

TO: California Air Resources Board

FR: Leilac U.S., Inc.

RE: Comments in Response to May 31, 2023, Workshop for Net-Zero Emissions Strategy for the Cement Sector

Leilac would like to thank the California Air Resources Board (CARB) for the opportunity to comment on the May 31st workshop continuing discussions and planning on the implementation of SB 596.

Leilac aims to apply a breakthrough in low-cost carbon capture technology that will enable the cement and lime industries to reduce their emissions dramatically – while retaining their international competitiveness – by capturing those process emissions at low cost. This is a completely new ‘type’ of carbon capture technology: Leilac is a “process modification” approach, as opposed to other forms of carbon capture that require additional chemicals or processes. Our technology simply stops the unavoidable CO₂ process emissions from being contaminated during these ‘hard to abate’ industrial processes. It uses simple, heated tubes that keep the CO₂ pure for capture. As minimal additional energy is required, and no chemicals are required, it can do so at a very low cost.

The technology has been piloted at scale, and a new replicable ‘module’ will shortly be built that is being designed to capture 100,000 ktpa of CO₂ as a retrofit. The design is modular and can be applied to cover all a plant's process emissions. It is being designed to use any fuel or energy source – providing a ‘future-proof’ solution. This technology is a practical and affordable pathway for local industries to thrive in a carbon-constrained future. This flexibility to be powered by low-carbon fuels (e.g., hydrogen) or electricity enables substantial air quality benefits for communities local to cement production facilities.

Leilac is supportive of the steps California is taking to decarbonize industrial processes and appreciates the opportunity CARB is providing to coordinate with companies and other stakeholders through these workshops. Leilac encourages the agency to consider and implement strategies and targets that include consideration of emerging and innovative technologies with potential to significantly decarbonize the cement sector.

We welcome the opportunity to serve as a resource to the agency to provide further information or answer any questions that may arise.

Sincerely,

Daniel Rennie
Chief Executive Officer

Introduction

The cement sector is responsible for ~8% of global CO₂ emissions, most of which are CO₂ emissions released directly and unavoidably from the processing of the raw materials. Leilac supports CARB's work to advance technologies that will be vital to improving climate change mitigation and adaptation success. Today, the global cement and lime industries are both committed and developing the tools to take dramatic steps in achieving net-zero production.

Leilac is excited about the opportunities on the horizon in California to decarbonize cement. We look forward to serving as a resource as CARB develops its strategy to achieve its 2045 goals. We view the strategy as important progress to establishing a cement decarbonization project in the State.

Definition of "Cement"

Although GHG emissions intensity per tonne of product is a good metric, the critical measurement is the total net emissions to the atmosphere. Should supplementary cementitious materials (SCMs) be used to increase production, without a decrease in clinker production, the benefit to total net emissions may be marginal. Equally, the emissions associated with the production of the SCMs should be included in the life cycle analysis for the product.

Ultimately, while SCMs are beneficial and should be actively supported and encouraged, there is only so far that substitution by SCMs can take us on the pathway to net-zero cement. Large volumes of clinker production will still be required, and carbon capture and storage will be essential in abating the resulting process emissions and achieving a net-zero by 2045 goal.

Support for Emerging and Innovative Technologies

During October 20th workshop, CARB outlined that 59% of the cement sector emissions in California stem from process emissions, while fuel combustion accounts for 36%.¹ The May 31st workshop primarily focused on potential clinker intensity reduction options and other product change management solutions. These solutions will serve to help meet the interim targets for emissions reduction. In order to achieve the long-term targets mandated by SB 596, Leilac encourages CARB to continue to consider the critical role that emerging and innovative CCUS solutions will play in reducing process emissions associated with clinker production. Though the agency highlights that the SB 905 process will also inform the implementation of CCUS projects in the State, Leilac would like to emphasize the importance of sector-specific considerations as well. Cement production facilities are unique in that they are often located near communities that have been adversely impacted by emissions and may have concerns regarding CCUS that should be considered independent of other industry segments to ensure communities are engaged in and understand solutions.

As highlighted in our comments in response to the October workshop, Leilac's solution offers a completely new 'type' of carbon capture technology by way of modifying the method for processing limestone. This approach enables a simple and efficient solution to capture

¹ Source: [CARB SB596 Kickoff Workshop Slides](#), October 20th.



unavoidable emissions that, in addition to its low cost and compatibility with clean fuel sources, has other significant benefits.

By keeping the process emissions pure, Leilac's approach does not require additional chemicals to separate CO₂ emissions from other gases, therefore enabling abatement of unavoidable CO₂ without the generation of additional CO₂ or other chemical emissions into the local environment. The straightforward nature of Leilac's technology will ultimately allow for implementation through a blueprint model. This model is designed to maximize the speed of adoption and impact of the technology, and ensure that decarbonization solutions that help create a sustainable local manufacturing base can be delivered by local companies using local resources.

There are minimal technical risks associated with the Leilac technology given its stage of development. The primary risk is associated with application at full scale in the most efficient way possible while ensuring that the design can be quickly and cheaply applied to all cement plants. Government support to help enable this technology, and other innovative technologies, is crucial to successfully de-risking these solutions and ensuring that CARB can meet its emission reduction targets for this sector in 2035 and beyond.

Additionally, while many existing policies and programs in North America reward projects that capture high volumes of CO₂, and those programs have positive impacts, CCUS technologies that prevent emissions at the source that minimise the need to use more fuel, should be prioritized in the development of targets and incentivized on equal footing as traditional CCUS solutions or other emission reduction strategies. Inclusion and incentivization of process emission solutions and projects that abate carbon in CARB's strategy and future policy development will help to establish projects that can achieve maximum decarbonization in the cement industry.

Conclusion

Again, Leilac would like to thank CARB for the opportunity to provide comments on this workshop and we welcome the opportunity to serve as a resource to the agency throughout this process. We are available to provide further information or answer any questions that may arise.