

**8 NOVEMBER 2023**

## Strategy Update - EV Batteries

Jupiter Mines Limited (ASX:JMS) (**Jupiter** or the **Company**) is pleased to provide an update to its five year Company Strategy, released on 31 March 2023.

The accompanying Strategy Update outlines Jupiter's progress with respect to its EV Battery Market entry strategy, exploring the potential to supply High Purity Manganese Sulphate Monohydrate (**HPMSM**), to the electric vehicle battery market.

*This announcement has been authorised for release by the Board of Directors of Jupiter Mines Limited.*

**For further information on Jupiter**, visit [www.jupitermines.com](http://www.jupitermines.com) or email [investorrelations@jupitermines.com](mailto:investorrelations@jupitermines.com)

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## EV BATTERIES

### Highlights

Jupiter has successfully produced a **>99.9% pure sample** of High Purity Manganese Sulphate Monohydrate – referred to as “HPMSM” or battery grade manganese – with Tshipi ore and utilising an internally developed hydrometallurgical production process (see photo at Fig. 1 to the right).



Figure 1 | Jupiter's >99.9% pure sample of High Purity Manganese Sulphate

This is the **first published record** of HPMSM being produced by a South African manganese miner using its own process.



The sample quality has targeted an **ex-China battery grade quality**, which conforms to specifications provided by the International Manganese Institute (“IMnI”).

Jupiter is **in preliminary, confidential discussions with counterparties** interested in the development of higher manganese content cathode chemistries; including vehicle manufacturers (“OEMs”) and battery manufacturers.

Jupiter is well-advanced in its development of a **market entry business case**. This includes consideration of facility location, waste and environmental factors, financial returns, and commercial model.

Jupiter is prioritising strategies that will **minimise energy use and carbon emissions** from the proposed new processing business.

Jupiter is on track to complete its scoping level market entry business case by **31 December 2023**.



# Strategy Update

## EV BATTERIES

### Jupiter's EV Strategy Progress

#### Technical

Jupiter has produced a laboratory sample of HPMSM utilising a hydrometallurgical process developed in-house. The sample produced was >99.9% pure. Jupiter conducted its testing against an ex-China specification developed by the International Manganese Institute. The test sample was within required tolerance limits for all specified impurity levels. The sample was produced using a representative sample of Tshipi's "low grade" product ore, which typically has an in-situ manganese content of between 28% and 32%.

#### Commercial

Should Jupiter's planned further work on this strategy prove successful, it intends to construct and operate a HPMSM conversion facility, utilising the flowsheet that has been developed. Jupiter would supply manganese ore to that facility for conversion into HPMSM.

Alongside co-investment from various external sources, Jupiter would invest equity into that facility. It is currently in preliminary, confidential discussions with several potential offtake customers and co-investors. These discussions both support the refinement of business case assumptions and help to cement informed, trusting relationships in place by the time final investment decisions are required.

#### Location

Jupiter is currently performing location studies to determine the ideal location of its first plant. The base case for this work is that Jupiter's refining facility would be in North America (either USA or Canada). An alternative potential location is Europe. Ultimately, the decision will be

informed by a variety of key criteria, including the location of likely offtake partners. Jupiter is also considering the merits of producing a manganese concentrate in South Africa, prior to transportation and refinement in North America (or elsewhere).

#### Other

Additional streams of work are currently underway, including third party waste optimisation studies, environmental considerations, market demand analysis, an evaluation of potential grant funding regimes and financial modelling of business case inputs.

#### Next Steps

The next step is for Jupiter to finalise the business case, which is currently underway and due to be delivered to the Jupiter Board by 31 December 2023. This will recommend, if appropriate, the commencement of more detailed work in early 2024 on the potential execution of the strategy. This may include constructing a pilot and demonstration plant, undertaking detailed engineering design work, and finalising commercial and funding arrangements, prior to a final investment decision and proceeding to plant construction.

While all dates will be determined by the business case, Jupiter may target any potential HPMSM production plant to be in operation by around 2027/2028. This allows sufficient time for permitting and construction. Jupiter estimates that it will also be appropriately timed for the significant lift in HPMSM demand, projected for the latter part of the current decade. This is based on shifts in cathode chemistries currently underway, combined with increased general demand for electric vehicles.

# Strategy Update

## EV BATTERIES

### Jupiter's EV Strategy Overview

Jupiter's Five-Year Strategy, announced on 31 March 2023, includes an initiative to complete an EV Battery Market entry strategy.

Jupiter's five year business strategy, announced in March 2023, includes a priority to explore a downstream entry into supplying HPMSM to the electric vehicle battery market.

This strategic focus is a response to the burgeoning demand for electric battery powered vehicles in the medium to long term and the associated rapid growth in demand for battery grade manganese, commencing in the mid-2020s.

