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12 July 2019

**ASX ANNOUNCEMENT**

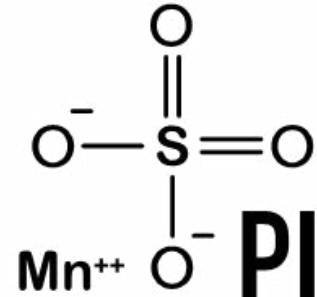
**Pilbara Metals Group Company Overview**

Mission NewEnergy Limited (**ASX:** MBT, **OTC:** MNELF) is pleased to provide the following company overview of Pilbara Metals Group Pty Ltd, a company to be acquired by MBT pursuant to a reverse take over as announced today.

- Announcement Ends -

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# PILBARA METALS GROUP

## COMPANY OVERVIEW

2019

# WHY PILBARA METALS GROUP?

## FIRST MOVER

PMG aims to be the first producer of high purity manganese sulphate (HP  $\text{MnSO}_4$ ) in Australia using a novel production process.

## CRITICAL BATTERY MATERIAL

High purity manganese derivatives have emerged as critical EV battery materials.

## LOW COST PROCESS

Novel, low cost production process utilising low grade manganese ore

## STRONG DEMAND

HP  $\text{MnSO}_4$  is driven by the need to reduce the \$/kwh of a high performance EV battery.

## DESIRABLE LOCATION

Located in Perth, Western Australia – a world class mining jurisdiction and quickly being recognized as a key battery material location.

## LOW CAPEX /HIGH NPV

Low capex, high NPV project – taking a low value ore to produce a high value, critical battery material.

## ACCESS TO CHEAP FEEDSTOCK

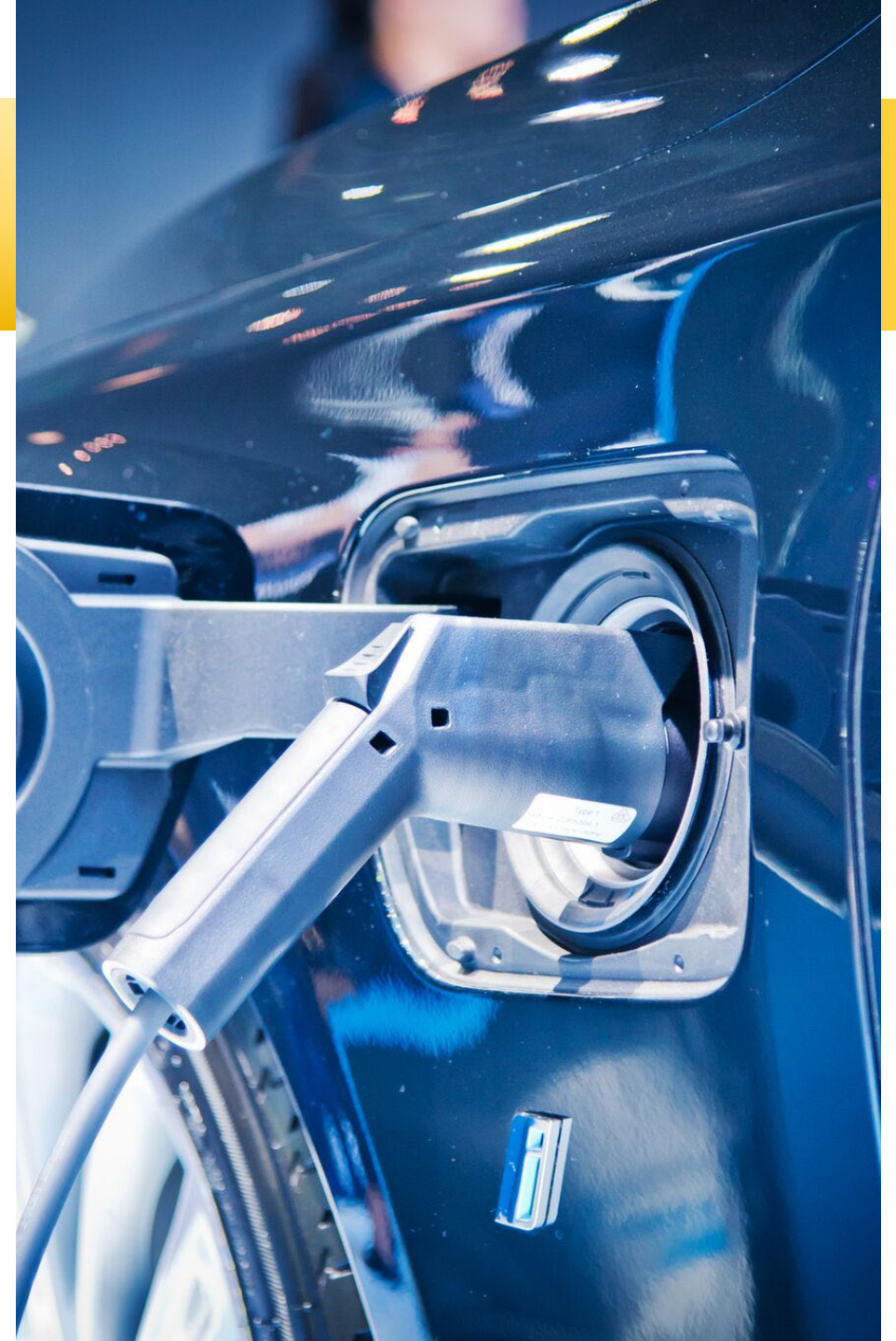
Abundant stock piles of low to medium grade manganese ore available in Western Australia.

# PROJECT OVERVIEW

- ✓ PMG plans to build a Manganese Sulphate Processing Plant on the Kwinana Industrial Strip, located south of Perth\*.
- ✓ PMG aims to have a production capacity of 40,000 tonnes per annum of high purity manganese sulphate (HP  $\text{MnSO}_4$ ) for the lithium-ion battery industry\*\*.
- ✓ Successfully completed initial test-work carried out by CSIRO to produce high purity manganese sulphate (HP  $\text{MnSO}_4$ ).
- ✓ NPV enhanced by significant biproduct credits.
- ✓ Provisional process patent lodged.
- ✓ PMG will utilise low grade to medium feedstock, abundant in Western Australia.
- ✓ HP  $\text{MnSO}_4$  is required if Western Australia is to become a producer of precursors or cathode material.
- ✓ Offshore expansion by licensing technology

\* Subject to confirmation of the feasibility of the Plant following the Front End Engineering Design (FEED) and Bankable Feasibility Study (BFS).

\*\* Minimum proposed plant capacity is based on market research surrounding the current market demand, as well as future market growth forecasts from both publicly available research, information provided by the International Manganese Institute (IMnI) and internal market research. This is subject to confirmation through the Feed Study & BFS.



