ASX Release 17 June 2025

MTM and Meteoric Sign MOU Following Breakthrough Testwork on MREC Feedstock

- **MOU signed with Meteoric Resources NL (ASX:MEI) following successful proof-of-concept beneficiation test work on Caldeira's rare earth element (REE)-rich mixed rare earth carbonate (MREC) product.**
- **Flash Joule Heating ("FJH") process successfully concentrated high-value magnetic REEs — including Nd, Pr (light) and Dy, Tb (heavy) — in a single, un-optimised flash, separating them from low-value La and Ce (waste).**
  - Separated >80 % of La and Ce mass from MREC product in a single flash, upgrading its value and reducing downstream processing load.
  - Front-end waste separation cuts transport, reagents, and environmental impact.
  - Recovered 81 % of terbium (Tb), one of the scarcest and most strategic REEs, in a single flash without solvents.
  - Magnet-REE distribution or product increased from 30 % to 72 % of total REO; heavy REEs (Sm–Lu + Y) rose from 6 % to 17 % (+186 %), while La + Ce dropped from 61 % to 7 % (–89 %) **— a step-change uplift in value.**
  - Multi-flash testing is expected to further enhance recoveries.
- **Magnet REEs like Nd, Pr, Dy and Tb are critical to both defence applications (missiles, guidance, radar) and civilian technologies (EVs, wind turbines, electronics).**
- **These results show that FJH can act as a mid-stream beneficiation step—and, with further optimisation, a fast, easily-deployable alternative to traditional solvent-extraction—potentially transforming Western rare-earth supply chains.**
- **Meteoric's Caldeira Project is among the world's most advanced ionic clay REE project under development, hosting one of the largest known ionic clay deposits globally (1.5 billion tonnes @ 2,359 ppm TREO)[1].**
- **MTM continues to advance discussions with other REE firms, including hard-rock and waste-stream projects.**

MTM Critical Metals Limited ("MTM" or the "Company") (ASX: MTM; OTCQB: MTMCF) is pleased to announce it has signed a non-binding Memorandum of Understanding (MOU) with Meteoric Resources NL (ASX: MEI) ("Meteoric") to collaborate on the downstream processing of mixed rare earth carbonate (MREC) from Meteoric's flagship Caldeira Rare Earth Project in Brazil — one of the leading ionic clay REE projects progressing toward commercialisation.

The MOU follows the successful completion of proof-of-concept testwork by MTM, using its proprietary FJH technology, on a sample of Meteoric's MREC product. The test demonstrated a chloride-based refining pathway that:

- **Concentrated valuable magnet and key heavy rare earths** — Nd, Pr, Dy, and Tb,
- **Separated >80 % of low-value material** (La, Ce) from the valuable magnet REEs in a **single, un-optimised flash**,
- **Recovered 81 % of terbium**, one of the rarest and highest-value REEs critical for defence and civilian technologies
- ⇒ **Without the use of acids or solvents.**

This FJH process delivers results **comparable to multi-stage solvent extraction**, but is faster, simpler, rapidly-deployable and modular - offering the potential to **dramatically reduce capital, operating costs and deployment timeframes** while supporting western supply chain development[2].

MTM Managing Director & CEO, Michael Walshe, commented: *"Our proof-of-concept work on Meteoric's MREC clearly shows the transformative potential of Flash Joule Heating. In a single flash we shifted the product mix decisively toward the high-value magnet rare earths, dramatically lifting material value while stripping out waste. Subsequent multi-flash runs are anticipated to further improve performance. FJH therefore offers what could become the first Western, chloride-based upgrading route for ionic-clay feedstocks, and we're excited to progress this breakthrough with Meteoric".*

[1] Ref: ASX:MEI Meteoric Resources NL ASX announcement, *'Investor Presentation'*, 15/05/2025
[2] Adamas Intelligence 2024, *Rare-Earths Market Outlook & Opportunities 2024-2035*, Adamas Intelligence, Toronto

