

ASX Announcement

19 August 2021

Calix CEO to present at Australian Carbon Capture Conference

Sydney, Australia 19 August 2021 – Multi-award-winning Australian technology company Calix Limited (ASX:CXL, **Calix** or **the Company**), is pleased to provide a copy of the presentation that Managing Director and CEO Phil Hodgson will be presenting at the Australian Carbon Capture, Utilisation and Storage Conference at 11:15am, Thursday 19th of August 2021.

Presenting: Phil Hodgson, Managing Director and CEO

Time: 11:15am AEST on Thursday 19th of August 2021

For more information on the conference click here: <https://www.informa.com.au/event/conference/energy-utilities/australian-carbon-capture-utilisation-storage-conference/>

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

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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](#)

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Carbon Capture from Cement and Lime Manufacturing

Australian CCUS Conference



Phil Hodgson
CEO and MD
Calix Limited

Important Disclaimer



This presentation has been prepared by Calix Limited (ABN 36 117 372 540) ("Company").

SUMMARY INFORMATION

This presentation contains summary information about the Company and its subsidiaries ("Calix") and their activities current as at 14th August, 2021. The information in this presentation is a general background and does not purport to be complete.

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FINANCIAL DATA

All dollar values are in Australian dollars (\$) or (A\$) and financial data is presented as at or for the financial year ended 30th June 2020, unless stated otherwise.

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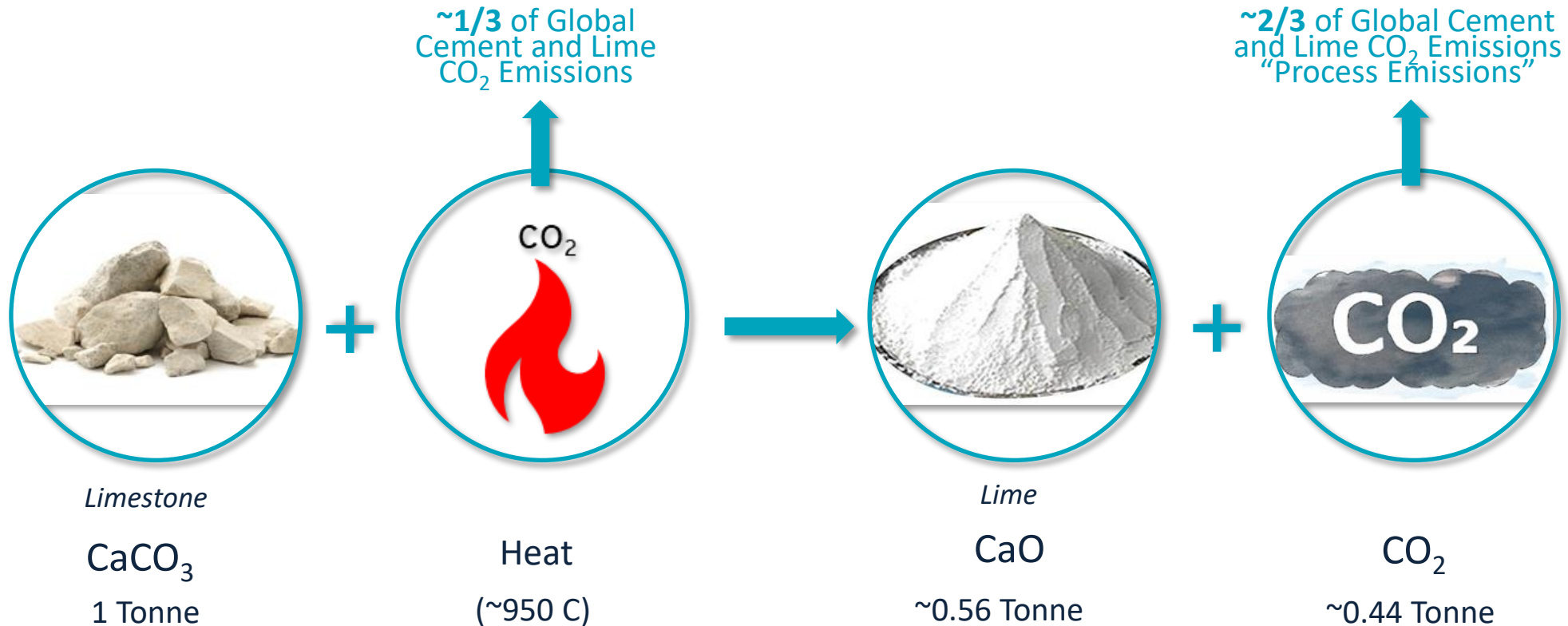
The CO₂ Problem – Cement and Lime

