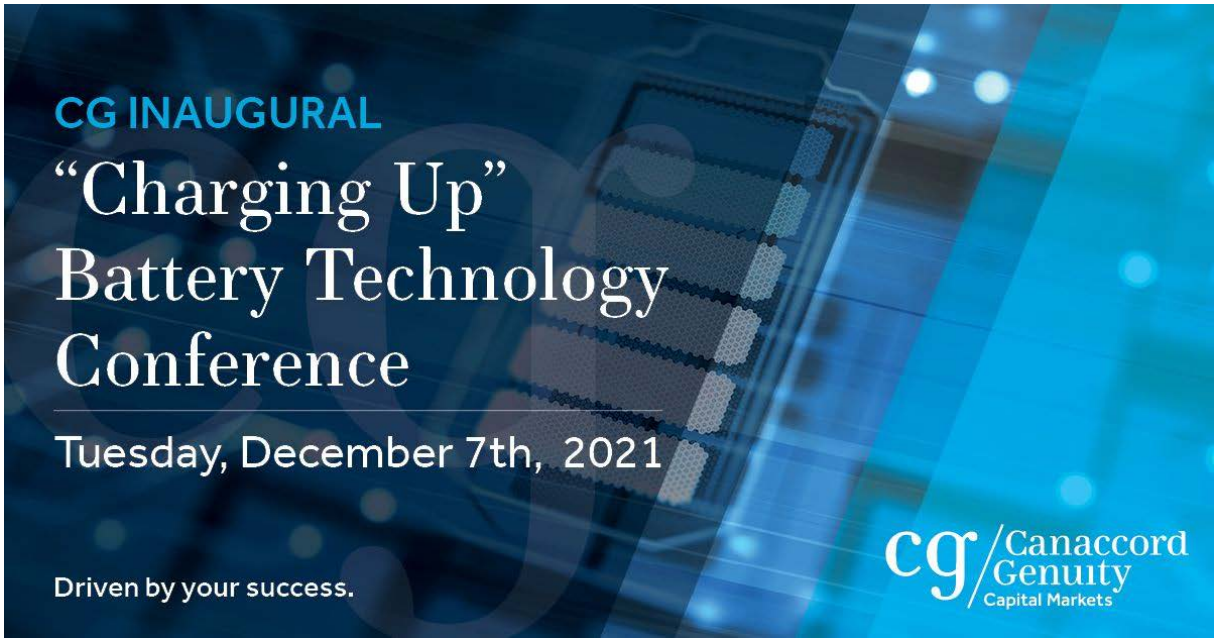
December 7, 2021

Calix to Present at Canaccord Battery Technology Conference

Sydney, Australia | December 7, 2021 – Multi-award-winning Australian technology company Calix Limited (ASX: CXL) (**Calix** or the **Company**) is pleased to provide the investor presentation which the Company's CEO, Phil Hodgson, will use during the Canaccord Charging Up Battery Conference today, 7th December 2021, at 10:15am AEST.



Please reach out to your Canaccord Genuity representative for additional details.

This announcement has been authorised for release to the ASX by:-

Phil Hodgson
Managing Director and CEO
Calix Limited
9-11 Bridge Street
Pymble
NSW 2073
Ph +61 2 8199 7400

About Calix

Calix is a team of dedicated people who are urgently developing great businesses, leveraging our patented technology, that deliver positive global impact.

The core technology is being used to develop more environmentally friendly solutions for water treatment, CO_2 mitigation, biotechnology, advanced batteries, and more sustainable mineral and chemical processing.

Calix develops its technology via a global network of research and development collaborations, including governments, research institutes and universities, some of world's largest companies, and a growing customer base and distributor network for its commercialised products and processes.

Because there's only one Earth – Mars is for Quitters.

Website: https://www.calix.global/
Twitter: @CalixLimited
Youtube: CalixLimited

For more information:

Phil Hodgson
Managing Director and CEO
phodgson@calix.com.au
+61 2 8199 7400

Darren Charles
CFO and Company Secretary
dcharles@calix.com.au
+61 2 8199 7400

Simon Hinsley
Investor Relations
simon@nwrcommunications.com.au
+61 401 809 653

“CHARGING UP”

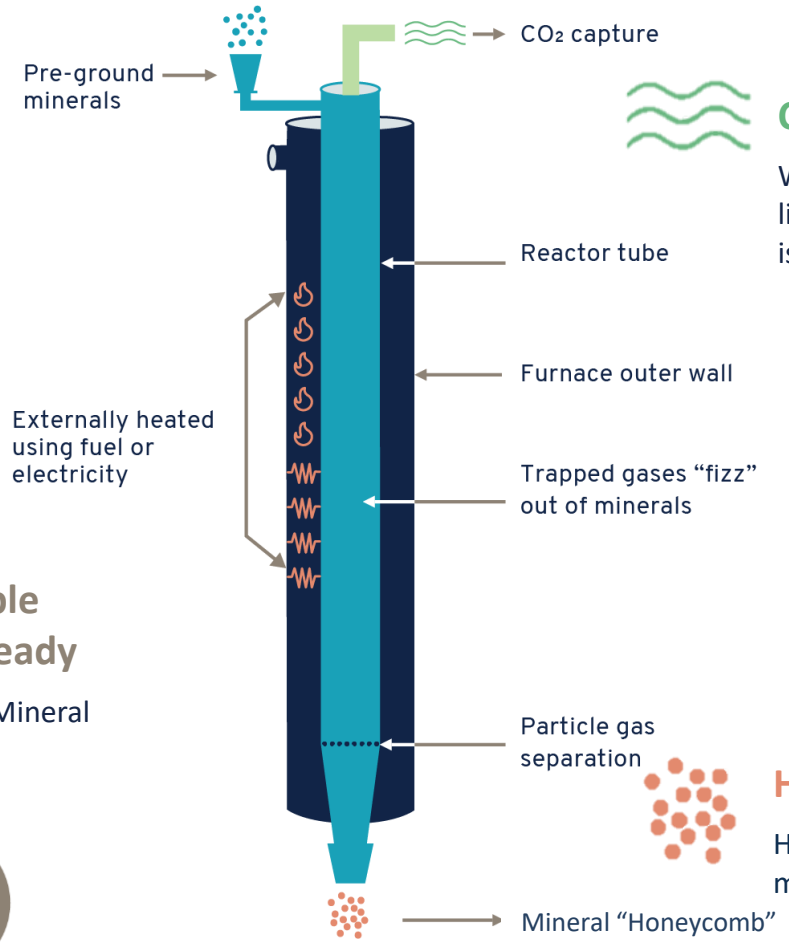
Canaccord Battery Technology Conference

7th December, 2021

calix | Solving global challenges

Our core technology platform

A PATENTED PLATFORM TECHNOLOGY WITH 3 KEY FEATURES



CO_2 capture

When processing limestone, gas exhaust is high purity CO_2

Renewable energy-ready

Chemical / Mineral Processing.

Highly-active materials

Highly porous "honeycomb" structure = more chemical- and/or bio-activity

A new way to "heat stuff up"

26 patent families covering core technology and applications

>A$100m has been invested to date in developing the technology.