MEI Managing Director & CEO, Stuart Gale, commented: *"We are excited by the potential of MTM's FJH technology to unlock an innovative, Western alternative, refining pathway for our Caldeira MREC product. This collaboration fits squarely within our strategy to pursue scalable and geopolitically aligned downstream solutions that enhance the value and flexibility of our rare earth supply".*

MTM's FJH TESTWORK – KEY OUTCOMES

The test program involved FJH processing conducted on a sample of Meteoric's MREC. The sample was processed in a chlorinated atmosphere to facilitate the formation and volatilisation of metal chlorides, which were collected via condensation into a mixed chloride solution. Temperature control and catalysts were employed to achieve separation. Post-flash water washing was then performed to extract the condensed metal chlorides from the reactor solids, and TotalQuant Inductively Coupled Plasma Mass Spectrometry (ICP-MS) was used to analyse both the water wash solutions and remaining solids.

The testwork achieved the following:

- **Effective separation (> 80%) of low-value La & Ce,** which combined accounts for ~60% of the total MREC mass.
- **Selective recovery of high-value Nd & Pr** into a combined chloride product & **co-recovery of Dy and Tb**, with pathways to further separation under development.
- **Retention of the Sm–Y suite (SEG REEs)** in a clean, concentrated residue, enabling additional downstream flexibility.

These results validate a **chloride-based upgrading route for MREC**, offering a scalable and modular alternative to conventional sulphate-leach and solvent extraction methods dominated by foreign-controlled facilities.

Table 1: REE Volatilisation – % Recovered from Reactor Solids & REE Enrichment

Element	% Recovery	Enrichment Factor	Interpretation
Praseodymium (Pr)	76 %	4.1×	Strong volatilisation in single flash
Neodymium (Nd)	65 %	2.9×	Major portion transferred to vapour
Dysprosium (Dy)	75 %	3.9×	High heavy REE recovery
Terbium (Tb)	81 %	5.3×	Near-total recovery in vapour phase
Gadolinium (Gd)	89 %	8.9×	Confirmed strong heavy REE separation
Samarium (Sm)	51 %	2.0×	Moderate recovery – to be improved by further flash runs
Lanthanum (La)	~17 %	0.2×	~83 % remained in solids – effectively separated from valuables
Cerium (Ce)	~12 %	0.3×	~88 % retained – effectively separated from valuables

NOTE: Enrichment = (REE % in condensate) ÷ (REE % in original feed). Values below 1.0 reflect effective separation.

REE Distribution Shift – Value Uplift in a Single Flash

The initial, un-optimised FJH flash radically re-balanced the rare-earth mix—more than doubling the magnet-REE share (+140 %) and almost tripling the heavy-REE share (+190 %), while cutting low-value light REEs by ~90 %, delivering a step-change uplift in product value in a single pass.

Table 2: REE Distribution Shift by Group – Value Uplift in a Single Flash (as REE oxides (REO)) (*see Appendix*)

REE Group	Share of Total REO Before	Share of Total REO After	Relative Change
Magnet REOs (Nd, Pr, Dy, Tb)	30.0%	71.8%	139%
Heavy REOs (Sm → Lu + Y)	5.9%	16.8%	186%
Light REOs (La, Ce)	60.9%	7.3%	-88%

Table 3: REE Distribution Shift – Value Uplift in a Single Flash (as REE oxides (REO)) (*see Appendix*)

Oxide Formula	Element Symbol	Element Name	Before FJH	After FJH	Change
Nd_2O_3	Nd	Neodymium	21.0%	48.8%	**133%**
Pr_6O_{11}	Pr	Praseodymium	8.1%	20.8%	**156%**
Dy_2O_3	Dy	Dysprosium	0.7%	1.7%	**139%**
Tb_4O_7	Tb	Terbium	0.2%	0.5%	**166%**
Sm_2O_3	Sm	Samarium	2.1%	3.8%	**87%**
Eu_2O_3	Eu	Europium	0.5%	0.1%	**-80%**
Gd_2O_3	Gd	Gadolinium	1.5%	2.3%	**48%**
Ho_2O_3	Ho	Holmium	0.1%	0.3%	**195%**
Er_2O_3	Er	Erbium	0.2%	0.6%	**143%**
Tm_2O_3	Tm	Thulium	0.0%	0.1%	**187%**
Yb_2O_3	Yb	Ytterbium	0.1%	0.3%	**189%**
Lu_2O_3	Lu	Lutetium	0.0%	0.0%	**189%**
Y_2O_3	Y	Yttrium	4.5%	13.3%	**196%**
La_2O_3	La	Lanthanum	59.6%	6.6%	**-89%**
CeO_2	Ce	Cerium	1.3%	0.7%	**-43%**

