

23 February 2023

Calix submission on the Australian Government Safeguard Mechanism Reforms Position Paper

Introduction to Calix

Calix Limited (ASX: CXL) is an Australian environmental technology company solving global challenges in industrial decarbonisation and sustainability, including CO₂ mitigation, sustainable processing, advanced batteries, biotechnology and water treatment.

Calix's patented core technology platform delivers efficient indirect heating of raw materials to enable the electrification of industries, efficient capture of unavoidable emissions and clean industrial processing solutions.

Calix's core technology platform is being applied to decarbonise a number of essential and hard-to-abate sectors. These include cement, lime and magnesium, where carbon capture and storage is essential to abate unavoidable process emissions, and iron and steel, lithium and other critical minerals, where Calix is enabling the efficient use of clean energy and hydrogen in place of carbon based sources of energy and reductants.

Leveraging its core technology platform and a global network of research and development collaborations, Calix is urgently developing CO₂ mitigation and sustainable processing technologies that deliver positive global impact. Low touch business models such as licensing, joint ventures and spin-out strategies are helping to commercialise each new application at speed, seizing every opportunity to urgently address sustainability challenges.

Calix welcomes Safeguard Mechanism reforms

Calix commends the Australian Government on its announced changes to the carbon emissions Safeguard Mechanism, its support for investment in decarbonisation technologies and its consideration of a carbon border adjustment mechanism. A price on carbon provides strong incentives for emitters to decarbonise and importantly, a stable base from which investment decisions on decarbonisation strategies and technologies can be made. Furthermore, these policies combined provide strong incentives and support for Australia's largest emitters to both reduce emissions on a pathway to net zero by 2050, and maintain their competitiveness in a decarbonising global economy.

Supporting a fair and progressive approach to baselines

Calix is supportive of the Australian Government's proposed hybrid approach to setting CO₂ emissions baselines. Industry averages, however, can be easily distorted in highly concentrated sectors dominated by a small number of large facilities, and may not provide sufficient incentives to meet our national emissions reductions targets in the medium to longer term.

Calix proposes that the Government consider a hybrid approach for existing facilities that, following a transition period, moves from using a baseline benchmarked against industry

average to one based on best available technology and international best practice. Calix also recommends that for new facilities, international best practice is based on use of the best available technology, including emerging technologies at a defined technology readiness level (e.g. TRL 7 or TRL 8).

This third phase of the hybrid approach would provide existing facilities with sufficient time to identify and implement appropriate decarbonisation technologies, including retrofittable solutions, before operating on a level playing field with new facilities. It would also provide additional incentive for existing facilities to take near-term action to decarbonise their operations, helping to accelerate development and adoption of abatement solutions and ultimately deliver a lower cost of CO₂ mitigation.

Industrial decarbonisation: education and resource dissemination

To assist industry in identifying appropriate emissions reductions strategies and best international practice, we encourage the Australian Government to work with industry groups to develop sector specific decarbonisation resources. Such resources should include assessments of available and emerging technologies, including technology readiness level, (projected) cost of CO₂ abatement, and case studies on application of the available and emerging technologies within the proposed Safeguard Mechanism framework.

An Australian CBAM

Calix also supports the introduction of a carbon border adjustment mechanism (CBAM) in Australia. The competitiveness of many of Australia's most economically important industries, as emissions-intensive exporters, is exposed to international competitive pressures resulting from tightening emissions reduction standards.

An Australian CBAM will be an effective mechanism to increase the competitiveness of our exports into major economic blocks with similar policy frameworks, including the European Union. As highlighted earlier in the Safeguard Mechanism reforms consultation process, an Australian CBAM will also be an important tool to prevent carbon leakage and the movement of carbon intensive economic activity offshore.

Together, the Safeguard Mechanism and an Australian CBAM can protect Australian producers by placing foreign imports on a level playing field, and act as a catalyst to develop significant competitive advantage in low carbon products.

Support for Carbon Capture Use and Storage

Cement and lime, responsible for around 8% of global CO₂ emissions, represent two of our most essential and hard-to-abate industries. Unlike other industries, they are inherently carbon intensive. Typically, over 60% of the emissions that result from cement and lime production are unavoidable process emissions, released directly from the raw material. Therefore, to reduce emissions from cement and lime production by 43% by 2030, electrification and the use of renewable energy sources will not be enough.

Abatement of process CO₂ is essential to enable cement and lime to meet our national emissions reduction targets – and carbon capture, utilisation and storage (CCUS) is the only viable abatement solution for unavoidable process emissions.

As other sectors of the economy decarbonise by switching to carbon free energy sources and chemical inputs, cement plants will likely become the single largest point source of CO₂ emissions. As such, they should be the focal point of CCUS infrastructure, with a priority for co-location of CO₂

users, particularly those that support other decarbonisation activities, such as synthesis of lower carbon synthetic fuels for shipping and aviation.