# MANGANESE

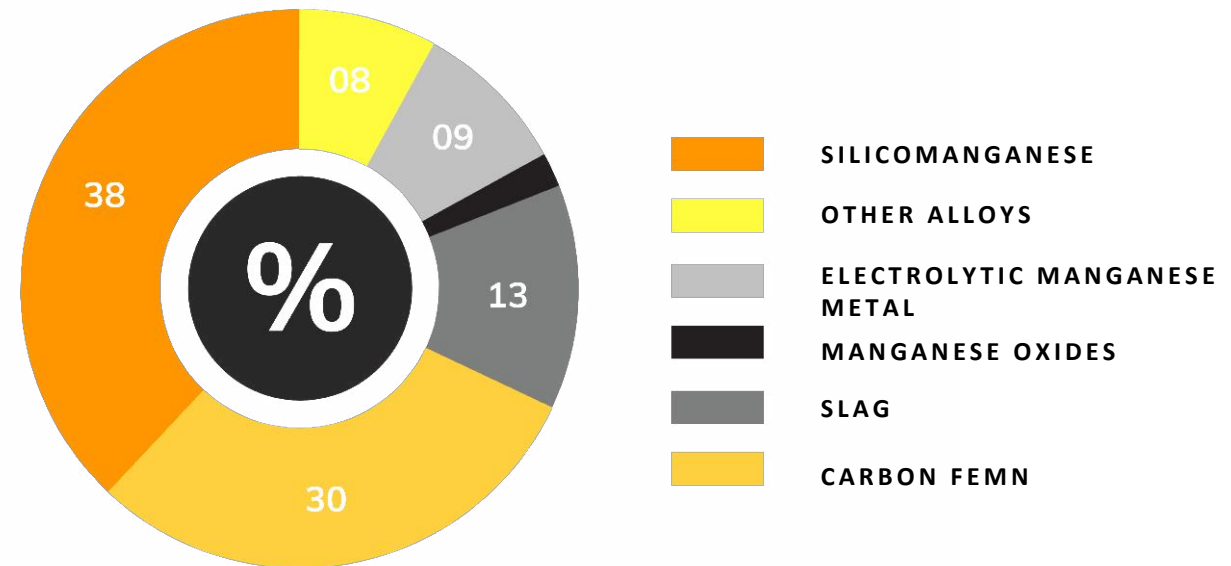


- ✓ 12th most abundant element on earth.
- ✓ Ductile, malleable and able to conduct electricity and heat.
- ✓ 90% of all manganese consumed goes into steel as an alloying element.
- ✓ Cost and chemical properties make it an ideal element for use in batteries.
- ✓ HP  $\text{MnSO}_4$  has emerged as a critical EV battery material.
- ✓ HP  $\text{MnSO}_4$  currently accounts for 10% of the global manganese market by volume but 40% of its global value.
- ✓ BASF reported to be developing a EV battery cathode with 70% Mn.



2%

OF ALL MANGANESE PRODUCED IS USED TO MAKE MANGANESE OXIDES



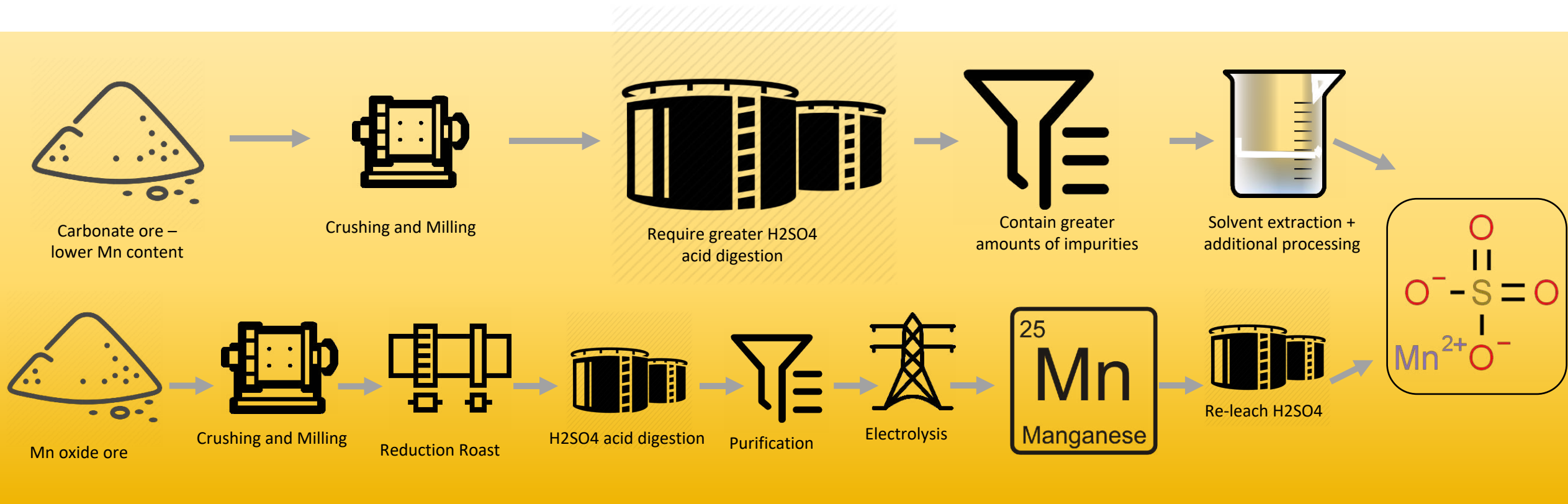
MANGANESE OXIDES ARE USED IN 3 TYPES OF BATTERIES



# CURRENT PRODUCTION TECHNIQUES

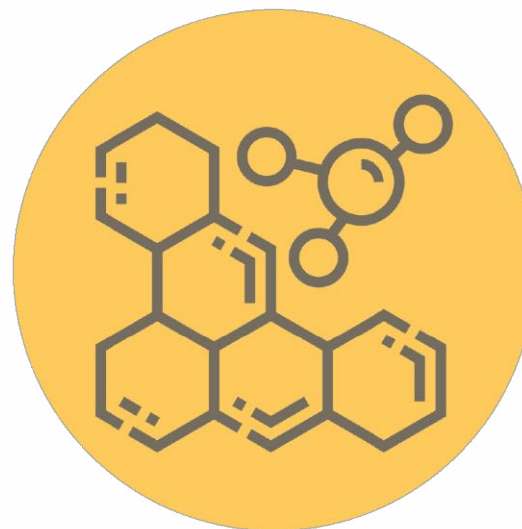
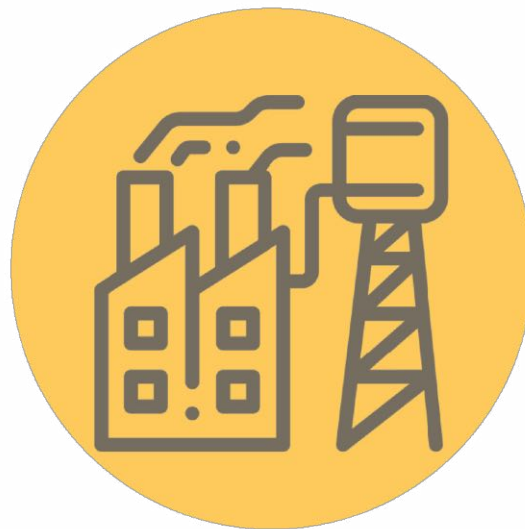
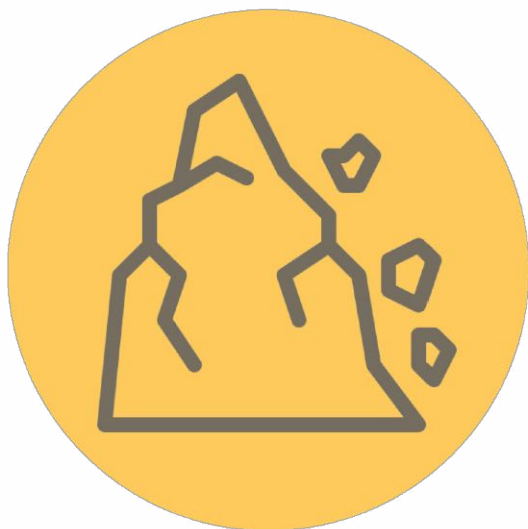
Existing  $\text{MnSO}_4$  production techniques face several challenges

