Coalition for Sustainable Cement Manufacturing & Environment
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June 24, 2022

Ms. Liane M. Randolph
Chair
California Air Resources Board
1001 "I" Street
Post Office Box 2815
Sacramento, California 95812

Subject: **The California Cement Industry's Comments on the Draft 2022 Scoping Plan Update**

Dear Ms. Randolph:

The Coalition for Sustainable Cement Manufacturing and Environment ("CSCME") provides these comments on the California Air Resources Board's ("CARB's") Draft 2022 Scoping Plan Update (the "Draft Update"), as issued on May 10, 2022.

CSCME is a coalition of all five cement manufacturers in California.[1] Since the passage of AB 32 in 2006, we have worked cooperatively and constructively with policymakers and regulators to develop policies that advance California's climate goals and promote the reduction of greenhouse gas ("GHG") emissions in the cement industry, while minimizing the risk of economic and emissions leakage. Those efforts include working with CARB on the design and implementation of the cap-and-trade program and working with legislators to refine and extend the program under AB 398.

As a result of these policies and associated industry investments, the California cement industry has made significant contributions to achieving California's 2020 GHG emissions reduction targets. For instance, between 2008 and 2020, the industry produced roughly the same amount of cement in 2020 as it did in 2008, but with 13 percent fewer total GHG emissions and 22 percent fewer combustion-related emissions.[2] As of 2019, the California cement industry accounted for less than 2 percent of the state's total GHG emissions, whereas the global cement industry accounts for roughly 8 percent of global GHG emissions.[3,4]

[1] The Coalition includes CalPortland Company, Cemex, Inc., Martin Marietta Materials, Mitsubishi Cement Corporation, and National Cement Company of California Inc. There are seven cement plants currently in operation in California.

[2] Calculated using industry data from U.S. Geological Survey (2000-2019). Annual Mineral Commodity Summary.; California Air Resources Board (2021). 2000-2019 GHG Inventory (2021 Edition). Full Inventory - Economic Sector Categorization.; and California Air Resources Board (2021). 2020 GHG Facility and Entity Emissions. Full Inventory - Economic Sector Categorization.

[3] California Air Resources Board (2021). 2000-2019 GHG Inventory (2021 Edition). Full Inventory - Economic Sector Categorization.

[4] McKinsey & Company (2020). Laying the Foundation for Zero-Carbon Cement.

With respect to the path forward, CSCME supports California's goal of achieving net carbon neutrality by 2045. In fact, the California cement industry has not only committed to achieving net carbon neutrality by 2045 but has also proactively offered a plan for realizing that goal.[5] That plan details nine distinct pathways for reducing GHG emissions in the California cement industry in the short, medium, and long terms, as well as the technological, economic, social, regulatory, statutory, and policy barriers that must be removed to fully unlock each pathway.

Consistent with that plan, the California cement industry actively worked in a cooperative and constructive manner with the legislature and sponsors to secure the passage of SB 596, which directs CARB to develop a cement-specific strategy for achieving net carbon neutrality by 2045. We look forward to working with CARB and other stakeholders to develop a long-term strategy that is tailored to the industry's unique characteristics, circumstances, and challenges, as well as the unique opportunities it provides to advance California's policy goals.

The Draft Update represents a meaningful next step in the journey toward achieving net carbon neutrality in the California cement industry. We support the Draft Update as a framework that is broadly consistent with the industry's roadmap and as a planning document that explicitly recognizes that the California cement industry is difficult to electrify, difficult to decarbonize, and highly exposed to economic and emissions leakage. We also generally support the Proposed Scenario, which appropriately acknowledges that the challenge of achieving net carbon neutrality requires the state to carefully balance a wide range of social, economic, and environmental considerations, including the risk of economic and emissions leakage.

The attached comments detail the cement industry's outlook and expand on a handful of critical points:

- The California cement industry supports the state's climate goals and is committed to achieving carbon neutrality by 2045.
- The California cement industry looks forward to working with CARB on the development of a carbon neutrality strategy that is tailored to the industry.
- The California cement industry supports the Proposed Scenario but recommends three cement-specific enhancements.
- The California cement industry cannot achieve carbon neutrality without the widespread deployment of CCUS.
- The California cement industry cannot achieve carbon neutrality without policies that level the carbon playing field with imported cement.
- The California cement industry cannot substantially reduce its GHG emissions profile before CCUS is widely deployed without unlocking pathways to low-carbon fuels.

[5] For more details regarding the industry's plan, see cncement.org/attaining-carbon-neutrality.