Concrete is the second most utilised substance on earth after water...



Cement and lime contribute around 8% of global anthropogenic CO₂ emissions - about 2.2 Billion Tonnes per annum*

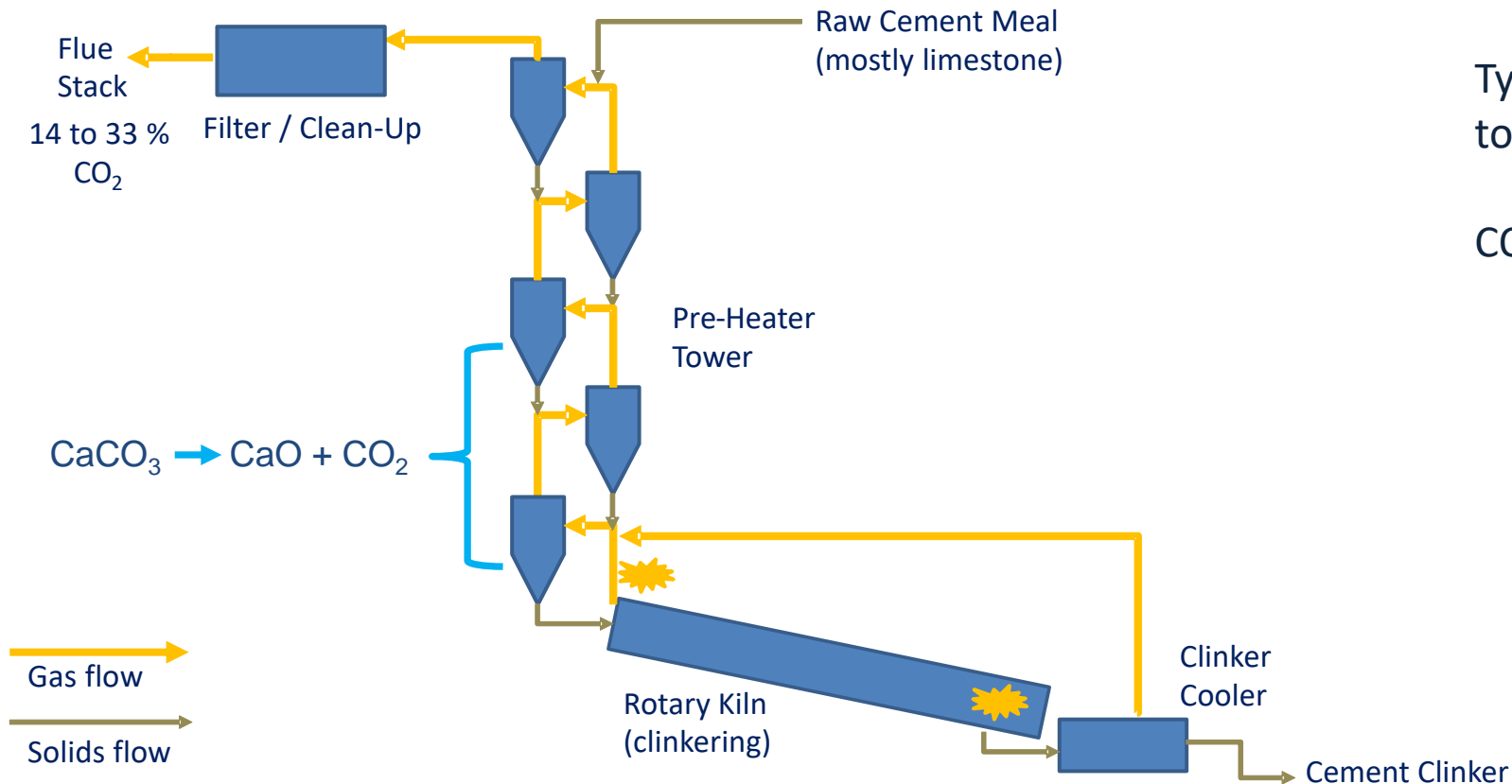
Around 2/3 of those emissions are unavoidable – coming from the raw material (limestone)