- ✓ Production via electrolytic manganese metal (EMM) is energy intensive and therefore expensive.
- ✓ Production from low grade oxide or carbonate ores consumes significant amounts of acid.
- ✓ Chinese ore sources suffering from declining grade profile.



# THE PMG ADVANTAGE

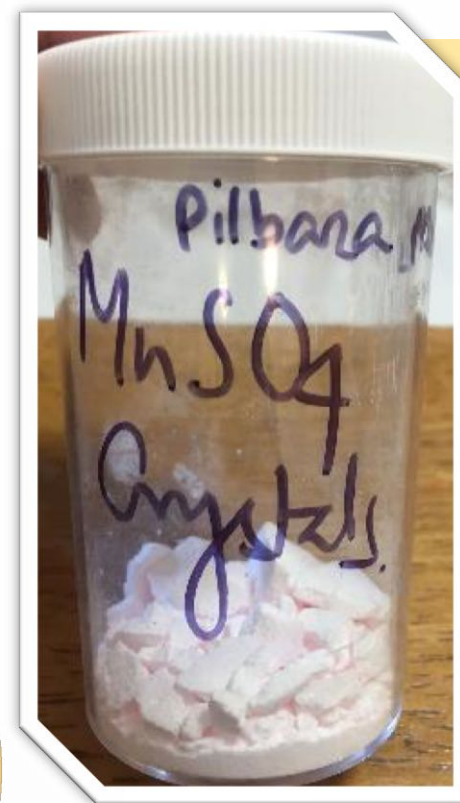
- ✓ Able to process cheap, low grade Mn Ore into high value HP  $\text{MnSO}_4$
- ✓ Significant saleable by-products –  $\text{MnSO}_4$  (fertilizer and food grade, FeO powder and others
- ✓ No electrolysis required – not energy intensive
- ✓ Low environmental footprint – consume water and local gas supply for power.



Low grade Mn ore  
Cryptomelane and pyrolusite  
 $\text{K}(\text{Mn}^{4+}, \text{Mn}^{2+})_8\text{O}_{16}$   
High Fe

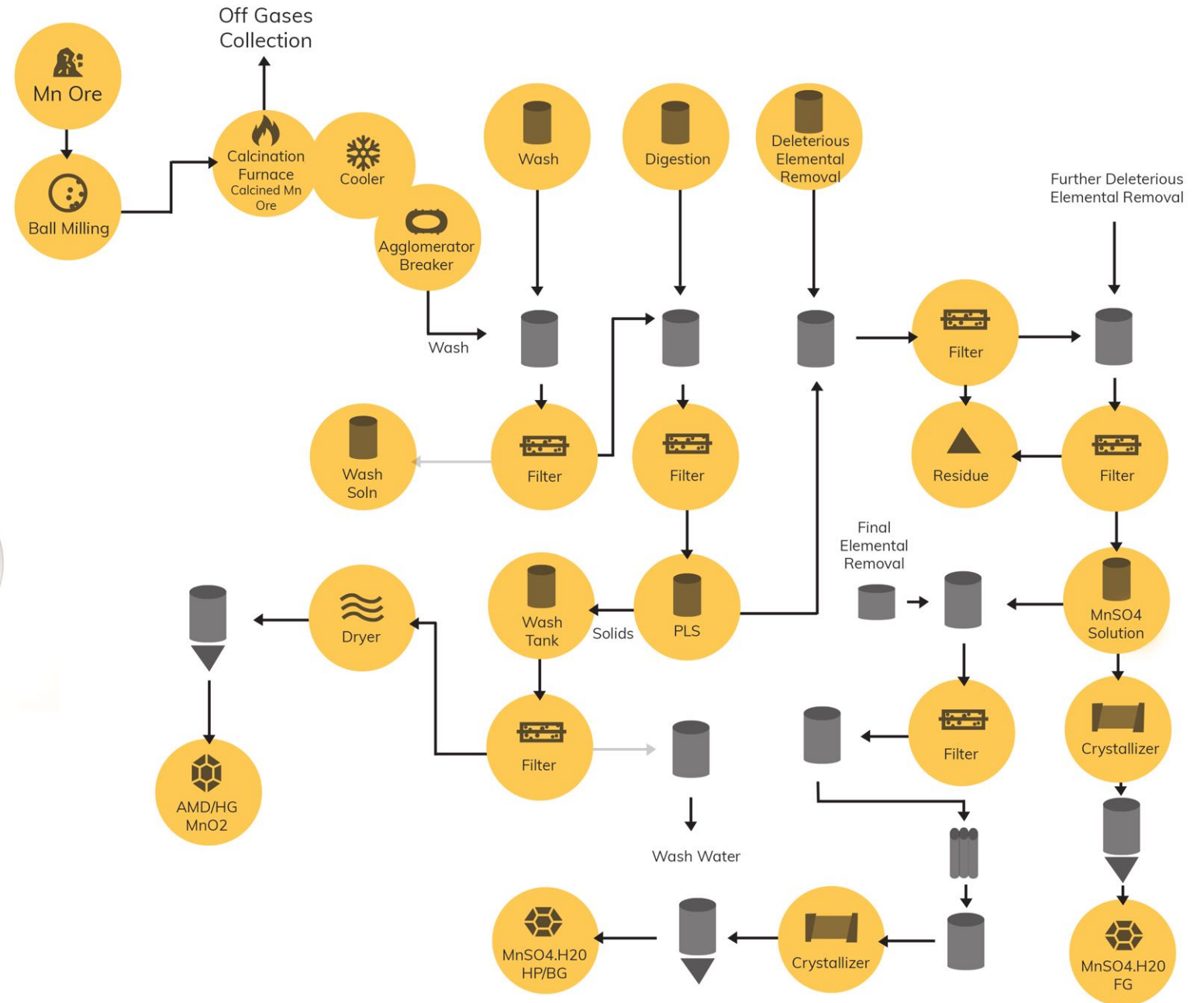
$\text{MnO}_2 + 2\text{H}_2\text{SO}_4 \rightarrow \text{MnSO}_4 + \text{H}_2\text{O}$   
Digestion, filtration, purification

HP $\text{MnSO}_4$	→	\$\$\$\$
$\text{MnSO}_4$ ag + food grade	→	\$\$
FeO powder	→	\$\$





# PMG'S PROCESS





# MANGANESE SULFATE MARKET

- ✓ The current market for HP  $\text{MnSO}_4$  is small but growing rapidly.
- ✓ 2018 global market estimates for battery spec  $\text{MnSO}_4$  was approximately 100,000 tonnes\*.
- ✓ EV unit demand for Mn will vary depending on battery chemistry.
- ✓ BASF believed to be developing a cathode contained 70% Mn.
- ✓ Some market forecasts expect the market to grow 10x by 2030\*\*.
- ✓ The largest portion of this HP  $\text{MnSO}_4$  will go into NMC and LMNO cathode material.
- ✓ Lower grade materials (<32% Mn) used in agriculture and food applications expected to grow in line with GDP.