The stakes are high. If successful, California will provide the world with a model for how to achieve net neutrality in an industry that is difficult to electrify, difficult to decarbonize, and highly exposed to the risk of economic and emissions leakage.

The path to net carbon neutrality in the California cement industry is clear. The strategic imperative and the social, economic, and environmental advantages associated with a strong local cement industry are equally obvious, especially in light of California's resilience, infrastructure, and affordable housing goals. The primary question is whether policymakers and regulators are able to remove the barriers that prevent the industry from attaining net carbon neutrality while remaining viable in a hyper-competitive marketplace for an indispensable and strategic commodity such as cement.

CSCME looks forward to working with CARB and with other government and non-governmental stakeholders to ensure that California continues to have a strong local cement industry that is capable of achieving net carbon neutrality while meeting the state's other ambitious policy goals.

I. THE CALIFORNIA CEMENT INDUSTRY SUPPORTS THE STATE'S CLIMATE GOALS AND IS COMMITTED TO ACHIEVING CARBON NEUTRALITY BY 2045.

Since the passage of AB 32 in 2006, the California cement industry has worked cooperatively and constructively with policymakers and regulators to realize the state's climate goals. Those efforts include contributing to the development and implementation of the cap-and-trade program; actively working for the refinement and extension of the cap-and-trade program through enactment of AB 398; lending industry support for AB 617, which provides additional monitoring and protections for environmental justice communities, and advocating for the creation of a cement-specific strategy for achieving carbon neutrality under SB 596.

In 2021, the California cement industry issued "Achieving Carbon Neutrality in the California Cement Industry"[6] — a landmark document that:

- Expressed the industry's view that "society must take bold steps now in order to avoid the worst impacts of climate change";
- Established the industry's commitment to achieving carbon neutrality by 2045, consistent with the state's long-term climate goals;
- Outlined nine distinct pathways for reducing GHG emissions in the industry over the short, medium, and long terms; and
- Identified the range of technological, economic, social, regulatory, statutory, and policy barriers that must be removed to fully unlock the potential of each pathway.

The Draft Update echoes and closely aligns with the industry's plan in several respects. It calls for bold action to avoid the worst impacts of climate change. It advances a scenario to achieve carbon neutrality

[6] For more details regarding the industry's plan, see cncement.org/attaining-carbon-neutrality.

by 2045. It identifies pathways for achieving that goal. And it emphasizes the importance of removing barriers, noting that "we absolutely must identify and address market and implementation barriers to be successful"[7] and that the transition will require "identification and removal of market and implementation barriers to the production and deployment of clean technology and energy."[8]

Accordingly, we support the Draft Update as a useful framework for thinking about the challenge of achieving carbon neutrality in general, and we encourage all interested stakeholders to review the industry's plan to better understand the specific barriers that must be removed to achieve carbon neutrality in the California cement industry in particular.

II. THE CALIFORNIA CEMENT INDUSTRY LOOKS FORWARD TO WORKING WITH CARB ON THE DEVELOPMENT OF A CARBON NEUTRALITY STRATEGY THAT IS TAILORED TO THE INDUSTRY.

In 2021, the California cement industry directly engaged with sponsors and the legislature in a cooperative and constructive manner to develop and refine SB 596, which was adopted with a degree of bipartisan support and was endorsed by key stakeholders from both the environmental and business communities. Consistent with the industry's commitment to achieve carbon neutrality, SB 596 requires CARB to develop and implement a comprehensive strategy to achieve net-zero emissions from cement used within the state no later than 2045.

As noted in the Draft Update, the California cement industry is difficult to electrify, difficult to decarbonize, and highly exposed to economic and emission leakage.[9] The good news is that, despite these obstacles, achieving carbon neutrality in the California cement industry is within our reach. The barriers that prevent the California cement industry from achieving its carbon neutrality goals are relatively well known and well understood. The primary uncertainty is whether policymakers and regulators are able to systematically remove those barriers without exacerbating the risk of leakage to imports and threatening the viability of local producers.

The importance of reducing GHG emissions while maintaining a viable and vibrant local cement industry cannot be overstated. Cement is an essential commodity for modern economies and is critical to translating California's environmental, economic, infrastructure, affordable housing, and climate resilience ambitions into real action. By sourcing its cement locally, California can avoid the GHG emissions associated with cement from jurisdictions with less stringent environmental regulations and its transportation over long distances. At the same time, cement is an affordable and durable material that is uniquely suited for the construction of buildings that provide maximum protection from fire, flood, and other growing threats from climate change.