Cement production involves high capital intensity, large processing plants



Typical plants produce >1 million tonnes of clinker per year and thus about ~1 millions tonnes of CO₂



Typical energy use 5 GJ / T Cement*

Typical wholesale price ~€60 (~AUS\$ 90) to per metric tonne

CO₂ abatement options:

CO₂ from FUEL: 1/3 of emissions

- Substitute coal / natural gas with waste fuel / biomass / electricity

CO₂ from LIMESTONE: 2/3 of emissions

- Amine
- Direct Separation
- Calcium Looping
- Oxyfuel
- Ammonia
- Membranes

Most developed

Least developed

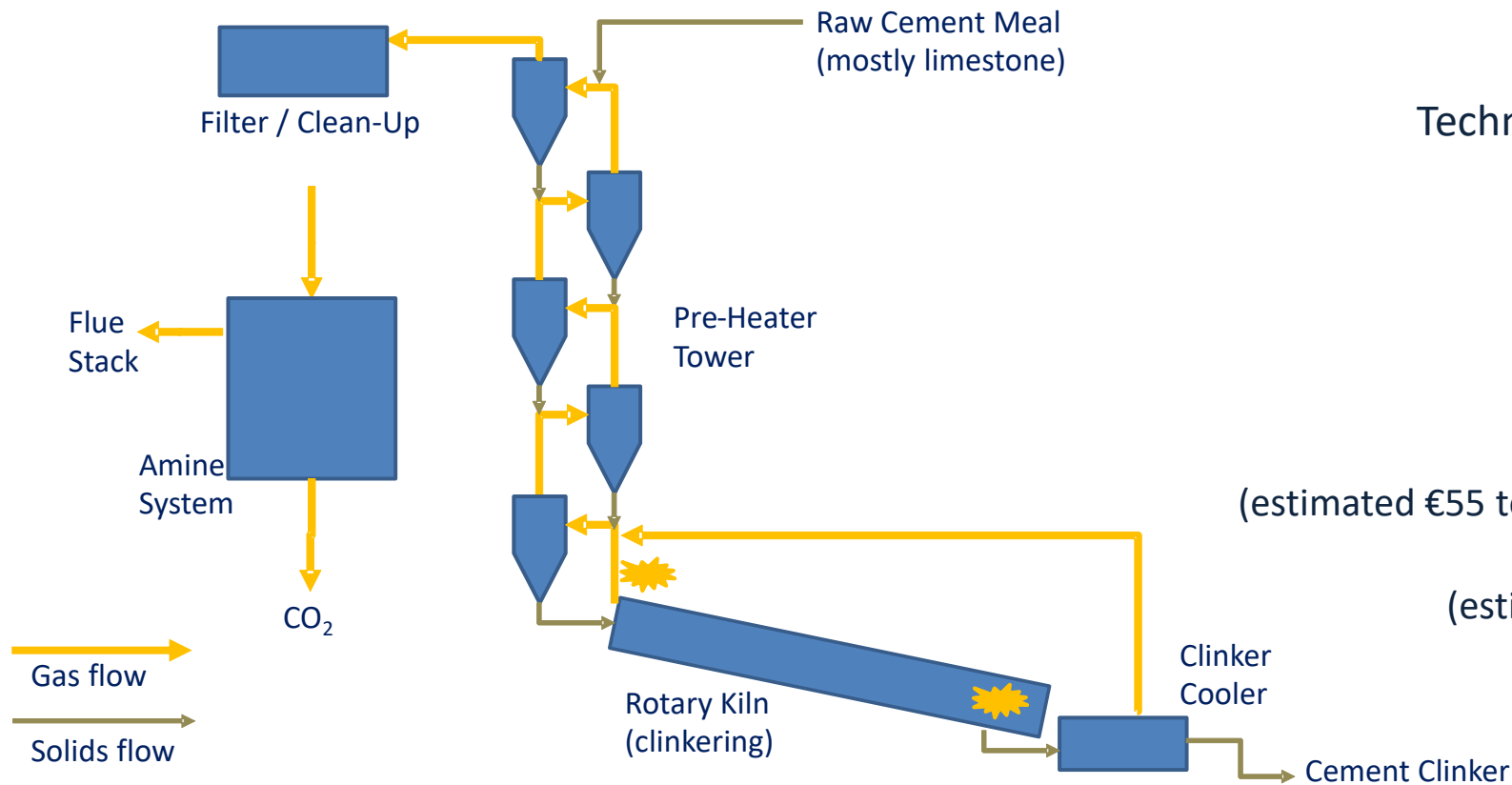
*About the same energy required to power 5 million toasters !!