\* International Manganese Institute  
(IMNI)

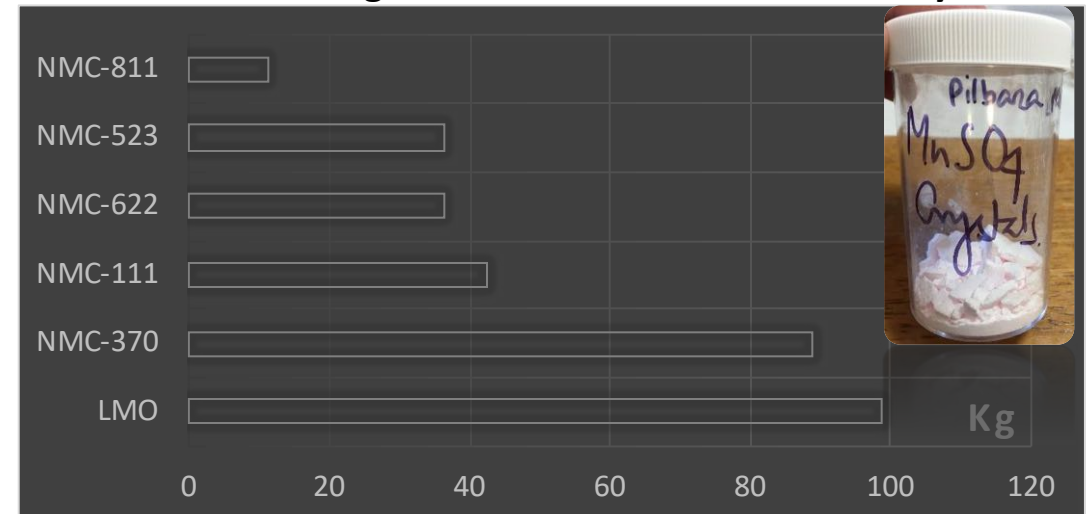
\*\* Benchmark Minerals

HP  $\text{MnSO}_4$  market expected to grow rapidly. Based on EV predictions only, and the current 622/523 structures

2018	→	2030
100,000t		860,000t

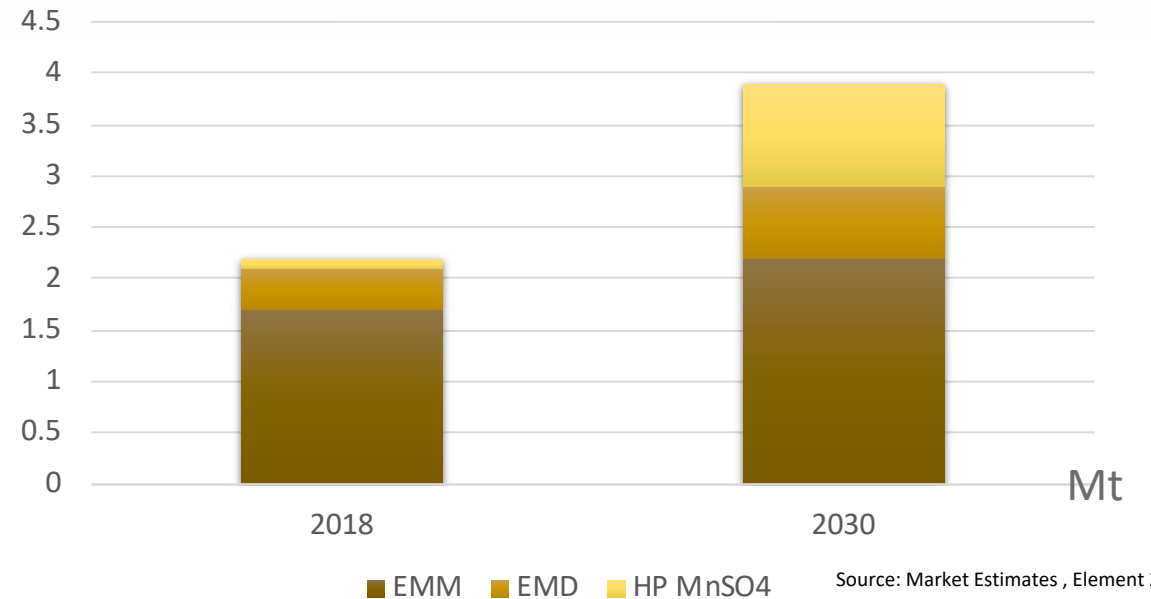
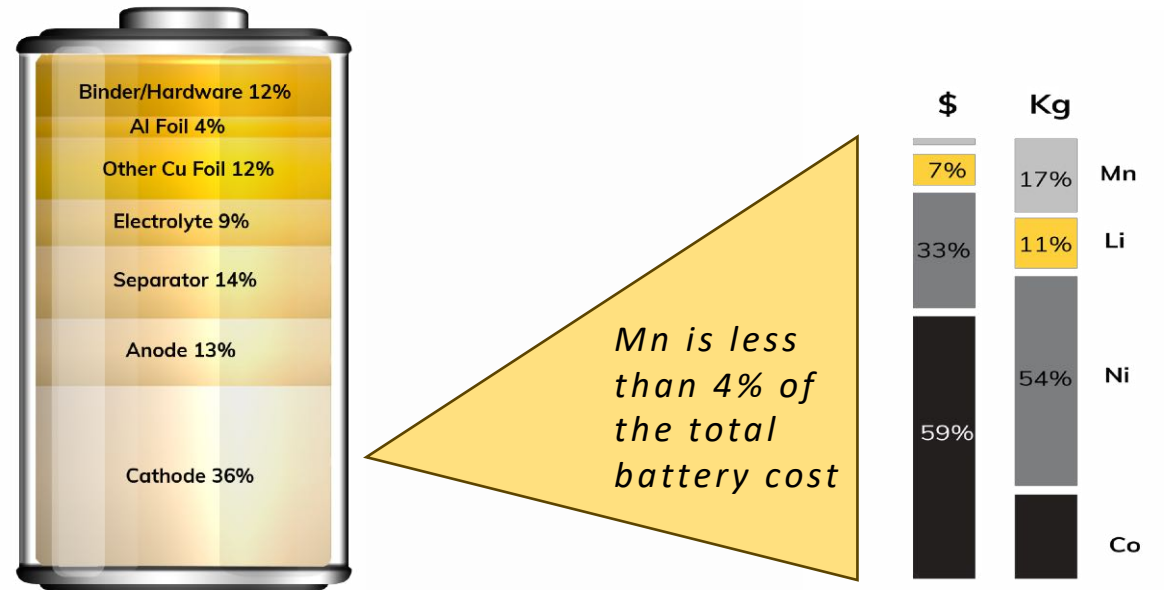
Nickel –Manganese-Cobalt or NMC has become one of the most popular cathode chemistries.