Our business opportunities and Environment, Social and Governance ("ESG") tailwinds

MULTIPLE "SHOTS ON GOAL" ESG OPPORTUNITY USING THE ONE PATENTED CORE PLATFORM TECHNOLOGY

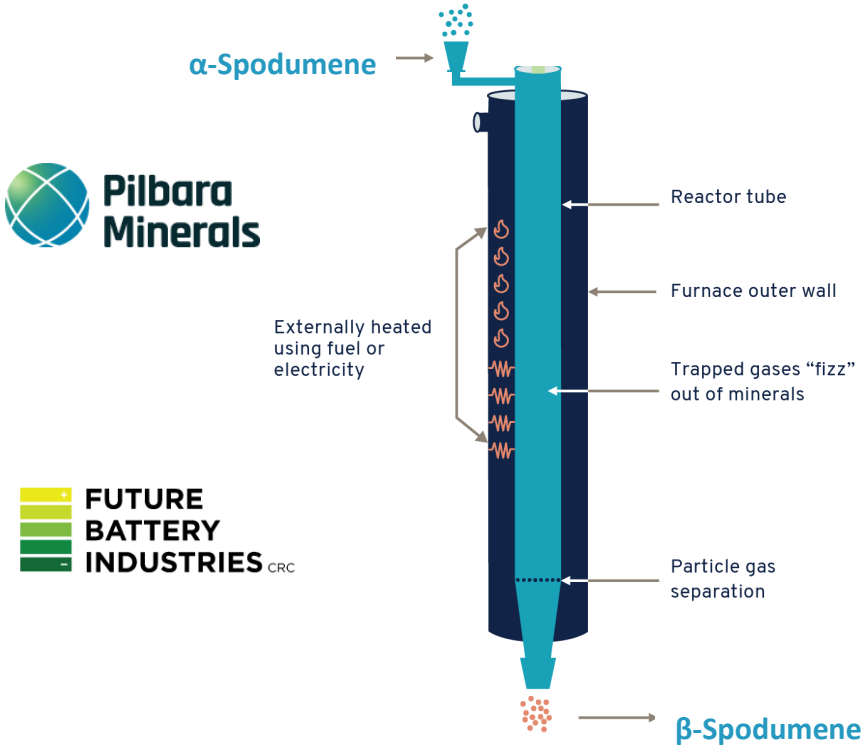
	Water	CO_2 Mitigation	Biotech	Advanced Batteries	Sustainable Processing
Our Business	• *Safe, environmentally friendly water treatment product* • *In-market since 2014* • *Growing revenue engine for the business* • *Successful US acquisition 2019*	• *Direct CO_2 separation for cement and lime – no theoretical energy penalty* • *Developing with €28m of EU funding* • *Partnering with some of the largest cement and lime companies*	• *Safe, environmentally friendly biotech product – multiple applications* • *Crop Protection – initial sales* • *Anti-Foul Marine Coatings – major trial underway*	• *Targeting safe, environmentally friendly, more recyclable, better performing batteries* • *Highly prospective early results* • *Substantial global battery development network*	• *Targeting renewable-energy driven industrial processes* • *First license agreement executed- energy storage* • *Several opportunities being developed – chemical industries*
ESG Issue	*Waste water discharge limits becoming tougher*	*Top economies, and cement companies, committing to net zero CO_2 by 2050*	*Increasing concern wrt biocides and their impact on the environment*	*Increasing concern wrt expensive battery materials and their recyclability, cost, safety and provenance*	*Industrial processes coming under increasing pressure to identify how they will electrify*
ESG Examples	*Germany taken to court by the EU for polluting European waterways with P and N*	*The price of CO_2 – as measured by the EU Emissions Trading Scheme - has jumped ~10-fold in 4 years*	*The EU has banned one of the largest selling broad spectrum fungicides from Feb 2021 - Mancozeb*	*Tesla, VW, Stellantis targeting a return to simpler, cheaper, safer chemistries for "people's EV;s"*	*Recent Deloitte survey found industrial manufacturers targeting 45% overall electrification by 2035*

With significant thematic tailwinds, Calix's business is very well positioned to benefit…

Opportunities to apply the Calix technology across the battery value chain

Sustainable Processing

Processing of spodumene to produce lithium

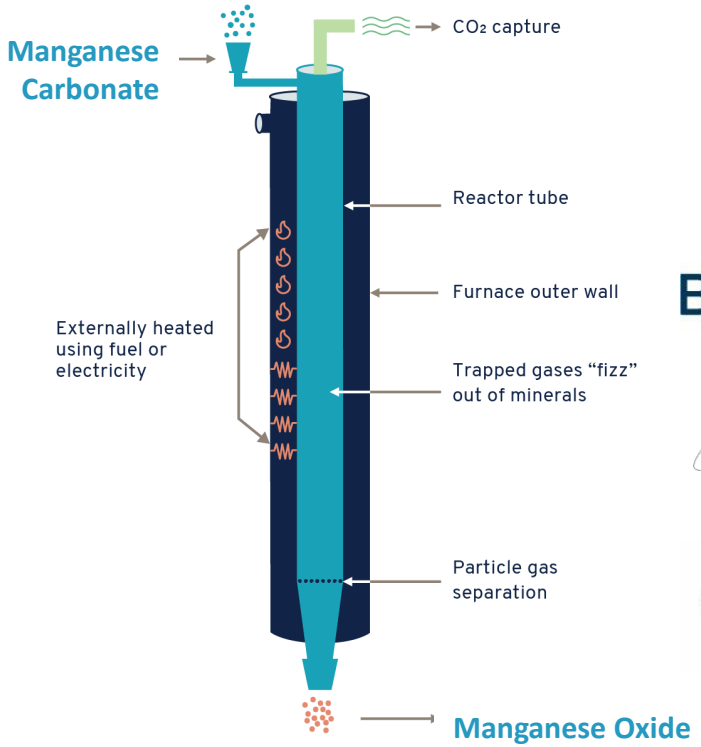


Pilbara Minerals

FUTURE BATTERY INDUSTRIES CRC

Advanced Batteries

The manufacture of advanced manganese oxide materials for lithium ion batteries



DEAKIN UNIVERSITY

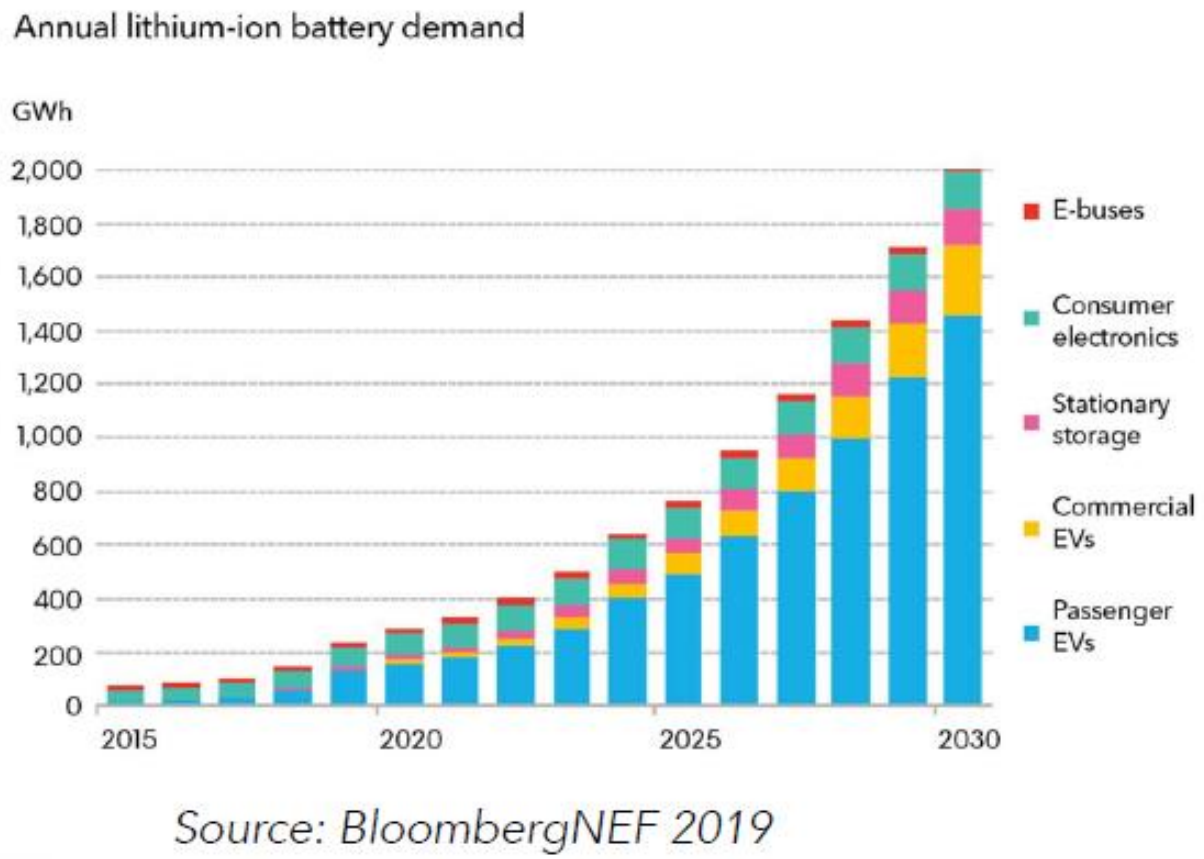
BATHTRI BATTERY TECHNOLOGY RESEARCH AND INNOVATION HUB

BORON MOLECULAR

Australian Government
Department of Industry, Innovation and Science

Market opportunity – why are Li-Ion batteries of interest ?