Amine is one solution for cement CO₂ emissions...

In use for decades in the power industry – but expensive !

Amine is one solution for cement CO₂ emissions...

In use for decades in the power industry – but expensive !



Advantages*

Technically, the most developed Ease of Retrofit

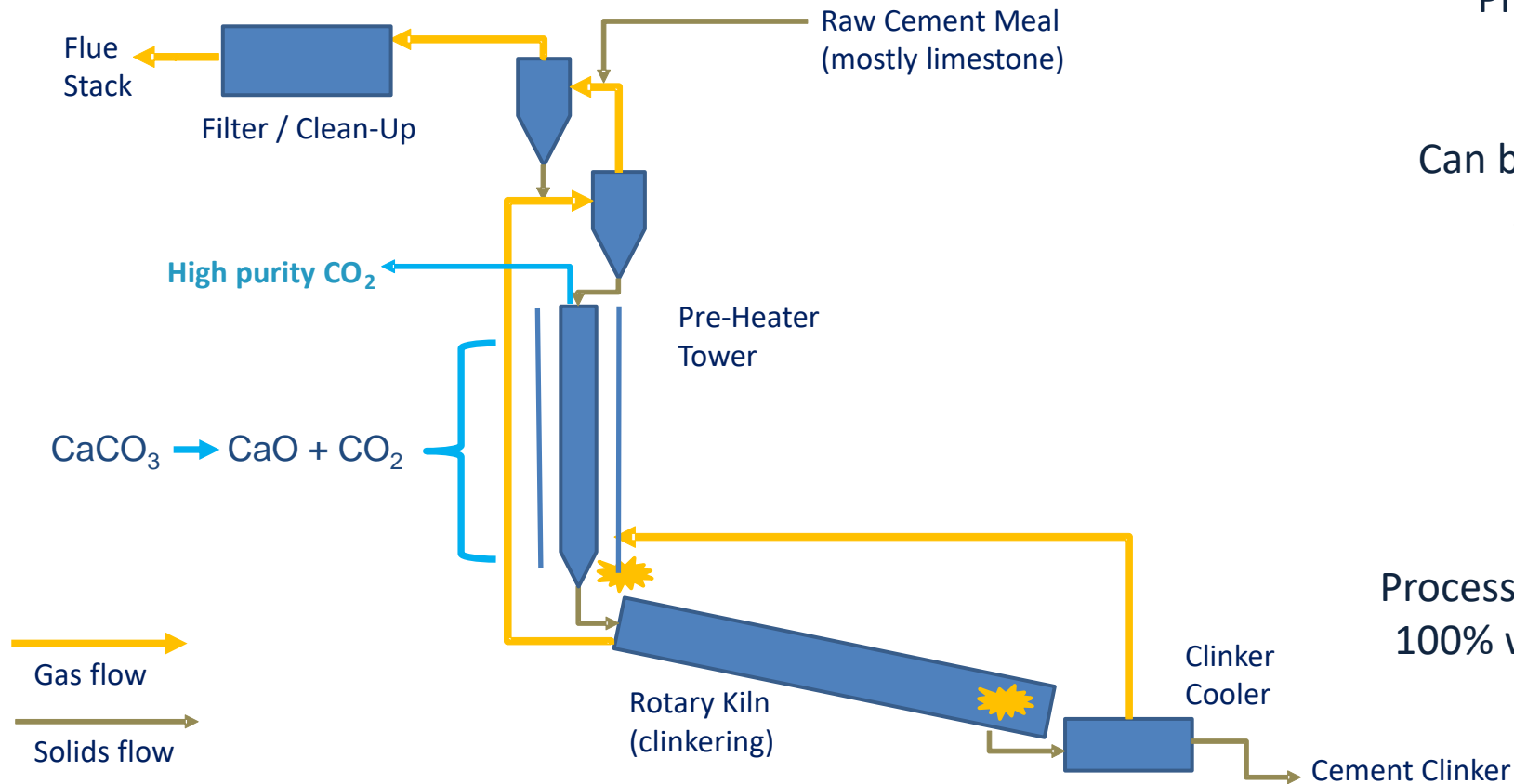
Disadvantages*

Cost
(estimated €55 to €189 (AUS\$ 85 to 290) / T CO₂ avoided)

Energy
(estimated 7 GJ / T CO₂ avoided)

Calix's solution for cement CO₂ emissions...

"LEILAC" (Low Emissions Intensity Lime and Cement) "Direct Separation" Technology



Advantages

Produces pure CO₂ stream for no theoretical thermal penalty

Can be easily retrofitted in modules (eg 20% of throughput at a time)