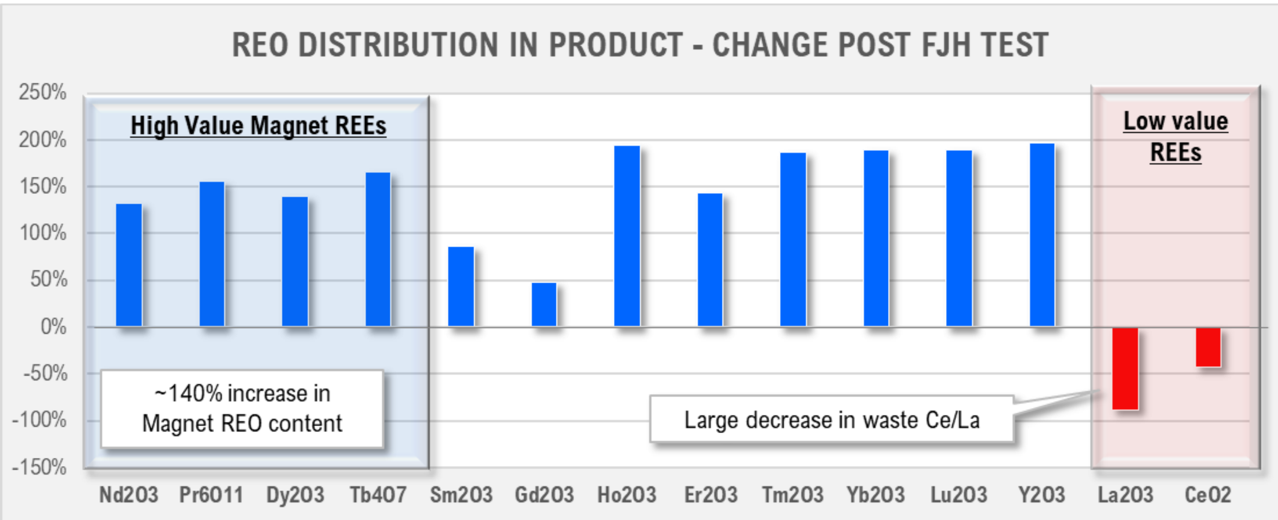

Fig. 1: Change in Rare Earth Element Oxide Percentage Distribution Post FJH Treatment

Positive blue bars above in Fig.1 show the percentage increase in each REO's share of the product stream, while negative red bars show reductions. Magnet REOs (Nd, Pr, Dy, Tb) rose by ~140 %, heavy REOs (Sm → Lu + Y) also climbed, and low-value light REOs La and Ce fell sharply, illustrating the flash's ability to concentrate value and reject waste in one step.

What the preliminary test work results show:

- **High-value REEs enriched and recovered (volatilised)**: A significant proportion of the most valuable magnet rare earths, including Nd, Pr, Dy and Tb, were captured in a clean chloride vapour stream in a single flash.
- **Low-value La and Ce largely retained in the residue**: Over 80 % of lanthanum and cerium remained in the reactor solids, confirming early-stage separation and reducing downstream processing burden.
- **Comparable to solvent extraction — but faster and simpler**: The level of enrichment and recovery achieved in this un-optimised, one-step flash rivals that of multi-stage solvent extraction, traditionally performed over 1000+ mixer–settler units[3].
- **Further multi-flash testing is expected to enhance recoveries**, **based on the compounding recovery yields from sequential multiple flashes,** particularly for neodymium (Nd), praseodymium(Pr) and dysprosium (Dy), in line with how recursive enrichment works in conventional flowsheets[3]**.**
- Further optimisation work is planned, including a multi-flash strategy to enhance overall REE recoveries and additional separation steps to isolate NdPr from DyTb, potentially unlocking a full solvent-free REE refining pathway.

