



Public Comments to CARB on SB596 Implementation

Introduction

The undersigned organizations appreciate the opportunity to provide comment to CARB on implementation of SB596. Here we outline a menu of policies and interventions that can collectively transform California’s cement industry. The goals of SB596 are ambitious and achievable but to reach them, the agency will need to consider a plethora of complementary policies to support the timely decarbonization of the state’s cement industry. Policies should aim to incentivize the wide market adoption of readily available decarbonization levers like clinker substitution, and simultaneously incentivize first of a kind, near-zero cement production in the state whether that’s in the form of emerging production pathways or carbon capture. In the comments that follow, we propose a series of policies that each further those two goals in a manner consistent with net zero production by 2045.

Policy levers

Support for blended cements & novel SCMs

Goal: Diversify market options for lower-carbon cement and concrete

To achieve the near-term emissions reductions of SB596, CARB must work with Caltrans and the Department of General Services (DGS) to lift the barriers hindering broader and wider adoption of Supplementary Cementitious Materials (SCMs). There are several types of alternative materials either in the form of SCMs or in the form of blended cements, such as limestone calcined clay cement (LC3), that can replace up to 50% of clinker in a final mix and reduce emissions by up to 40%. In addition to the emissions benefits, SCMs can also enhance concrete’s long-term strength and durability. A 2015 Caltrans study concluded that “SCMs can dramatically improve the overall performance and lower the long-term cost of transportation pavements and concrete structures”.¹ As the U.S. moves away from coal-fired power plants and primary steel production, the availability of the most widely used SCMs (fly ash, blast furnace slag) is facing supply constraints. Fly ash supply dropped by over 50% from 2010 to 2019² while most slag consumed in the US is imported. There are several other SCMs that could be mixed in to reduce the reliance on fly ash, slag, and clinker such as calcined clays and ground glass. CARB must work with Caltrans and DGS to encourage the use of alternative SCMs.

Broader use of SCMs in state projects is also hindered by the state’s use of prescriptive specifications which often overprescribe cement content and under-prescribe SCMs leading to

¹ <https://dot.ca.gov/-/media/dot-media/programs/research-innovation-system-information/documents/research-results/task0887-rrs-1-15-a11y.pdf>

² Thomas H Adams, “Fly Ash Use in Concrete Increases Slightly As Overall Coal Ash Recycling Rate Declines,” American Coal Ash Association, December 15, 2020, 5.

higher embodied carbon emissions and often costlier, underperforming concrete. The National Ready Mixed Concrete Association (NRMCA) conducted a survey of concrete producers which concluded that one of the main reasons for restricting the use of SCMs is the maximum limits set in project specifications.³ Prescriptive specifications can also lead to poor mix design and inefficient proportioning. Concrete producers can reduce their carbon emissions by 15-20% through more efficient mix designs currently hindered by prescriptive standards.⁴ The transition to performance specifications has been made simpler through the American Concrete Institute's (ACI) guidance⁵ which codifies the essential elements, testing and verification procedures of performance specifications that can replace typical prescriptive requirements in codes. Performance specifications will allow for much-needed flexibility and enable the use of novel design mixes with lower carbon emissions.

In order to further promote the use of blended cements, CARB should also revise how California's cap-and-trade allocates allowances to the cement industry. The program currently allocates allowances based on clinker and mineral additives produced. If CARB were to instead allocate allowances under cap-and-trade based on cement output, it could further encourage the use of blended cements, as such blends would serve to reduce the compliance obligation on covered cement plants. We encourage CARB to modify the obligation point for cement in cap-and-trade program, alongside any other measures it takes to implement SB596.

That nuance should also be taken into account as CARB is considering the definition of cement to be used in SB596. CARB's definition should be encompassing of blended cements and cements manufactured using novel processes and alternative raw materials.

Public procurement of low-carbon concrete

Goal: Increase market adoption of lower carbon cement and concrete.

California must leverage the purchasing power of its public agencies to create a market for low-carbon cement and concrete. California must adopt a public procurement policy that sets a global warming potential (GWP) benchmark for concrete in state projects that ramps down over time to drive gradual but continuous emissions reductions.

