MTM CRITICAL METALS

MTM Critical Metals Ltd

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ASX Release

10 April 2025

Ultra-High-Grade Gold (over 550 g/t) and Other High-Value Metals Recovered from E-Scrap, and Supply Agreement Secured

METAL RECOVERY TEST RESULTS

- **Ultra-High-Value Printed Circuit Board (PCB) Feedstock: Gold & Silver concentrations of 551g/t and 2,804g/t respectively, copper at 42%**, substantially exceed traditional mining grades and highlight economic potential of E-Scrap.
- **Outstanding Recoveries: Achieved over 95% recovery for gold & titanium, with silver, tin, & zinc exceeding 90%** into water-soluble metal chlorides using Flash Joule Heating (FJH) technology. Results verified by multiple test runs.
- **High-Value Feedstock:** E-Scrap tested originated from end-of-life U.S. electronics, including cell phones, laptops, data processing servers, and telecommunications equipment[1].
- **Single-step, acid-free process eliminates toxic waste and converts metal-rich waste into water-soluble metal chlorides—without prolonged heating or acids used in traditional methods like smelting.**

LONG-TERM E-WASTE FEEDSTOCK SUPPLY AGREEMENT

- **Supply Chain Secured**: Signed Letter of Intent (LOI) for five-year e-waste supply agreement with leading U.S.-based recycling firm Dynamic Lifcycle Innovations, including significant penalties for non-performance regarding the 700 tonnes per annum (TPA) of E-scrap, ensuring a consistent supply (target ~800t/year with 700t minimum).
- **Long Term Supply Agreement** with one of the largest recyclers in the U.S., this secures long-term feedstock for MTM's U.S. operations, de-risking commercial rollout and enhancing credibility with offtake partners**.** Agreement to become binding at the signing of the formal supply contract, anticipated over the coming weeks.
- **Department of Defence (DoD) Interest:** Recent meetings with the U.S. Department of Defence highlighted strategic interest in MTM's sustainable, domestic E-Waste recovery process for recovering precious and critical materials.
- **Significant Market Opportunity:** Global E-Waste generation reached 62Mt in 2022, projected to rise to 82Mt by 2030, with a recycling market valued at $250 billion by 2032 (Allied Market Research, 2023; Baldé et al., 2024).

MTM Critical Metals Limited ("MTM" or the "Company") (ASX: MTM; OTCXB: MTMCF) has achieved a breakthrough in sustainable metal recovery, unlocking ultra-high-grade gold (551 g/t) and other valuable metals from electronic waste (E-Waste), alongside securing transformative 5-year supply agreement with Dynamic Lifecycle Innovations, Inc. ("Dynamic"), a leading U.S. recycling company.

Leveraging the Company's proprietary Flash Joule Heating (FJH) technology, exceptional recovery rates were achieved from ultra-high-grade E-Waste feedstock, including 100% gold recovery at 551 g/t and 97% silver recovery at 2,804 g/t. The processed feedstock was a metal-rich e-waste residue supplied by a U.S. recycling partner specialising in converting plastics to syngas, with whom commercial discussions are ongoing. These results, combined with a secured supply chain, position MTM as a leader in the $250 billion E-Waste recycling market projected for 2032.

Founded in 2001, Dynamic Lifecycle Innovations Inc. is a leading provider of electronics recycling and IT asset disposition (ITAD) services in the United States, specialising in secure data destruction, responsible e-waste recycling, and refurbished electronics. The company is headquartered in Onalaska, Wisconsin.

MTM Managing Director & CEO, Michael Walshe, commented: *"Securing this supply agreement marks a pivotal milestone in MTM's commercialisation journey. Reliable feedstock is fundamental to any recycling operation, and this agreement ensure a scalable, long-term supply. Combined with our breakthrough gold recovery results, MTM now has both the technology and supply chain to underpin a robust commercial rollout and strategic partnerships. Together, these advancements significantly de-risk our business model and pave the way for additional strategic partnerships in the U.S. and globally".*

[1] Note: This tested material was provided by a supplier other than Dynamic. (the new feedstock supply partner discussed).