We look forward to working with CARB to develop a long-term strategy that reflects these unique challenges and recognizes the important role that a local cement industry plays in modern economies,

[7] California Air Resources Board (2022). Draft 2022 Scoping Plan Update. vii

[8] California Air Resources Board (2022). Draft 2022 Scoping Plan Update. x

[9] California Air Resources Board (2022). Draft 2022 Scoping Plan Update. 68

including through its ability to contribute to the state's various policy goals. But the margin for error is slim. On the one hand, policies that methodically remove barriers to GHG reductions, support long-lived capital investments, and create a level playing field with imported products have the potential to provide the world with a model for how to achieve carbon neutrality in a difficult to decarbonize industry. On the other hand, policies that require cement producers to reduce GHG emissions more swiftly or more severely than science, technology, or economics allow will merely undermine the competitiveness of the cement industry and increase imports without a net reduction in global GHG emissions — providing the world with a cautionary tale about the consequences of policies that ignore real-world constraints.

III. THE CALIFORNIA CEMENT INDUSTRY SUPPORTS THE PROPOSED SCENARIO BUT RECOMMENDS THREE CEMENT-SPECIFIC ENHANCEMENTS.

CSCME agrees that the Proposed Scenario set forth in the Draft Update strikes the appropriate balance across a range of social, economic, and environmental considerations and likely results in less emissions leakage compared to the alternative scenarios.

We also agree with many of the sector-specific actions and "strategies for achieving success" that are intended as context for implementation of the Proposed Scenario. We particularly agree with many of the proposed strategies in the "industry" and "carbon dioxide removal" sections, including the need to invest in research and development and pilot projects to identify options for reducing process emissions, developing infrastructure to support CCUS deployment, streamlining barriers to permitting projects that reduce GHG emissions, and other actions to remove barriers to using lower-carbon fuels and rapidly deploying CCUS technology in the cement industry.

However, some of the proposed strategies are unclear or open-ended, including plans to "{e}valuate and propose, as needed, changes to strengthen the Cap-and-Trade Program" and "{e}stablish markets for low-carbon products and recycled materials using Buy Clean California Act and other mechanisms". In the absence of more details, these vague strategies fall significantly short of creating the confidence required to make the long-term capital investment plans necessary to achieve carbon neutrality in the California cement industry. CSCME looks forward to additional details on these strategies so that it can evaluate the Proposed Scenario in its entirety.

Finally, we believe that the Proposed Scenario can be enhanced and should be expanded to include three cement-specific measures:

- Minimizing the risk of emissions leakage via a border carbon adjustment or other similar market mechanism to level the playing field with imported cement, as detailed in Section V.
- Expanding the cement industry's access to and use of renewable natural gas and removing barriers that prevent access low-carbon fuels, as detailed in Section VI.
- Recognizing and incorporating cement's role as a carbon sink into the state's carbon neutrality accounting framework, as detailed in Section VII.

The collection of cement-specific measures and strategies for success should not be viewed as a menu of options — all GHG reduction pathways must be fully unlocked to achieve carbon neutrality, especially in a difficult-to-decarbonize sector such as cement. The California cement industry requires access to a broad and flexible portfolio of strategies that will enable each plant to chart a course that aligns with its unique needs and circumstances. In addition, the cement industry cannot achieve carbon neutrality on its own — many of these measures and strategies rely on factors that are entirely outside the industry's control. As a result, success will depend on tight alignment and close coordination among a wide range of stakeholders, including policymakers, regulators, developers, engineers, architects, contractors, and the communities within which they operate.

IV. THE CALIFORNIA CEMENT INDUSTRY CANNOT ACHIEVE CARBON NEUTRALITY WITHOUT THE WIDESPREAD DEPLOYMENT OF CCUS.

Due to the presence of significant process emissions, the California cement industry cannot achieve carbon neutrality without the relatively rapid and widespread deployment of CCUS technology.[10] Process emissions comprise roughly two-thirds of total GHG emissions in the California cement industry — effectively forming a "wall" that prevents deep decarbonization using available technology. CCUS is the only known solution that has the potential to substantially reduce process emissions. As noted in the Draft Update, "Process emissions from cement manufacturing are significant and will continue even if the sector were to operate using zero-carbon fuels; thus carbon capture and use/sequestration will be a likely component of any strategy to fully decarbonize cement manufacturing."[11] Simply put, achieving carbon neutrality in the California cement industry is impossible without the widespread deployment of CCUS technology.

