



## ASX Announcement

2 September 2021

# Calix Investor Day Presentation

**Sydney, Australia 2 September 2021 – Multi-award-winning Australian technology company Calix Limited** (ASX:CXL, Calix or the Company), is pleased to provide a copy of the presentation materials for its Investor Day to be held today, Thursday 2 September from 10:00AM AEST to 12:15PM AEST.

The Investor Day will profile all lines of business, their achievements and outlook, led by the lines of business managers, with some special guests. Investors will be able to submit questions to be answered at the end of each segment.

The agenda for the Investor Day is as follows:

10am: Introductory comments	Phil Hodgson, Calix CEO and Managing Director
10:05: Re-Cap FY21 Financial Results	Darren Charles, CFO
10:20: Water Business	Bill Karis and Doug Kelley
10:40: CO <sub>2</sub> Business	Phil Hodgson and Adam Vincent
11:00: Sustainable Processing	Andrew Okely and Michael Wheatland
11:20: Biotech	Rob van Merkestein
11:40: Advanced Batteries	Matt Boot-Handford
12:00: "The Skunkworks"	Mark Sceats and Matt Boot-Handford
12:15: Conclusions / summary / last questions	Phil Hodgson

Register for the investor webinar at the link below:

[https://us02web.zoom.us/webinar/register/WN\\_bQL9HLjvTQOHn0Kdtmlcuw](https://us02web.zoom.us/webinar/register/WN_bQL9HLjvTQOHn0Kdtmlcuw)

Investors can submit live questions during the webinar and are also invited to send questions prior to the webinar to [simon@nwrcommunications.com.au](mailto:simon@nwrcommunications.com.au).

After registering, you will receive a confirmation email containing information about joining the webinar.

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

Phil Hodgson, Managing Director and CEO  
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## About Calix

Calix is a team of dedicated people developing a unique, patented technology to provide industrial solutions that address global sustainability challenges.

The core technology is being used to develop more environmentally friendly solutions for sustainable processing, advanced batteries, crop protection, aquaculture, wastewater and carbon reduction.

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:

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# Calix Limited Investor Presentation

September 2021



# MARS IS FOR QUITTERS



We believe our responsibility starts at home.

That's why we're driven to use our unique technology to repair, preserve and prevent future harm to it.

Because there's only one Earth, and it's already ours.

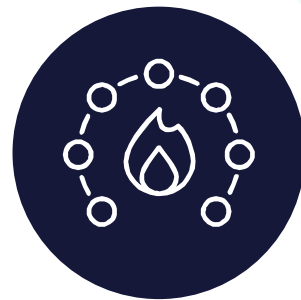
# “Environment / Social / Governance” (ESG) Interest is growing



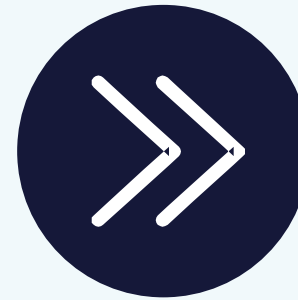
GLOBAL ECONOMIES, COMPANIES AND INVESTMENT FUNDS ARE ALL HEADING IN ONE DIRECTION



**50% of global GDP\***  
and carbon emissions currently  
under net-zero commitments.  
Source: Energy and Climate  
Intelligence Unit



**Companies committed  
to net-zero emissions**  
CAC 40, DOW 30, FTSE100 and  
IBEX 35. Source: ECOACT



**ESG Exchange Traded Funds  
double in 2020**  
US\$ 8 billion net inflows in Oct 2020  
compared to US\$ 3 billion in Dec  
2019 globally. Source: BloombergNEF



**USD 3 trillion *per  
year* to 2030**  
Global investment capital  
required to achieve  
sustainability outcomes\*\*

\*Excludes US – would jump to 2/3 if US commits also

\*\*IEA World Energy Outlook 2020 – Sustainable Development Scenario

# The ESG investment theme is only just beginning



“It’s not often an investing theme comes along that is both certain, and certainly huge, but we’ve got one right now. The theme is climate change, or more specifically, the transition to a zero-carbon world.”

**Alan Kohler –  
13 Feb 2021**

“The amount of money moving into ESG [environmental, social and governance] or low-carbon strategies has been very, very large. If you look at all of the motivators around the world, this kind of investing is going to be growing very, very quickly over coming years. I think it’s **something no investor can ignore**”

**IFM quantitative equities  
executive director  
Laurence Irlicht  
AFR - 15 Mar 2021**

“TPG has amassed private equity's largest war chest dedicated to technology aiming to curb climate change amid a growing scramble by investors drawn to one of the world's foremost global challenges. (It) has landed **\$5.4 billion** in funding for the first close of its new Rise Climate Fund, and is still targeting a total of \$7 billion, up from an initial goal of \$5 billion. “

**Ryan Price  
Pitchbook –  
27 July 2021**

“Climate change is the next major mega-trend, and we believe it represents the biggest investment opportunity since the internet. We’re just at the beginning of the next big S-curve, a massive and sustainable decades-long growth trend.”

**Munro Partners Portfolio  
Manager James Tsinidis  
AFR - 1 Sep 2021**

“Investors should no longer view the transition to a low-carbon economy as a distant event as it is happening here and now. Climate risk is investment risk, and the narrowing window for governments to reach net-zero goals means that investors need to start adapting their portfolios today. We are still in the early stages of a tectonic shift toward sustainable investing, and the full consequences of this shift are not yet in market prices.”

**BlackRock’s global chief  
investment strategist - Wei Li in  
AFR - 1 Sep 2021**

# Calix Limited is developing multiple environmental business opportunities



## Water

Water Treatment  
Aquaculture



## CO<sub>2</sub> Mitigation

Cement  
Lime



## Biotech

Crop Protection  
Marine Coatings



## Advanced Batteries

Advanced Cathode & Anode materials



## Sustainable Processing

Mineral and chemical processing

Common Technology Platform Each a multi-\$B opportunity\*

Growing direct / distributor sales

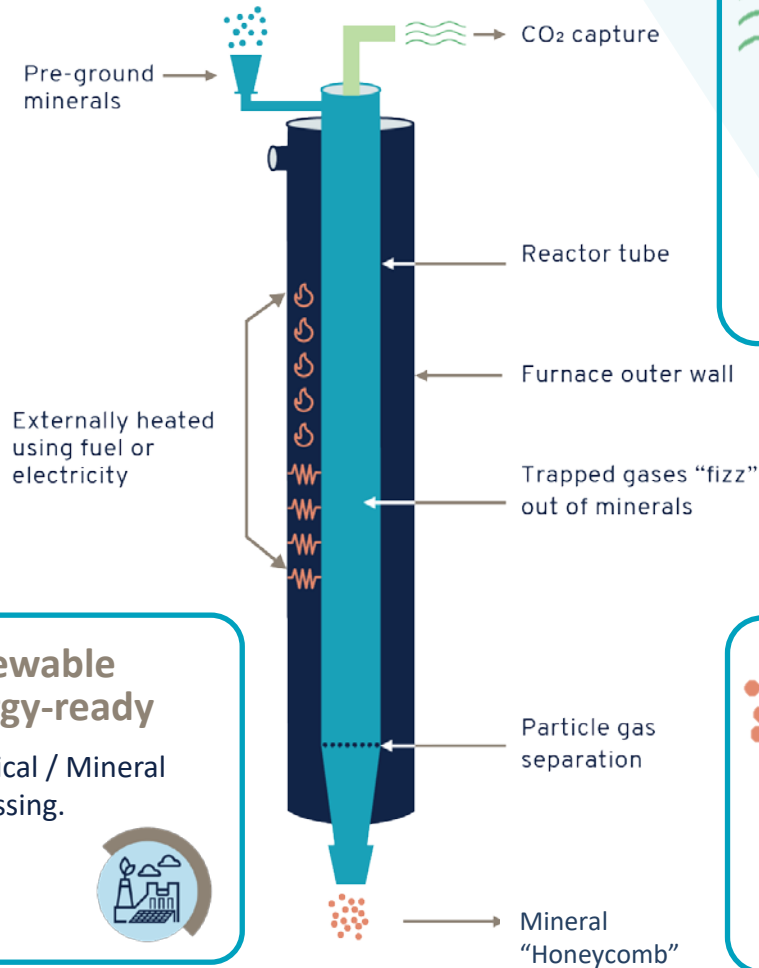
JV / Licensing and/or Spin-out

*\*Frost and Sullivan - Market Opportunity for Calix Flash Calcination : Calix Prospectus 2018, Section 2 for Water, CO<sub>2</sub>, Advanced Battery (including Sustainable Processing) and Crop Protection opportunities*



# Calix's Core Technology

A PATENTED PLATFORM TECHNOLOGY WITH **3** KEY FEATURES



**1**

**CO<sub>2</sub> capture**

When processing limestone, gas exhaust is high purity CO<sub>2</sub>

**3**

**Renewable energy-ready**

Chemical / Mineral Processing.

**2**

**Highly-active materials**

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

**A New Type of Kiln...**

**The "Calix Flash Calciner" or CFC**

25 patent families covering core technology and applications

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

## Summary of achievements – FY21



### Water

Strong growth of 36% in core product sales

Improved gross margins on sales from 24% to 27%



### CO<sub>2</sub> Mitigation

Low Emissions Lime and Cement project passes pre-FEED milestone

MOU's executed with Adbri and Tarmac for CO<sub>2</sub> mitigation projects for lime in Australia and the UK

Part of successful "HILT-CRC" bid for \$39m in Australian government funding – heavy industry decarbonisation



### Biotech

Crop protection product continues successful results and initial sales in Europe

3 Materials Transfer agreements executed for marine coatings and trials commenced

\$1m secured under the Australian Governments Modern Manufacturing Modernisation Fund to advance biotech capability



### Advanced Batteries

Highly prospective early results – capital raised to in-house capability



### Sustainable Processing

Calix electric calciner ordered by SaltX for their novel energy storage system

MOU executed with Pilbara Minerals for "midstream" lithium salt JV

MOU executed with RHIMagnesita for joint development of CO<sub>2</sub> mitigation solution for refractory industry

March 2021: Successfully raised \$19m through a Placement and subsequent Share Purchase Plan (SPP), providing additional funding for the Company to invest in its advanced battery development program and accelerate the development of its other lines of business.

# Introduction – Calix, Sustainability and Positive Impact

## OUR GENERAL MANAGER – MARKETING AND COMMUNICATIONS



**Audrey Barucchi**

### **General Manager - Marketing and Communications**

- Audrey is responsible for planning, development of Calix's marketing and communications strategies and plans, that cover a full mix of tools, including media and public relations, internal communications, brand marketing, web marketing, advertising, direct marketing, digital and social media and production of materials.
- Audrey specialises in the fields of engineering marketing and communication strategies with a focus on differentiation and brand equity, and a strong interest in sustainable development and circular economy.
- Prior to Calix, Audrey was National Marketing Manager for Douglas Partners, an Australian leader in geotechnical engineering. She also worked in sourcing and procurement in different parts of China for several years.
- Audrey holds a Bachelor in Applied Foreign Languages (LEA), a Master of Management (SKEMA Business School), an MBA in International Business and is studying a Master of Psychology. She is also a certified Yoga Instructor.

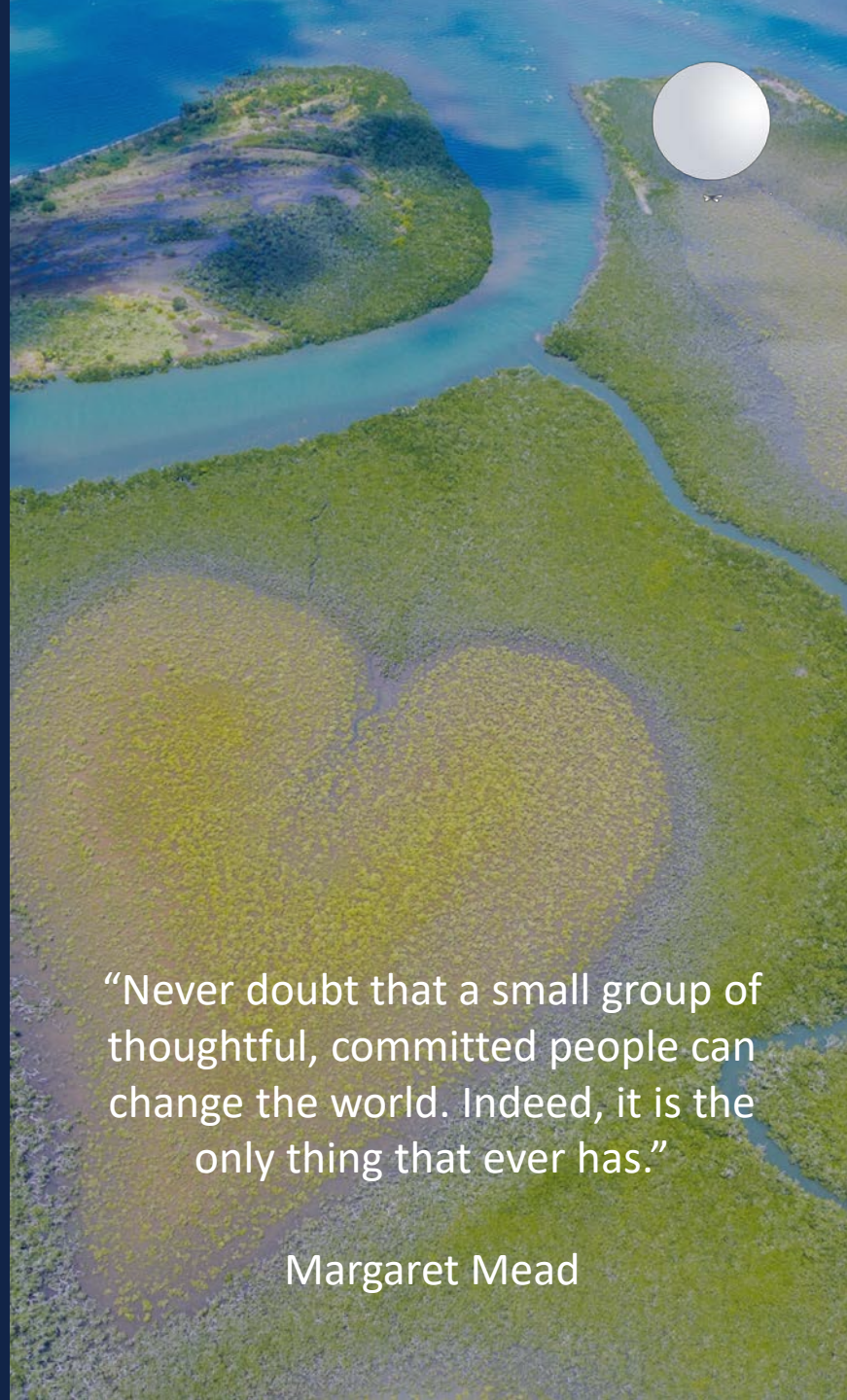
# Sustainability

LIVING UP TO OUR PROMISES

Solving Global Challenges has been the basis of Calix's passion and business for more than a decade, with a mission to become a leading global innovator of industrial solutions for the environment.