Unprecedented E-Waste Metal Grades and Recovery Performance

The tested feedstock, derived from U.S.-sourced printed circuit boards (PCBs), revealed significantly high metal content, particularly in precious metals. Note: This tested material was provided by a supplier other than Dynamic (the new feedstock supply partner discussed). Key results include:

Table1: Summary of Testwork Results[2]

Element	Feedstock Grade	Recovery to Chloride (%)
Gold (Au)	551 g/t	100%
Silver (Ag)	2,804 g/t	97%
Copper (Cu)	41.60%	91%
Tin (Sn)	13.20%	97%
Aluminium (Al)	5.20%	91%
Zinc (Zn)	1.30%	99%
Nickel (Ni)	1.40%	81%
Titanium (Ti)	0.20%	100%

These grades are remarkable when compared to traditional mining operations. For context, typical gold ore grades range from 1–5 g/t (Hagelüken, 2006), meaning this processed E-Waste feedstock contains over 100 times more gold per tonne than conventional ore. Similarly, silver at 2,804 g/t far exceeds typical mined ore concentrations, which are often below 1,000 g/t (Baldé et al., 2024). This high-grade feedstock, combined with near-perfect recovery rates for precious metals (100% for gold, 97% for silver), highlights the immense economic potential of E-Waste as a resource.

Figure 1: Photo of (L) original E-Waste printed circuit board waste & (R) metal rich char (E-Waste with plastics removed by separate process)

[2] Note: This tested material was provided by a supplier other than Dynamic. (the new partner discussed).

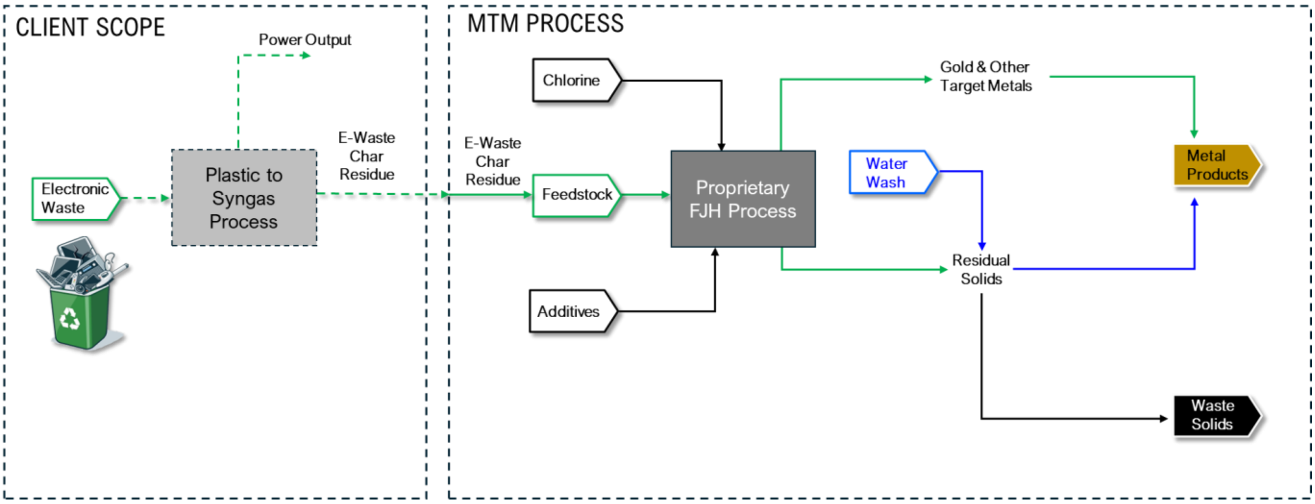

Figure 2: E-Waste Process Flow Diagram for Metal Recovery

The e-waste material tested in this study consisted of a metal-rich char, produced via a separate upstream process that removed the plastic fraction by converting it into synthesis gas (syngas). This left behind a concentrated, carbonaceous residue enriched in metals, which was then processed by MTM using its FJH technology. In addition to this material, MTM has also conducted prior testwork on unprocessed, raw e-waste (including whole printed circuit boards)[3], with similarly encouraging recovery results—demonstrating the flexibility and robustness of the process across different feedstocks.

Economic and Environmental Significance

The recovery of metals from E-Waste not only addresses a pressing environmental challenge but also creates substantial economic value. Globally, E-Waste contains an estimated $62 billion worth of recoverable materials annually, yet only ~15% was recycled in 2022 (Baldé et al., 2024). By recovering high-value metals like gold (current market price ~ US$100,000/kg) and silver (~US$1,000/kg), MTM can generate significant revenue while reducing reliance on energy-intensive mining.

Environmentally, the FJH process offers a cleaner alternative to traditional acid-based or pyrometallurgical methods, using up to 500 times less energy and avoiding toxic solvents (Tour et al., 2021). This aligns with global sustainability goals and supports a circular economy by repurposing end-of-life electronics into valuable raw materials.