The Draft Update and the Proposed Scenario recognize the importance that CCUS technology will play in achieving carbon neutrality in general. For instance, the Draft Update references the need to "{i}ncorporate CCS into other sectors and programs beyond transportation where cost-effective and technologically feasible options are not currently available."[12] Moreover, the modeling that supports the Proposed Scenario demonstrates the "targeted need for CCS on large facilities such as refineries and cement."[13] We agree with such statements, although we also note that CCUS is more important to the cement industry as a decarbonization lever than any other sector. As noted by Rebecca Dell, Director of the Industry program for the ClimateWorks Foundation, "{e}ven if we decide that we don't want to use CCS in any other part of our economy, I think the place that we are most likely to end up relying on CCS as our primary decarbonization pathway is in the cement industry."[14]

[10] CSCME includes utilization together with carbon capture and storage because innovation and new technologies may facilitate commercial scale utilization that would provide a potential alternative to storage alone.

[11] California Air Resources Board (2022). Draft 2022 Scoping Plan Update. 167

[12] California Air Resources Board (2022). Draft 2022 Scoping Plan Update. 177

[13] California Air Resources Board (2022). Draft 2022 Scoping Plan Update. 175

[14] Roberts, D., & Dell, R. (Hosts). (Feb 11, 2022). Volts Podcast: Rebecca Dell on Decarbonizing Heavy Industry [Audio podcast episode]. In *Volts*.

Accordingly, CSCME agrees with many of the "strategies for success" for industry and for CO2 removal included in the Draft update, including:

- "{i}nvest in research and development and pilot projects to identify options to reduce…process emissions",
- "{d}evelop infrastructure for CCS and hydrogen production to reduce GHG emissions where cost-effective and technologically feasible non-combustion alternatives are not available",
- "{i}ncorporate CCS into other sectors and programs beyond transportation where cost-effective and technologically feasible options are not currently available",
- "{e}valuate and propose, as appropriate, financing mechanisms and incentives to address market barriers for CCS…", and
- "{e}valuate and propose, as appropriate, the role of CCS in SB 596."[15]

The application of CCUS technology in the cement industry today is neither widespread nor operational at scale and remains a long-term solution. It is, however, at a critical inflection point. Feasibility studies have shown promising results, but the technology remains very costly and is not yet commercially viable. A recent Department of Energy report found an estimated cost of $400 million for a CCUS facility with 90 percent capture estimate on cement plants.[16] To put that figure into perspective, consider that it is similar to the cost of building a new cement plant. In other words, the adoption of CCUS is a high-stakes, high-risk decision that requires a producer to effectively "double down" on the California market without any increase in capacity or output.

To maximize the odds of making the widespread deployment of CCUS in the cement industry a reality, policymakers and regulators should focus on advancing three key objectives:

1) **Inspire confidence in the long-term future of the industry in California**: Growing leakage risk and increasing compliance costs (including under the cap-and-trade program via a declining cap adjustment factor and increasing carbon prices) will make it difficult for the cement industry to make large, long-lived capital investments in CCUS. Policymakers and regulators should adopt policies that ensure there is a viable and vibrant local cement industry capable of adopting CCUS technology when it becomes more widely available.

2) **Improve the risk-reward profile for CCUS investments in California:** In terms of capital investment and operating costs, CCUS is akin to building a new cement plant inside an old cement plant (but without an increase in output). Policymakers and regulators should adopt policies that sufficiently improve the risk-return profile for cement industry partners, including public funding, public financing, public price guarantees, and public purchase guarantees, among others.

[15] California Air Resources Board (2022). Draft 2022 Scoping Plan Update. 168 and 177-178.

[16] Fout, T. (2022). TEA of Industrial CO2 Capture and a Baseline Analysis for CO2 Capture on Cement Production. United States Department of Energy, National Energy Technology Laboratory.

3) **Create a level playing field with imported cement:** Unless the capital and operating costs of CCUS are realized through 100 percent public funding, California cement producers will need to pass through those costs to customers to generate a sufficient return on their investment. Policymakers and regulators should implement policies that level the playing field and ensure that local investments in CCUS – public or private – are not simply undermined by imported cement that is not subjected to similar standards and costs (see next section for more detail).

Time is of the essence — experience suggests that California will need at least 10 years to make CCUS at cement facilities a reality.[17] Moreover, good *timing* will be key. Policies that rely on unrealistic timelines or effectively force local producers to adopt CCUS technology before a supportive environment is in place will merely drive plants out of business, triggering all the economic and environmental consequences that come with replacing local cement production with imported products.

V. THE CALIFORNIA CEMENT INDUSTRY CANNOT ACHIEVE CARBON NEUTRALITY WITHOUT POLICIES THAT LEVEL THE CARBON PLAYING FIELD WITH IMPORTED CEMENT.