## Contained Manganese in a 90Kw/H Battery Pack



# MANGANESE SULFATE DEMAND

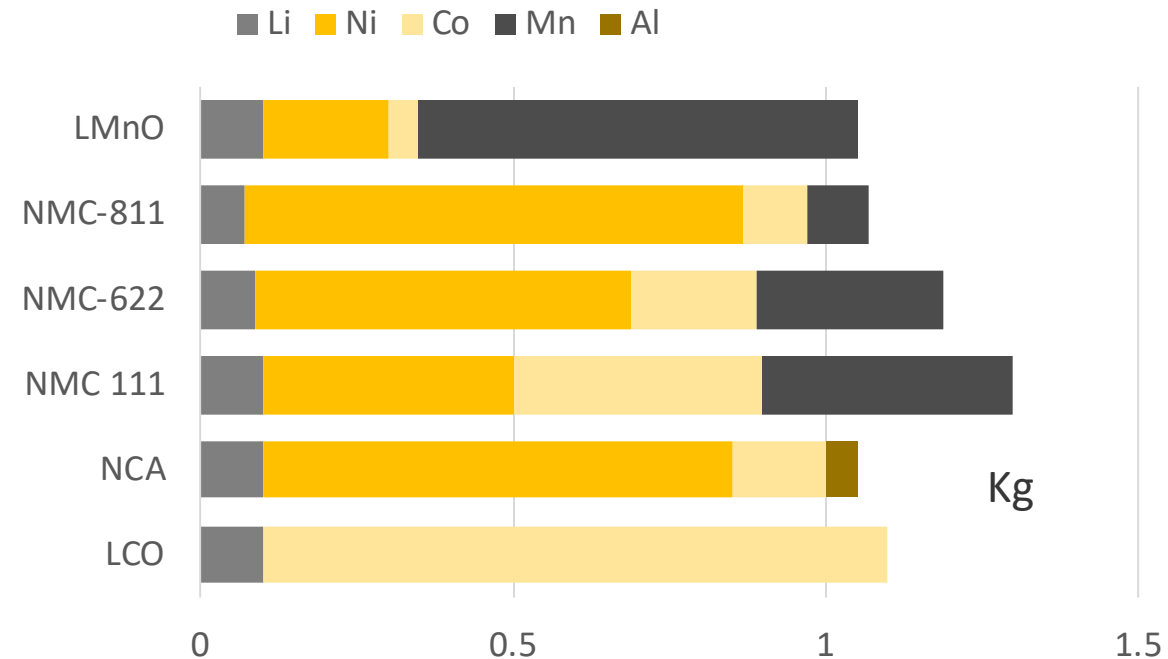
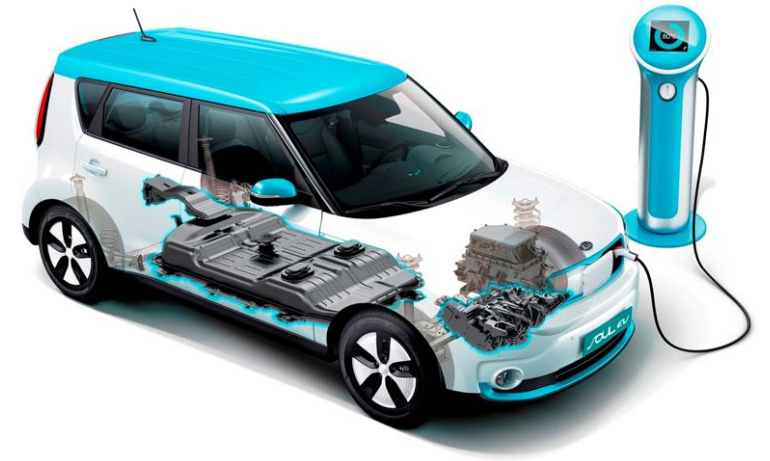
- ✓ Battery cathode manufacturers and NMC powder producers procure HP  $\text{MnSO}_4$  that has either been made from Mn carbonate ore or from electrolytic manganese metal (EMM).
- ✓ The alternative to purchase High-Purity EMM in order to make their own HP  $\text{MnSO}_4$  via a hydro-metallurgical process.
- ✓ Cathode cost estimated to be less than 4% of the total cost of the battery pack – reducing price sensitivity.



# BATTERY CHEMISTRY

## A MOVING FEAST FOR Mn

- ✓ Nickel–Manganese–Cobalt or NMC has become one of the most popular cathode chemistries. The drive for lower cost may work in favor of higher Mn content
- ✓ **NMC 2-7-1**  
Manganese rich, BASF is leading the development of a cathode that contains 70% Mn.
- ✓ **LMNO**  
This chemistry is expected to dominate as solid state cathodes gain market share.
- ✓ **NMC 8-1-1**  
Cheaper because of less cobalt but more difficult to produce. Benchmark Mineral does not expect market share to exceed 25% until 2026.
- ✓ **NMC 1-1-1**  
Most common chemistry today. Drive for improved energy density and lower raw material costs has seen 1-1-1 losing market share to 5-3-2 and 6-2-2.
- ✓ **NMC 5-3-2 and 6-2-2**  
Beginning to gain significant market share and capital commitment to meet EU diesel engine guidelines.