Cost = lowest theoretical

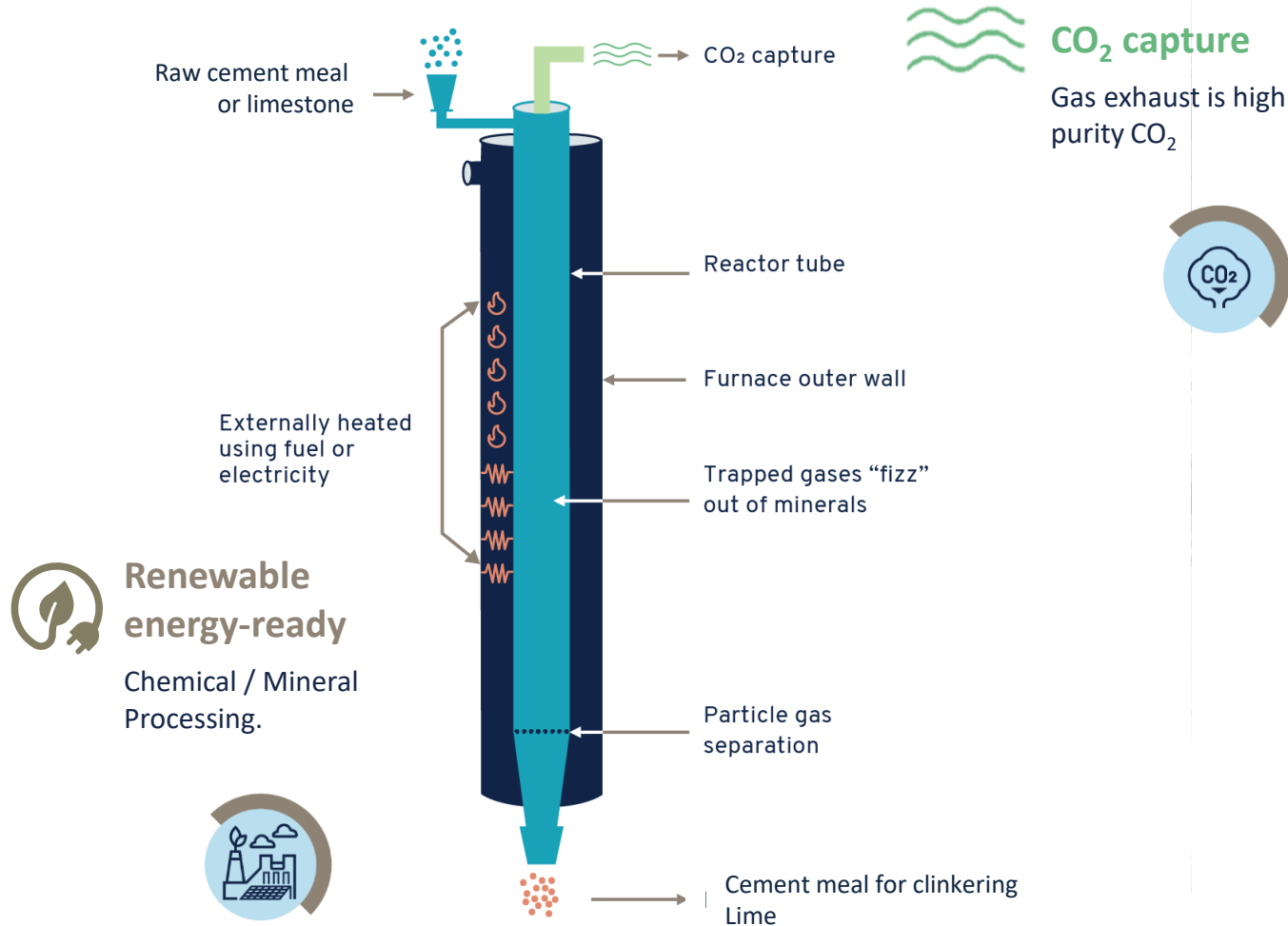
Easy to electrify

Disadvantages

Process CO₂ only (ie 60% of emissions) – for 100% will need fuel-side capture, biomass or renewable electricity

Calix's core technology

A patented Australian invention – a new type of kiln...



A rapidly changing landscape...

- **2018** – EU ratifies phase 4 of the Emissions Trading Scheme, CO₂ permit price jumps from €5 to over € 25. It has recently hit € 58 – a new record
- **2019** – HeidelbergCement pledges net zero CO₂ by 2050, and a 30% reduction on 1990 emissions by 2025