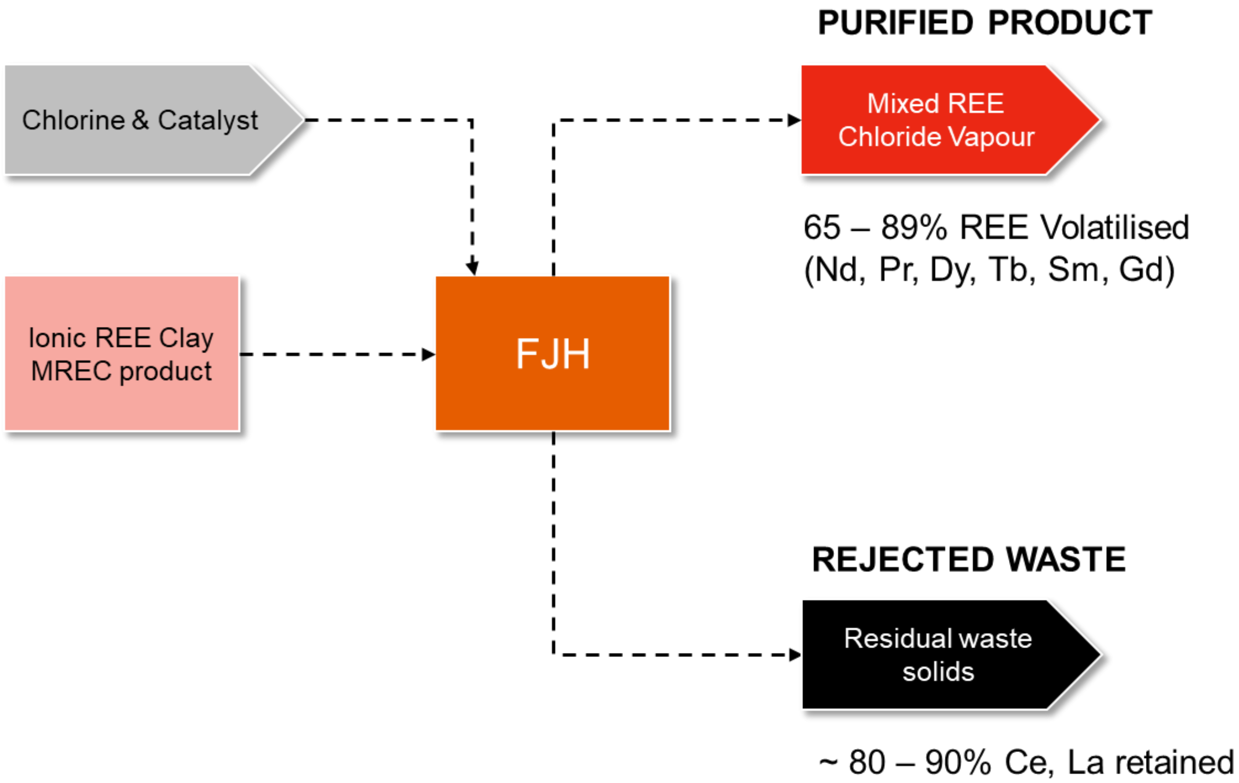

Fig. 2: Single-step Flash Mass Balance

About the Caldeira Project[1]

Meteoric's Caldeira Project, located in Minas Gerais, Brazil, is an advanced ionic adsorption clay (IAC) rare earth project . The project hosts a world-class Mineral Resource Estimate of 1.5 Billion tonnes @ 2,359 ppm TREO (ASX:MEI 15/05/2025[1]), with an outstanding distribution of magnet rare earths including neodymium (Nd), praseodymium (Pr), dysprosium (Dy), and terbium (Tb). Caldeira is on track to become a globally significant producer of separated magnet REEs.