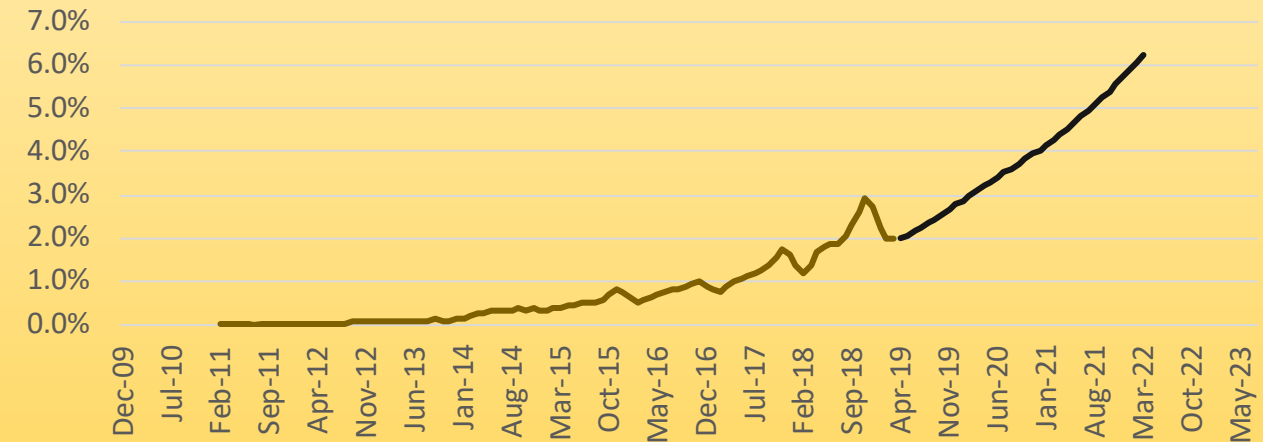


# LONG TERM DEMAND FORECAST

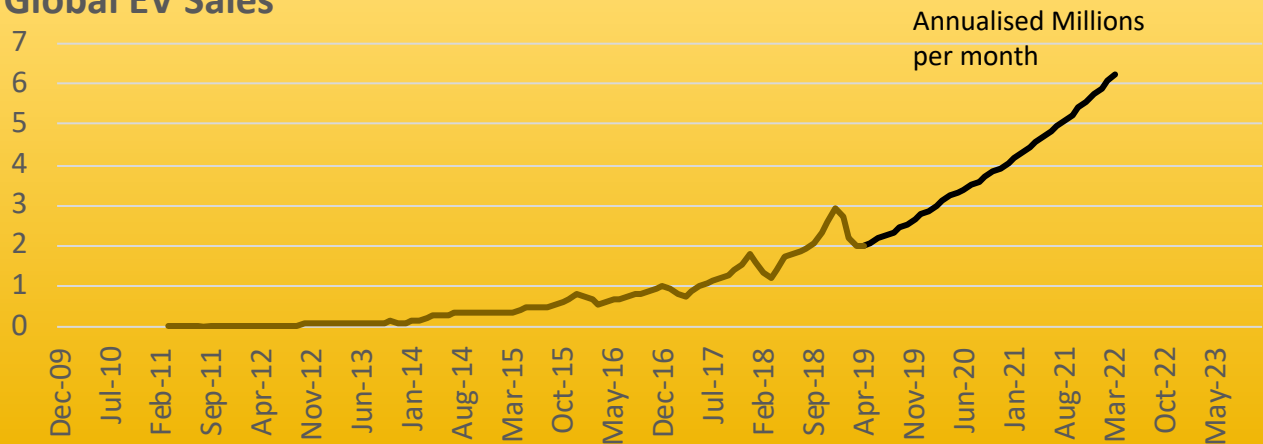
## EV BATTERIES AND STORAGE

- ✓ Li-ion battery market due to increase ~20x in the next twenty years
- ✓ Major countries targeting cumulative BEV / PHEV sales of 13.4m by 2020 and 5m by 2025 (BHP)
- ✓ Battery pack costs are falling
  - 2010: ~US\$1,000/kWh
  - 2019: ~US\$140/kWh
  - 2030(f): ~US\$60/kWh
- ✓ The primary cathode chemistry in 2040 will be NMC and LMNO, requiring manganese input of at least one million tonnes of manganese metal equivalent.
- ✓ NMC and LMNO structures survive the transition into solid state batteries.

Global EV Market Share

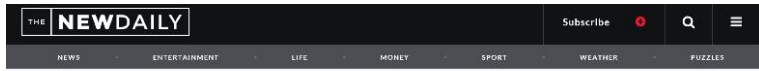


Global EV Sales





## WA taps into boom for raw materials for EV and storage batteries



MONEY • FINANCE NEWS •

9:42pm, May 27, 2019 Updated: 6:18pm, May 28

### Why Australia is well placed to capitalise on the global lithium boom

#### MONEY & MARKETS

**Wesfarmers, the owner of Bunnings, set to enter EV market as \$776 million takeover bid for lithium miner and Tesla supplier strengthens**

 ALEKS VICKOVICH  
MAY 23, 2019, 1:42 PMperth **now**

LITHIUM ASX STOCKS - LEARN THE 31  
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WA News