- **2020** – EU legislates net zero CO₂ by 2050. Several countries follow
- **2021** – EU votes to introduce carbon border-tariff by 2023

Technology – operational experience and funded to demonstration scale



A rapid but so far very successful technical development program

HEIDELBERGCEMENT



Building a better future



Imperial College
London



Built

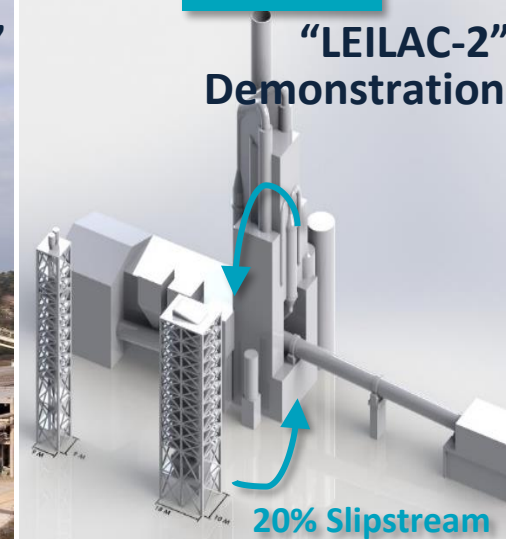


“CFC-15000”



“LEILAC-1”
Pilot

Funded



“LEILAC-2”
Demonstration

20% Slipstream

In Planning



“LEILAC-3”
Full Scale

100% Replace

Australia - 2013

Belgium - 2019

Hannover - 2023

EU or US - ASAP

Scale (kTpa) CO₂

25

25

100 (20% of Full Scale)