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[3] Peng, Z., Yang, X. & Li, H. 2019, 'Hydrometallurgical processing of ionic-clay rare earths', *Hydrometallurgy*, vol. 187, pp. 123–130; Zheng, J. & Swain, B. 2017, 'Recovery and separation of rare earths from chloride solutions using solvent extraction', *Journal of Rare Earths*, vol. 35, no. 8, pp. 711–734; Xiong, Y. et al. 2022, 'REE separation in southern China – status and prospects', *Rare Metals*, vol. 41, pp. 345–352

STRATEGIC SIGNIFICANCE

Rare earth processing is typically complex, expensive, and dominated by Chinese-controlled infrastructure. Most developers produce (or plan to produce) an MREC product, but then rely on established offshore solvent extraction (SX) refineries — which can involve hundreds to over a thousand mixer–settler stages — to reject low-value elements like lanthanum and purify high-value magnet metals such as neodymium, praseodymium, dysprosium, and terbium to commercial specifications[4]. **MTM's breakthrough Flash Joule Heating offers a potential breakthrough alternative.**

In this un-optimised single-flash run, MTM achieved what normally requires multiple acid-leach steps and over 1000 SX stages:

- **Separated over 80 % of the low-value La** which otherwise dilutes the commercial value of MREC[5].
- **Extracted a concentrated mix of Nd, Pr, Dy, and Tb chlorides** — the high-value metals that go into magnets for EVs, wind turbines, and defence systems.
- **Captured the early-volatilising SEG group (Sm–Y)**, simplifying the path to separated heavy REE products.
- **This establishes a modular, Western-based refining pathway with significantly lower CAPEX and OPEX, enabling secure, allied-aligned REE supply.**

With over 90% of global MREC currently exported to Asia for refining[5], MTM's FJH route:

- Upgrades MREC in-country, eliminating reliance on overseas SX circuits.
- Provides a path to secure a western Dy/Tb supply chain.
- Supports strategic REE independence for allied economies.

The MREC processed by MTM was produced using Meteoric's ammonium sulfate (AMSUL)-based desorption flowsheet. MTM's FJH route begins downstream of MREC production and offers a Western-aligned alternative to the conventional acid-leach and solvent-extraction processes typically used in large-scale refining operations abroad. This positions the FJH process as a complementary solution to Meteoric's upstream MREC production, unlocking the potential for in-country or allied downstream refining capability. MTM is currently advancing additional separation methods for chloride intermediates and will provide further updates as commercial and technical milestones are reached. See Fig. 3 below for comparison with traditional flowsheet.