By aligning innovation and development initiatives with the UN Sustainable Development Goals (SDGs), we are driven to make a positive difference for the long term. Since 2020, Calix has been a member of the United Nations Global Compact, supporting its ten founding principles related to:

- Human Rights
- Labour
- Environment
- Anti-Corruption



“Never doubt that a small group of thoughtful, committed people can change the world. Indeed, it is the only thing that ever has.”

Margaret Mead

# Positive Impact

GIVING BACK

At Calix, we take our Corporate Social Responsibility (CSR) seriously, and we believe we can help create lasting social change that benefits the whole society, continue to support the communities in which we operate, while continuing to grow.

Calix has been a corporate member of WaterAid since 2019, an international not-for-profit organisation, determined to make clean water, decent toilets and good hygiene normal for everyone, everywhere within a generation.

Calix is a proud Official Supporter of Ocean Impact Organisation, supporting innovation for a healthy ocean. Calix sponsors the Bacchus Marsh Senior Women's AFL football team, the Cobras.



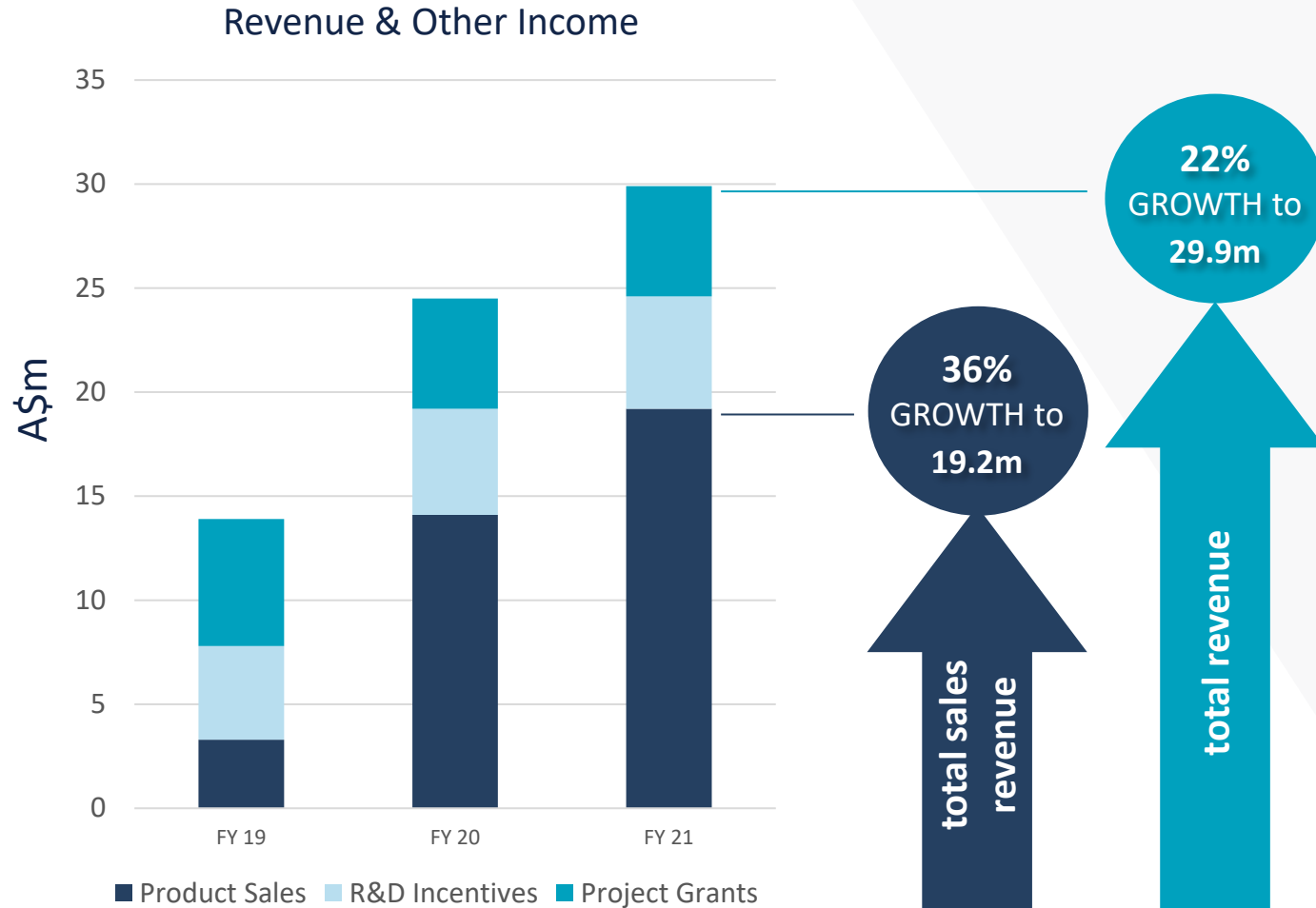


## Recap – FY21 Financials



# Summary of Results FY21 – Continued Revenue Growth

SALES REVENUES AND PROJECT AND GRANT REVENUES CONTINUE GROWTH TRAJECTORY



## Key Take-aways

**Strong growth in total sales & revenue**

**Project grant income continues with R&D projects funded for up to 3 years**

**Gross profit & other income up on growing margins**

**Operating profit remains positive + re-investment for growth continues**

### Sales Breakdown

- Aus / South East Asia revenue were down ~16% (\$0.7m) largely due to COVID impacts (\$0.5m) on our SEA business compared to FY20
- US revenues continued their growth – up ~12% since acquiring the business in December 2019
- Overall gross margin grew to 27% (up from 23% pcp)

# Summary of Results FY21 - Profit & Loss Highlights

ACCELERATING SALES, MAINTAINING +VE OPERATING PROFIT AND RE-INVESTING FOR GROWTH



	FY21 (\$m's)	FY20 (\$m's)	Comment
Sales revenue	19.2	14.1	Up 36%
Total revenue	29.9	24.5	Up 22%
Gross Profit & Other income	15.7	13.7	Up 15%
Sales & Marketing expenses	5.9	5.0	
R&D	7.1	5.6	
Admin	2.6	1.7	
Operating Profit	0	1.5	

Despite COVID, we continued to grow sales from our municipal & industrial customers – wastewater treatment an “essential service”.

The impact of our plant upgrades in the US are starting to flow through to growing gross margin – up from 23% to 27% compared to FY20.

Project grant income continues to flow through, with R&D projects funded for up to 3 years.

Growth in opex represents increased investment in R&D, engineering and commercial support, including new people, to strengthen capability across our lines of business

## Summary of Results FY21 – Balance Sheet highlights

GROWING OUR ASSET BASE, VERY LOW DEBT, BUILDING BALANCE SHEET STRENGTH



	30 June 21 (\$m's)	30 June 20 (\$m's)	Comment
Total Assets	51.6	42.8	
Total Liabilities	13.5	16.6	
<b>Net Assets/Total Equity</b>	<b>38.1</b>	<b>26.2</b>	
<i>Excluding deferred revenue</i>			
Current assets	27.0	19.4	
Current liabilities	5.2	8.3	
<b>Net surplus of current assets over current liabilities [ex deferred revenue]</b>	<b>21.8</b>	<b>11.1</b>	
<b>Property, plant &amp; equipment</b>	<b>14.5</b>	<b>14.6</b>	
<b>Intangible assets, including goodwill</b>	<b>8.9</b>	<b>8.0</b>	

Capital raise in March, strongly supported by new and existing investors, heavily oversubscribed, provides strong base as we accelerate investment in our Lines of Business.

Cash on hand of \$15.1m and \$8m in grants & rebates receivable over the next quarter. We have no debt – and undrawn facilities of \$4m

Continue to take conservative approach to the carrying value of our R&D Plant assets (LEILAC-1) - written down to zero. However, Leilac-2 is unlikely to be impaired as aggressively.

Intangibles increased as we have finalised the IER acquisition accounting and continued investment in patent portfolio. To date, all R&D has been expensed as incurred – not capitalised as intangible asset



# Summary of Results FY21 – Cash Flow Statement highlights

CONTINUED UNDERLYING PRUDENT MANAGEMENT OF CASH



	FY21 (\$m's)	FY20 (\$m's)	Comment
<b>Operating Cashflows</b>	<b>(8.1)</b>	<b>10.2</b>	
Receipts from govt bodies	7.1	16.3	
Payments to LEILAC partners	(4.3)	-	
<b>Investing Cashflows</b>	<b>(6.9)</b>	<b>(16.2)</b>	
PPE	(6.3)	(5.7)	
Intangibles	(0.6)	(0.8)	
Business acquired	-	(9.6)	IER acquisition
<b>Financing Cashflows</b>	<b>19.1</b>	<b>12.6</b>	
New share issue	19.2	15.3	
Movement in debt	0.2	(2.4)	
<b>Cash at end of period</b>	<b>15.1</b>	<b>11.1</b>	

Operating cashflow during FY21 impacted by timing of grant funding profile (FY20 v FY21). **Further \$8m due in next 3 months to fund investments made in FY21.**

Capex investment predominantly in core tech / LEILAC (\$5.1m) and in the expansion of US water manufacturing capability and grow margin (\$1.2m).

March cap raise helps to position the business for planned investment in Advanced Battery and Biotech development facilities – recently supplemented with further grant funding via AusIndustry.



## Deep Dive – Water Business



# Introductions

## OUR WATER BUSINESS SENIOR MANAGEMENT...AND SPECIAL GUEST !



**Bill Karis**

### General Manager Water – ANZ, SEA, EU

- 9-year career with Shell - sales and marketing of fuels and lubricants to a broad range of market segments through multiple channels.
- 2 years with Bluescope Distribution as Sales Transformation Manager
- 3 years as General Manager Wholesale at United Petroleum, delivering double digit growth.
- In addition to his corporate career, Bill started up and grew private company Self-Drive Pty Ltd over 18 years into a multi-million-dollar turn-over business, and remains a director there.
- Bill holds a Bachelor of Mechanical Engineering (University of Technology, Sydney).



**Doug Kelley**

### General Manager Water – US President of IER

- Dr. Kelley is a Ph.D. Chemist with 29 years of research & development experience in water and wastewater treatment technologies.
- He worked with Nalco for 14 years in basic research and new product development.
- He is also the co-inventor on numerous patents related to scale and corrosion control in boiler and cooling water environments.
- As President of Inland Environmental Resources (IER), Doug has spearheaded the development of proprietary, safe, environmentally-friendly, and cost-effective chemical products based on Magnesium Hydroxide.
- Dr. Kelley is a member of the American Chemical Society, American Society of Heating, Refrigeration, & Air-Conditioning Engineers, and the Water Environment Federation.



### Our Special Guest – Duane Leach

City of Snohomish  
WWTP Senior Operator



## Challenge

### TIGHTENING LEGISLATION

Wastewater is normally discharged to the environment, requiring treatment and proper management to protect public health and the environment.

Municipal: Sewer systems collect and transport waste-water to treatment plants, but those sewer systems themselves need treatment

Industrial: Ever tightening restrictions on industrial waste-water discharge limits

To manage wastewater requires infrastructure and chemical dosing and with discharge limits continuing to tighten globally (nitrogen & phosphorus in US, the EU and new environmental limits emerging in China)

Why Water ?

LIMITS ON WASTEWATER DISCHARGE WILL CONTINUE TO TIGHTEN... MAGNESIUM HYDROXIDE LIQUID ("MHL") IS THE ANSWER

## Solution

### MAGNESIUM HYDROXIDE

Unlike alternative chemicals such as iron chlorides and caustic soda, MHL is non-hazardous and a non-corrosive chemical, that is not environmentally detrimental, while sodium is a salinity hazard.

Magnesium Hydroxide Liquid (MHL) offers

higher and longer-lasting alkalinity than caustic soda or lime

Does not cause pH "hot spots"

Enhances bio-treater performance

Provides hydrogen sulphide gas (H<sub>2</sub>S) control

For special applications requiring phosphate / nitrate reduction such as for aquaculture, Calix's very high surface area MHL is ideal



## Our US business

### CAUSTIC REPLACEMENT AND NEW OPPORTUNITY IN MUNICIPAL



#### Business basics:

- ~24,000 tons MHL production across 4 manufacturing facilities
  - Each facility capable of up to 10,000 MHL tons pa
  - Takes largely locally sourced magnesium oxide and “hydrates” to magnesium hydroxide – local brand name “Amalgam”
- Fleet of 13 company owned trucks, 100+ Dosing systems deployed
  - Specialising in caustic replacement – selling proposition based upon safety, longer-term lower cost, world class product, service & technical expertise.
  - Business core in Pacific Northwest and Midwest
  - FY21 Revenues of \$US11.4m, Roughly 11% of estimated total current US MHL market, and less than 5% of total addressable market including caustic & municipal market. Gross Margin ~ 27%.