### Perth to get \$400m lithium plant

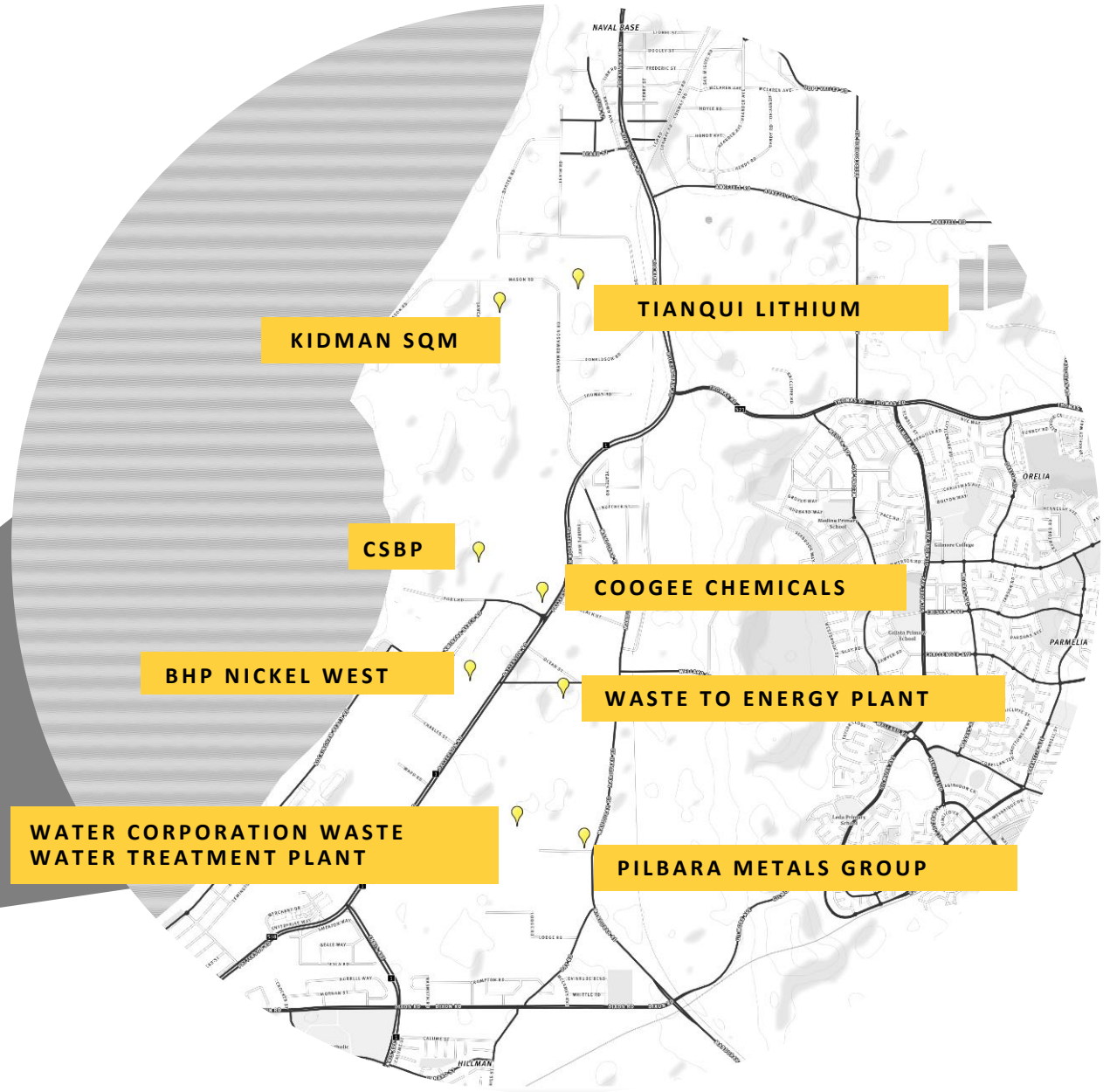
AAP | News From Australia

## THE KWINANA STRIP BATTERY ECOSYSTEM

- ✓ Western Australia – a world class mining and processing jurisdiction.
- ✓ The Kwinana Strip is set to become the hub of the lithium-ion battery industry in Australia.
- ✓ Access to a skilled work force (avoid FIFO)
- ✓ Access to key utilities – water and power.
- ✓ BHP Nickel West Refinery have announced they expect to produce nickel sulphate and cobalt sulphate which will lead to the production of precursors.
- ✓ A Western Australian ASX listed company has announced plans to produce their own lithium-ion battery with a LMNO cathode in 2019 (Lithium, Manganese, Nickel, Oxide).

# THE KWINANA STRIP BATTERY ECOSYSTEM

Perth



# ORE SOURCE

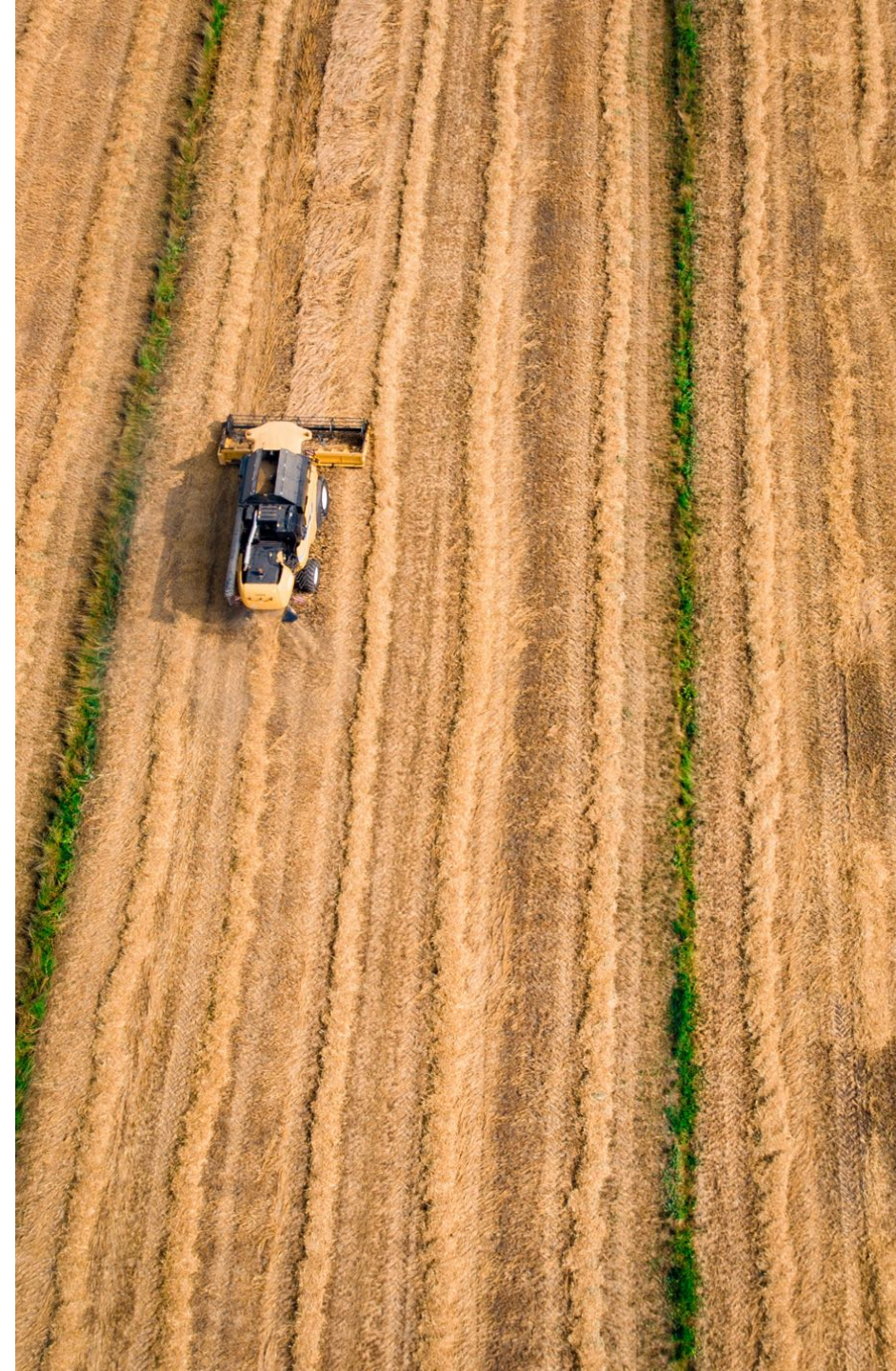
- ✓ Multiple third party ore sources available within Western Australia with some already processed and stockpiled.
- ✓ Low grade Mn, high Fe is not economically viable for the manufacture of Mn metal due to not being able to separate the two elements economically.
- ✓ Impurities in ore are not a factor that affect our  $\text{HP MnSO}_4$ . Easily removed during the process by adjusting quantities of reagents.
- ✓ Size not a factor, chips, fines or lump products all are usable.
- ✓ Not a miner but may fully integrate in the future, with tenement applications over prospective manganese ground in the Pilbara.
- ✓ Multiple ore source options to ensure continuity of supply.