THE LI ION BATTERY MARKET HAS GROWN VERY QUICKLY, AND IS PREDICTED TO ACCELERATE FURTHER…



While there are varying predictions as to the growth of Li-Ion battery demand, there is consensus on two things…

- **Growth will be driven by electric vehicles, with significant growing contribution from stationary storage**

- **Growth will be very fast over the next decade**

The World Energy Outlook 2021 Report released by the International Energy Agency estimated the battery market would grow to around **US$850 billion per annum** by 2050, with over 3 billion electric vehicles predicted under their net-zero emissions scenario

Why lower carbon foot-print lithium ?

GLOBAL CAR MANUFACTURERS TARGETING NET ZERO CO_2 INPUTS

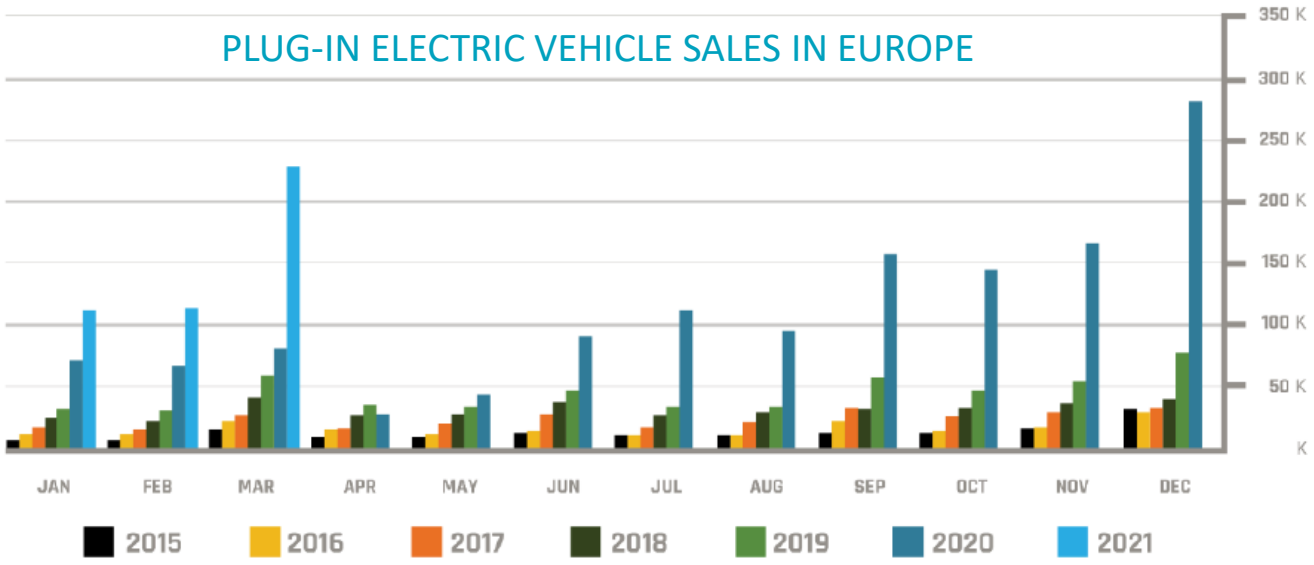


Chart source: Inside Evs 'EV sales blog data

New EU regulatory framework for Batteries*

requirement to comply with maximum lifecycle carbon footprint thresholds (as of 1 July 2027)

by 1 January 2026, the creation of a battery passport

BMW intends to use only materials that are produced using regenerative sources of electricity,

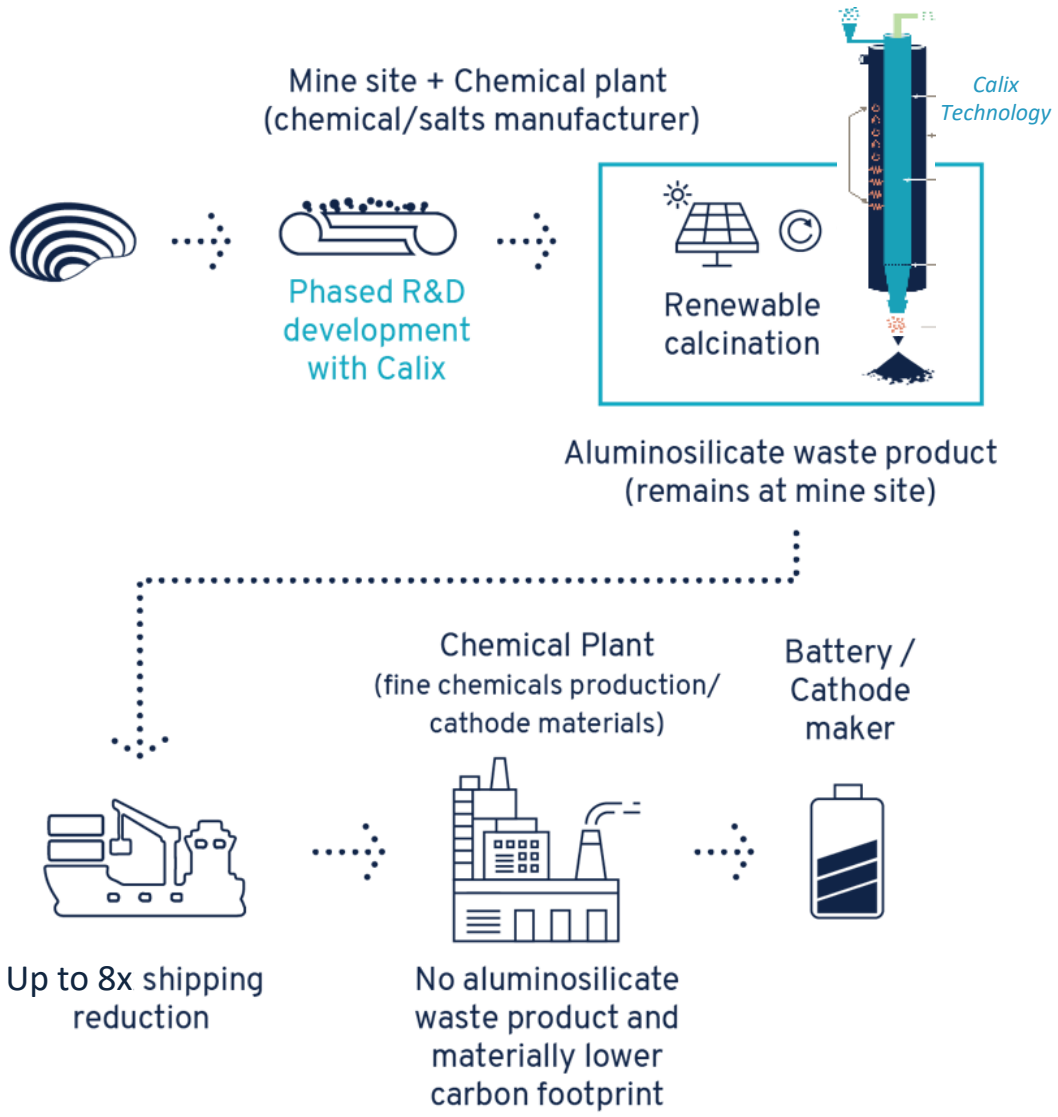
Next Milestone Ambition 2039: The global Mercedes-Benz supply chain is becoming CO2 neutral

"For electric vehicle batteries and energy storage, the EU would need up to **18 times more lithium and 5 times more cobalt in 2030**, and almost **60 times more lithium and 15 times more cobalt in 2050**

* Batteries https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/689337/EPRS_BRI(2021)689337_EN.pdf

*2 European Parliament Economic and Social committee of the Regions: Critical Raw materials Resilience.