# Our US business

## CAUSTIC REPLACEMENT AND NEW OPPORTUNITY IN MUNICIPAL



### Corporate Office:

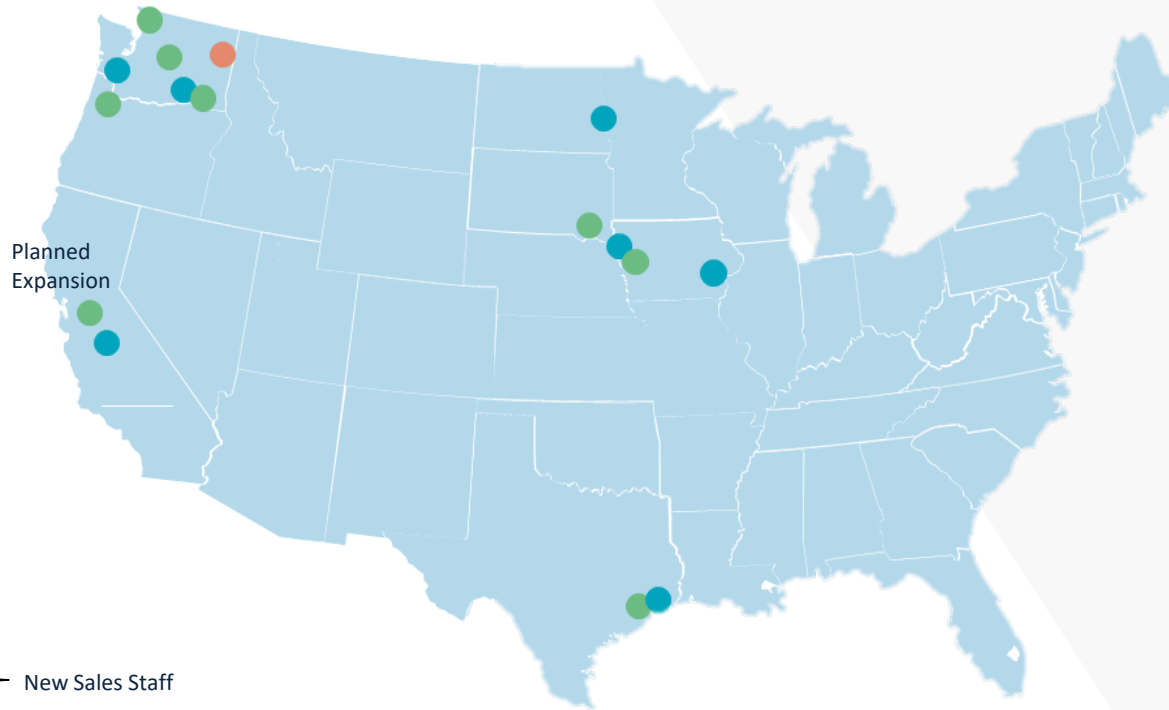
- Spokane, WA

### Operations:

- Pasco, WA
- Centralia, WA
- Sioux City, IA
- Muscatine, IA
- Houston, TX
- Fresno, CA
- Grand Forks, ND

### Sales/Technical Support Staff:

- Wenatchee, WA
- Sumas, WA
- Walla Walla, WA
- Denison, IA
- Gaston, OR
- Houston, TX
- Sioux Falls, SD
- Sacramento, CA



### Strategy:

- Having established more stable product with new technology, seed new markets, then follow-up with local hydration plants (10,000 Tpa capacity) to lower costs
- Aggressive growth planned – US\$1.5m investment to:
  - Seed market in 2 new US states (underway – Texas , California)
  - At least 1, and up to 3 new hydration plants this FY plus local logistics
  - 3 new sales professionals hired
  - High Customer Retention 96%, strong marketing leads, 4 quality leads per month per salesperson, 1 in 4 conversion, 3-month sales cycle, \$250K average customer revenue size
  - Enter municipal / sewer treatment market using Aus monitor / dosing cvp
- Medium Term: Establish “local” raw materials supply and build a Calix calciner



# Water Business - Rest of World



## MARKET LEADING MONITORING DOSING SOLUTION IN WASTEWATER AND UNIQUE PRODUCT IN AQUACULTURE

### Business basics:

- AUS – Solutions for Water Authorities / Councils to optimise odour control & treatment plant KPI's. Calix are the only mine to customer supplier
- AUS – Eng, Ops & technical capabilities offering market leading monitoring - dosing solutions with service & maintenance. leading to KPI's based contracts
- AUS - FY21 Revenues of AUS\$3.6m - roughly 40% of total MHL market
- SEA – AQUA-Cal+ is our unique aquaculture water conditioner that delivers increased feed performance and yield through improved water quality that otherwise is trying to be achieved by multiple chemicals. Active in China, Malaysia, Vietnam and Indonesia
- SEA - total farmed prawn market across SEA estimated ~ 45,000Tn AQUA-Cal+ (\$US67m revenue). Good gross margin business.
- EU - FY21 Market Entry Reseller agreement with partner in Germany executed. Focus on WWTP biogas generation based on results of local trial. 4000+ private and municipal players generate bio electricity. Overall, market looks very similar to US

### Strategy:

- AUS/NZ – **SHARE OF WALLET**: Focus on organic growth in key accounts - industry leading monitoring & dosing solutions with ongoing service and maintenance.
- China – **REBUILD**: recently employed Steve Shaw (Xiao Haidong), Steve has a Master's degree in Aquaculture with a depth of experience in mainland China - focused on developing "Marque" account(s), Sub-Distributors and retailers. Tough Government Discharge limits recently introduced - could place our product at an advantage.
- SEA – **GROW**: FY22 targeting 2 new distributors: Thailand & India
- EU - **NEW MARKET ENTRY**: FY22 - establish raw materials supply, more paid trials and target an EU Hydration plant



**Calix self-contained dosing unit, with continuous H<sub>2</sub>S monitoring & customer telemetry interface**





## Deep Dive – CO<sub>2</sub> Business





# Introductions

## OUR CO2 BUSINESS SENIOR MANAGEMENT...



**Daniel Rennie**

### **General Manager Cement Decarbonisation**

- Dan worked originally in the electricity industry, followed by the Global Carbon Capture and Storage Institute (GCCSI) as a regional representative for Europe based in France. During that time he ran the European CCS Demonstration Project Network, which contained 7 large scale projects.
- He joined Calix in July 2014, primarily to assist with developing the LEILAC proposal under the European Union's H2020 programme, then as the coordinator of the LEILAC project, which started in January 2106.
- Dan has a MA in history from St Andrews in the UK



**Adam Vincent**

### **General Manager Lime Decarbonisation**

- Adam joined Calix in July 2010 after 15 years in technical and operations management
- Has overseen the building and commissioning of Calix's first three demonstration and commercial processing facilities in Australia and Europe.
- Resided in the UK 2016-2018 while managing the LEILAC 1 project.
- Returned to the role of General Manager – Research and Development.
- In January 2021 Adam moved into the role of General Manager – Lime decarbonisation, where he is responsible for the commercial exploitation of the Calix technology into the lime segment.
- Adam holds a Bachelor of Chemical Engineering degree (RMIT University) and a Masters of Engineering Science (Monash University).



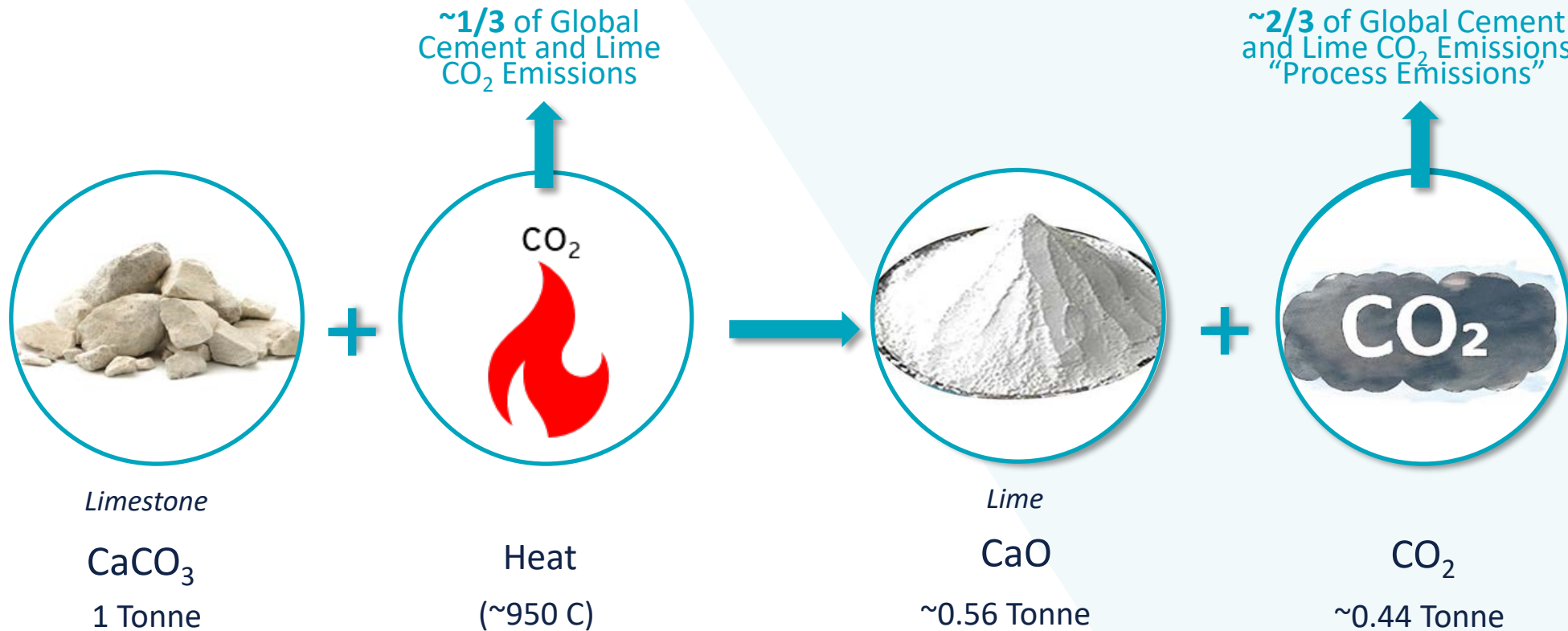
# The CO<sub>2</sub> Problem

LIMESTONE IS THE SECOND MOST UTILISED SUBSTANCE ON EARTH



Cement and lime contribute between 5% and 8% of global anthropogenic CO<sub>2</sub> emissions - about 2.2 BT per annum\*

Around 2/3 of those emissions are unavoidable – coming from the raw material (limestone)



\*Global CO<sub>2</sub> emissions from cement production, 1928–2018 Robbie M. Andrew CICERO Center for International Climate Research, Oslo 0349, Norway, Earth Syst. Sci. Data, 11, 1675–1710, 2019 <https://doi.org/10.5194/essd-11-1675-2019>



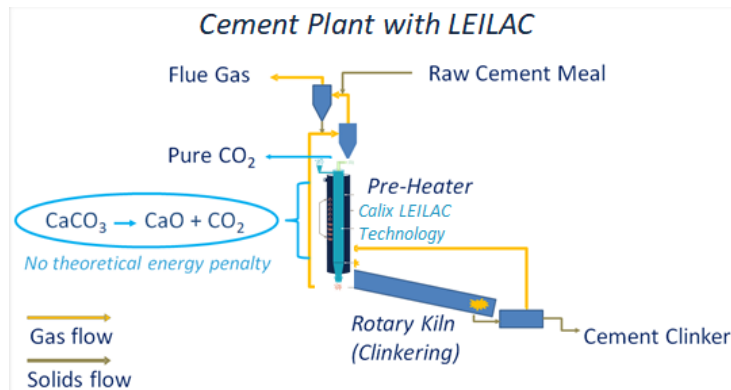
# Growing legislative pressures and incentives continue

OUR INITIAL TARGET MARKETS, THE EU AND US, HAVE MADE SIGNIFICANT MOVES IN THE LAST TWO MONTHS



## European Union – Legislative Progress

- 2018 – EU ratifies phase 4 of the Emissions Trading Scheme, CO<sub>2</sub> permit price jumps from €5 to over € 25
- 2019 – HeidelbergCement pledges net zero CO<sub>2</sub> by 2050, and a 30% reduction on 1990 emissions by 2025
- 2020 – EU legislates net zero CO<sub>2</sub> by 2050. Several countries (and companies !) follow. Innovation fund established contributing 60% of CAPEX and OPEX (for 10 years) for CO<sub>2</sub> projects



### July 2021

- CO<sub>2</sub> EU ETS permit price doubles since 2019 to over € 55 / tonne
- EU introduces even more strict / ambitious targets in draft legislation
  - 55% reduction by 2030 from 1990 levels
  - Maritime shipping to be included for the first time in CO<sub>2</sub> caps

## United States – Legislative Progress

- 2008 – “45Q” tax credit system, up to 75MT CO<sub>2</sub> total, enacted providing
  - US\$10/tonne CO<sub>2</sub> stored via Enhanced Oil Recovery (EOR) and
  - US\$20 / tonne stored in geologic formations (GS)
- 2018 – 45Q was reformed to US\$35 for EOR and US\$50 for GS, and uncapped but limited to 12 years claimable. Minimum facility size dropped from 500kTpa CO<sub>2</sub> to 100kTpa CO<sub>2</sub>
- **May – Sep 2021**
  - Various Acts being introduced into congress and senate looking to increase EOR to \$US50 - 60 and GS to US\$85 / tonne CO<sub>2</sub> + min. facility size dropped to 10kTpa, claimable out to 20 years

Belgium - 2019	Hannover - 2023	EU or US - ASAP
<p>“LEILAC-1” (built)</p> <p>5% slipstream (Cement) Small commercial capacity (Lime)</p>	<p>“LEILAC-2” (funded)</p> <p>20% slipstream (Cement) Large commercial capacity (Lime)</p>	<p>“LEILAC-3” (in planning)</p> <p>100% capacity (Cement)</p>