[3] Ref. ASX: MTM releases: 08/10/2024, 'Significant Multi-Metal Recovery from Electronic Waste Including Palladium & Tin'; 25/09/2024, 'High Silver & Copper Recovery from e-Waste using FJH'; 12/09/2024 'High Gold Recovery from E-Waste using FJH Technology'.

E-Waste Supply Agreement – Key Commercial Terms

As part of MTM's strategy to commercialize its technology, the Company's wholly-owned U.S. subsidiary **Flash Metals USA, Inc.** has executed a **Letter of Intent (LOI) with Dynamic Lifecycle Innovation Inc.**, a U.S.-based recycling partner. **This LOI outlines the principal terms for a long-term e-waste supply agreement which will become binding at the signing of the supply agreement, securing a consistent supply of high-grade feedstock to support MTM's planned operations and scale-up in the United States.** The key commercial terms outlined in the LOI with Dynamic Lifecycle Innovations. are as follows:

- **Initial Term:** Five (5) years, commencing Q4 2025.
- **Renewal Option:** Extendable for additional 5-year terms by mutual written agreement. (Either party must give at least 180 days' notice prior to the end of the term if they elect not to renew.)
- **Volume Commitment:** Target annual volume of ~800 tonnes of PCB-rich e-waste material, with a firm **Minimum Annual Volume** commitment of 700 tonnes. This equates to an average of approximately 65–70 tonnes per month. Dynamic Lifecycle Innovations will supply, and MTM will accept, at least the minimum volume each year. Actual monthly shipments may vary, but any significant supply shortfall measured on a quarterly basis below 180 tons per quarter will trigger significant financial penalties.
- **Feedstock Type and Grade:** High-Grade, Medium-Grade and Low Grade printed circuit board (PCB) rich electronic waste, containing recoverable precious, base, and critical metals. (Grade classifications are based on metal content thresholds defined in the agreement's specifications.) The materials are to be provided in sorted, bulk form (e.g. sorted PCB scrap) and must meet agreed quality standards (minimal unrelated debris, no hazardous exclusions outside typical e-waste).
- **Pricing Structure: Market-indexed pricing** linked to the **Scrap Register** (or an equivalent) monthly average price for electronic scrap. The price paid per shipment will be adjusted based on the actual assay of recoverable metals in that shipment. In practice, an initial reference price is set for High-Grade, Medium-Grade, and Low-Grade material, and after MTM processes each batch, the final payment is adjusted **up or down** according to the verified metal content (assay results) to reflect the true grade. This ensures MTM only pays for the metal value received, and Dynamic Lifecycle Innovations. is rewarded for higher-grade deliveries.
- **Non-Exclusivity:** The supply arrangement is **exclusive for the first 700 tons per year of e-scrap**, meaning Dynamic LifeCycle Innovations will continue to sell similar e-waste materials to other parties other than the 700 TPS to MTM , and MTM may source from other suppliers above the 700 TPA. This provision gives MTM access to incremental feedstocks in the market supporting potential future expansion.
- **Renewal & Termination Conditions:** After the initial 5-year term, the agreement can be renewed as noted above. Either party may terminate earlier for cause if the other party materially breaches the agreement and fails to cure the breach within 30 days of notice. Additionally, MTM (the Buyer) has the right to terminate the agreement without penalty if Dynamic Lifecycle Innovations. (the Supplier) fails to deliver at least 100% of the agreed **Minimum Annual Volume** for two consecutive years, after giving 60 days' notice and opportunity to cure the shortfall. Standard termination rights for events of force majeure and prolonged inability to supply are also included.
- This Long Term LOI serves as a framework for the definitive supply agreement, reflecting the mutual intentions of both parties to formalise the outlined terms. While the LOI is detailed in nature, the final agreement remains subject to the negotiation and execution of definitive documentation.

Strategic Importance: Securing this long-term feedstock supply is a **critical step in MTM's path to commercialisation**. Consistent input supply de-risks the operational scale-up by ensuring the planned FJH processing facilities have sufficient high-value material to operate continuously. This underpins MTM's financial model – a reliable tonnage of feedstock translates to a predictable throughput of metals for sale, supporting revenue forecasts and growth targets.

Technical Overview: FJH and Future Refining Pathways

MTM's proprietary FJH technology represents a revolutionary approach to metal recovery from E-Waste. The process leverages a metal-rich char residue provided by a U.S. client, who first processed the E-Waste to recover its plastic content as syngas. MTM then subjected this char to FJH, where rapid electrical pulses heat the material up to ~3,000°C in milliseconds, in the presence of chlorine and a catalyst. This single-step process converts the metals into a water-based solution of mixed metal chlorides, achieving exceptional recovery rates—100% for gold and titanium, 97% for silver and tin, and 99% for zinc, as detailed in the results table.