Reduced CO_2 footprint lithium salt production



Targeted benefits of the Calix Technology to the spodumene industry

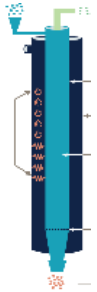
- Higher value product produced on-site from fines
- Less shipping of waste
- Higher recovery from the ore body
- Can be renewable energy-powered
- Lower CO_2 foot-print product = competitive advantage as carbon barriers are erected

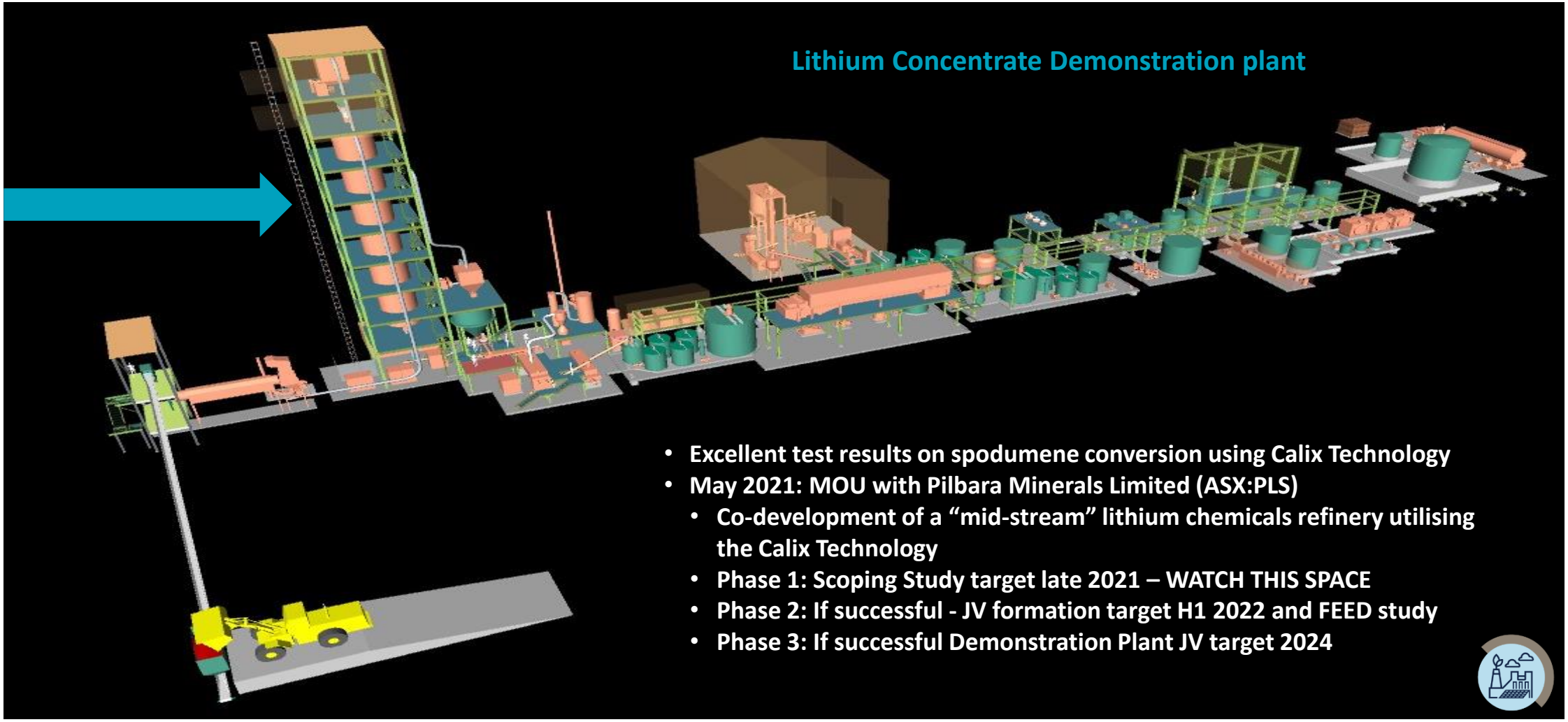
Pilbara Minerals

An electric / renewably - powered Australian lithium process

DEVELOPING ON-SHORE, LOW CARBON PROCESSING OF SPODUMENE ORE FINES TO PRODUCE A LITHIUM SALT

Calix Technology

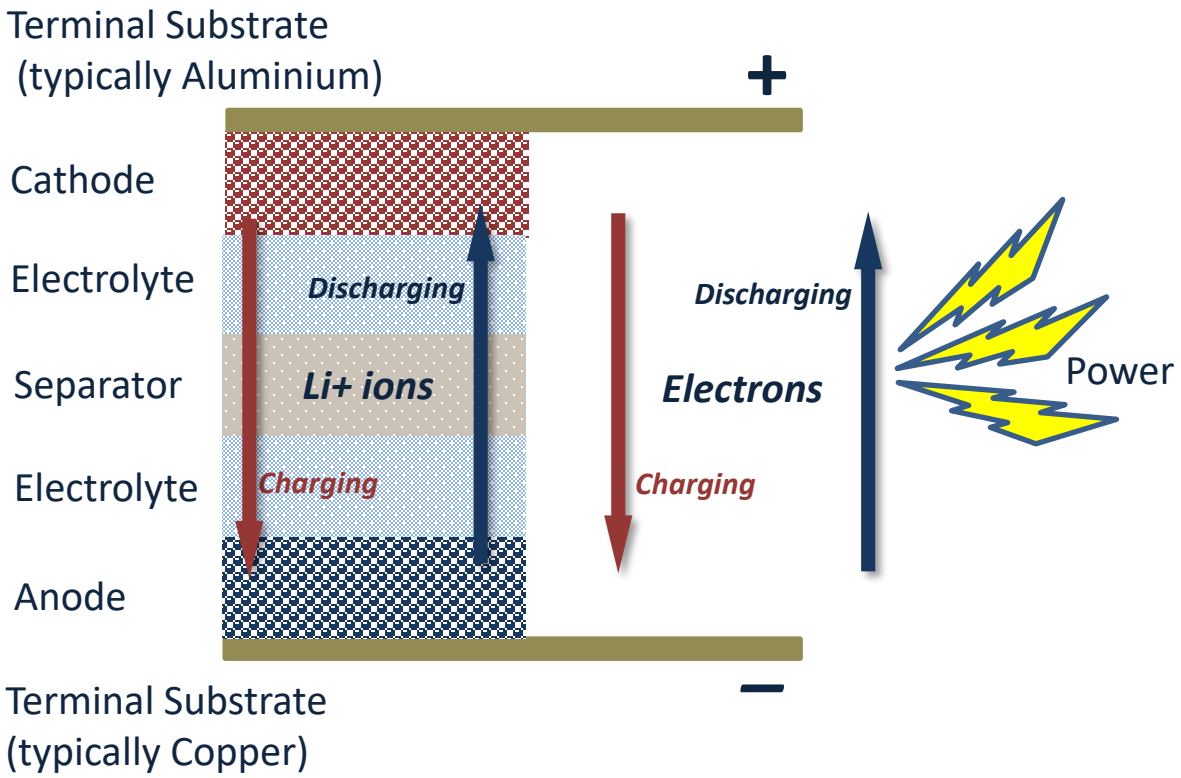




- Excellent test results on spodumene conversion using Calix Technology
- May 2021: MOU with Pilbara Minerals Limited (ASX:PLS)
  - Co-development of a “mid-stream” lithium chemicals refinery utilising the Calix Technology
  - Phase 1: Scoping Study target late 2021 – WATCH THIS SPACE
  - Phase 2: If successful - JV formation target H1 2022 and FEED study
  - Phase 3: If successful Demonstration Plant JV target 2024

How do lithium ion batteries work ?