# Global market opportunities – cement and lime decarbonisation



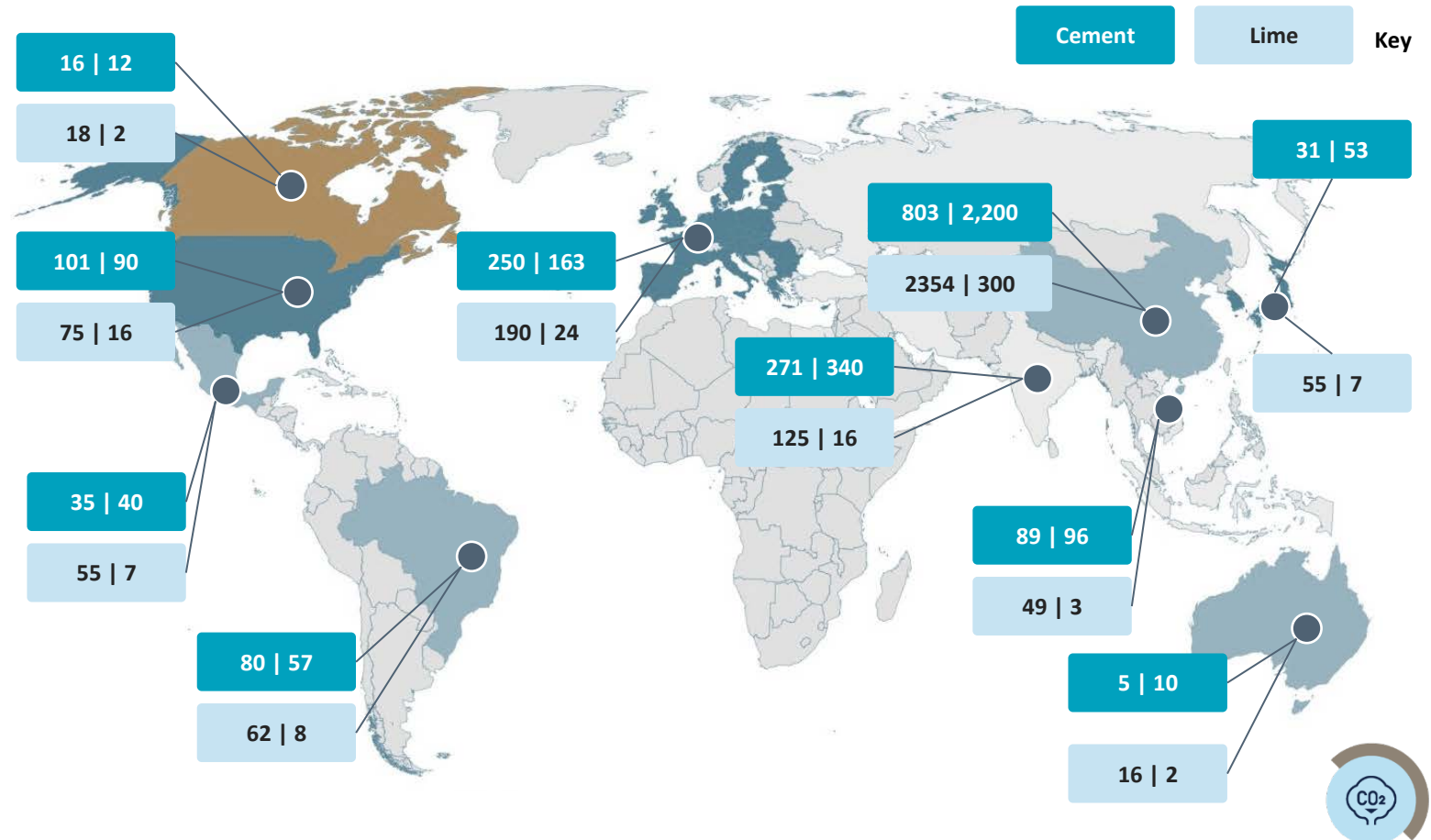
LEILAC HAS SUBSTANTIAL OPPORTUNITY IN ALL PRIMARY TARGET REGIONS, AND WORKING WITH SOME OF THE LARGEST CEMENT, LIME, CHEMICAL AND UTILITIES COMPANIES

LEILAC's immediate focus is on large markets with established carbon pricing regimes and/or similar mechanisms, and developed / developing CO<sub>2</sub> infrastructure

LEILAC is also closely monitoring developments in large markets with some CO<sub>2</sub> policy support emerging (ie China, Middle East), as well as India

## Key markets for lime and cement production:

Number of plants | millions of tonnes produced\*



Source for production data: USGS cement statistics and lime statistics, 2020. Europe: [https://publications.europa.eu/resource/cellar/07d18924-07ce-11e8-b8f5-01aa75ed71a1.0001.01/DOC\\_1](https://publications.europa.eu/resource/cellar/07d18924-07ce-11e8-b8f5-01aa75ed71a1.0001.01/DOC_1)  
 \* In latest year for which data available – typically 2020. Source for China data: DATIS Export Group: <https://datis-inc.com/blog/how-many-cement-plants-are-producing-in-china-2020/> Australia - [Link](#)

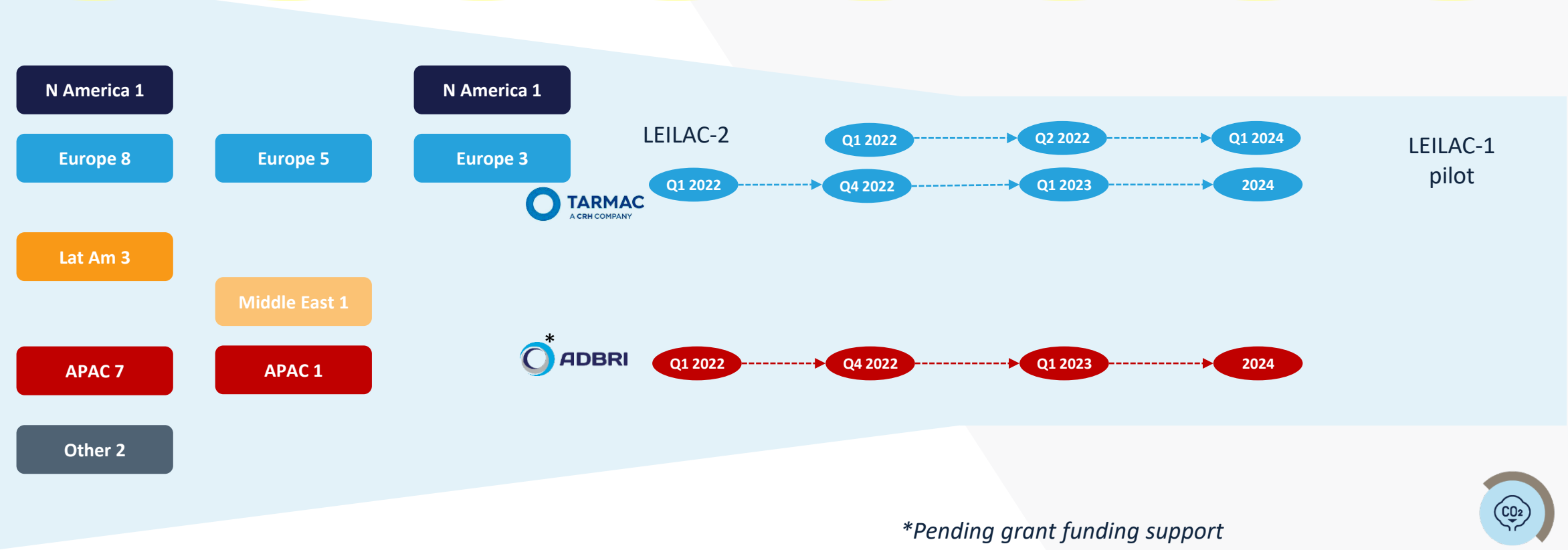


# Our opportunity pipeline for cement and lime



INTEREST IS COMING NOT JUST FROM EUROPE AND THE AMERICAS, BUT ALSO FROM THE MIDDLE EAST AND ASIA...

First contact	Initial scoping	Detailed scoping	Pre FEED	FEED	Final procurement	Construction	Operations
Initial dialogue with customer	Workshop(s) etc to identify preferred site and customer needs	Workshops to define the scope of and terms for a pre-FEED study	Completion of a pre FEED study, leading to agreement to proceed	Completion of FEED study, leading to FID	Final engineering and procurement, leading to contract execution	Construction and commissioning phase	Operations
21	7	4	1	-	-	-	1



\*Pending grant funding support



## Case Study – cement - US

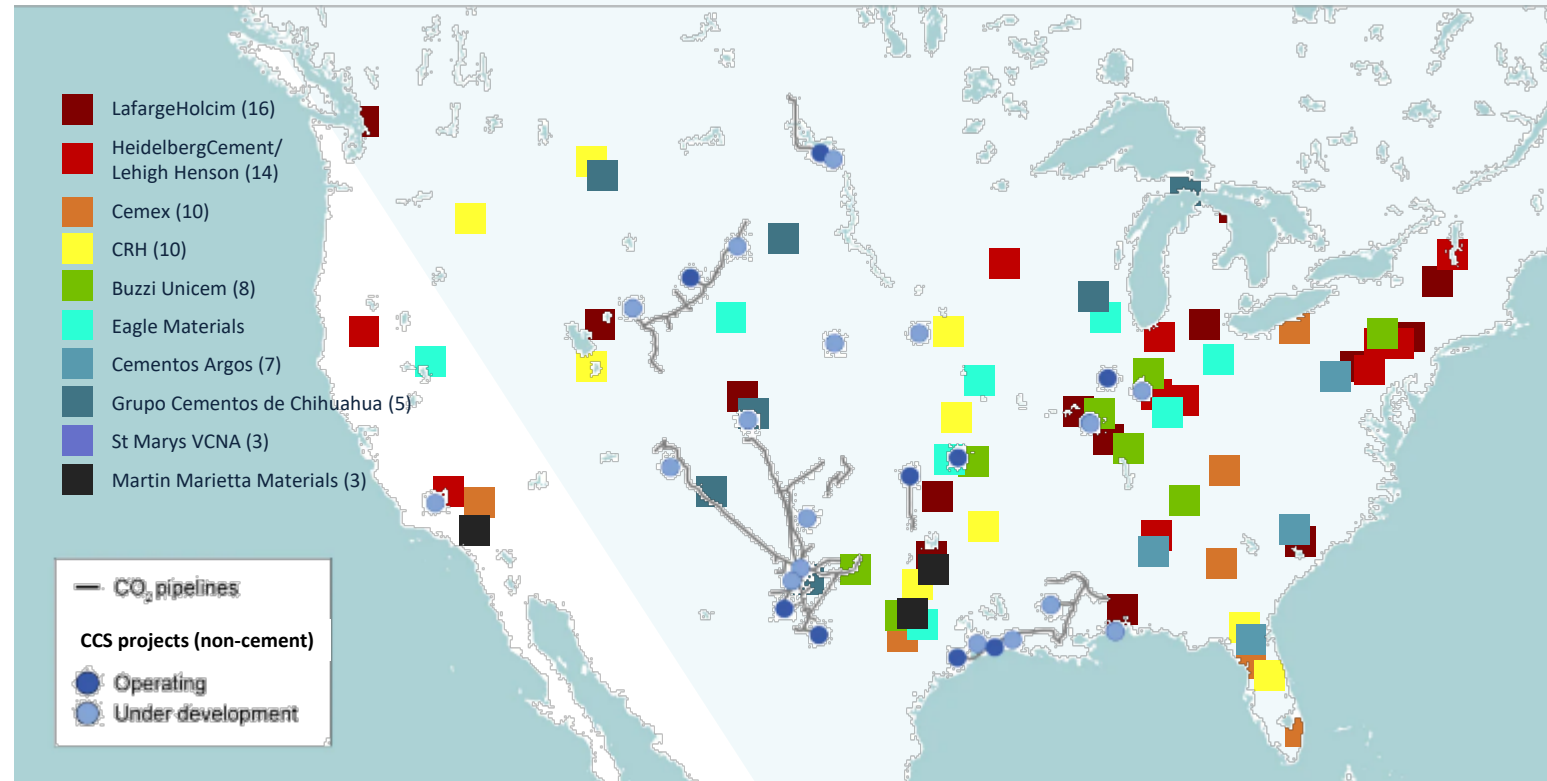
THE US HAS A CO<sub>2</sub> INFRASTRUCTURE IN PLACE, DEVELOPED IN THE 1970S TO ENABLE “EOR”



### US CO<sub>2</sub> pipeline and cement plant locations

More than 4000 miles of CO<sub>2</sub> pipelines are in place and, as of 2014, approximately 68 million tonnes of CO<sub>2</sub> are being injected underground annually for Enhanced Oil Recovery (“EOR”)

A number of cement plants can, and will, take advantage of the CO<sub>2</sub> transport infrastructure that was developed and built in the 1970s.



Cement production in the U.S. via 96 cement plants – comprising at around **128** kilns of which 118 kilns are dry process (long dry, preheater, preheater/precalciner) and 10 are wet process. Most plants were constructed in the 1980s. As a result, the average efficiencies are low compared to countries with newer plants, such as China and India. These produce around **90 million tonnes per annum of CO<sub>2</sub>**.



# Case studies – lime – Australia and the UK



LIME IS MOVING QUICKLY, BOTH IN AUSTRALIA AND THE UK

June 2021: Calix key partner in successful \$39m Federally-funded Heavy Industry / Low Emissions Co-Operative Research Centre (HILT-CRC)

Both a cement and lime opportunity (lime used in steel & aluminium production)



- First project / license agreement “full-scale” application



## • March 2021: Heads of Agreement for Lime project – ADBRI (ASX:ABC)

- 20kTpa CO<sub>2</sub> separation capacity
- Fuel options include hydrogen & renewable electricity
- Additional funding to be sought under HILT-CRC and/or Federal Low Emissions Technology initiatives
- Milestone targets\*\* Phase 1: Early 2022 Pre-FEED, Phase 2 late 2022 FID, Phase 3 2024 Commissioning