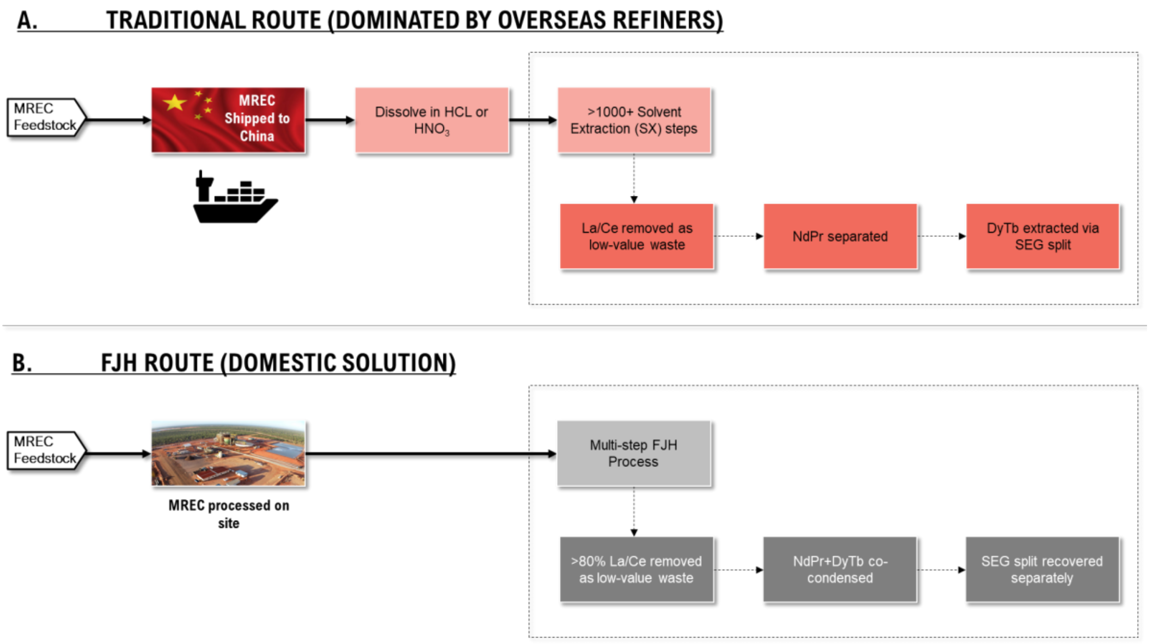

Fig. 3: Comparison of Traditional MREC Processing vs MTM's Flash Joule Heating (FJH) Route

[4] Gupta, C.K. & Krishnamurthy, N. 2005, *Extractive Metallurgy of Rare Earths*, CRC Press, Boca Raton, p. 191.
[5] Peng, Z., Yang, X. & Li, H. 2019, 'Hydrometallurgical processing of ionic-clay rare earths', *Hydrometallurgy*, vol. 187, pp. 123–130; Zheng, J. & Swain, B. 2017, 'Recovery and separation of rare earths from chloride solutions using solvent extraction', *Journal of Rare Earths*, vol. 35, no. 8, pp. 711–734; Kawoosa, V.M. & Gu, J., 2025. JL Mag Rare-Earth says it obtained export licenses for rare earth products to U.S., Europe. Reuters. https://www.reuters.com/world/china/jl-mag-rare-earth-says-it-obtained-export-licenses-rare-earth-products-us-europe-2025-06-11/.

NEXT STEPS AND MOU SCOPE

Under a non-binding Memorandum of Understanding (MOU), MTM Critical Metals Ltd (MTM) and Meteoric Resources NL (Meteoric) have agreed to collaborate on the potential downstream processing of MREC material from Meteoric's Caldeira Rare Earth Project using MTM's proprietary FJH technology. The MOU was executed following the successful completion of proof-of-concept FJH testwork on Meteoric-supplied MREC, which demonstrated the potential for a Western-based chloride-based refining route. The collaboration will focus on optimising the application of FJH to this material and assessing commercial models for downstream separation.

MTM continues to engage with other rare earth developers globally, including hard-rock projects, to assess potential applications of FJH for downstream processing and refining. The exclusivity provision under this MOU is limited to ionic clay REE projects in Brazil.

OBJECTIVES OF THE COLLABORATION

- **Technology Application:** Evaluate the technical and commercial feasibility of applying MTM's FJH technology to upgrade Meteoric's MREC into high-value REE chloride intermediates.
- **Flowsheet Integration:** Explore how FJH-based processing can be integrated with Meteoric's broader downstream strategy.
- **Commercial Structuring:** Consider potential arrangements including technology licensing, processing fees, and/or joint development models for downstream refining.
- **Data and Information Sharing:** Share technical data as required to assess the viability of a long-term processing relationship.
- **Exclusivity:** MTM and Meteoric have agreed that, for the term of this MOU, MTM will not enter into any other commercial arrangements for the application of FJH technology to third-party ionic rare earth clay projects in Brazil, without Meteoric's prior written consent. The exclusivity is limited to ionic-clay projects in Brazil and does not restrict MTM's ongoing discussions with hard-rock, recycling or other feedstock providers.

ROLES AND RESPONSIBILITIES

MTM Critical Metals Ltd

- Provide technical expertise and ongoing optimisation of the FJH process on Meteoric MREC.
- Undertake scale-up planning, flowsheet integration work, and indicative engineering design.
- Share results from testwork and separation trials to support evaluation of downstream options.