500

Feedstock

Magnesite

Limestone / Cement Meal

Cement Meal

Capital Cost (€m)

11*

8*

16**

52 to 66**

Operating Experience /
Targets

- Over 7 years commercial operation
- Minimal maintenance (~€60k pa, or <~5% of capital for a FOAK)

- Already commercial scale for lime
- Technology concept proven
- >95% purity CO₂, Achieved 70% Max Throughput for cement
- Test runs complete – public release soon – final report

- Target full integration of process and heat
- Commercial demonstration scale module
- FID early 2022, commissioning late 2023 / early 2024
- Test runs to end-2024

- Industry- and grant-funded (EU), or possible risked equity (US)
- 6 cement and 4 lime projects under discussion

*FOAK Actual

**FOAK to NextOAK Target retrofit, including CO₂ compression. NOAK target Greenfield is €37m including compression

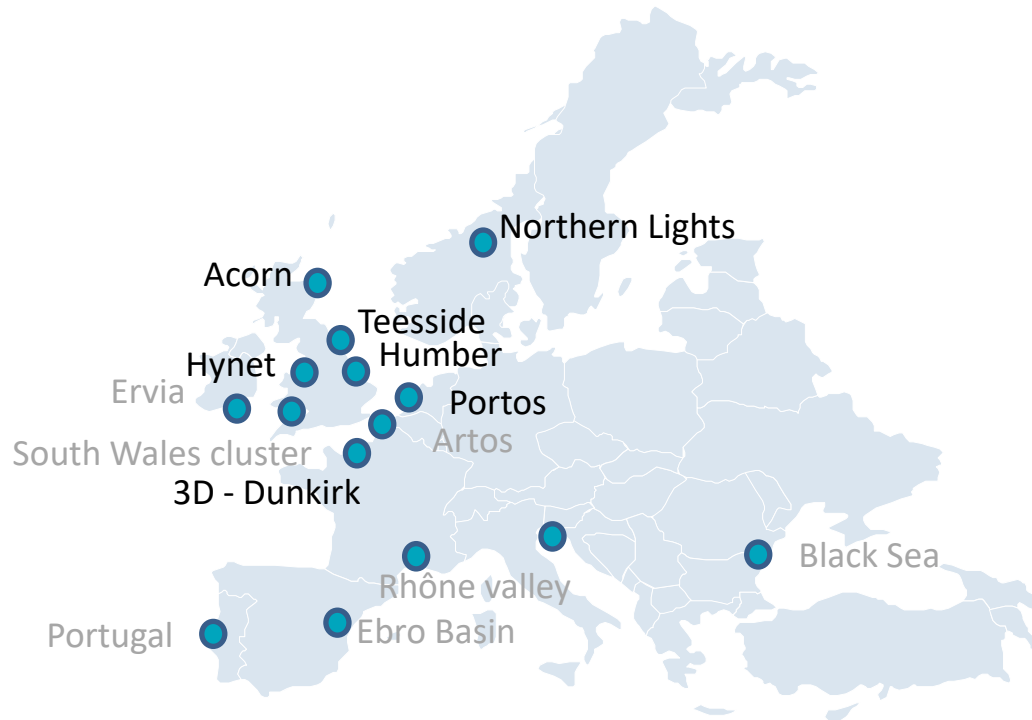
What to do with CO₂ ?

There will be too much CO₂ produced from lime and cement to be utilised – it must be safely sequestered