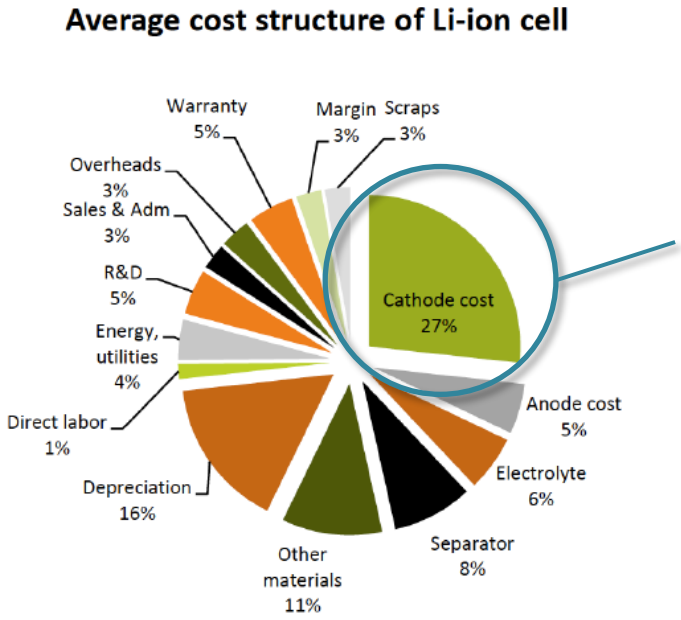
AND WHY IS THE CATHODE SO IMPORTANT ?



The cathode, as the source of Li+ ions, is the main determiner of the capacity and voltage of the battery

During **charging**, lithium (Li) ions flow from the cathode to the anode via an electrolyte, through a separator

During **discharge**, they flow back to the cathode, generating a flow of electrons from the anode into the external circuit (eg your phone, or car !) and back to the cathode also



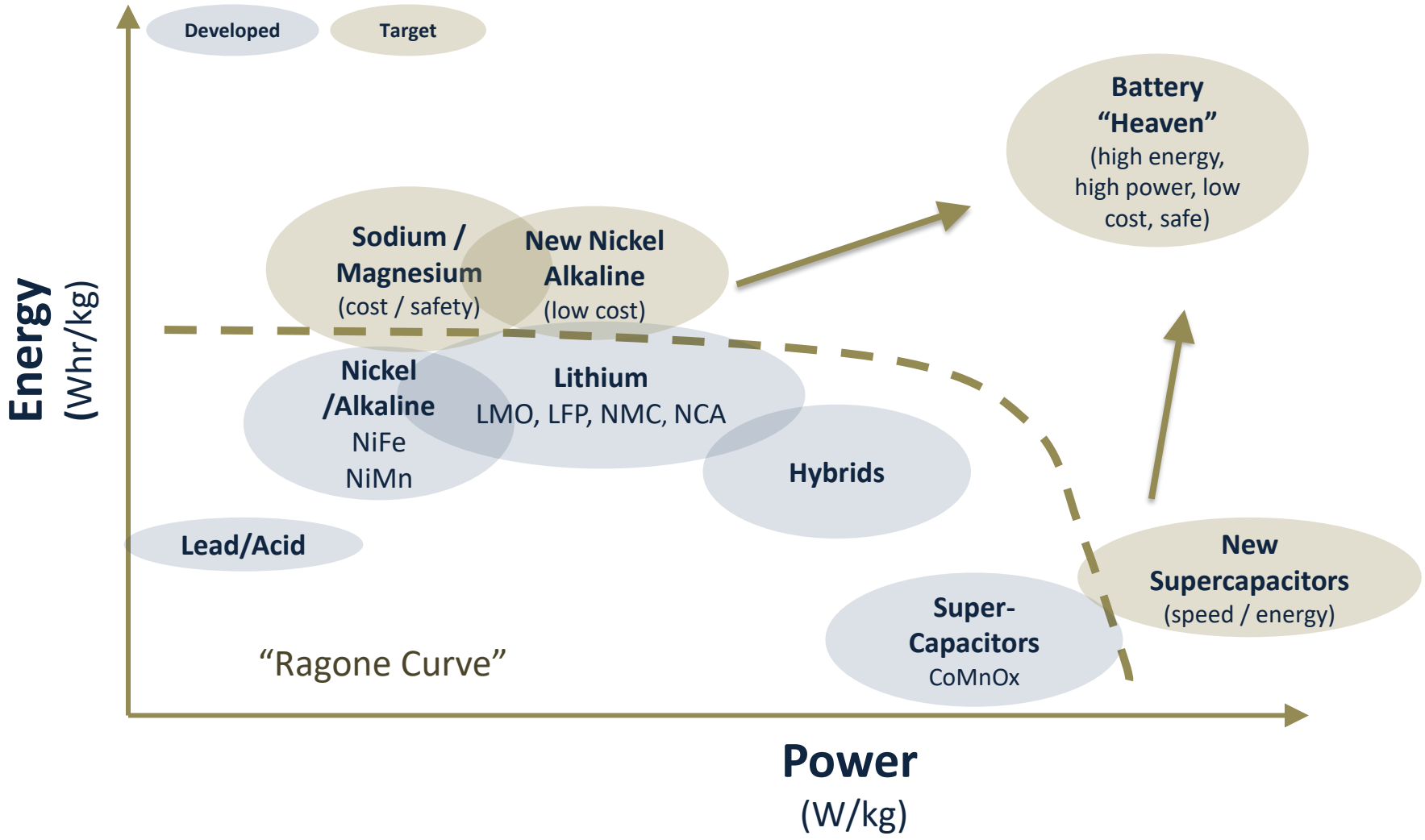
Source: Avicenne 2018

The cathode is also the most expensive component of a Lithium Ion battery – over ¼ of the cost ! – due to…

1. ***Materials***
2. ***Energy***
3. ***Capital***

What are the key operating properties of Li-Ion batteries?

SO FAR (!) HAS BEEN A TRADE-OFF BETWEEN ENERGY AND POWER…



- "energy" defines how much "fuel" is in the tank
- "power" defines how quickly the energy can be used, and replenished
- EV's are driving development to push the Ragone Curve outward !
- But energy and power are not the only parameters of interest…

Energy and power important, but so is cost, safety, and increasingly - the energy used to produce the battery…

HOW THE TOP 4 CHEMISTRIES STACK UP…

Cathode Chemistry	Key Elements	Stability	Voltage (V, vs Lithium)	Specific Energy (Wh/kg)	Typical Cost ($/kg)	Cost / Energy ($/kWh)	Safety [1]	Energy to Produce Cathode [2]
NMC or NCM	Ni, Mn, Co	Good	3.8	140-180	20 – 28	30 – 43		135
NCA	Ni, Co, Al	Poor	3.8	80-220	23 – 30	30 – 40		TBC
LFP	Fe, P	Excellent	3.4	80-130	10 – 12	18 – 22		39 - 48
LMO	Mn	Poor	4.1	105-120	8 - 15	16 - 30		26