Significance of Single-Step Conversion to Mixed Metal Chlorides

The conversion of metals from processed E-Waste into metal chlorides form at high recovery rates, in a single step without acid or prolonged heating, is a transformative advancement in E-Waste recycling. Compared to existing techniques:

1. Efficiency and Speed:
    - Traditional Methods: Conventional E-Waste metal recovery typically involves hydrometallurgical or pyrometallurgical processes. Hydrometallurgy typically uses strong acids (e.g., aqua regia, nitric acid) to leach metals, requiring multiple steps—crushing, leaching, and solvent extraction—over several hours or days. Pyrometallurgy, such as smelting, involves prolonged heating at high temperatures (1,000–1,500°C) for hours, often in multiple stages to separate metals (Cui and Zhang, 2008).
    - FJH Advantage: FJH achieves the same result in milliseconds, with the entire conversion to metal chlorides occurring in a single step. This drastically reduces processing time, enabling higher throughput and scalability for industrial applications.
2. Energy Efficiency:
    - Traditional Methods: Pyrometallurgical processes are energy-intensive, consuming 1,000–2,000 kWh per tonne of E-Waste due to prolonged heating (Tesfaye et al., 2017). Hydrometallurgical processes, while less energy-intensive, require significant energy for heating acid solutions and managing waste streams.
    - FJH Advantage: FJH uses rapid electrical pulses, potentially consuming substantially less energy than smelting (Tour et al., 2021). This energy efficiency reduces operational costs and aligns with global sustainability goals, making the process potentially economically and environmentally superior. The e-waste material tested in this study consisted of a metal-rich char, produced via a separate upstream process that removed the plastic fraction by converting it into synthesis gas (syngas). This left behind a concentrated, carbonaceous residue enriched in metals, which was then processed by MTM using its proprietary FJH technology. In addition to this char-based material, MTM has also conducted prior testwork on unprocessed, raw e-waste (including whole printed circuit boards), with similarly encouraging recovery results—demonstrating the flexibility and robustness of the FJH process across different e-waste feedstocks.
3. Environmental Impact:
    - Traditional Methods: Hydrometallurgy generates large volumes of acidic waste, requiring neutralization and disposal, which poses environmental risks if not managed properly (e.g., soil and water contamination). Pyrometallurgy produces greenhouse gas emissions and toxic fumes (e.g., dioxins from burning plastics), necessitating expensive gas scrubbing systems (Hagelüken, 2006).
    - FJH Advantage: FJH avoids acid use entirely, eliminating acidic waste streams. The process also bypasses prolonged heating, reducing emissions and the need for extensive gas treatment. The use of chlorine is controlled within the FJH reactor, and any byproducts (e.g., excess Cl_2) can be captured and reused, minimizing environmental impact.

4. High Recovery Rates in a Single Step:
   - Traditional Methods: Conventional processes often require multiple stages to achieve high recovery rates, with losses at each step. For example, hydrometallurgical leaching may recover 80–90% of gold, but subsequent solvent extraction and precipitation steps can reduce overall yields to 70–80% (Syed, 2012). Pyrometallurgy struggles with volatile metals like zinc, often losing 20–30% to slag or off-gassing (Cui and Zhang, 2008).
   - FJH Advantage: FJH achieves near-perfect recovery rates (e.g., 100% for gold, 97% for silver) in a single step, directly converting metals into chlorides. This minimizes losses, ensuring that nearly all valuable metals are captured in a form ready for standard processing. The mixed metal chloride solution is a versatile intermediate, compatible with standard downstream separation techniques, as discussed below.
5. Simplified Downstream Processing:
   - Traditional Methods: The output of traditional processes varies—pyrometallurgy produces a mixed metal alloy requiring further refining (e.g., electrolysis), while hydrometallurgy yields a complex leachate that needs multiple separation steps (e.g., solvent extraction, ion exchange). These steps add complexity and cost (Baldé et al., 2024).
   - FJH Advantage: By converting metals into a water-based mixed metal chloride solution, FJH creates a uniform starting point for downstream refining. Metal chlorides are highly soluble and reactive, making them ideal for separation using established techniques like selective precipitation or electrowinning. This simplifies the overall process, reducing the number of steps needed to produce saleable products.
6. Versatility Across Metal Types:
   - Traditional Methods: Pyrometallurgy struggles with low-concentration metals (e.g., titanium at 0.2%) due to volatilization or slag losses, while hydrometallurgy may require tailored leaching conditions for each metal, increasing complexity (Tesfaye et al., 2017).
   - FJH Advantage: FJH effectively recovers both high-concentration metals (e.g., copper at 41.6%) and trace metals (e.g., titanium at 0.2%) in a single step, with recovery rates of 91–100%. This versatility ensures that a wide range of metals—precious, base, and critical—can be captured efficiently, maximizing the value extracted from E-Waste.