This strategic priority requires the development of a business case to determine the optimal way for Jupiter to

enter the market, given its study on the market and a consideration of Jupiter's relative strengths in this area.

Jupiter is a major global manganese producer, with part ownership of a manganese mine with stable production and more than 100 years of remaining life. Jupiter is also the largest "pure play" listed manganese miner in the world, with major shareholders (POSCO and AMCI) who are already active in the downstream EV battery materials space.

For these reasons, Jupiter believes that it is competitively well positioned to enter the HPMSM market.



# Strategy Update

## EV BATTERIES



## Jupiter's EV Strategy Appeal of HPMSM Market

### Market Opportunity

Based on its strategic analysis and discussions with market participants, Jupiter believes that there will be a growing and long-term demand for HPMSM, that will be undersupplied for a period, commencing in the late 2020s (see Figure 3, Page 6).

This will provide an appropriate and timely opportunity for Jupiter to enter this market.

### Financial Attraction

Based on our preliminary financial analysis to date, Jupiter believes that the HPMSM market could provide very attractive investment returns.

### Diversification

Jupiter's primary market is the steel industry. An investment in the production of HPMSM would enable market diversification and reduce product risk.

While relatively small in comparison, downstream diversification into supplying the HPMSM market would provide an opportunity for Jupiter to optimise the use of its mineral resources.

### Existing Capability

Jupiter is already a large incumbent miner of manganese ore and we have team members who have experience in the production of pure manganese products.

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## EV BATTERIES

### Jupiter's EV Strategy Competitive Advantage

**Jupiter believes that it has notable competitive advantages that will improve its likelihood of success and contribute value to any future HPMSM endeavour.**

#### High Quality, Low Risk Counterparty

Through its part ownership of the Tshipi manganese mine in South Africa, Jupiter is already a major manganese player. Jupiter is the largest publicly traded, pure play manganese miner in the world, with strong cashflows and zero debt.

#### Access to an existing, proven, long life and sustainable source of ore

Tshipi is one of the largest five producing manganese mines in the world. Unlike some potential competitors, Jupiter does not need to develop a mine to enter the HPMSM market. Tshipi has a strong ESG track record and over 100 years of mine life remaining.

#### Low Cost

Tshipi is a low-cost manganese mine, with a significant production of suitable ore available for conversion into HPMSM without impacting on, or sacrificing, primary ore production. Extraction of ore for HPMSM could deliver meaningful synergies.

#### Significant and Relevant Backing

Two of Jupiter's largest long-term investors are POSCO and AMCI. Both are active participants and investors in downstream processing across the battery mineral complex.



**"We are very encouraged by the high purity testing results that we've achieved through the HPMSM production process that we developed, as well as the progress we are making on our business case development more generally.**

**Our aim is to bring distinctive value to this downstream integration strategy and to derive attractive returns in exchange."**

**Brad Rogers**

Managing Director, Jupiter Mines

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### Background Manganese & EV Batteries

Manganese is an increasingly important battery metal, amongst its other uses. Inclusion of manganese in the cathode of electric vehicle batteries introduces cost efficient energy density as well as potential enhancements in safety.

According to the International Energy Agency, the typical electric vehicle will require more manganese than more commonly known battery minerals such as lithium and cobalt (see Fig. 2 below).