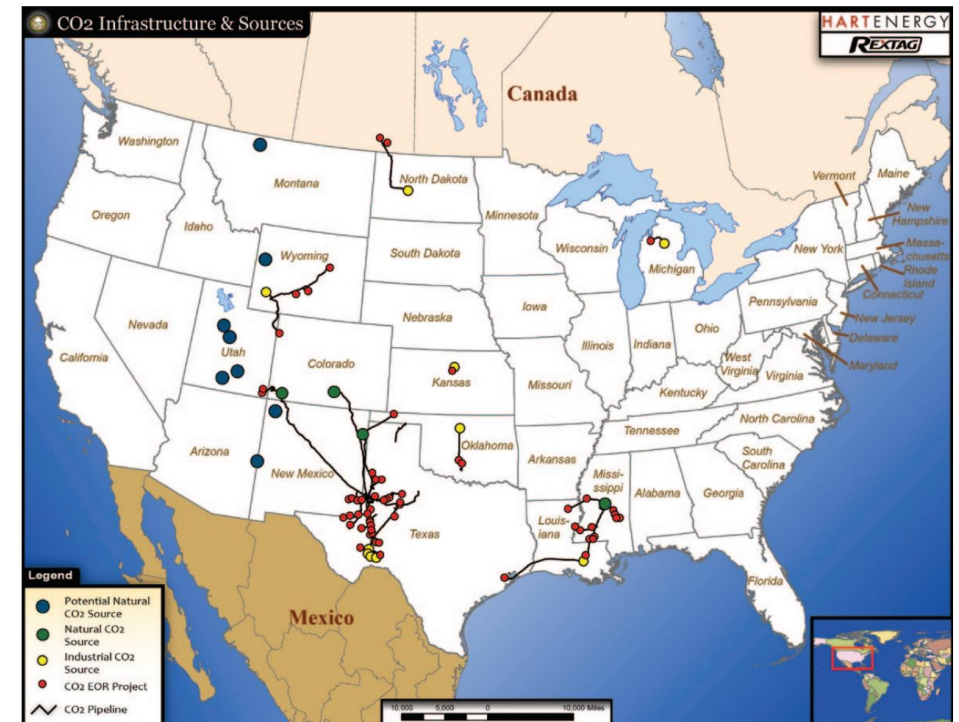
Europe

CO₂ Sequestration (CCS) Hub Development Projects:



US

Mainly Enhanced Oil Recovery (EOR) use, for which there is already extensive infrastructure:



Source: Hart Energy/Rextag, 2012

Even under the most optimistic CO₂ utilisation scenarios*, only about 13% of captured CO₂ could be utilised...we have no alternative but to develop safe sequestration options

*Creating Value from Emissions – IEA Technology Report September 2019

<https://www.iea.org/reports/putting-co2-to-use>

*US Oil and Gas Journal

What about Australia ?

What are we doing in Australia wrt heavy industry and manufacturing emissions, and what could we be doing ?



Actually – we are doing quite a lot (albeit only recently !...and a bit hit and miss so far) .. Some examples and thoughts...

Initiative	(My) Description	(My) Thoughts...
Emissions Reduction Fund	On-line auction of Australian Carbon Credit Units (ACCUs) from certified emissions reduction projects	A zero-technical-risk scheme that will drive zero technical innovation, thus ultimately just cost-up current technologies funded by the taxpayer
(Federal) Low Emissions Technology Strategy	5-priority technologies in a roadmap, adjustment of ARENA and CEFC to drive innovation and commercialisation in new technology areas including CC(U)S	Good progress – but ... <ul style="list-style-type: none">- No 2050 target- Debate around ARENA / CEFC mandate and CC(U)S has so far ignored industrial CO₂ emissions – especially for industries such as cement, lime (used in steel, aluminium etc) – the debate must be widened- Process could lean towards “picking winners”
(State) NSW Net Zero Plan, VIC Climate Change Strategy	States leading the way in setting net zero targets by 2050 – in line now with over 2/3 of countries (by GDP) globally	Good progress <ul style="list-style-type: none">• you have to start with an ambitious target!• you have to have programs that support technical development, spur local skills development, and lower risk for industry
Heavy Industry / Low Emissions Technology Co-Operative Research Centre	“HILT-CRC” - A\$39m in funding, matched by A\$45m in cash and \$130m in-kind, to de-carbonise Australian heavy industry. Lead by Univ. of Adelaide, industry partners include ADBRI, Alcoa, Boral, Fortescue, South32	Great progress Program /approach similar to EU H2020 schemes – government – supported industry solutions with strong links to research institutions



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.



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