Future Refining Pathways

- While the FJH process has successfully produced a mixed metal chloride solution, MTM is currently exploring off-the-shelf, existing refining techniques to separate and purify these into saleable products.

Strategic Market Opportunity

The global E-Waste market is expanding rapidly, projected to grow from $57.8 billion in 2022 to $244.6 billion by 2032, with a CAGR of 15.7% (Allied Market Research, 2023). Key regions include:

- United States: Generated ~7 million tonnes of E-Waste in 2021, with recycling rates below 25% (Scoop Market, 2023). This represents a significant untapped opportunity for MTM's technology.
- Japan: A leader in E-Waste recycling, with stringent regulations ensuring high recovery rates (Baldé et al., 2024).
- Taiwan: A semiconductor hub with mandated recycling targets of 75% for manufacturers (Baldé et al., 2024).
- Europe: The largest E-Waste recycling market, driven by the EU's Critical Raw Materials Act (2023) and WEEE Directive, targeting 4 kg per capita recycling annually (Statista, 2023).

MTM is actively engaging with partners in these regions to scale its operations, leveraging regulatory tailwinds and growing demand for sustainable metal recovery solutions.

Summary of Method & Results

Initial tests demonstrated significant valuable metal chloride recovery from printed circuit board (PCB) E-Waste utilising FJH carbochlorination and water washing.

- **Single Flash Test**: The initial, unoptimized test was conducted using samples of processed E-Waste as described earlier. The feedstock was flashed in a chlorinated atmosphere to facilitate the formation and separation of metal chlorides and the vapourised products were collected via condensation.
- **Water Washing**: After flashing, water washes were conducted to remove metal chlorides from the residual solids. TotalQuant Inductively Coupled Plasma Mass Spectrometry (ICP-MS)[4] was used to quantify the metals in both the solid byproducts and the water wash solutions.

Next Steps

- Pilot-Scale Testing: Expand testing on diverse E-Waste streams to validate scalability.
- Commercial Partnerships: Finalise agreements in the U.S., Japan, Taiwan, and Europe to establish regional operations.
- FJH Demonstration Plant: Site selection in Texas, USA, targeting operational status by the end of Q4 2025.

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

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[4] TotalQuant refers to a mode in ICP-MS where all measurable elements are detected and quantified in a single run without prior specific selection of elements. This is particularly useful for complex samples where a comprehensive elemental profile is required. It is considered qualitative (or semi-quantitative) (±25% accuracy) because, in the TotalQuant mode, it provides a broad overview of the elements present in a sample without the rigorous calibration that would be needed for fully quantitative results & does not account for possible elemental interferences between various metals.

PREVIOUS DISCLOSURE

The information in this announcement is based on the following MTM Critical Metals Limited ASX announcements, which are all available from the MTM Critical Metals Limited website www.mtmcriticalmetals.com.au and the ASX website www.asx.com.au.

Previous **e-waste-related announcements** highlighted

Date	Description
08/10/2024	Significant Multi-Metal Recovery from Electronic Waste Including Palladium & Tin
25/09/2024	High Silver & Copper Recovery from e-Waste using FJH
12/09/2024	High Gold Recovery from E-Waste using FJH Technology

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. Additionally, MTM holds exploration assets prospective for niobium (Nb), rare earth elements (REE), and gold, strategically located in Western Australia and Québec.

- 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.

- MTM's West Arunta Nb-REE exploration assets are situated in one of Australia's premier exploration hotspots, where over $60 million has been invested by ASX-listed companies such as WA1 Resources, Encounter Resources, Rio Tinto (in JV with Tali Resources), and IGO Limited. MTM also holds tenements in other key mineral regions across Western Australia, including the Mukinbudin Nb-REE Project, East Laverton Gold & Base Metals Project, and Mt Monger Gold Project. In Québec, the Pomme Project is a highly promising carbonatite intrusion rich in REE and niobium, located near the world-class Montviel deposit.

To learn more, visit:

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