Given the large volumes of CO₂ that must be captured, CO₂ beyond what can be used will need to be permanently stored, either by mineralisation or geological sequestration. Transport infrastructure will be required from cement and lime plants and other large point sources of unavoidable emissions. Many such plants are not conveniently located near ports or sequestration locations. Development of CO₂ transport and storage infrastructure is an essential enabling step for inherently carbon intensive industries, such as cement and lime, to decarbonise in accordance with the national emissions reduction targets and baselines set out in the Safeguard Mechanism reforms.

The Australian Government can play a central role in supporting and coordinating the development of economical CO₂ transport, including by road, rail, ship or pipeline, as well as use and storage infrastructure, including the development of Australia's significant potential for geological sequestration.

Government support that helps to solve the question of 'what to do with the captured CO₂' would remove a significant barrier to investment in decarbonisation technologies by industry. Such support could include funding the development of CO₂ transport and storage infrastructure and/or providing additional incentives for CO₂ capture, such as guaranteeing the offtake and/or price of CO₂ captured from industry. Such support would provide certainty for investment by industry, and could and should be targeted at industries that have no alternative to carbon capture, such as cement.

Defining a role for Direct Air Capture

Decarbonisation across all sectors of the economy is vital to achieving net zero emissions by 2050 and avoiding the most catastrophic effects of climate change. Modelling by the International Panel on Climate Change (IPCC), however, shows that decarbonising alone will not be enough to achieve global climate goals. The excess CO₂ already in our atmosphere must also be mitigated. The IPCC projects that global carbon dioxide removal in the order of 1–10 billion tonnes of CO₂ per year could mitigate residual emissions and, in most scenarios, achieve net negative emissions to return global warming to 1.5°C, following a peak.

Direct Air Capture (DAC) of CO₂ is a nascent industry that has the potential to remove ambient CO₂ at the gigatonne scale. For this potential to be achieved, DAC technology must be developed to be scalable and economical, and infrastructure to safely and permanently store the captured CO₂ must also be available at low cost.

In the context of the Safeguard Mechanism reforms, the potential development and application of DAC technology has two significant implications: creating additional demand for carbon transport and storage infrastructure, and creating a new, scalable approach to offset emissions and generate carbon credits.

Although removal of dilute ambient CO₂ will likely continue to be less efficient than CO₂ capture at source, DAC facilities can be built in optimal locations that enable low-cost renewable energy inputs and are adjacent to natural CO₂ sequestration capacity. Alternatively, DAC facilities can also be co-located with other large point sources of CO₂ capture, such as cement plants, to maximise the utility of CO₂ transport infrastructure and deliver synergies and cost-savings for the renewable energy generation required to support the electrification of heavy industry and the use of DAC.

Australia's natural renewable energy resources and its potential for CO₂ sequestration make it an ideal location for DAC. Suitable policy settings, similar to those introduced under section 45Q in the United States, could act as a catalyst for a DAC industry in Australia, helping to reduce the cost of decarbonising other hard-to-abate industries through shared infrastructure

development costs and an alternative carbon offset solution. Additionally, the Government can support the development of DAC technology in Australia through targeted funding of DAC research and development, and support for DAC demonstration plants.

Value capture and value creation through decarbonisation

For Australia, the global transition towards a net zero emissions economy represents a unique moment of opportunity. Australia possesses a potentially unrivalled combination of renewable energy resources and iron ore, lithium and other critical minerals. Together with significant industry expertise and innovative Australian technologies, these natural advantages can enable Australia to create and capture more of the minerals' value chain through sustainable downstream processing and the export of premium, low carbon products.

The proposed reforms to the Safeguard Mechanism, combined with the introduction of an Australian CBAM, can deliver a framework that provides the necessary incentives and stability for industry to invest in the opportunity for value capture and value creation from Australian resources, as described below.

Electrification of heavy industry

Electrification is a key enabling technology for Australian heavy industry to contribute towards our national emissions reduction commitments. The electrification of mineral and chemical processing would allow industry to decouple its energy intensive processing requirements from the generation of carbon dioxide, other greenhouse gas emissions and pollutants.

Electrification of heavy industry can also incentivise further investment and development of renewable energy generation capacity, as well as help facilitate the incorporation of increasing amounts of renewable generation by enabling large industrial energy consumers to provide grid-load balancing capabilities.

At-mine processing

Low and zero emissions processing at the mine site promises a new paradigm in the supply of minerals, and one that can be a key advantage for Australian heavy industry. By processing minerals at the mine site, Australian producers can dramatically reduce the creation and transport of waste, simplify logistics and streamline mineral supply chains, thereby significantly reducing the economic and environmental cost associated with current practices. At-mine processing would be particularly beneficial for remote mining operations where transportation costs can be a significant proportion of the overall cost of production.