- Second project / license agreement “full-scale” application



## • July 2021: MOU for Lime project – Tarmac Ltd (UK)

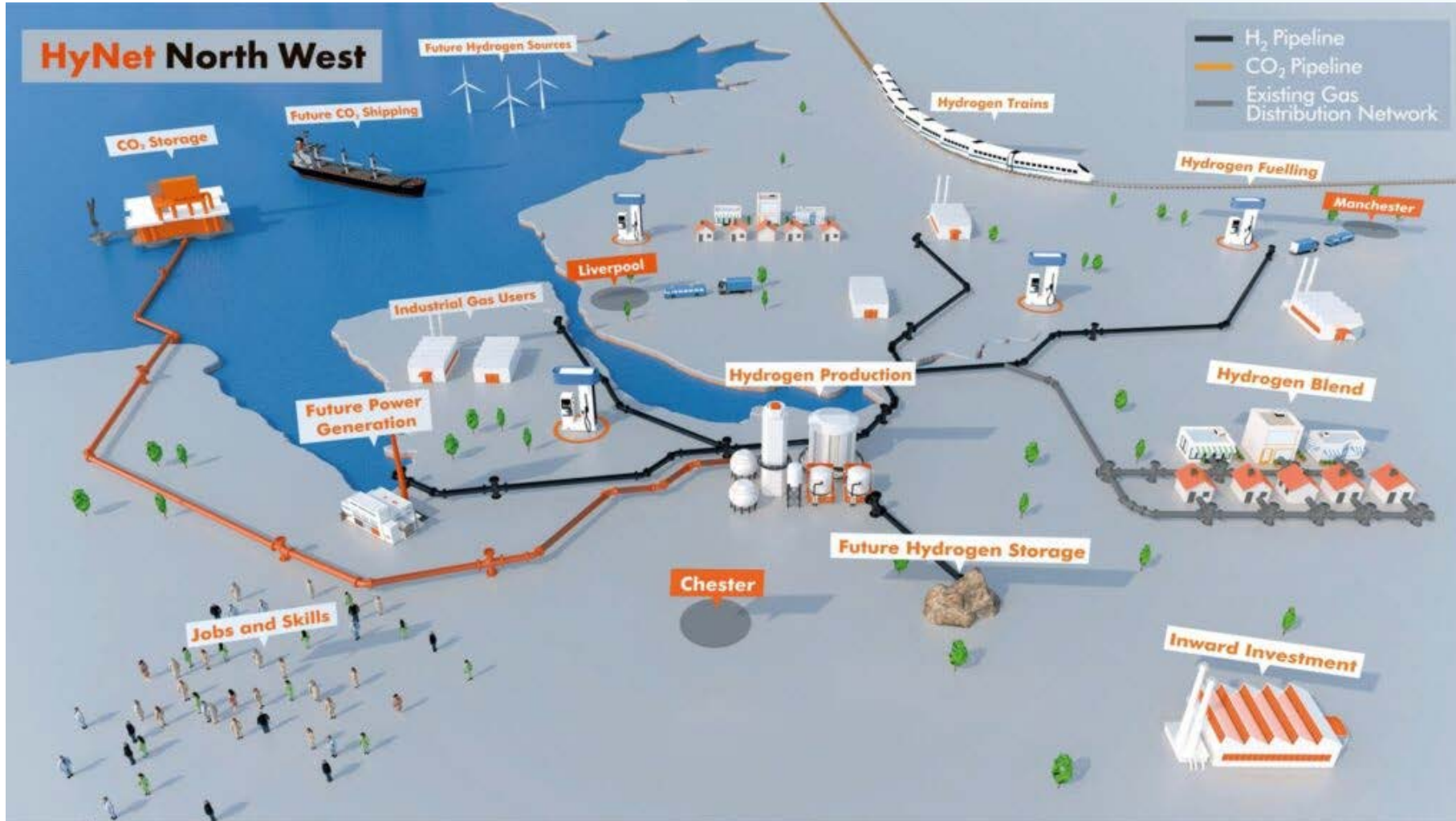
- 20kTpa CO<sub>2</sub> separation capacity
- Fuel options include hydrogen & renewable electricity
- Additional funding to be sought under UK BEIS £1b Net Zero Innovation Portfolio
- Milestone targets - Phase 1: End-Dec Pre-FEED, Phase 2 mid 2022 FID, Phase 3 early 2024 Commissioning

\*\*Pending grant funding support



# CO<sub>2</sub> capture and storage case study

TARMAC AND THE HYNET CLUSTER – UK – TARGETING STORING CO<sub>2</sub> PLUS H<sub>2</sub> PRODUCTION BY 2025



**HyNet North West**  
<https://hynet.co.uk/about/>







## Deep Dive – Sustainable Processing Business



# Introductions

OUR SUSTAINABLE PROCESSING BUSINESS SENIOR MANAGEMENT...AND SPECIAL GUEST !



**Andrew Okely**

## General Manager Sustainable Processing

- Andrew joined Calix in early 2012. His experience covers general business management, sales process design, contract formation and negotiation, business and technical presentations, and strategic planning.
- He has been involved in several international projects, with particular exposure to Asia, and has worked with a wide range of minerals and metals.
- Andrew began his career at Pasminco's Research Centre in Newcastle in 1990, where he investigated various hydro- and pyro-metallurgical processes.
- Andrew had a 17-year career at Outotec where he was Director, Sales and Marketing for the South East Asia Pacific region, in addition to being a member of the executive management team.
- Andrew holds a Bachelor of Engineering (Metallurgical degree (Royal Melbourne Institute of Technology University), a Postgraduate Certificate in Marketing and a Master of Business Finance (University of Technology, Sydney).



**Michael Wheatland**

## Manager – Sustainable Processing

- Joining Calix in 2012, Michael has not only been a critical part of the concept and design of Calix's core technology, but has also led key commercialisation initiatives.
- Michael is now responsible for the global rollout of the Calix Calciner technology across multiple global markets, addressing minerals such as Lithium, Magnesite, and Clay.
- Before joining Calix, Michael had successfully implemented multi-million-dollar projects with Rio Tinto, BHP, Alcoa and now with Calix Sustainable Processing, all of which contribute to his vision of a more sustainable world.
- Michael Wheatland is an Internationally Chartered Engineer



**Ken Brinsden**

## Managing Director & CEO Pilbara Minerals Limited

- Mr Brinsden is a mining engineer with over 25 years' experience in surface and underground mining operations, including roles in mine management, production, and brown-fields and green-fields development roles across a range of commodities.
- Mr Brinsden joined Pilbara Minerals as Chief Executive Officer in January 2016, was appointed Managing Director and CEO in May 2016.
- Mr Brinsden has led the development of the Pilgangoora Lithium-Tantalum project, which has progressed from first drill hole to production in under four years. This exponential growth has resulted in Pilbara Minerals now being one of the world's leading lithium raw materials suppliers with a portfolio of growth options to execute, as the demand for battery raw materials increases.



# Sustainable Processing

CALIX TECHNOLOGY ... EVERYWHERE!



*SaltX*

**Mineral looping  
energy storage**

Bloomberg New Energy Finance predicts Cumulative Energy storage to grow to 942GW by 2040\*<sup>1</sup>



*Refractory*

**CO<sub>2</sub> reduction into existing magnesia production processes**

15 Million Tonnes \*<sup>2</sup> per annum global addressable market



*Spodumene*

**Revolutionary at-mine low CO<sub>2</sub> footprint Li salt manufacturing in Australia**

World Bank modelling shows 500% growth of Lithium to 2050\*<sup>3</sup>



*LC3*

**Next Generation Clay Cement**

Potential Clay production to meet demand 1.1B Tonnes p.a. \*<sup>4</sup>



*Alumina*

**Electrifying Aluminium Oxide production**

Global Alumina production on steady growth past 125Mtpa in 2021 \*<sup>5</sup>



*Electrification*

**Converting thermal processes to electricity**

Deloitte report indicates 45% target for electrification of industrials by 2035\*<sup>6</sup>

\*<sup>1</sup> Environment and Energy Study Institute (2019)

\*<sup>2</sup> Based on RHIM being 15% of the global market (RHIM Annual Report 2020)

\*<sup>3</sup> Forecasts indicate that Lithium is on a 500% growth curve by 2050 (World Bank 2017)

\*<sup>4</sup> Mining Industry worldwide statistics and facts (M. Garside 2021, Statista)

\*<sup>5</sup> Global aluminium oxide production survey, Statista 2021

\*<sup>6</sup> Electrification of Industrials (Deloitte Insights 2021)



# Revolutionary chemical energy storage solutions

SUSTAINABLE PROCESSING : ENERGY STORAGE – COLLABORATING ON LONG TERM ENERGY STORAGE POTENTIAL OF CALCIUM SALTS.



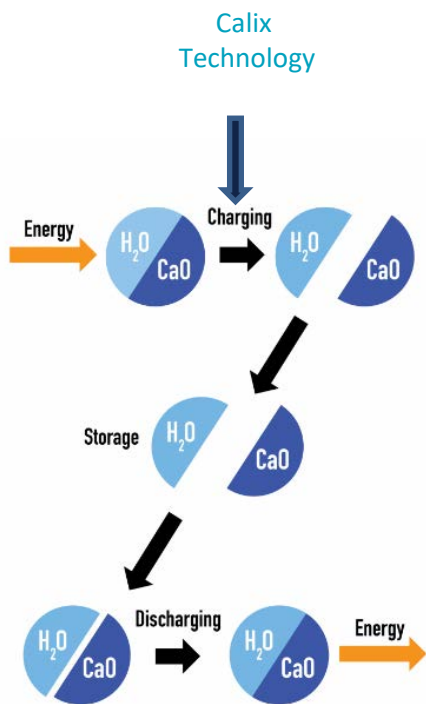
## Example application:

Helsinki city district heat system provided > 7200 GWh of heat to homes and businesses in 2018, 89% of this generated using carbon based fuels (coal and gas) generating 56% of Helsinki's direct CO<sub>2</sub> emissions. Helsinki City has committed to totally replacing these plants by 2035\*. Transition to renewable electricity to feed heat to these systems via the SALTX concept would require **45 LEILAC-2** size Calix units.

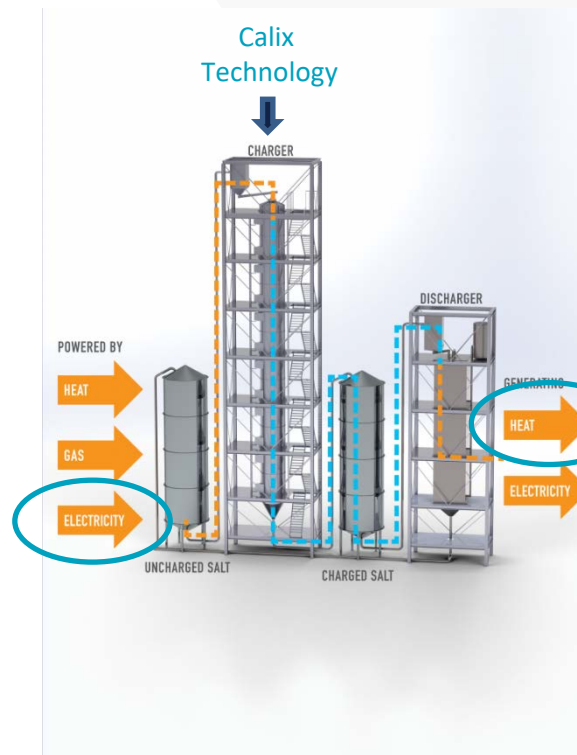
## First steps

SaltX and Calix announced pilot plant to be built in Feb 2021

- Site for pilot plant in Stockholm established
- Design finished for 12m long 270kW pilot calciner
- All items procured, most delivered to site, installation underway.

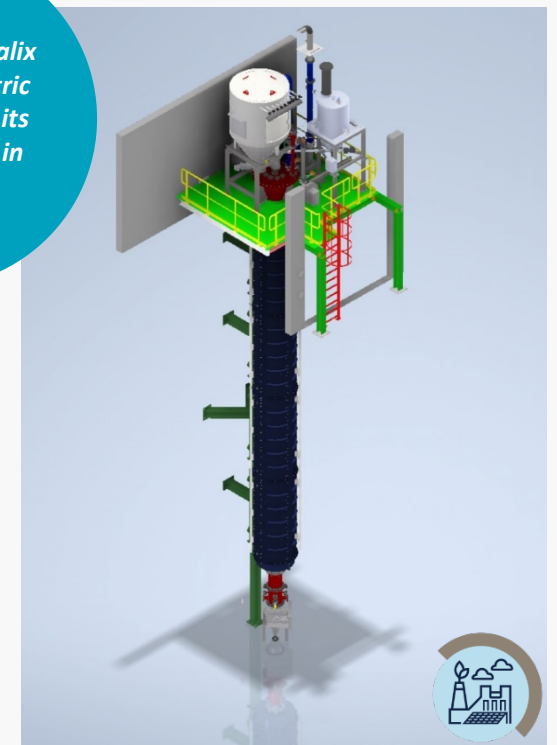


Thermochemical Energy Storage, Calix technology performs the "charging" function using renewable / "spare" electricity. The energy can be stored as a salt for days, weeks or even months before discharging when needed.



Final design of Calix technology electric kiln based upon its "BATMn" plant in VIC

Target market is existing district heat networks which are prevalent throughout the northern Hemisphere including huge cities such as New York and Moscow.



\*<https://energychallenge.hel.fi/heating-helsinki-today>

# Towards net-zero in the Refractory Industry

SUSTAINABLE PROCESSING: MAGNESIA REFRACTORIES – ANOTHER INDUSTRY STRIVING FOR NET ZERO



RHI Magnesita 2021 Half Year Results release 28 July 2021. “Sustainability is fundamental to RHI Magnesita’s long term strategy. The €50 million R&D investment towards CO<sub>2</sub> reduction technologies is progressing well. The company commenced a partnership with Calix Limited to develop a Calix Flash Calciner at an RHI Magnesita site for the capture and storage of CO<sub>2</sub>”.

- **July 2021: MOU with RHI Magnesita (LON:RHIM)** for Calix Technology kiln for (magnesia) refractories
  - Covers concept to Pre-Front End Engineering and Design (Pre-FEED) for a commercial-scale facility
  - 25kTpa CO<sub>2</sub> separation capacity
  - Considering CO<sub>2</sub> re-use or sequestration
  - Fuel options include renewable electricity
- **August 2021**
  - Proof of concept with CO<sub>2</sub> pilot scale tests of >98.5% purity.
  - Results verified by SGS Australia, an independent, NATA certified laboratory.

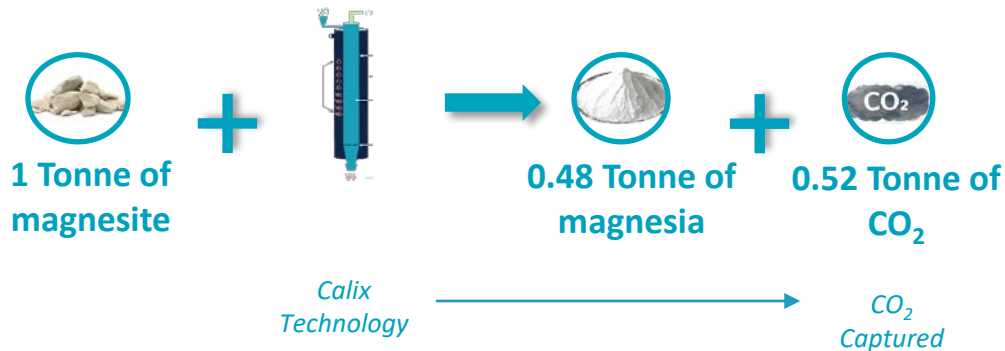
Current progress: 2 Potential Projects have commenced Pre-FEED studies:

- Project 1 – CO<sub>2</sub> separation and sequestration or re-use.
  - 25ktpa capacity producing feed for “green” refractories business development.
- Project 2 – CO<sub>2</sub> reduction through the use of a fully electric calciner.
  - 25ktpa capacity producing low CO<sub>2</sub> MgO for multiple applications.
  - As of late 2020, renewable energy accounted for **87% of the domestically produced electricity** in this location

Next steps

- Complete Pre-FEED studies and move to FEED study phase in FY22
- Develop strategy for wider refractory industry engagement.