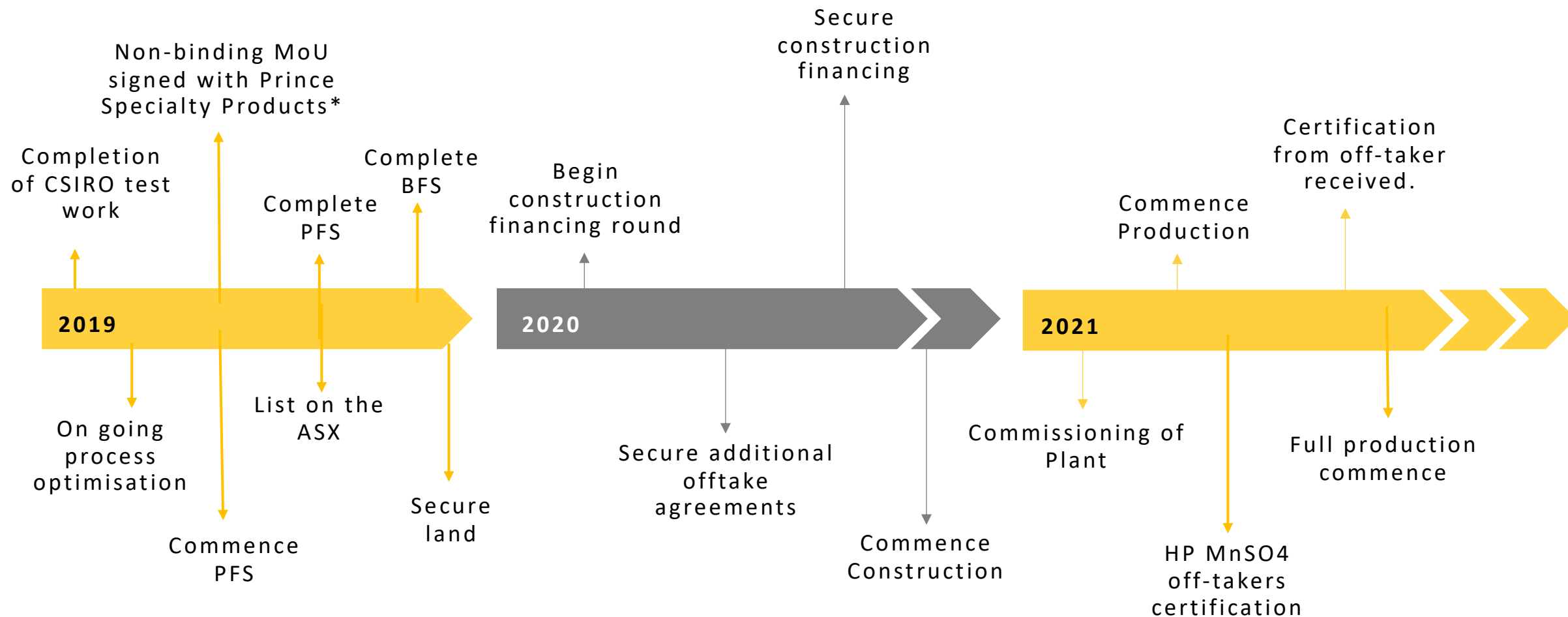
# MnSO<sub>4</sub> USE IN AGRICULTURE

- ✓ Manganese is one of 6 trace elements necessary for plant growth.
- ✓ Used in stockfeed.
- ✓ 30,000 tonnes per annum of Manganese Sulphate is imported into Australia each year. PMG has identified by communicating with importers that the market is growing.
- ✓ PMG aims to offer a cost competitive product to the Australian agriculture industry by substituting 100% of the volume currently imported.
- ✓ As the agriculture industry grows in developing countries, so does the demand for high quality manganese.





# MILESTONES



\* Prince Specialty Products, part of the Prince - Erachem Group of companies. The non-binding MOU is subject to the negotiation and execution of a Definitive Agreement, with PMG allowing Prince to purchase up to 40k/t of MnSO<sub>4</sub> product as required, the right to distribute into the European and North American markets, packaging of the goods to the satisfaction of Prince, pricing, and for a period of up to 5 years.



# KEY PEOPLE

## NON-EXECUTIVE CHAIRMAN

**SIMON ANDREW**

Mr Andrew has 20 years' experience in financial markets in Asia and Australia.

He has worked in various roles as an equity research analyst for several global investment banks including Deutsche Bank and BoA Merrill Lynch.

## CHIEF SCIENTIST & PROCESS ENGINEER

**DR. YATENDRA SHARMA**

Dr. Sharma is qualified in chemistry with a PhD in Chemical Technology with a distinction from Technische Universitaet Graz in Austria.

## MANAGING DIRECTOR

**ROBERT MANDANICI**

Mr Mandanici has worked in both the Private and Government sector and has extensive knowledge of corporate governance processes and procedures.

He was previously the Managing Director of ASX listed Lithex Resources Limited.

## EXECUTIVE DIRECTOR

**ANNETTE CRABBE**

Miss Crabbe has over 10 years experience in management within the processing, mining and construction industries.

She holds a Diploma of Business and is currently completing a BCom (Economics & Finance)

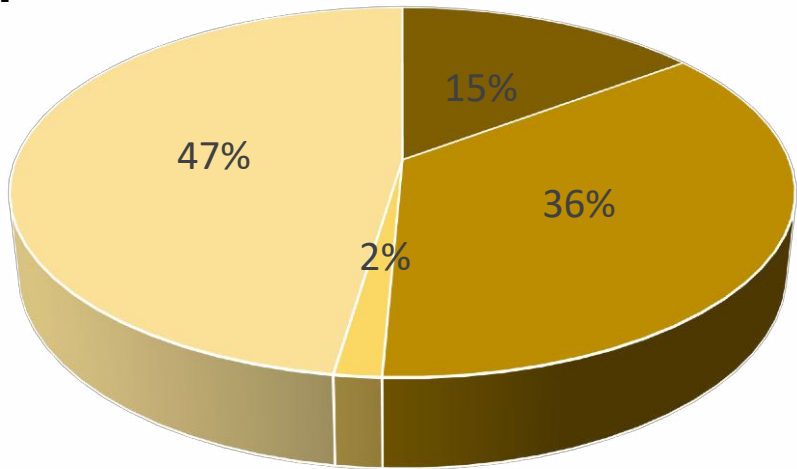
# CORPORATE SNAPSHOT

## INDICATIVE CAPITAL STRUCTURE

	\$4.6m Raise	\$6.0m Raise
Mission NewEnergy (MBT) shares	40,870,275	40,870,275
Shares issued to PMG	99,000,000	99,000,000
Advisor & Broker Shares	4,600,000	6,000,000
Convertible Note	35,714,285	35,714,285
ASX Capital Raise	131,428,571	171,428,571
Total Mission NewEnergy (MBT) shares	311,613,131	353,013,131
Mkt Cap @\$0.035	\$10,906,459	\$12,355,459
EV (Enterprise Value) *	\$6,306,459	\$6,355,459

SUBJECT TO MBT SHAREHOLDER APPROVAL

- Existing MBT Shares
- Shares issued to PMG
- Advisor & Broker Shares
- ASX Capital Raise



## KEY PEOPLE

NON-EXECUTIVE CHAIRMAN

➤ SIMON ANDREW

CHIEF SCIENTIST & PROCESS ENGINEER

➤ DR. YATENDRA SHARMA

MANAGING DIRECTOR

➤ ROBERT MANDANICI

EXECUTIVE DIRECTOR

➤ ANNETTE CRABBE

**PMG plans to list via a reverse takeover of Mission NewEnergy (ASX:MBT).**

\*EV being indicative market capitalization less indicative cash, post ASX capital raise.



# DISCLAIMER



This presentation contains only a brief overview of Pilbara Metals Group Pty Ltd ("Pilbara Metals Group") and its respective activities and operations. The contents of this presentation, including matters relating to the geology or metallurgy of Pilbara Metals Group projects, may rely on various assumptions and subjective interpretations which it is not possible to detail in this presentation and which have not been subject to any independent verification.

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The information contained in this presentation is not a substitute for detailed investigation or analysis of any particular issue. Current and potential investors and shareholders should seek independent advice before making any investment decision in regard to Pilbara Metals Group or its activities.




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