October 9, 2024

Hanjiro Ambrose, Ph.D.
California Air Resources Board (CARB)
1001 I Street
Sacramento, CA 95814

Re: Comments on the Kick-off Workshop on Building Embodied Carbon

Dear Dr. Ambrose:

Brimstone appreciates the opportunity to provide comments to the California Air Resources Board (CARB) in connection with the September 19, 2024, workshop on building material decarbonization. We strongly support California's efforts to reduce carbon emissions associated with building materials through policies such as SB 596 (Becker); CARB's building embodied carbon framework pursuant to AB 2446 (Holden) and AB 43 (Holden); incorporating embodied carbon limits in the state's building codes; and clean procurement strategies—most importantly using advance market commitments (AMCs) to accelerate the commercialization of transformational, low carbon building materials.

About Brimstone

Brimstone is a California-based company, headquartered in Oakland, with a deeply decarbonized process for making ordinary portland cement (OPC), the type of cement used in virtually all construction worldwide. The conventional production of cement today is responsible for 7.5% of global carbon emissions, nearly the same climate impact as all the world's cars.

The Brimstone process produces industry-standard OPC, specifically ASTM C150 cement, from carbon-free, calcium silicate rocks, rather than limestone. This avoids the 60% of emissions that originate from cement's traditional feedrock. Overall, the process drastically reduces carbon emissions in all energy scenarios, and is carbon-neutral or even carbon-negative when using clean energy.

Brimstone is upending the conventional wisdom that CO_2 emissions are inevitable to manufacture cement, and that carbon capture, with all its cost and complexity, is the only way to decarbonize cement production. The U.S. Department of Energy recently selected Brimstone to negotiate an award of up $189 million to construct the first commercial-scale plant deploying its deeply decarbonized cement manufacturing process.

Decarbonizing Cement Is Critical to Reducing Climate Impact from Buildings

As the workshop highlighted, construction and construction materials are a major source of greenhouse gas emissions. While the slides highlighted that building materials and construction account for 11% of all global greenhouse gas emissions, the vast majority of these emissions come from the production and use of cement and concrete. Cement production alone is responsible for 7.5% of global carbon emissions, and nearly a quarter of industrial sector emissions worldwide.[1] Unlike other major sources of industrial emissions, policymakers have only recently turned their attention to cement sector emissions, which are expected to grow without further policy intervention.

California has begun to take important steps to address this policy gap, including through SB 596, and we look forward to the forthcoming release of a cement decarbonization framework as well as the emergence of an embodied carbon framework through this process. Much work will remain to implement those frameworks and to quickly deliver targeted emissions reductions from cement and other building materials. We therefore appreciate the willingness of CARB to work with Brimstone, other innovators, and stakeholders overall, to accelerate the development and implementation of those frameworks and achieve the State's climate goals.

Clean Procurement, Especially Through Advance Market Commitments, Is Critical to Commercializing Ultra-Low Embodied Carbon Materials and Achieving Net-Zero Construction

Given the magnitude of this challenge, California's approach to decarbonizing building materials must be both comprehensive and forward-looking, aligning the state's ambitious carbon neutrality goals with practical steps for achieving them. This begins with public procurement. By and large, the low-carbon solutions commercially available today are only incrementally better than the status quo. This is particularly true for cement and concrete. Accordingly, to dramatically reduce embodied carbon, and ultimately achieve net-zero carbon construction, the state needs to prioritize policies that facilitate the scale-up and commercialization of truly transformational, low-carbon building materials.

No policy is more critical in the near term to support the rapid development of low carbon technology solutions for the cement sector than the use of AMCs. AMCs are emerging as a key tool federally for catalyzing the commercialization of decarbonized solutions for hard-to-abate sectors and carbon removal. For emerging technologies to scale, financial institutions need to know that there will be a buyer for the low-carbon product once a facility is built or retrofitted. This is the financing mechanism for a whole range of technologies today, including renewable power—where developers typically sign a power purchase agreement with a utility before building a project. Without the confidence of a market and future offtake agreement, new low carbon facilities cannot obtain financing, delaying—if not entirely blocking—the state's ability to achieve its climate goals.

[1] International Energy Agency (IEA) and Cement Sustainability Initiative (CSI), "Technology Roadmap: Low-Carbon Transition in the Cement Industry," 2018.

For cement and concrete, in particular, the state is by far the largest consumer in California. The product that the state chooses to use will set the market, and there are currently no preferences or requirements for low carbon cement and concrete. Even policies that do urge the use of lower embodied carbon building materials, such as new requirements in the CALGreen building code, naturally must rely on existing products and technologies to set emissions baselines that are only incrementally better than today's average.

Developing new, lower carbon products requires innovative procurement strategies, namely AMCs. This powerful strategy can demonstrate demand for deeply decarbonized products, unlocking private financing for first-of-a-kind facilities and accelerating the commercialization of innovative solutions. This strategy is therefore essential for commercializing the products California needs to hit its climate targets, particularly around cement and concrete, and should be a key plank in the state's climate strategy. Most importantly, CARB should explicitly call for the state to utilize advance market commitments in its forthcoming SB 596 report on decarbonizing the cement industry in California.

Workshop Feedback

We appreciate CARB hosting this preliminary workshop and requesting specific feedback, which we provide below.

Reporting Requirements

While Brimstone supports the use of Environmental Product Declarations (EPDs) as a common reporting approach, EPDs generally require a year or more of plant-specific data. Requiring EPDs for procurement without an alternative option could therefore shut out new entrants early on in their commercial path and slow the availability of emerging, deeply decarbonized building materials. To avoid this counterproductive and unintended consequence and advance the development of innovative solutions, California should allow companies to furnish a third-party Life Cycle Assessment (LCA) to substantiate Global Warming Potential (GWP) claims during the initial period of plant operation. This flexibility would help avoid market barriers and speed up the adoption of low-carbon materials.

Emissions Baselines

The national trade associations for cement industry, the Portland Cement Association (PCA), and for the concrete industry, the National Ready-Mix Concrete Association (NRMCA), generate average EPDs for their industries.[2,3] These are useful as *product-specific* baselines. They should only be used to compare the GWP intensity of *functionally equivalent* materials. For example, the PCA's OPC baseline is the right comparison for Brimstone, which produces standard ASTM

[2] https://www.calportland.com/wp-content/uploads/2024/05/PCA_EPD_Portland_Athena_Final_revised_Oct2023.pdf
[3] https://www.nrmca.org/association-resources/sustainability/environmental-product-declarations/

C150 OPC. The use, application, strength, and other characteristics should determine, on a product-by-product basis, whether the OPC baseline is the correct baseline for non-OPC cements.

Conclusion

We appreciate CARB's ongoing efforts to address emissions from the cement industry and the embodied carbon of building materials more generally. To achieve California's climate goals, it is imperative for the state to adopt a comprehensive and forward-looking strategy. This strategy must include a focus on priority near-term actions, such as advance market commitments, that will drive the commercialization of transformational solutions. We urge CARB to explicitly include the use of this tool in its forthcoming SB 596 report, and to provide flexibility in reporting requirements under the embodied carbon building standards to support new market entrants.

Thank you for considering our comments. We look forward to continued collaboration with CARB to achieve California's decarbonization targets. Please do not hesitate to reach out if you have any questions or need further information.

Sincerely,

Simon Brandler
VP of Policy & Public Affairs
Brimstone