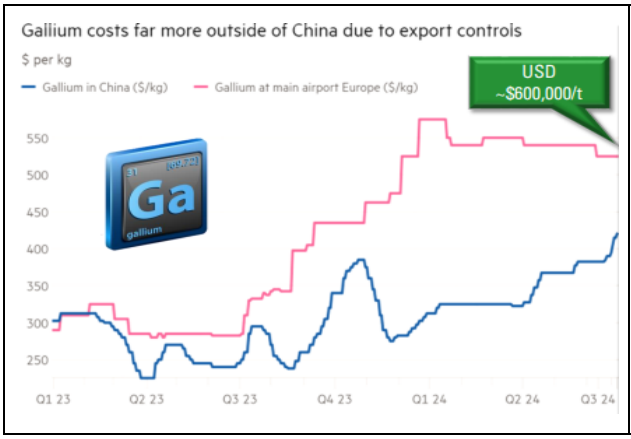
Source: Company

In light of geopolitics and specific export controls (particularly on germanium as outlined in our recent report on Battery Age Minerals (ASX:BM8)), there is an urgent need for secure and diversified supply chains. A recent US Geological Survey (USGS) report found that a complete ban on China on these critical metals could reduce gallium availability by 40%, increase prices by 250%, and even hit US GDP by 0.42%[5].

A blanket ban may seem unbelievable to some investors, but this was a reality for a couple of months in 2023. Although exports have resumed, volumes are nowhere near what they were prior to the restrictions. Global prices increased substantially in the months following the ban (Figures 3 and 4).

[5] https://pubs.usgs.gov/publication/ofr20241057

Figure 3: Gallium pricing



Source: Company and Argus

Figure 4: Germanium pricing

Source: Company and Argus

MTM can play a part in establishing a local supply chain, and this partnership with Indium can make the potential a reality. It comes at an opportune time, with the incoming Trump administrating emphasising a need for US industrial and economic independence. Although tariffs are the most anticipated measures, including potentially on gallium and germanium from China, there may also see enhanced incentives for domestic manufacturing and federal funding for critical mineral recovery and recycling technology.

What's next?

Once the pilot scale plant has been tested, the inevitable next step is taking FJH it to commercial scale.

Once the pilot scale plant has been tested, the inevitable next step is taking FJH to commercial scale. The company will seek further strategic collaborations with industry, government and academia. If NeoMetals (ASX: NMT) is any precedent, we could see a (sub-)licensing deal prior to commercial production. When commercialised, FJH will aim to have a sustainable business model with recurring revenue based on the quantity of material processed.

MTM is also seeking non-dilutive funding sources, particularly government grants. Programs such as the Critical Minerals Development Program in Australia and the Critical Minerals & Materials program in the US seek to provide funding towards critical minerals projects so that the supply chain can be diversified before China and nations can still produce the ultimate applications critical metals are used in – particularly defence and decarbonisation applications.

MTM has told investors that it is actively applying for government grants based on supply of critical materials and that it has received a Letter-of-Support for Indium for a US Department of Energy (DOE) grant pertaining to 'Advancing Technology Development for Securing a Domestic Supply of Critical Minerals and Materials'.

Our valuation of MTM

We value MTM at A$63.9m (or $0.16 per share) in our base case or A$83m ($0.21 per share) in our bull case.

In our initiation report, we outlined a view that MTM could trade at a market cap of ~A$63.9m (which is $0.16 per share) and $83m in our bull case ($0.205 per share). This in line with a couple of peers (specifically Zeotech (ASX:ZEO) and Neometals (ASX:NMT)) once it has passed pilot-scale testing and has secured a licensing deal. The news of the MoU with Indium is a positive step for the company, although it is short of a full-licensing deal (Figure 5).

Figure 5: DCF calculation

Valuation	BASE	BULL
Equity value (A$ m)	**63.9**	**83.0**
Shares outstanding	404.2	404.2
Implied price (A$ cents)	**0.158**	**0.205**
Current price (A$ cents)	0.090	0.090
Upside (%)	75.6%	127.8%

Source: Pitt Street Research

We foresee MTM being re-rated to our valuation range driven by the following factors:

- Completion of a 1 tonne per day pilot/demonstration plant.
- Results related to:
  i) testing of bauxite residue,
  ii) recovery of precious metals (gold, platinum etc) from electronic waste.
- Partnerships or collaborations with potential strategic customers and joint-venture partners – both chemical companies and owners of difficult-to-process mineral deposits.
- Securing government grants or other sources of non-dilutive funding in various jurisdictions.
- Further optimisation of the FJH approach.

Risks

We see the following key risks to our investment thesis:

- **Development risk**: The road to a viable commercial product is very long. Much development and engineering work remains which brings with it a risk of technical failures, or at the very minimum, extended development periods.
- **Funding risk**: MTM will continue to require external funding to support its development plans for the foreseeable future. Raising funds on favourable terms (both debt and equity) along with timeliness may be a challenge for the company. If it secures equity funding, this would dilute shareholder value. Any debt financing would not have this effect, but could present challenges dependant on the terms secured and the progress made by the company.
- **Commercial risk:** Even if and when MTM's technology is commercialised, it will be a challenge in and of itself to find commercial partners for its technology. Lower than anticipated adoption rates may hamper future growth.
- **Licensee risk:** MTM's ability to commercialise the FJH technology is from its licensing of the technology from Rice University. A withdrawal of the license or change in conditions could be catastrophic for the company. Alternatively, existing propositions in the agreement may have the potential to hinder FJH's development and commercialisation.
- **Key personnel risk**: There is the risk the company could lose key personnel and be unable to replace them and/or their contribution to the business.

Appendix I – Analysts' Qualifications

Stuart Roberts, lead analyst on this report, has been an equities analyst since 2002.

- Stuart obtained a Master of Applied Finance and Investment from the Securities Institute of Australia in 2002. Previously, from the Securities Institute of Australia, he obtained a Certificate of Financial Markets (1994) and a Graduate Diploma in Finance and Investment (1999).
- Stuart joined Southern Cross Equities as an equities analyst in April 2001. From February 2002 to July 2013, his research speciality at Southern Cross Equities and its acquirer, Bell Potter Securities, was Healthcare and Biotechnology. During this time, he covered a variety of established healthcare companies, such as CSL, Cochlear and Resmed, as well as numerous emerging companies. Stuart was a Healthcare and Biotechnology analyst at Baillieu Holst from October 2013 to January 2015.
- After 15 months over 2015–2016 doing Investor Relations for two ASX-listed cancer drug developers, Stuart founded NDF Research in May 2016 to provide issuer-sponsored equity research on ASX-listed Life Sciences companies.
- In July 2016, with Marc Kennis, Stuart co-founded Pitt Street Research Pty Ltd, which provides issuer-sponsored research on ASX-listed companies across the entire market, including Life Sciences companies.
- Since 2018, Stuart has led Pitt Street Research's Resources Sector franchise, spearheading research on both mining and energy companies.

Nick Sundich is an equities research analyst at Pitt Street Research.

- Nick obtained a Bachelor of Commerce/Bachelor of Arts from the University of Sydney in 2018. He has also completed the CFA Investment Foundations program.
- He joined Pitt Street Research in January 2022. Previously he worked for over three years as a financial journalist at Stockhead.
- While at university, he worked for a handful of corporate advisory firms

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