**Calix has been producing Magnesium Oxide commercially since 2013. Refractory MgO Market: 15 Mtpa, US\$20b in 2018. \***



\* Based on RHIM being 15% of the global market (RHIM Annual Report 2020)



# Why lower carbon foot-print lithium ?

GLOBAL CAR MANUFACTURERS TARGETING NET ZERO CO<sub>2</sub> INPUTS

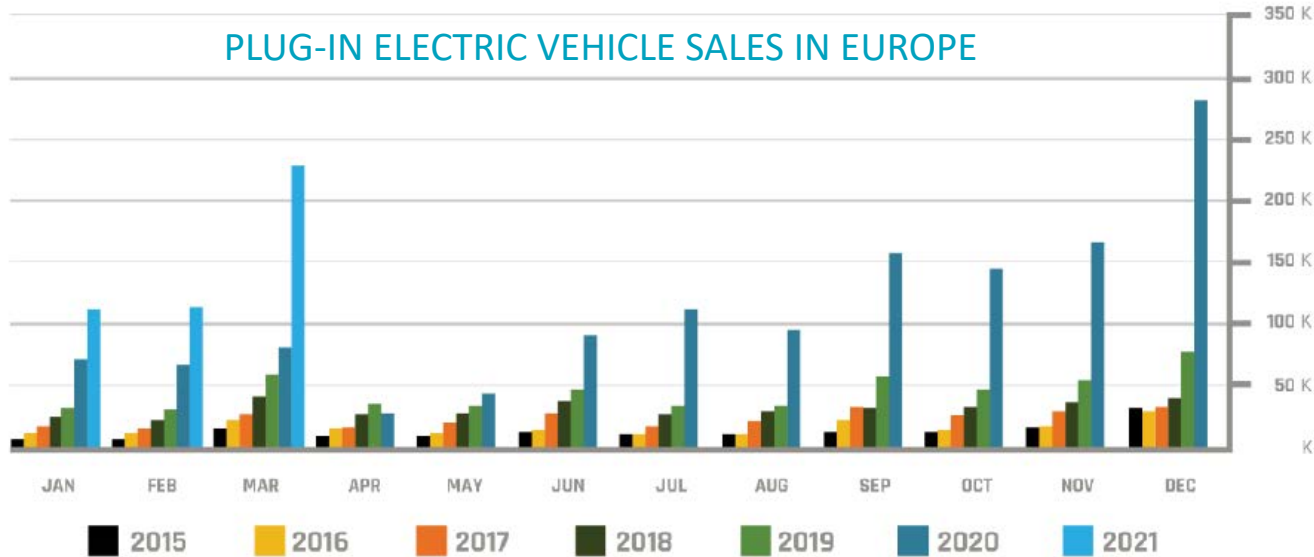


Chart source: Inside Evs 'EV sales blog data

**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 CO<sub>2</sub> neutral

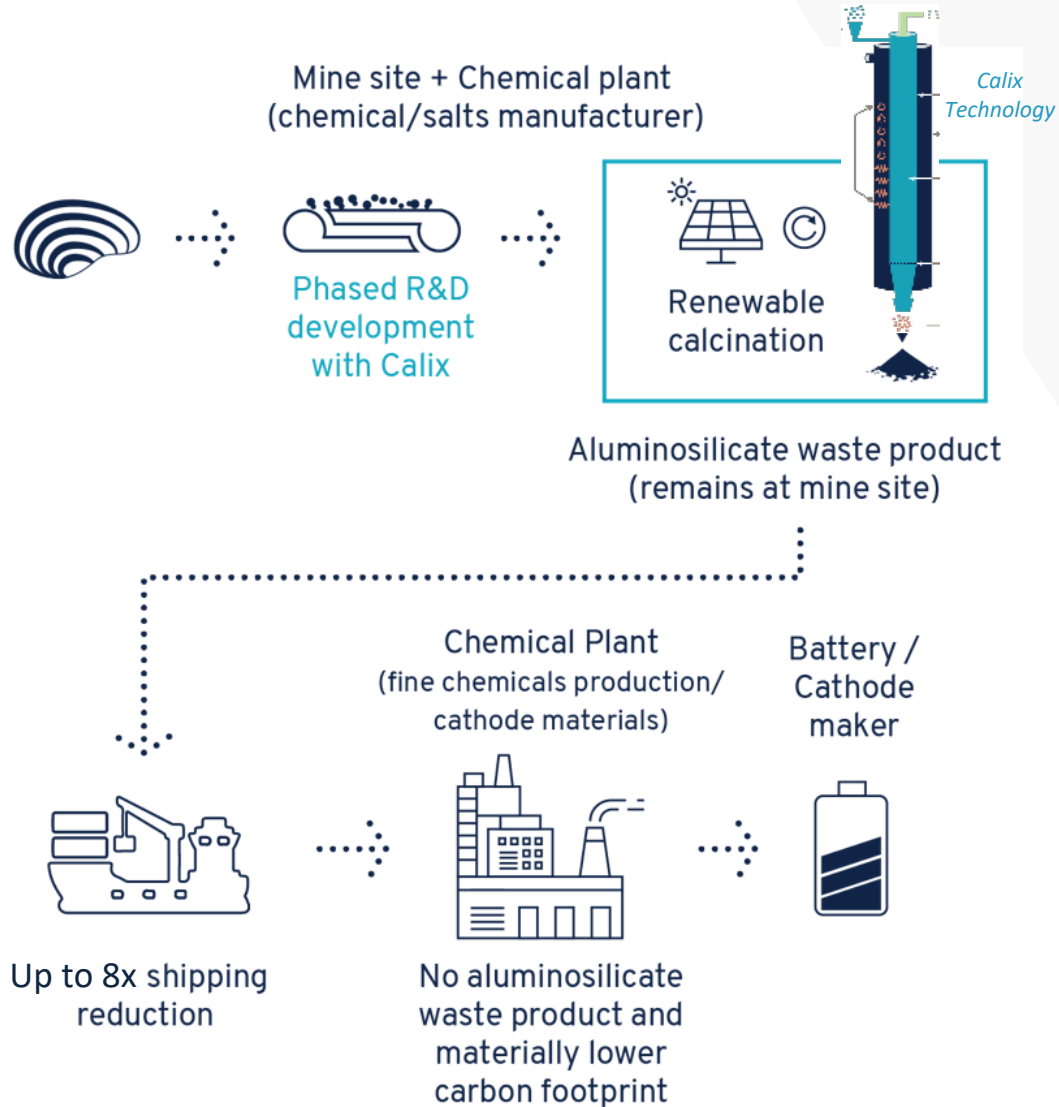
"For electric vehicle batteries and energy storage, the EU would need up to **18 times more lithium** and **5 times more cobalt** in 2030, and almost **60 times more lithium** and **15 times more cobalt** in 2050

\* Batteries [https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/689337/EPRS\\_BRI\(2021\)689337\\_EN.pdf](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<sub>2</sub> footprint Lithium salt production



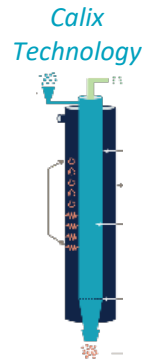
# An electric / renewably - powered Australian lithium process

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

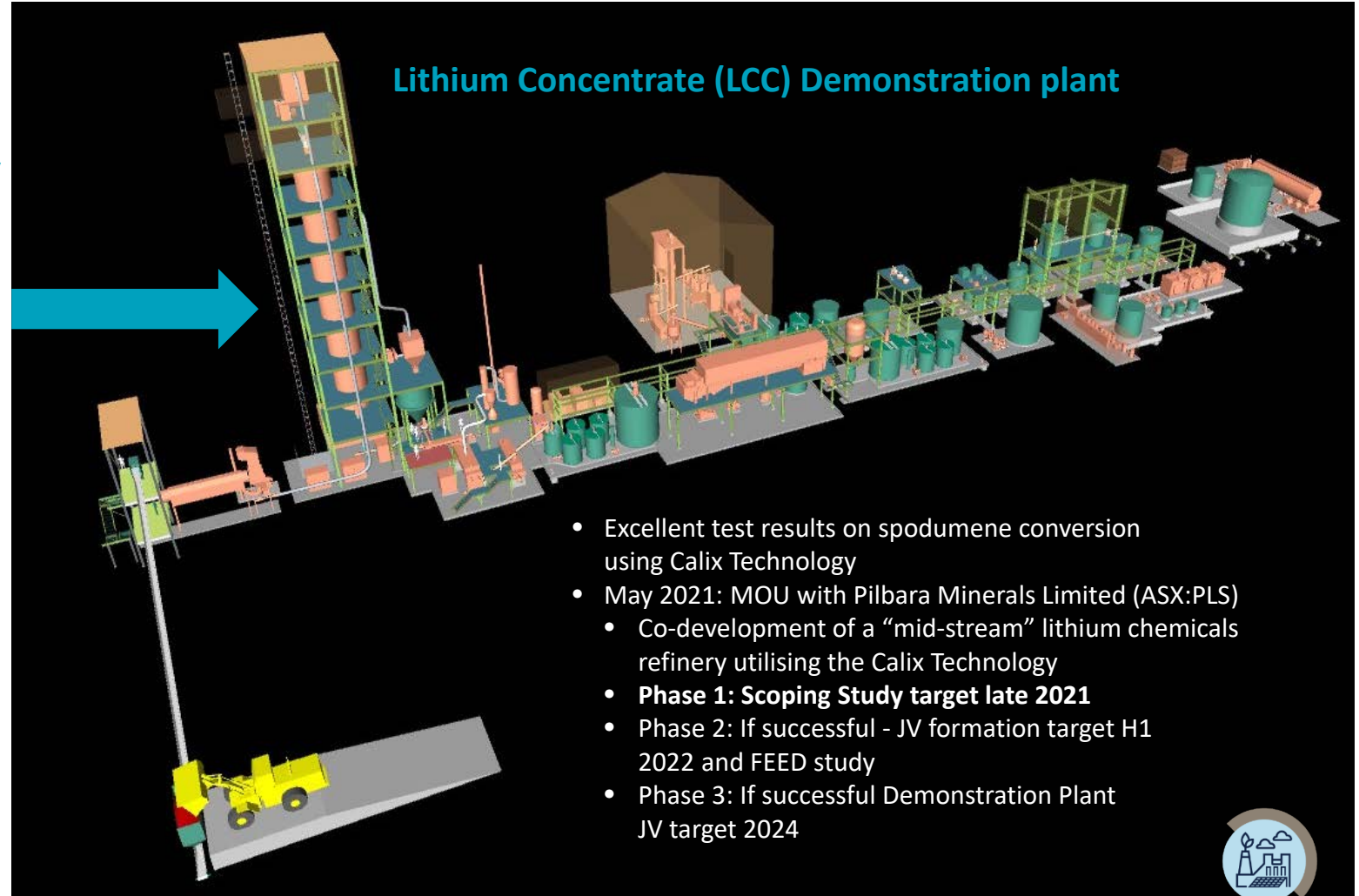


## Potential benefits of the Calix Technology to the spodumene industry

- Higher value product produced on-site
- Less shipping of waste
- Higher recovery from the ore body
- Can be renewable energy-powered
- Lower CO<sub>2</sub> foot-print product = competitive advantage as carbon barriers are erected



## Lithium Concentrate (LCC) Demonstration plant



## Local Market Snapshot...

- Current lithium carbonate prices DDP China > US\$20,000 / tonne\* vs spodumene concentrate at US\$1,320/ tonne\*
- Australian Spodumene-derived lithium salt market (Lithium Carbonate Equivalent) could hit 400kTpa\*\* by 2025
- CXL and PLS looking to jointly develop a solution to be licensed to the total market

- 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**
  - Phase 2: If successful - JV formation target H1 2022 and FEED study
  - Phase 3: If successful Demonstration Plant JV target 2024

\*S&P Global Platts August 27, 2021

\*\* Benchmark Mineral Intelligence (2020)







## Deep Dive – Biotech



# Introductions

## OUR BIOTECH BUSINESS SENIOR MANAGEMENT...



**Rob van Merkestein**

### Business Manager – Bioactive Materials

- Rob has a technical and commercial background, initially working with CSIRO and then with ICI / Orica Limited where he invented, developed and then successfully commercialised novel water treatment technology in Australia.
- Rob has since supported the development and commercialisation of several advanced water treatment technologies in the global water treatment sector directly or via technology licensing or joint venture.
- Rob joined Calix as Business Manager – bioactive materials in 2015, focused on the development and commercialisation of bioactive materials applied in crop protection, marine anti-fouling and in future, human and animal health applications. He brings significant expertise in fundamental and applied chemistry, product and application development, technology commercialisation and business management.
- Rob holds a Bachelor of Applied Science (chemistry) from Swinburne U.



**Mark Sceats**

### Chief Scientist

- Mark co-founded Calix in 2005, is an Executive Director and a member of the Board's Technology Committee.
- Mark is a qualified physical chemist with 40 years' experience.
- Mark has previously worked at the James Franck Institute at the University of Chicago, and as an Assistant Professor of the University of Rochester NY, USA, where he was awarded the Alfred P Sloan Fellowship for his work. Later he was employed by the University of Sydney as a Reader in the School of Chemistry for his research work on chemical reaction kinetics. Mark has published more than 140 academic papers in physical chemistry, and is an inventor of 36 patented inventions.
- Mark was awarded the M.A. Sargent Medal of the Institute of Engineers Australia for his contributions to optical communications and the Centenary Medal of the Commonwealth of Australia for his contributions to Australian society.
- Mark has degrees in Science (Hons 1st Class) and a PhD (University of Queensland). He is a Fellow of the Australian Academy of Technological Sciences and Engineering, a Fellow of the Royal Australian Chemical Institute, and a Companion of the Institute of Engineers Australia.