The California cement industry constantly operates under an elevated threat of being undermined by imported product that is not subject to the same environmental regulatory requirements or compliance costs. The severity of that threat is dictated by three realities:

- **Cement is a fungible commodity that is the textbook example of a highly substitutable product.** Cement is produced to exact specifications and primarily sold in bulk without distinctive packaging or labeling, making domestic and imported cement indistinguishable and highly substitutable.

- **Cement purchasers are price sensitive and, given that cement is highly fungible, cement producers compete almost exclusively on the basis of price.** According to the International Trade Commission ("ITC"), purchasers rank price as the most important purchase factor by far and a small price differential is sufficient to induce customers to shift suppliers, whether domestic or foreign.[18, 19]

[17] Estimated timeline is based on the typical permitting timeline for industrial projects in California and prior cement industry projects. While this timeframe will vary from project to project, potential exposure to litigation due to the California Environmental Quality Act can significantly lengthen the permitting process for industry projects. For more detail on requirements and timelines for CCUS investments in California, reference Energy Futures Initiative's report "An Action Plan for Carbon Capture and Storage in California: Opportunities, Challenges, and Solutions."

[18] *Cement from Japan, Second Review* at II-8 (Table II-1); *see id*. at II-7 ("in the first review, when gray Portland cement purchasers were asked to list the three most important factors considered when choosing a supplier, price was ranked first most often by a wide margin").

[19] "In a product such as cement, however, even small levels of underselling must be considered significant." *Cement from Japan* at 64 (Separate Views of Commissioner Rohr); *see Cement from Japan, Second Review* at I-14-I-15, quoting Response of Domestic Producers to Notice of Institution at 7; *Cement from Japan, Mexico, and Venezuela Review* at 39 n.238 (a cost savings of "$3 per ton is substantial, particularly for a highly-substitutable, price-sensitive product, such as cement").

- **The California cement market is logically and economically accessible to cement manufacturers throughout the world.** California's coastal location and deepwater ports make it a prime target for countries with excess cement capacity, particularly China and other Asia Pacific nations.

The threat of economic and emissions leakage to the California cement industry has shifted and evolved since the adoption of AB 32. Prior to the Great Recession, the industry faced intense competition from imports as a result of an overleveraged economy and an unprecedented housing boom. The ensuing economic downturn and long recovery decimated the state's cement industry, with demand falling by roughly half. Competition from imports waned, resulting in a welcomed reprieve from leakage risk but also masking the growing competitive disadvantage created by the state's asymmetrical climate policies. But that competitive disadvantage has become more salient in recent years as the market has healed, the cost of compliance has increased, and competition from imports has grown more intense. As of 2021, imports represented more than 25 percent of California cement consumption — the highest import market share since before the Great Recession.[20,21]

The industry's competitive position is likely to deteriorate under a status quo scenario in which carbon prices rise, allowance allocations decline, and there are no serious efforts to hold imports to a similar environmental standard. It stands to reason that such circumstances would make it impossible for private investors to approve any significant GHG reduction projects (especially such high-stakes, high-risk projects like CCUS) that would merely add to that competitive disadvantage and increase the odds that such efforts will be undermined by imports. It also stands to reason that the public sector *should not* make such investments, as it will simply waste taxpayer funds for the same reasons.

Simply put, the California cement industry cannot make the capital investments needed to substantially reduce its GHG footprint (much less achieve carbon neutrality) in the absence of a policy mechanism that holds imported cement to a similar environmental standard. As documented in our submissions to CARB over the past decade, we believe the appropriate mechanism is an "incremental border adjustment" that imposes costs on imported cement that exceeds the industry's allowance allocation rate. Such an approach would align the carbon costs of all cement-based products consumed in the state, regardless of where it is produced.

More importantly, such an approach would effectively close a "carbon loophole" in California's GHG accounting systems and ensure that the state holds itself responsible for the GHG emissions associated with its cement consumption — not just those that are produced within its borders. The adoption of an incremental carbon border adjustment would also assist California with reclaiming its mantle as a leader on such issues in light of recent events: the European Union is likely to implement an incremental border adjustment into their Emissions Trading Scheme in the near future; and federal policymakers have

[20] U.S. Geological Survey (2021). Annual Mineral Commodity Summary.