- The first modern electric cars such as the first generation Nissan Leaf, used **Lithium Manganese Oxide** (LMO) cathodes because of low cost and good intrinsic safety, at the expense of lower capacity and lifetime (stability)
- Tesla has used **Nickel Cobalt Aluminium** (NCA) and a lot of other car-makers use **Nickel Manganese Cobalt** (NMC) due to higher energy densities, albeit at higher cost and safety concerns
- However, Tesla, Stellantis and VW are now targeting “people’s vehicles” EV’s with simpler manganese and iron chemistries - mainly driven by safety, cost and longevity
- ..and with the EU introducing carbon tariffs from 2023, the amount of energy used in producing batteries will also be important

1. Source except for NCA: Avicenne Energy http://www.avicenne.com/pdf/Fort_Lauderdale_Tutorial_C_Pillot_March2015.pdf , NCA: assumed the same if not slightly worse than NMC https://batteryuniversity.com/learn/article/safety_of_lithium_ion_batteries
2. CATHODE MATERIAL production energy consumption in mmBTU/T – “Material and Energy Flows in the Production of Cathode and Anode Materials for Li-Ion Batteries” – Argonne ANL/ESD-14/10
3. Stellantis EV Day https://www.stellantis.com/en/investors/events/ev-day-2021

Why might Calix's technology be suited to battery materials ?

THE CALIX TECHNOLOGY ENABLES A SIMPLER, CHEAPER, LOWER ENERGY PRODUCTION ROUTE …

Australian Government
Department of Industry, Innovation and Science

Current Manufacturing and Most R&D routes

- *Exotic Chemistries*
- *High purity pre-cursors*

- *Micro- and Nano-particles*
- *Multiple spacing / layering techniques*
- *Waste materials !*

Assembled crystals

Li_2CO_3
(Solid)

Sintering Furnace

750 ^{0}C
Typically 20 hours*
(~56% of the Energy required to produce LMO)

Calix route

Ag-grade Manganese Carbonate micro-particles

$MnCO_3$

- *Calix BATMn Reactor*
- *Controlled flash heating, oxidation*
- *No waste*

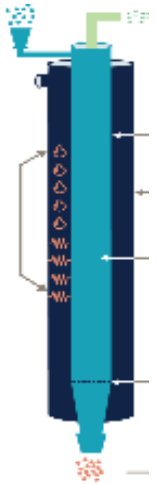
Mn_xO_y → CO_2

Controlled nano-porosity, strong flexible micro-crystals

Li(OH)
(Solution)

Sintering Furnace

800 ^{0}C
2 hours
(could reduce LMO energy footprint by up to 40%)



Calix Technology "BATMn" Can be renewably powered

Already at Commercial Scale 2000 Tpa, ~A$2m

*Assumes solid state manufacturing route – "Estimating the Cost and Energy Demand for Producing Lithium Manganese Oxide for Li Ion Batteries" https://publications.anl.gov/anlpubs/2020/03/158938.pdf

Can we use cheaper, less pure materials ?

OUR EARLY TEST WORK HAS CONCENTRATED ON CHEAP, AGRICULTURAL, **NON-BATTERY** GRADE MANGANESE…

Chemical Composition (weight %)		Standards		Commercial LMO	Calix LMO	
		High Capacity [1]	High Power [1]	As tested	(washed)	(unwashed)
Main elements	Mn	58.0 ± 2.0	57.5 ± 2.0	59.5	58.2	56.3
	Li	4.2 + 0.4	4.1 + 4.0	3.97	3.84	3.76
Impurities	K	< 0.05	< 0.01	0.01	< 0.01	0.03
	Na	< 0.3	< 0.1	0.3	0.05	0.27
	Ca	< 0.03	< 0.03	0.02	0.32	0.78
	Fe	< 0.01	< 0.01	0.01	0.02	0.02
	Cu	< 0.005	< 0.005	0.0002	0.0018	0.0017
	S	-	< 0.167	0.5	0.31	0.91
	Mg	-	-	0.02	0.6	0.6

- Commercial LMO, and Chinese LMO Standards, show much lower concentrations in Ca, Fe, Cu and Mg impurities
- Simply washing with water lowered some of the impurities (K, Na, Ca and S)
- And the performance ?....see next few slides !

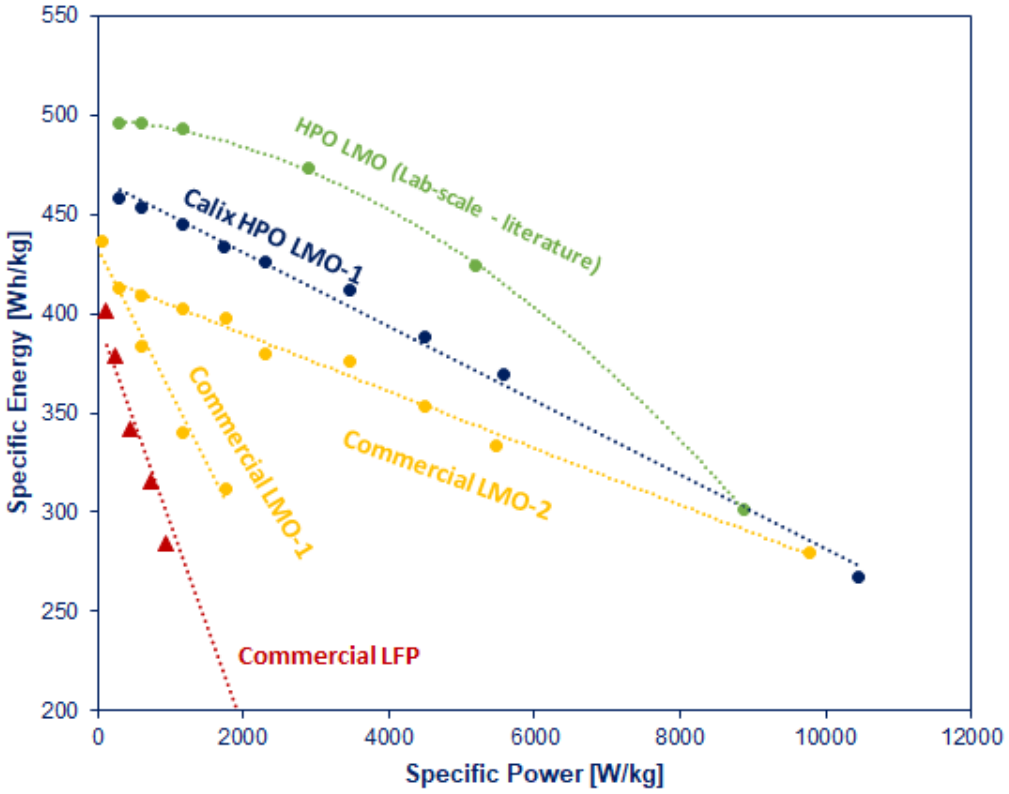
1. YS/T 677-2016, Lithium manganese oxide, People's Republic of China Nonferrous Metals Industry Standard

Can we make better performing materials ?