# Why Biotech ?

SOME UNFORTUNATE WORDS WE'VE ALL RECENTLY LEARNED; PANDEMIC, VARIANT, RESISTANCE



## Drivers

**When conventional pesticides, biocides & anti-biotics no longer meet our needs:**

- pests and pathogens evolve and develop resistance
- society decides their unintended impacts are too great

**a new paradigm, and novel supporting technology and products are required...**

## Biotech

**The Biotech Line of Business focusses on developing novel bio-active materials for billion-dollar applications.**

- our approach; proof of concept → R&D, external engagement & co-development → tech. licencing → manufacturing
- our target markets;
  - ✓ crop protection; safer, more sustainable food production
  - ✓ advanced coatings; environmentally friendly marine-fouling and corrosion control
  - ✓ human & animal health; pharmaceuticals & veterinary medicine

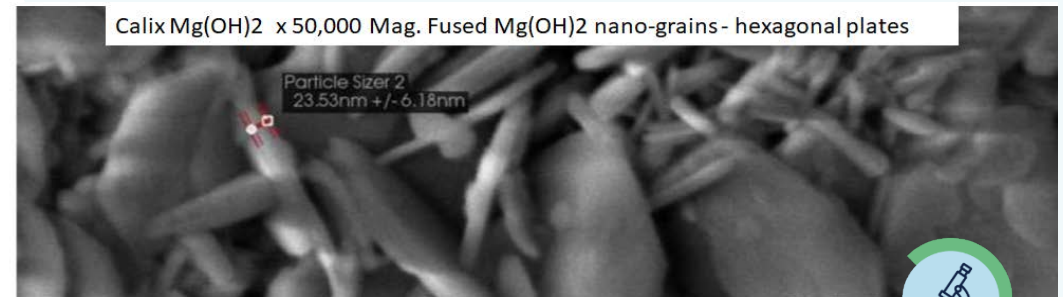
## Materials & Bio-activity

Unique NANO-form magnesium oxide & derivatives.

- intrinsically safe; milk of magnesia!
- NANO-form; complex & unique

NANO-forms are bio-active

- unique, non-lethal mode of action
- tech. supported by extensive scientific literature



# Agriculture: bio-active material for crop protection

CASE STUDY: CALIX MATERIALS TO BECOME INTEGRAL TO AGRONOMIC MANAGEMENT IN THE NETHERLANDS...



## Proof-Of-Concept.

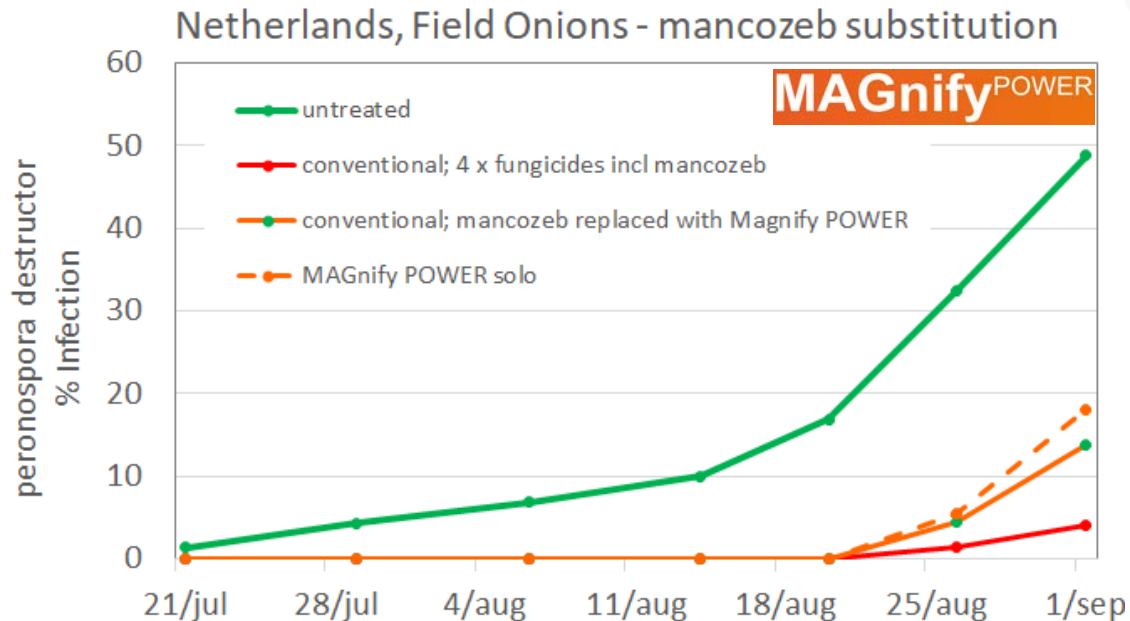
- 5th consecutive year of field trials
- broad spectrum anti-fungal efficacy
- 1<sup>st</sup> Eu distribution licence; already in-market!

## Value Proposition.

- reduced toxic pesticide use
- substitute for banned actives
- safety, productivity, sustainability

## Commercialisation – target milestones.

- Australia: label registration; FY22
- 2<sup>nd</sup> global licence (in negotiation – crop protection major)



## Drivers for Market Entry - Netherlands:

- Global agricultural powerhouse (worlds 2nd largest exporter)
- leader in sustainable agriculture
- many crops highly susceptible to fungal disease

## Mancozeb; the global farmer "go-to" fungicide (200 ktpa.)

- identified endocrine disruptor
- banned in Europe (2022) & in review globally (US, India etc.)
- "indispensable"; substitute urgently required



# Marine Coatings: additives for enhanced bio-fouling control



LONG TERM FOULING TRIALS CONTINUE TO SHOW HIGHLY PROSPECTIVE RESULTS WITH DIFFERENT COATINGS

## Proof-Of-Concept.

- 26-month exposure trial completed
- further trials in planning
- end-user trials; Vic & Qld.

## Value Proposition; end-user.

- reduced maintenance costs
- environmental sustainability

## Value Proposition – manufacturer

- reduced inputs costs & regulatory compliance

## Market Engagement.

- Est. \$6b coatings market – addressable market TBD
- Coating manufacturer trials underway
- Europe, NZ & Australia

### Added to an in-market coating.

9 months exposure – Cairns, Qld



Ablative marine coating – no additive



Ablative marine coating – 200 g /L Calix additive

### Added as a biocide (Cu) substitute.

3 months exposure – Williamstown Vic

Untreated	Cu substitution with bio-active MgO		
	13X	14X	15X

i. 50% w/w Cu<sub>2</sub>O substitution  
 ii. Commercial CuSCN ablatives  
 iii. 100% w/w CuSCN substitution  
 Coated Panel Observations:  
 - mild fouling  
 - mainly scum  
 - no 2° or 3° colonizers apparent  
 - equivalent fouling; i ~ ii ~ iii



### Proof-Of-Concept.

- prelim. studies; bacterial suppression apparent
- Additional screening studies in planning
- screening for dermal fungal suppression tbc.
- screening for virus inactivation tbc.

### Value Proposition.

- Pathogen suppression
- negligible toxicity
- reduced antibiotic dependence
- limited resistance pathway

### Development pathway.

- **phase 1; discovery & development, 1Yr . \$50 K**
- phase 2; pre-clinical studies (in-vivo / animal) 2Yr. \$150 K
- co-development & partnering
- phase 3; clinical studies (animal & human), 2 plus Yr.
- phase 4; FDA post market safety monitoring

## Effect of Calix bio-active materials on pathogenic antibiotic resistant bacteria.

	<i>S. aureus</i> (MRSA)	<i>E. coli</i>	<i>P. aeruginosa</i>	gram (-) & gram (+)
<b>Infection source &amp; infections caused</b>	Hospital & community acquired infection: - skin, blood, lungs	Hospital & community acquired infections: - skin, urinary tract	Hospital acquired infection: - skin, blood, lungs	
<b>Suppression evident ?*</b>	<b>YES</b>	<b>YES</b>	<b>YES</b>	<b>BOTH</b>

\* >90% suppression at 1 g/L concentration





## Deep Dive – Advanced Batteries



# Introductions

OUR ADVANCED BATTERY BUSINESS SENIOR MANAGEMENT...AND SPECIAL GUESTS!



**Dr Matt Boot-Handford**

Battery Materials Development  
Programme Lead



General Manager R&D  
Deputy Chief Scientist



**Dr Mark Sceats**

Chief Scientist



Co-founder  
Executive Director



**Prof. Patrick Howlett**

Partner on CRC-P Advanced Hybrid Batteries



Senior Researcher –  
Institute for Frontier Materials

Director of the Battery Technology Research  
and Innovation Hub  
(BatTRI-Hub)



**Mr Oliver Gross**

Battery Industry Consultant to Calix



Walter P. Chrysler Technical Fellow,  
for Energy Storage Systems, at Stellantis  
(formally Fiat Chrysler Automobiles),  
where he is responsible for the  
Battery systems technology roadmap  
and architecture.





# Why Advanced Batteries ?

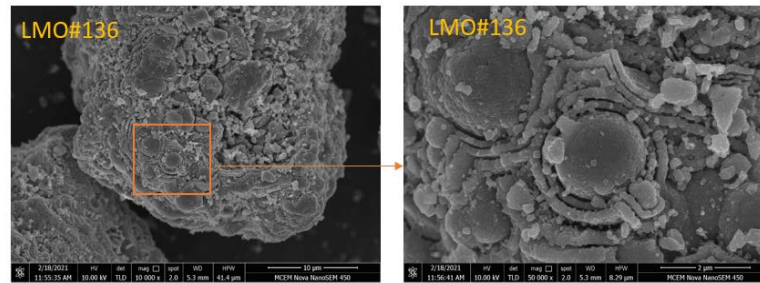
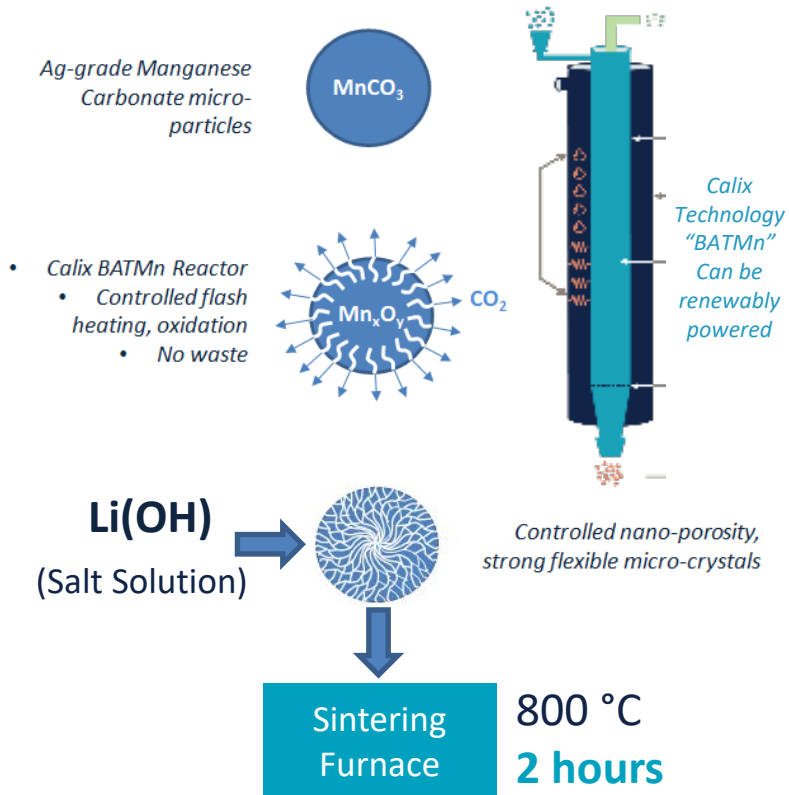


ENERGY STORAGE IS UNDERGOING A REVOLUTION FROM MOLECULES TO ELECTRONS...  
AND CALIX TECHNOLOGY COULD BE A GAME-CHANGER IN THIS SPACE ALSO....

Approx. 6x **lower energy** route than conventional LMO production, and is producing **strong, active** “onion-ring” structures in the tiny crystals...

While there are varying predictions as to the growth of Li-Ion battery demand, there is consensus on *three* 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 importance of lower carbon manufacturing is emerging and looks set to dominate, especially in Europe, the fastest growing battery market**



The cathode, as the source of Li+ ions, is the main determiner of the capacity and voltage of the battery, and also the most expensive component.

*How do we reduce cost and carbon foot-print, while maintaining or even improving performance ? Calix is developing an improved lithium manganese oxide (LMO) cathode - a cheap, simple and safe chemistry*



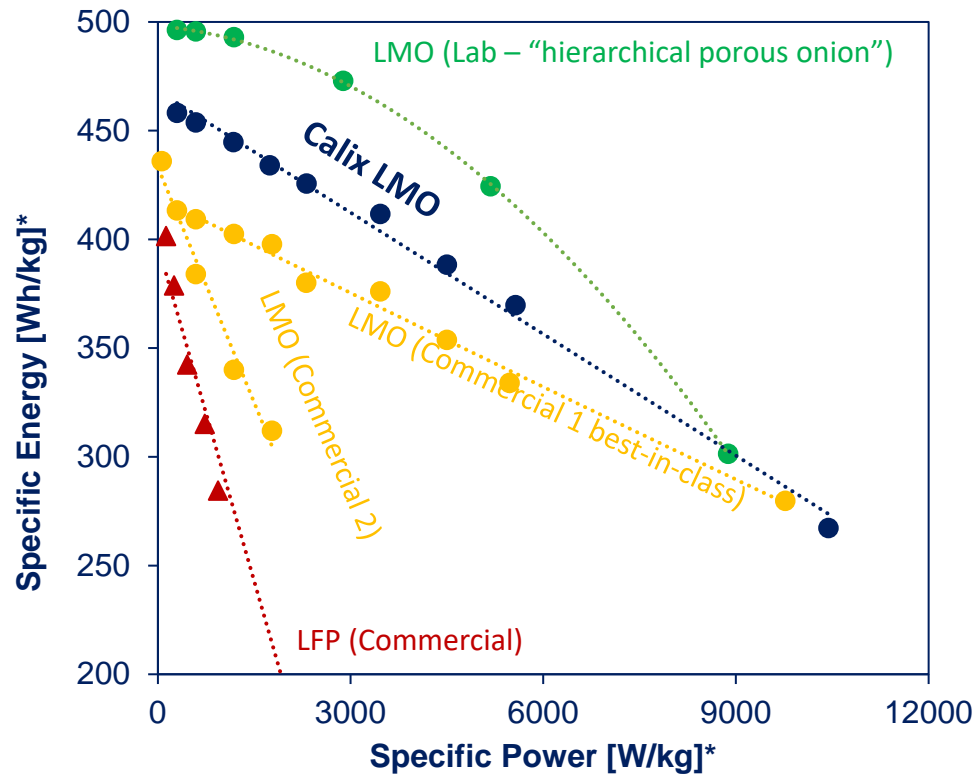
# It's all about crystal structure ... made using Calix Technology