[21] *See* United States Geological Survey Mineral Industry Survey December 2021 release Tables 2A and 2B (Shipments of Portland and Blended Cement – State of Destination) and International Trade Commission Dataweb portal import data for 2021 (Imports for Consumption by Customs District, First Unit of Quantity, HS Code 2523).

recently introduced legislation along the same lines.[22] Applying a similar policy to the California economy would expand the cement industry's ability to invest in crucial GHG abatement measures and protect both public and private investment necessary to achieve carbon neutrality in the California cement industry.[23]

It is important to note that the adoption of policy mechanisms to level the playing field with imported products is neither unprecedented nor impractical. CARB has effectively been implementing such a mechanism in the electric power sector since the inception of the cap-and-trade program almost a decade ago. Likewise, CARB has adopted resolutions recognizing the importance of such measures to the California cement industry and directed staff to investigate their feasibility.[24] Finally, as has been noted in prior comments, cement is the ideal product to pilot such a measure, as it is a commodity that is rarely transported long distances over land, it is imported through a small number of known ports by sea, and it is rarely if ever transported in the form of a more integrated, downstream product (i.e., concrete cannot be economically transported long distances).[25]

For these reasons, CSCME strongly recommends that CARB incorporate a mechanism into the Draft Update that levels the carbon playing field between locally-produced and imported cement. Specifically, we propose that CARB endorse an incremental carbon border adjustment (or functionally similar mechanism) that subjects locally produced and imported cement to the same environmental regulatory standard and compliance costs.

VI. THE CALIFORNIA CEMENT INDUSTRY CANNOT SUBSTANTIALLY REDUCE ITS GHG EMISSIONS PROFILE BEFORE CCUS IS DEPLOYED WITHOUT UNLOCKING PATHWAYS TO LOW-CARBON FUELS.

The high heat requirements of cement manufacturing make electrification infeasible for the foreseeable future. As a result, the industry needs support to deploy viable low-carbon fuels now. Low carbon fuels that are both available and able to reach the high heat required for manufacturing include, but are not limited to, renewable natural gas ("RNG"), biomass-derived fuels, refuse-derived fuels, and engineered municipal solid waste.

[22] The EU CBAM would require importers of certain products to purchase emissions allowances equal in value to the carbon price that would have been paid if the goods were produced in the EU. For more on the European plan see *European Commission (2021).* Carbon Border Adjustment Mechanism: Questions and Answers. For U.S. federal legislation, see the Clean Competition Act introduced by Senator Sheldon Whitehouse (D-RI) in June 2022.

[23] Implementing a carbon border adjustment was proposed as an additional action to minimize emissions leakage in the 2017 Scoping Plan (p.73). Additionally, Senate Bill 596, Section 38561.5 (b) (4) – enrolled September 13, 2021 – directs the state board to develop a comprehensive strategy for cement industry carbon neutrality, to include provisions to minimize and mitigate potential leakage via a "border carbon adjustment mechanism."

[24] See California Air Resources Board (2010) Resolution 10-42 at 4 and 11.

[25] See, e.g., CSCME, Final Comments On CARB's October 28, 2010 Proposed Cap-and-Trade Regulation And Supporting Documents, December 15, 2010 (including Exhibits with prior submissions); CSCME, Comments Related to the Risk of Leakage in the Cement Sector, May 10, 2016.

Renewable Natural Gas

RNG is a critical component of decarbonization for the cement industry. Unlocking RNG usage for the cement industry provides a near-term pathway for the industry to meaningfully reduce its emissions. Moreover, when derived from certain feedstocks, RNG has a negative carbon intensity, which means that RNG has the potential to play an important role in offsetting unavoidable industry emissions on the path to carbon neutrality.

The development of policy solutions to prioritize RNG deployment in the cement industry aligns with both supply constraints and the optimal use of such supply. RNG supply is limited, especially compared to the fossil natural gas that it is intended to displace. To maximize climate benefits, RNG should be directed into industries with significant carbon footprints, high process heat requirements, and limited abatement alternatives. The cement industry fulfills all these conditions, and it also requires a relatively small amount of RNG to realize large reductions in industry emissions — for instance, just 15 percent of statewide RNG potential would be sufficient to displace *all* of the industry's fossil fuel combustion, essentially eliminating the cement industry's combustion emissions.[26]

The primary barrier for deployment in the cement industry is regulatory in nature. RNG production requires financial incentives to be economically viable. However, current regulation effectively restricts the use of RNG to the transportation sector and prevents more valuable applications of RNG (i.e., fuel for difficult-to-decarbonize industries). In California, the primary incentive for RNG production comes from Low Carbon Fuel Standard ("LCFS") credits that producers accrue when selling RNG products to transportation sector end-users. LCFS credits (combined with federal renewable fuel standard credits) are sufficiently high to disincentivize RNG production for other uses like cement production or other industrial applications.