Meteoric Resources NL

- Provide MREC feedstock samples for technical evaluation.
- Participate in flowsheet and commercial structuring discussions.
- Support engagement on regulatory, environmental, and permitting considerations for potential processing sites.

TERM AND TERMINATION

- This MOU is non-binding and will remain in effect for twelve (12) months from the date of signing, unless extended by mutual agreement or terminated by either party with thirty (30) days written notice. Termination will not affect any obligations relating to confidentiality or data sharing.

CONSIDERATION

- No binding commercial terms or financial commitments are established under this MOU. Any future agreement between the parties will be subject to further negotiation and formal documentation.

While the agreement remains non-binding, it reflects a shared strategic intent between MTM and Meteoric to jointly evaluate scale-up pathways, commercial structuring, and the potential integration of FJH-based refining into Meteoric's downstream strategy, with a view to establishing a definitive processing partnership upon successful completion of key technical and commercial milestones.

This announcement has been authorised for release by the Board of Directors.

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ABOUT MTM CRITICAL METALS LIMITED

MTM Critical Metals Limited (ABN 27 645 885 463), is an ASX & OTCQB-listed company with management teams in Perth, Western Australia, and Texas, USA, and specialises in advanced metal recovery technologies. MTM's 100%-owned USA subsidiary **Flash Metals USA Inc** is based in Texas, USA. MTM possess exclusive licensing rights to the innovative *Flash Joule Heating technology*, a cutting-edge metal recovery and mineral processing method developed by esteemed researchers at Rice University, USA.

Flash Joule Heating (FJH) is an advanced electrothermal process that enhances metal recovery and mineral processing compared to traditional methods. By rapidly heating materials in a controlled atmosphere, FJH efficiently extracts metals like lithium from spodumene, gallium from scrap, and gold from E-Waste, among others. This technology has the potential to revolutionise metal recovery by reducing energy consumption, reagent use, and waste, offering a more economical and environmentally friendly alternative.

To learn more, visit:

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APPENDIX - ADDITIONAL INFORMATION

Testwork Procedure Summary

Preliminary testwork was conducted by MTM Critical Metals Ltd at the KnightHawk Engineering (KHE) laboratory in Houston, Texas, on a mixed rare earth carbonate (MREC) sample produced from Meteoric's Caldeira ionic clay project in Brazil.

The sample was subjected to Flash Joule Heating (FJH), a proprietary process that uses electrical energy to rapidly heat material in the presence of chlorine gas and proprietary catalysts. Separation of rare earth elements was achieved by exploiting differences in chlorination and volatilisation temperatures between magnet REEs (e.g. Nd, Pr) and lower-value REEs (e.g. La, Ce). Post-reaction solids were analysed by ICP-OES, with results indicating a significant increase in the La+Ce to Nd+Pr ratio, confirming effective preliminary separation of target magnet REEs.

REE Symbol / Abbreviation and Full Name / Oxide Conversion Factor from Elemental

Symbol	Element Name	Standard Oxide	REO Conversion Factor
Y	Yttrium	Y_2O_3	1.2699
La	Lanthanum	La_2O_3	1.1728
Ce	Cerium	CeO_2	1.2284
Pr	Praseodymium	Pr_6O_{11}	1.2082
Nd	Neodymium	Nd_2O_3	1.1664
Sm	Samarium	Sm_2O_3	1.1596
Eu	Europium	Eu_2O_3	1.1579
Gd	Gadolinium	Gd_2O_3	1.1526
Tb	Terbium	Tb_4O_7	1.1762
Dy	Dysprosium	Dy_2O_3	1.1477
Ho	Holmium	Ho_2O_3	1.1455
Er	Erbium	Er_2O_3	1.1435
Tm	Thulium	Tm_2O_3	1.1421
Yb	Ytterbium	Yb_2O_3	1.1387
Lu	Lutetium	Lu_2O_3	1.1371