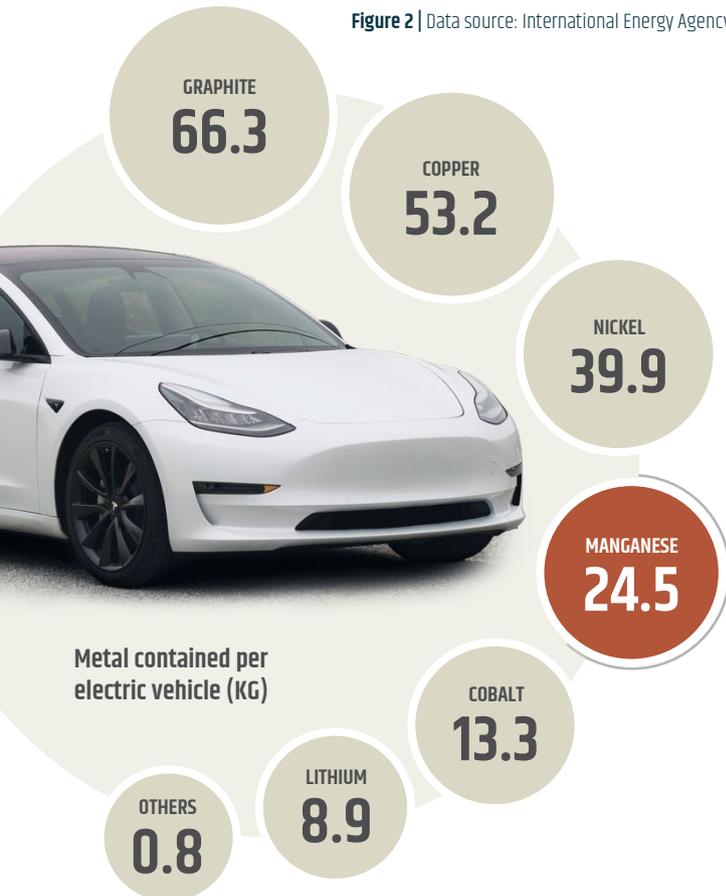


“Manganese sulfate is an increasingly strategic input which helps to improve battery safety and lower the cost of cathode chemistries—understanding how manganese refining capacity will scale is at the **heart of the lithium-ion economy** and its longer-term technological evolution.”

**Maximillian Court**

Product Director, Benchmark Minerals

Figure 2 | Data source: International Energy Agency



Due to the forecast high growth in electric vehicles, as well as the growing popularity of manganese within electric vehicle batteries, most analysts expect very high growth in demand for manganese for use in electric vehicle batteries over the next 20 years. Bloomberg NEF expects there to be a supply deficit of 72% (relative to total demand) by 2030. As can be seen in Fig. 3 below, these forecasts result in battery grade manganese being more under-supplied than other key battery metals by the end of this decade.

2023	METAL	2030
-63,000 tons LCE	Lithium carbonate	+268,000 tons LCE
+82,000 tons LCE	Lithium hydroxide	-47,000 tons LCE
+6,000 tons contained metal	Cobalt sulfate	+22,000 tons contained metal
+312,000 tons contained metal	Nickel sulfate	-7,000 tons contained metal
+14,000 tons contained metal	Manganese sulfate	-453,000 tons contained metal

Figure 3 | Battery metals market balance in 2023 and forecast for 2030. Source: Bloomberg New Energy Finance. Note: Negative values indicate deficit. LCE is lithium carbonate equivalent.

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### Background Continued

While the use of manganese in steel alloys will continue to remain the primary market by volume for the metal, the value-in-use premium that is likely to be derived from applications in the battery materials sector, especially for lower grade manganese ores, is attractive.

Battery grade manganese is referred to as High Purity Manganese Sulphate Monohydrate ("HPMSM"). HPMSM is the product of a process - that converts manganese ore into HPMSM - utilising either hydrometallurgical or pyrometallurgical means.

Key to the value of HPMSM for use in batteries is the reduction or removal of unwanted minerals ("impurities" - minerals other than manganese) found in the ore through the hydrometallurgical or pyrometallurgical processes. Hydrometallurgical processes are generally tailored to specific manganese ore bodies. It is important to have a long term, stable source of manganese ore available for use.

Today, China produces 98% of all HPMSM in the world.

Much of the future demand for HPMSM is anticipated to come from OEMs located outside of China. As widely stated, those companies - and their host governments - wish to encourage battery supply chains that are located within their own countries.

This, combined with the significant forecast growth in demand for HPMSM, will require the addition of significant new HPMSM production capacity before 2030.



**"Manganese's elemental properties, its lower-cost application in batteries, and its concentration in China is why western OEMs, governments and businesses need to address upcoming market deficits; and it's important that they engage with that future story now."**

**Jess Roberts**

Head of Forecasting, Benchmark Minerals



# Strategy Update

## EV BATTERIES

### Background Jupiter Mines

#### Jupiter

Jupiter Mines Limited (ASX: JMS) is a pure-play manganese mining producer listed on the ASX. Headquartered in Perth, Western Australia, Jupiter's core asset is a 49.9% stake in Tshipi é Ntle Manganese Mining ("Tshipi") which operates the Tshipi manganese mine in South Africa's Kalahari region.

Jupiter has a track record of returning value to shareholders, including through regular dividends, and a strategy to grow its exposure to manganese, a key metal used in steel and - increasingly - in the renewable energy space.

On 31st March 2023 following a comprehensive strategic review of its environment and opportunities, Jupiter released a Company Strategy. The strategy outlines the Jupiter's five-year plan to become the leading manganese producing company in the world by 2028, with a reputation for reliability, responsibility and robust returns. Jupiter will achieve these objectives through strategies to improve operating efficiency, grow production volume and enter the EV battery market, while being accountable to a new ESG framework.

#### Tshipi

Tshipi is one of the world's largest and lowest-cost open pit manganese mine in the Kalahari Manganese Field, located in the Northern Cape in South Africa.

Tshipi has been in production since 2012 and has more than 100 years of mine life remaining.



Figure 4 | Tshipi Manganese Mine, South Africa

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