CARB is aware of the importance of industrial RNG deployment, noting in the Draft Update "biomethane currently displaces fossil fuels in transportation and will largely be needed for hard-to-decarbonize sectors" and including a modeling scenario in Alternative Scenario 1 where RNG is "directed to Cement facilities by 2035."[27] Given the cement industry's limited decarbonization pathways, CARB should prioritize its access and use of RNG (as prescribed in Alternative Scenario 1), which will allow it to transition away from coal and pet coke and substantially reduce its combustion emissions. To effectively achieve this goal, CARB should address the regulatory preference provided to transportation applications of RNG under the LCFS, thereby reducing the cost barriers to RNG deployment in cement manufacturing and other

[26] California's 2030 RNG supply potential was estimated at 197 billion cubic feet (bcf) per Energy Futures Initiative (2019), Optionality, Flexibility, and Innovation: Pathways for Deep Decarbonization in California. Replacing fossil fuel combustion in the cement industry with RNG would require an estimated 29.6 bcf of RNG and would reduce the industry's combustion emissions by roughly 95%.

[27] Draft Update at 152. Additionally, in Appendix H at 14, CARB notes that post-2030, RNG is "used for pipeline blending instead of transportation in line with ZEV EO N-79-20 and because remaining natural gas pipeline consumption post-2030 reflects harder-to-decarbonize end uses such as high temperature industrial heat."

difficult-to-decarbonize industries. By amending these barriers, CARB can more effectively deploy limited RNG resources, which, when combined with CCUS, represent the future of a green cement industry.

Biomass-Derived Fuels

Although there is an abundance of biomass waste in California that the cement industry could use as a low carbon feedstock, the state lacks the necessary infrastructure and market to economically divert this material to industrial users. Biomass-derived fuels can drive GHG reductions up to 10-15 percent of total cement industry emissions by replacing fossil fuels without generating emissions that are "new" to the carbon cycle. However, barriers posed by regulatory uncertainty and permitting processes that expose the industry to litigation stymy industry progress toward substituting fossil fuels for biomass-derived fuels.

By ignoring an abundant source of low carbon fuels that can help the California cement industry reach carbon neutrality, California will limit alternatives to fossil fuels to sources that are either not yet technologically mature or face severe supply constraints. Unlocking this barrier could also ensure that forest and agricultural residues will be put to productive use, supporting the state's broader forest management efforts.

Refuse-Derived Fuels and Engineered Municipal Solid Waste

Permitting challenges, low landfilling costs, and unfavorable classifications of potential feedstocks create a challenging supply landscape for refuse-derived fuels in California, despite high volumes of materials destined for a landfill that would enable the cement industry to meaningfully reduce its fossil fuel use. California has adopted nominally ambitious statutory waste diversion goals, but it has not improved or updated the necessary policies to make good on those goals. It is currently more cost effective to landfill solid waste and tires than to manage them in a more environmentally responsible manner by allowing the expanded use of refuse-derived fuel and increasing the use of engineered municipal solid waste by the industry.

Unlocking barriers to the cement industry's use of refuse-derived fuels represents a clear "win-win-win" that would divert solid waste from landfills, reduce industry emissions from fossil fuel combustion, and avoid potent methane emissions and other harmful environmental impacts stemming from landfilling. Successfully deploying refuse-derived fuels in the cement industry to make progress towards carbon neutrality will require statutory and regulatory support, public investment in pre-processing of materials to be used as a feedstock, and further efforts to simplify and speed up the permitting process.

VII. CARB SHOULD RECOGNIZE AND INCORPORATE CEMENT'S ROLE AS A CARBON SINK INTO THE STATE'S CARBON NEUTRALITY ACCOUNTING FRAMEWORK

Cement is unusual in that it is both a source and a sink of GHG emissions. A substantial portion of GHG emissions are effectively reabsorbed and sequestered by the cement in concrete over time. This process, called "recarbonation," occurs when hydrated cement within concrete reacts with the CO_2 in ambient air to sequester carbon in concrete, functionally reducing embodied GHG emissions over the full lifecycle of

cement.[28] As a result, achieving net neutrality in the cement industry does not necessarily equate to eliminating all emissions.