## RECAP: EARLY HALF-CELL RESULTS

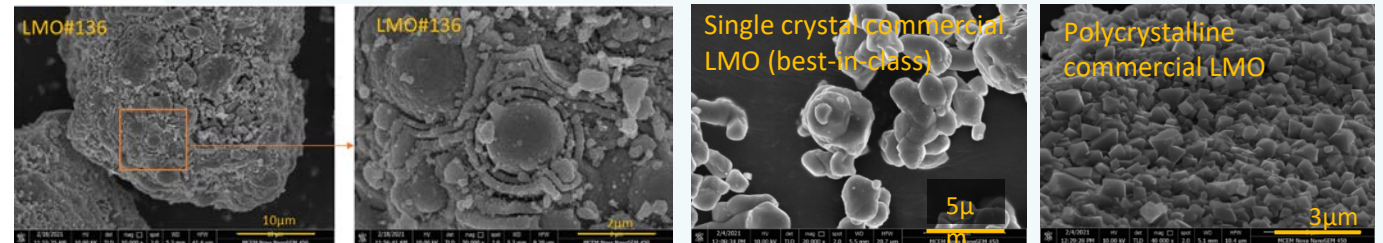


### Recap– “cracking the onion”

Calix is developing a high-performance, low-cost lithium manganese oxide (LMO) cathode technology for lithium-ion battery applications



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

\* Specific energy and power presented on a per unit weight of the cathode active material (CAM) basis

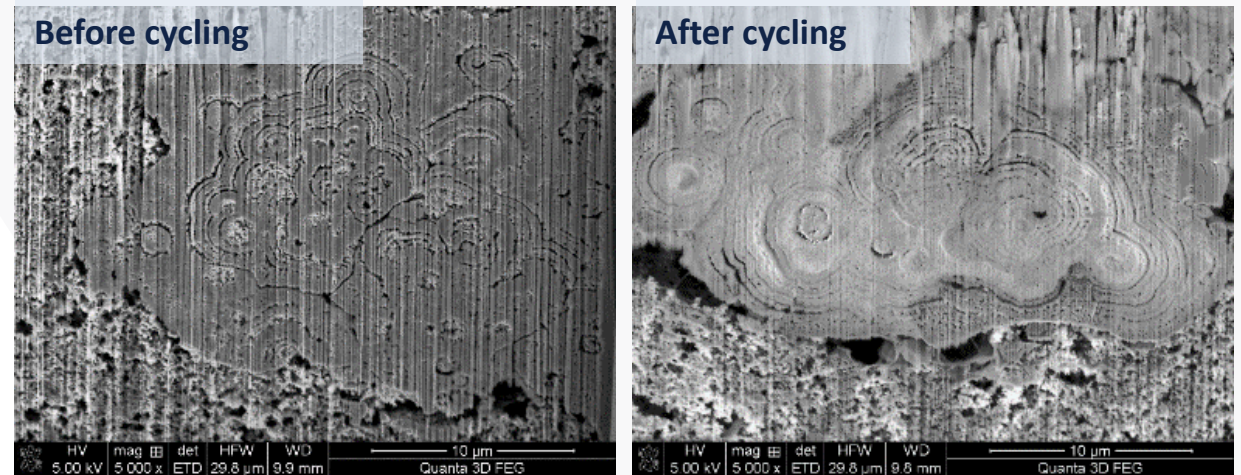
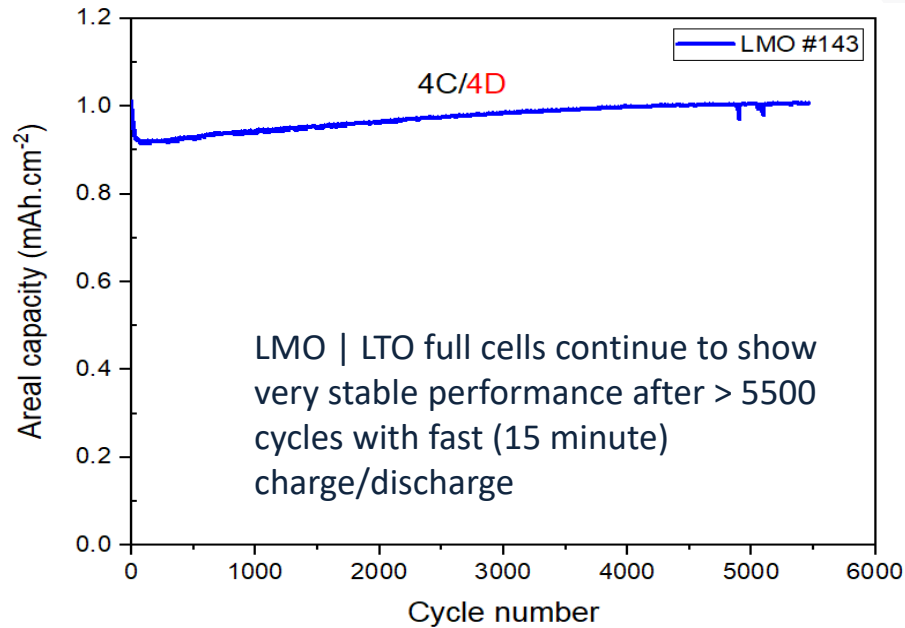
\* All results are from half-cell electrochemical discharge rate screening tests with CAM loadings of 0.5 mAh/cm<sup>2</sup>



# Full coin cells – significant performance longevity demonstrated



ADVANCED BATTERIES: LONG TERM STABILITY AT HIGH RATE DEMONSTRATED TO OVER 5000 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 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



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

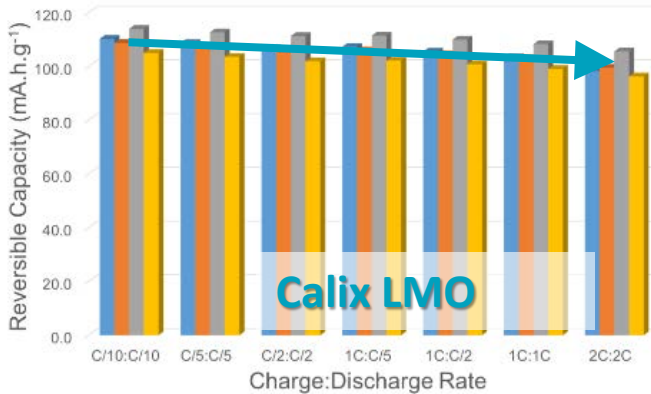
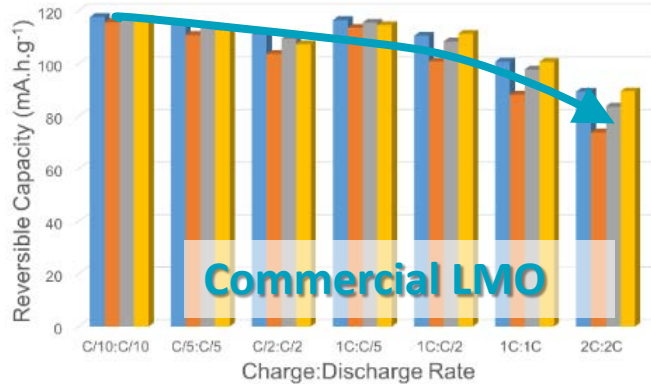
Binayak Roy, Pavel Cherepanov, Cuong Nguyen, Craig Forsyth, Urbi Pal, Tiago Correia Mendes, Patrick Howlett, Maria Forsyth, Douglas MacFarlane,\* and Mego Kar\*



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

# Commercial format – pouch cell prototypes

ADVANCED BATTERIES: 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 the next stage of pouch cell production scale-up programme is underway – expected completion end-2021
- 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<sup>2</sup>)



# Enhancing our capability...

BUILDING THE TEAM, R&D AND PRODUCTION CAPABILITY



Calix's coin-cell assembly and testing suite is now operational

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Upgrade of laboratories at Calix's Bacchus Marsh Production Facility underway

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In-housing of additional battery materials development skillsets recruitment underway

<https://bit.ly/3mQBYtl>

<https://bit.ly/2V4mRkG>

# Progress since our March 2021 capital raise

## ADVANCED BATTERIES: ACCELERATION PLANS – ON TRACK



Key Challenge	Description		2021	2022	2023	2024
LMO Full Cell Performance	<ol style="list-style-type: none"> <li>Commercially-relevant loadings of Cathode Active Material<sup>1</sup></li> <li>Long term 500-1000+ charge-discharge cycling performance</li> </ol>	Complete	✓			
Field Trials	Demonstration of the technology in a commercially relevant format at real world/application specific conditions <sup>2</sup>	On Track				
Scale-Up	Demonstrate electrochemical performance of materials produced in commercially relevant quantities (grams → kgs → tonnes) <ol style="list-style-type: none"> <li>Stage 1: Lab (grams) → pilot production (kgs) - underway</li> <li>Stage 2: Pilot production (kgs) → Commercial demo (tonnes)</li> </ol>	On Track		Stage 1		
Optimised / Combined / New Chemistries	<ol style="list-style-type: none"> <li>Optimise LMO</li> <li>Test new materials / chemistries</li> </ol>	On Track		Stage 2		
Electrode / Electrolyte Optimisation	Experiment with different combinations to maximise cycling stability	On Track		Iterative / On-going		
		On Track		Iterative / On-going		

1. >2 mAh/cm<sup>2</sup>  
 2. (1- 10 kWh)



## “The skunkworks”



# Introductions

OUR CHIEF SCIENTIST AND FOUNDER...AND DEPUTY CHIEF SCIENTIST



**Mark Sceats**

## Chief Scientist

- Mark co-founded Calix in 2005, is an Executive Director and a member of the Board's Technology Committee.
- Mark is a qualified physical chemist with 40 years' experience.
- Mark has previously worked at the James Franck Institute at the University of Chicago, and as an Assistant Professor of the University of Rochester NY, USA, where he was awarded the Alfred P Sloan Fellowship for his work. Later he was employed by the University of Sydney as a Reader in the School of Chemistry for his research work on chemical reaction kinetics. Mark has published more than 140 academic papers in physical chemistry, and is an inventor of 36 patented inventions.
- Mark was awarded the M.A. Sargent Medal of the Institute of Engineers Australia for his contributions to optical communications and the Centenary Medal of the Commonwealth of Australia for his contributions to Australian society.
- Mark has degrees in Science (Hons 1st Class) and a PhD (University of Queensland). He is a Fellow of the Australian Academy of Technological Sciences and Engineering, a Fellow of the Royal Australian Chemical Institute, and a Companion of the Institute of Engineers Australia.



**Matt Boot-Handford**

## General Manager R&D & Deputy Chief Scientist

- Before joining Calix, Matt was Acting Head of the Energy Engineering and Carbon Capture Research Group in the Department of Chemical Engineering at Imperial College London. He also held roles as a Research Associate at Imperial College London and Visiting Scholar at the University of Technology Sydney. Matt worked closely with Calix in his previous roles at Imperial College on the EU funded ASCENT and LEILAC projects.
- Matt joined Calix in January 2019 to head up its research and development (R&D) programme for batteries and catalysts materials development where he oversaw R&D focused on the exploitation of Calix's technology and nano-active materials for electrochemical energy storage and catalyst applications.
- Matt was appointed General Manager for Research & Development and Deputy Chief Scientist at Calix in July 2021 and now heads up Calix's R&D programmes, projects and activities across its core and emerging business development areas.
- Matt holds a PhD in Chemical Engineering and Master of Research in Green Chemistry from Imperial College London, UK and a BSc in Chemistry from the University of Nottingham, UK.



# A glimpse into the future from our Chief Scientist

CALIX CO-FOUNDER, CHIEF SCIENTIST AND EXECUTIVE DIRECTOR MARK SCEATS  
GM R&D AND DEPUTY CHIEF SCIENTIST MATT BOOT-HANDFORD










## Outlook for FY22



# Our next 12 months' priorities...

REVENUES, MARGINS, PROJECT EXECUTION AND DEAL FLOW...AND ACCELERATION TARGET ITEMS FROM RECENT CAP RAISE



 <p><b>Water</b></p>	 <p><b>CO<sub>2</sub> Mitigation</b></p>	 <p><b>Biotech</b></p>	 <p><b>Advanced Batteries</b></p>	 <p><b>Sustainable Processing</b></p>
<p><b>Revenue and Gross Margin growth via...</b></p> <p><b>US: At least</b></p> <ul style="list-style-type: none"> <li>• 1 new plant</li> <li>• 1 major new US state entries</li> </ul> <p><b>EU:</b></p> <ul style="list-style-type: none"> <li>• First partner agreement</li> <li>• Convert paid trials to customers</li> <li>• 1 new plant</li> </ul> <p><b>Asia:</b></p> <ul style="list-style-type: none"> <li>• Re-establish Chinese AQUA-Cal+ sales</li> </ul>	<p><b>Cement and Lime</b></p> <ul style="list-style-type: none"> <li>• Successful test campaign conclusion –LEILAC-1 <b>Results into public domain soon...</b></li> <li>• Successful FID – LEILAC-2</li> <li>• Convert at least two MOU’s to full project / license agreements - “full-scale” application</li> </ul>	<p><b>Crop Protection</b></p> <ul style="list-style-type: none"> <li>• 2<sup>nd</sup> license agreement</li> <li>• APVMA approval</li> </ul> <p><b>Marine Coatings</b></p> <ul style="list-style-type: none"> <li>• Successful initial trials with MTA partners</li> </ul> <p><b>Next new biotech application...health / pharma – successful phase 1 study</b></p>	<p>Successful full (coin) cell results</p> <p>Initial positive pouch cell results</p> <p>Scale-up production trials – cathode materials</p> <p>First battery module – commercial format</p>	<p><b>Refractories</b></p> <ul style="list-style-type: none"> <li>• Convert MOU to full Project or License agreement</li> </ul> <p><b>Spodumene</b></p> <ul style="list-style-type: none"> <li>• Successful feasibility study</li> <li>• Convert MOU to full Project or License MOU</li> </ul> <p><b>Develop next new sustainable processing application</b></p>

Because there's only one Earth...



...Mars is for quitters

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