At-mine processing involves the thermal treatment of raw mineral ore to enable on-site solvent extraction of the valuable mineral. This allows the valuable portion of the mineral to be extracted on site while the gangue mineral can be returned to the mineral deposit, both eliminating the cost and environmental impact associated with transportation of the gangue mineral and the environmental impact that would otherwise occur with waste disposal off-site. This is particularly important for minerals such as rare earths and vanadium, where the waste rock can be very damaging to the environment when not properly managed.

Value capture and creation

As international trading partners decarbonise their economies and introduce prices on the carbon emissions of their imports, Australia should look to maintain and improve its competitiveness by providing sustainable sources of minerals to the world.

Electrification of mineral processing and the use of locally sourced renewable energy offers significant opportunities for Australian producers to develop highly competitive and future proof downstream processing solutions. By doing so, producers can add value to minerals by converting low-value ores into high-value products.

Processing minerals at the mine site with locally produced renewable electricity has the potential to reduce the cost of production. In addition, decarbonised mineral products can be increasingly expected to attract a premium price with trading partners and increase revenues from the sector, particularly as carbon pricing mechanisms and carbon border taxes become more prevalent.

By combining Australia's significant natural advantages in mineral and renewable energy resources, Australian producers can not only move up the value chain to capture more value from our resources, but also create value by delivering a reliable supply of premium, low carbon intensity refined mineral products.

Synergies with Australian green hydrogen

Australia's abundant renewable resources can also translate into a natural competitive advantage for the generation of 'green' hydrogen. Sustainable processing solutions that use green hydrogen as a reducing agent can enable significant value creation in the production of high-value refined products. This is in addition to the dramatic abatement of CO₂ emissions that would otherwise result from the processing of ores to metal when fossil-based reductants are used.

The use of green hydrogen as a reductant, in combination with renewably powered thermal processing, offers enormous potential for Australian production of green iron, rare earth metals and vanadium. As well as creating high-value decarbonised products for export, domestically refined metals can also supply Australian manufacturing industries to provide a competitive advantage in the production of lithium-ion batteries, vanadium redox flow batteries and rare earth magnets for vehicle and wind turbine motors, amongst other things.

For the production of metals by green hydrogen to be economically viable, expensive green hydrogen must be used as efficiently as possible. This can be achieved by using hydrogen only as a reductant, and recycling it in the process, rather than also combusting it as a fuel.

Improving supply chain security

Developing sustainable downstream processing capabilities in Australia would also diversify supply chains of critical minerals for Australia and its trading partners.

The ability to process minerals at the mine site would enable the production of critical minerals that are in high demand for Australian manufacturing supply chains, reducing Australia's reliance on imported minerals and helping to ensure the continuity of supply for the manufacturing industry.

Moreover, Australia can provide a stable and dependable source of critical minerals to international trading partners around the world.

Catalysing innovation and economic growth

Australia's hard-to-abate industrial facilities, such as cement and lime plants, are mostly located in regional areas. Enabling the decarbonisation of these facilities helps to ensure their economic viability in a future low carbon global economy, supporting regional jobs and ensuring the sustainability of the manufacturing base in Australia.

Developing downstream processing capabilities for the sustainable production of minerals on shore and at mine sites can also create jobs and economic growth in the mining sector, particularly in

regional Australia. Additionally, the production of high-value products can help make the Australian minerals industry more attractive to buyers and investors, further improving growth and job creation.

Downstream processing and the domestic creation of high-value intermediate and end products from critical minerals can also promote the development and commercialisation of Australian technologies. These include enabling technologies for more sustainable production of critical minerals, and technologies that utilise local sources of critical mineral products.

About Calix

Calix Limited (ASX: CXL) is an environmental technology company solving global challenges in industrial decarbonisation and sustainability, including CO₂ mitigation, sustainable processing, advanced batteries, biotechnology and water treatment.

Calix's patented core technology platform delivers efficient indirect heating of raw materials to enable electrification of industries, efficient capture of unavoidable emissions, and green industrial processing solutions. Its flash heating approach can also produce unique nanoporous materials with enhanced chemical and/or bio-activity.

Leveraging its core technology platform and a global network of research and development collaborations, Calix is urgently developing multiple environmental businesses that deliver positive global impact. Because there's only one Earth, and it's already ours.

Mars is for quitters.

Website: <https://www.calix.global/>

Twitter: [@CalixLimited](https://twitter.com/CalixLimited)

LinkedIn: [@ Calix Limited](https://www.linkedin.com/company/calix-limited)

YouTube: [CalixLimited](https://www.youtube.com/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

Investor enquiries

investorrelations@calix.global

Media enquiries

media@calix.global