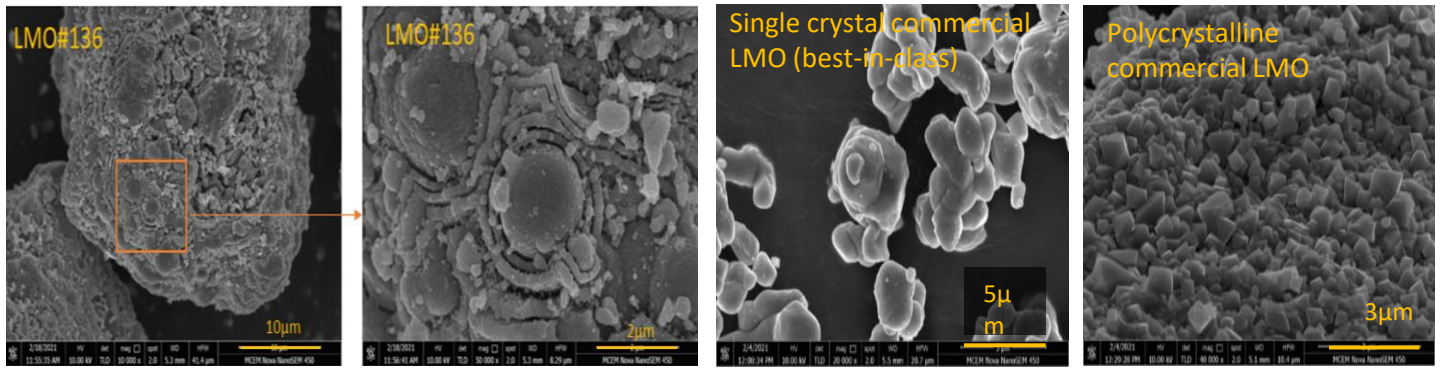
EARLY HALF-CELL RESULTS ON THE CALIX CATHODE CRYSTALS SHOW VERY ENCOURAGING PERFORMANCE

“cracking the onion” – creating “Hierarchical Porous Onion” (HPO) nano-structures

Calix is developing a high-performance, low-cost lithium manganese oxide (LMO) cathode technology based upon HPO crystal structures



The Calix LMO materials display a novel meso-porous onion structure similar to the best lab-scale, exotic nano-derived materials reported in the scientific literature.



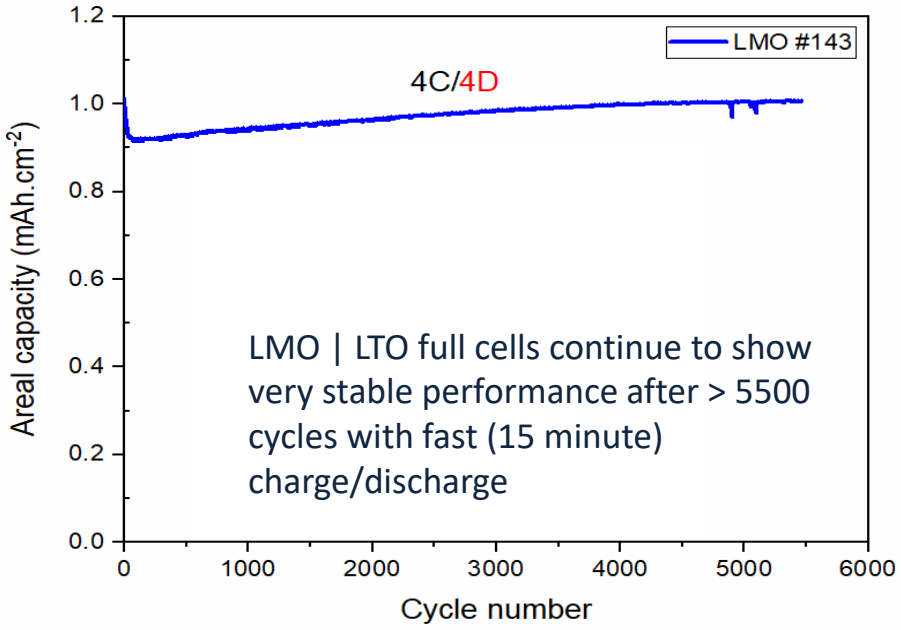
The novel structure facilitates exceptional rate performance surpassing the performance of its commercially available competitors

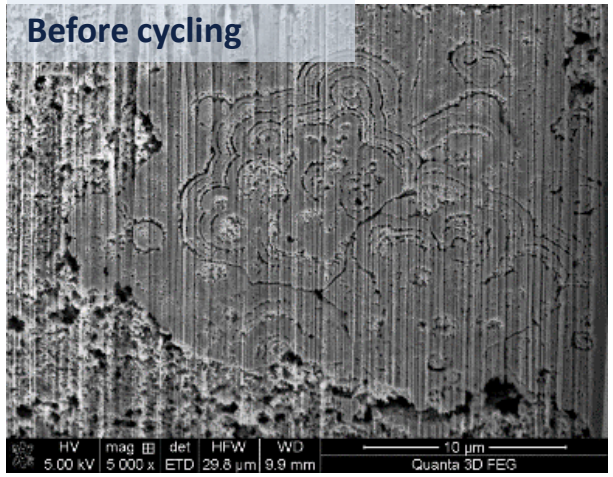
1 Li, Z., Feng, X., Mi, L. *et al.* Hierarchical porous onion-shaped $LiMn_2O_4$ as ultrahigh-rate cathode material for lithium ion batteries. *Nano Res.* **11,** 4038–4048 (2018).

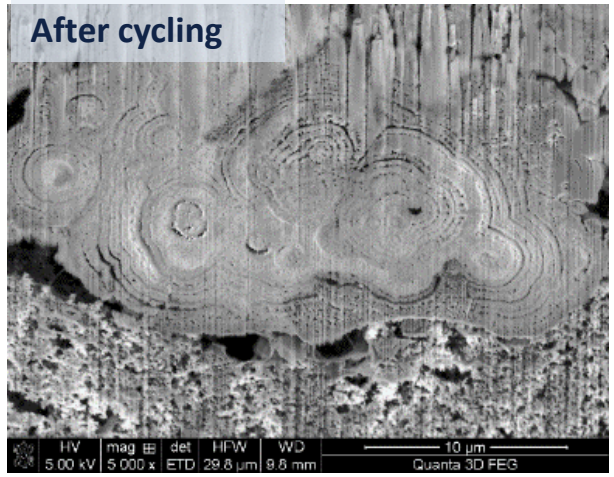
* Specific energy and power presented on a per unit weight of the cathode active material (CAM) basis
* All results are from half-cell electrochemical discharge rate screening tests with CAM loadings of 0.5 mAh/cm^2

Full coin cells – significant performance longevity demonstrated

ADVANCED BATTERIES: LONG TERM STABILITY AT HIGH RATE DEMONSTRATED TO OVER 5500 CYCLES





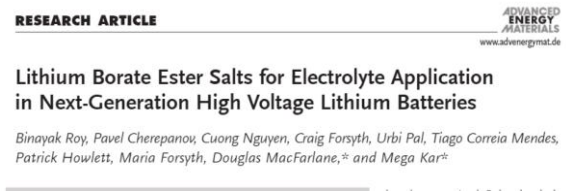


No observed decay in novel structure of Calix LMO following electrochemical cycling (high magnification, x-sectional images of cathode foils)

The development of high voltage, non-flammable, water tolerant electrolytes tailored to Calix electrode materials is underway through the CRC-P and storEnergy training centre

Electrochemical test results continue to show that Calix's LMO chemistries provide outstanding rate capability and stability in full cell over extended life-cycle testing

High magnification imaging shows that the unique mesoporous structure is preserved following cycling with no structural degradation


RESEARCH ARTICLE

ADVANCED ENERGY MATERIALS
www.advenergymat.de

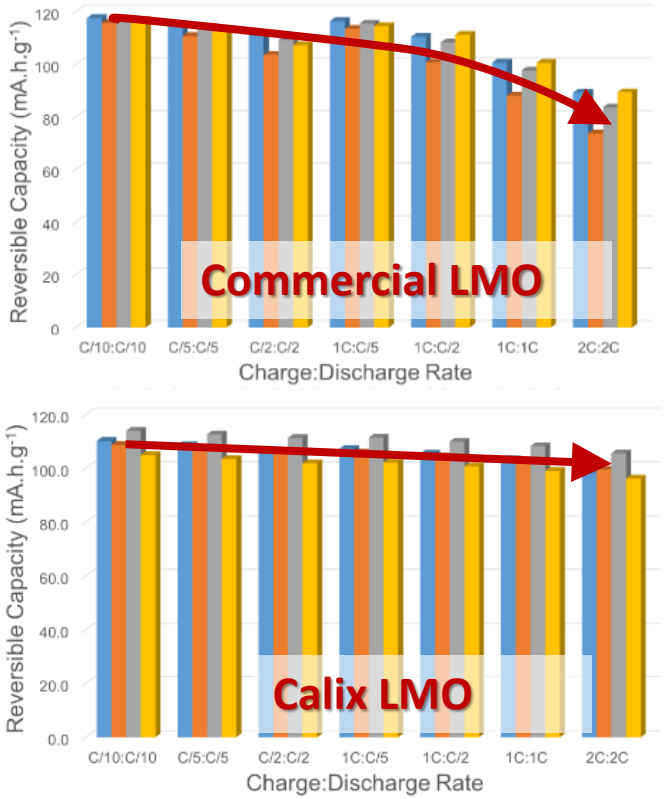
Lithium Borate Ester Salts for Electrolyte Application in Next-Generation High Voltage Lithium Batteries