Research suggests that the amount of reabsorption is a significant share of the cement industry's emissions, though estimates vary. For instance, a 2016 peer-reviewed study published in the journal *Nature* estimated that 43 percent of global cement industry process-related emissions from 1930 to 2013 have ultimately been absorbed through this process.[29,30] In contrast, a recent study conducted by MIT's Concrete Sustainability Hub found that 5.5 percent of the total carbon emitted by cement used for streets and highways is eventually reabsorbed and sequestered — heavily dependent on end-use best practices to maximize carbon uptake.[31]

Just as CARB is working to better reflect the GHG impacts associated with natural and working lands, it should expand its GHG accounting boundaries and processes to account for the GHG emissions that are absorbed through the recarbonation process. More generally, the role that cement plays as both a source of and sink for GHG emissions should be acknowledged and incorporated into strategies to achieve carbon neutrality in the cement industry, including the implementation of SB 596.

VIII. SUMMARY OF POLICY RECOMMENDATIONS

To create a supportive environment for cement industry decarbonization that unlocks carbon neutrality by 2045, CARB and other stakeholders should provide the following:

- **Strategic Alignment & Clarity:** Align the 2022 Draft Update to reflect the necessity of CCUS to cement industry carbon neutrality and the 2035 target codified by SB 596.
- **Allowance Allocations:** Consider adjustments to the allowance allocation framework that would assist the cement industry with navigating the next decade and/or until cost-effective, technologically feasible, and commercially available technologies to decarbonize are available.
- **Public Support for CCUS in the Cement Industry:** Begin developing the policy mechanisms needed to positively shift the risk-reward profile for CCUS investments via public funding, financing, and price guarantees.

[28] The European Cement Association, "Recarbonation." https://lowcarboneconomy.cembureau.eu/5-parallel-routes/downstream/recarbonation/ (accessed June 21, 2022).

[29] Although there is currently no definitive 'calculator' for quantifying recarbonation expectations across various types of cement mixes, the *Nature* finding is consistent with findings of a paper published in the *International Journal of Life Cycle Assessment* in 2014. In this case, the researchers found that Portland Cement captured 47% of emissions on a lifecycle basis (i.e., 'cradle-to-grave'). The development of suitable and universal methodology for quantifying cement's role as a concrete sink is underway and would ultimately enable building decisions to be made based on a fuller and more accurate accounting of lifetime GHG emissions.

[30] Xi, F., Davis, S. J., Ciais, P., Crawford-Brown, D., Guan, D., Pade, C., ... & Bing, L. (2016). Substantial global carbon uptake by cement carbonation. Nature Geoscience, 9(12), 880-883. https://www.nature.com/articles/ngeo2840.

[31] Azari-Jafari, H., Gregory, J., Guo, F., Kirchain, R. (2021). Carbon Uptake of Concrete in the US Pavement Network. Resources Conservation and Recycling, 167, 1-21.
https://www.sciencedirect.com/science/article/abs/pii/S0921344921000045?via%3Dihub

- **Collaboration on Applying CCUS to Cement:** Consistent with the goals of SB 596, convene and coordinate among key stakeholders with respect to deploying CCUS in the California cement industry without any undue delay.

- **Border Adjustment:** Implement an incremental border carbon adjustment or similar market mechanism to signal the state's commitment to maintain a level playing field, minimize leakage, and provide the basis for recovering the costs associated with significant investments required for GHG reductions, including for CCUS.

- **Permitting:** Support efforts to provide a fast-track permitting process for industrial projects that have a clear and unmistakable GHG benefit. This issue remains one of the most limiting factors to unlocking carbon reduction strategies in the cement industry.

- **Alternative Fuel Supply:** Consider ways to encourage or incentivize the diversion of supply-constrained fuels to the California cement industry (as opposed to other industries that may have a wider range of options for making progress toward decarbonization).

- **GHG Accounting:** Revise Cap-and-Trade GHG accounting procedures to expressly recognize the GHG benefits of alternative fuels and the recarbonation properties of cement and concrete.

- **Interagency Cooperation:** Lead efforts to create an interagency coordinating group to effectively implement strategies, deconflict oversight, and facilitate collaboration among relevant state agencies.

IX. CONCLUSION

In providing support to the California cement industry as discussed above, CARB can foster a regulatory environment that preserves the competitive balance and climate benefits of locally produced cement, which will enable the industry to chart a feasible course to carbon neutrality by 2045. The urgency of the climate challenge is clear. With the support of CARB's convening authority and by reducing the uncertainty of industry investment, the California cement industry can meet the challenge of deep decarbonization head on and take the actions necessary to reduce net emissions to zero, while continuing to provide the climate-friendly raw materials needed to realize the state's infrastructure and resilient development ambitions.

Sincerely yours,

Erika Guerra
Chair, Executive Committee
Coalition for Sustainable Cement Manufacturing & Environment

CC:

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