Binayak Roy, Pavel Cherepanov, Cuong Nguyen, Craig Forsyth, Urbi Pal, Tiago Correia Mendes, Patrick Howlett, Maria Forsyth, Douglas MacFarlane,* and Mega Kar*

https://onlinelibrary.wiley.com/doi/epdf/10.1002/aenm.202101422

Commercial format – pouch cell prototypes

PROTOTYPING AND SCALE-UP OF COMMERCIAL FORMAT CELLS FEATURING CALIX LMO IS UNDERWAY



- Calix has engaged AMTE Power and its partners QinetiQ and MEP technologies to undertake prototyping and scale-up of commercial format pouch cells and battery packs exploiting Calix high performance LMO material
- The initial pouch cell design and prototyping programme which will inform the cell design specifications for the next stage of pouch cell production scale-up programme is underway – first phase has been completed and second phase is underway
- Prototype battery pack (2 kWh) being developed to commercial scale for demonstration of the first truly 'Australian cathode' in 2022

Single layered pouch (SLP) cell prepared by Qinetiq featuring Calix LMO cathode

"Calix has developed an intriguing class of electrode materials with a truly unique structure. We're excited to be working with Calix on the integration and demonstration of its LMO and future cathode chemistries into prototype battery pack for high power applications"

Dr Mamdouh Abdelsalem, AMTE Power

Half-cell benchmarking tests of Calix LMO relative to a commercial competitor LMO as carried out by Qinetiq were consistent with Deakin's results and show that the rate performance of Calix's LMO is retained at commercially relevant coating formulations (>95wt% LMO) and active material areal loadings (2mAh/cm^2)

Our battery universe is broad, and expanding…

MULTIPLE DEVELOPMENT AND TRAINING PROGRAMS IN AUSTRALIA AND EUROPE…

Progress since our March 2021 capital raise

ADVANCED BATTERIES: ACCELERATION PLANS – ON TRACK

Key Challenge	Description		2021	2022	2023	2024
LMO Full Cell Performance	1. Commercially-relevant loadings of Cathode Active Material[1] 2. Long term 500-1000+ charge-discharge cycling performance	Complete	✓			
Field Trials	Demonstration of the technology in a commercially relevant format at real world/application specific conditions[2]	On Track				
Scale-Up	Demonstrate electrochemical performance of materials produced in commercially relevant quantities (grams → kgs → tonnes) 1. Stage 1: Lab (grams) → pilot production (kgs) - underway 2. Stage 2: Pilot production (kgs) → Commercial demo (tonnes)	On Track On Track	Stage 1		Stage 2	
Optimised / Combined / New Chemistries	1. Optimise LMO 2. Test new materials / chemistries	On Track	Iterative / On-going			
Electrode / Electrolyte Optimisation	Experiment with different combinations to maximise cycling stability	On Track	Iterative / On-going			

1. >2 mAh/cm²
2. (1- 10 kWh)

In Summary: Opportunities to apply the Calix technology across the battery value chain

Sustainable Processing

Processing of spodumene to produce lithium

- ✓ Excellent test results on spodumene processing using Calix Technology
- ✓ May 2021: MOU with Pilbara Minerals Limited (ASX:PLS)
- ✓ Co-development of a “mid-stream” lithium chemicals refinery utilising the Calix Technology
  - ✓ Phase 1: Scoping Study target late 2021 – WATCH THIS SPACE
  - ✓ Phase 2: If successful - JV formation target H1 2022 and FEED study
  - ✓ Phase 3: If successful Demonstration Plant JV target 2024

Advanced Batteries

The manufacture of advanced manganese oxide materials for lithium ion batteries

- ✓ New $LiMn_2O_4$ cathodes formulated to multi-kg scale
- ✓ Significantly lower energy and carbon processing route than conventional LMO production
- ✓ Unique structure facilitates high-rate and performance stability
- ✓ Prototype battery pack (2 kW) being developed to commercial scale for demonstration of the first truly ‘Australian cathode’ in 2022
- ✓ Process flexibility – applicable to a wide range of electrode materials

Glossary

Term	Meaning
Aluminium (Al)	Chemical element with the symbol Al
Anode	The negative electrode of a battery
BATMn	Calix's core kiln technology – electrified – for battery and catalyst materials production
C, 2C, 4C, D	Charge rate, 1 C = charge in 1 hour, 2C charge in 30 min, 4C charge in 15 min etc. D is discharge – same metrics
Calcium (Ca)	Chemical element with the symbol Ca
Carbonation	The capture of carbon dioxide by contacting with lime (calcium oxide), to form limestone (calcium carbonate)
Cathode	The positive electrode of a battery
CO_2	Carbon Dioxide
Copper (Cu)	Chemical element with the symbol Cu
Electrode	The material that stores the lithium ions in a charged (anode) or discharged (cathode) state in a lithium ion battery
Electrolyte	The medium that allows ions to move between the battery electrodes, via the separator
ESG	Environment, Social and Governance considerations
Fines	Small particles, which are usually very difficult to handle in kilns etc as they simply get blown out
Iron (Fe)	Chemical element with the symbol Fe
LFP	Lithium Iron Phosphate – a battery cathode material
LMO	Lithium Manganese Oxide – a battery cathode material
Lithium (Li)	Chemical element with the symbol Li
Lithium Concentrate / Lithium Salt / "Mid-Stream" Lithium	A form of lithium that is high in lithium content, to be shipped and utilised by battery producers
Lithium ion	The ionic form of lithium (Li+) – a positively charged atom of lithium
LTO	Lithium Titanium Oxide – a battery anode material

Glossary

Term	Meaning
Manganese Carbonate ($MnCO_3$)	Form of manganese used mainly in agriculture as a fertiliser supplement
Magnesium (Mg)	Chemical element with the symbol Mg
Manganese (Mn)	Chemical element with the symbol Mn
Nickel (Ni)	Chemical element with the symbol Ni
NCA	A battery cathode material made from nickel, aluminium and cobalt
NCM, or NMC	A battery cathode material made from nickel, manganese and cobalt
Potassium (K)	Chemical element with the symbol K
Separator	The barrier between the anode and the cathode that prevents them touching, inside the battery
Sodium (Na)	Chemical element with the symbol Na
Spodumene	A high lithium-containing ore, and the source of the majority of the world's lithium supply
α-Spodumene	A tight Li-crystal formation, from which extraction of Li is difficult
β-Spodumene	A loose Li-crystal formation, from which extraction of Li is much easier than the alpha-form
Sulphur (S)	Chemical element with the symbol S
Tpa	Tonnes per annum
Wh / kWh	Watt-hours / kilowatt-hours - a measure of energy

Because there's only one Earth…

…Mars is for quitters

Phil Hodgson
Managing Director & CEO
phodgson@calix.global
+61 2 8199 7400

Darren Charles
CFO & Company Secretary
dcharles@calix.global
+61 2 8199 7400

Simon Hinsley
Investor Relations
simon@nwrcommunications.com.au
+61 401 809 653

Follow us on Twitter **@Calixlimited**

Subscribe to our Newsletter