A large portion of concrete and cement used in California goes toward state-funded projects, many of which are transportation projects overseen by Caltrans. Caltrans has taken steps to reduce the emissions associated with the materials used in their operations, including implementing Buy Clean California for some materials like carbon steel rebar; piloting environmental product declaration (EPD) collection for concrete, asphalt, and aggregate; and approving Portland Limestone Cement (PLC) which reduces emissions by around 10% compared to Ordinary Portland Cement (OPC).

³ <https://www.nrmca.org/wp-content/uploads/2020/09/Performance-Based-Specifications.zip>

⁴ https://rmi.org/wp-content/uploads/dlm_uploads/2021/08/Embodied_Carbon_full_report.pdf

⁵ https://www.concrete.org/store/productdetail.aspx?ItemID=32914&Language=English&Units=US_AND_METRIC

The initial groundwork for a concrete public procurement policy is currently under consideration in the legislature (AB 1250, Friedman) and includes supply-chain specific EPD collection for all state transportation projects.⁶ The time is ripe for such a requirement since Caltrans has had EPD reporting for concrete for a few pilot programs. In addition, the Inflation Reduction Act contains \$250 million in funding to support manufacturers of all sizes in creating EPDs through grants and technical assistance. Expanding EPD collection in California at this moment can leverage this important source of funding.

If AB 1250 is adopted, Caltrans will put in place data-collection processes that will generate valuable data about the emissions-intensity of different concrete mixes used in transportation projects around the state. This data will then enable the establishment of a GWP benchmark for concrete that could gradually ramp down to drive continuous reductions as the market evolves. AB 1250 also directs Caltrans to report on the carbon emissions associated with cement, concrete, and asphalt used in state transportation projects, as well as the availability of lower emission materials and the potential emission reduction that would result from their use.

While AB 1250 would only apply to Caltrans, eventually this policy should be expanded to cover all state agencies, so that data on concrete-intensive projects overseen by other agencies including the Department of Water Resources and Department of Natural Resources can inform the setting of a GWP benchmark. In addition, putting in place concrete EPD collection requirements will set up these agencies to eventually comply with a state concrete procurement rule.

AB 1250 would also require Caltrans to develop language for a model performance-based bid specification that includes a global warming potential benchmark for concrete and asphalt used in state projects. Even though numerous low-carbon concrete alternatives with similar costs, durability, and performance to incumbent concrete blends exist today, they are unlikely to be adopted on a widespread basis unless explicitly asked for in bid specifications. Examples from other states show us that we can reduce emissions from concrete by up to 50% with no green premium. Caltrans would develop language on what this bid specification might look like, to help inform how the embodied carbon of materials might eventually be addressed in the bidding process.

This important groundwork paves the way for a robust and ambitious low carbon concrete procurement policy, but it serves only as a first step. Next, a GWP benchmark and mandatory compliance must be established to create a stable demand signal for lower carbon concrete. Low carbon concrete procurement should not be limited to transportation projects alone. Legislation in California (AB2446 – Holden) requires CARB “to develop a framework for measuring and then reducing the carbon intensity of the building materials used in the construction of new buildings”, both residential and commercial. Low-carbon material procurement requirements for public buildings can help create a strong market signal for low-

⁶ https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202320240AB1250

carbon cement and concrete in the near to medium term and drive emissions reductions aligned with the goals of AB244, as well as SB596.

Advanced Purchase Commitments

Goal: Support scale up of emerging technologies and novel production processes

It's crucial that CARB focus on policies that will help deeply transform the market and ensure the cement industry has enough incentive to make radical investments in new and innovative technologies. With the goal of supporting the scale up of emerging technologies and novel production processes, CARB should assess the use of advanced purchase commitment policies for ultra-low carbon cement and concrete, where state agencies enter into agreements to purchase ultra-low carbon cement or concrete starting on a certain future date. Such commitments ensure that innovative projects lock-in an offtaker (in the form of the state) which is often a necessary criterion to secure finance to scale-up projects and plants. This type of policy support can enable first of a kind near-zero carbon cement projects and start the necessary process of de-risking early technologies.

Global, voluntary, private advanced purchase commitments for the cement and concrete sectors are currently being set up through the First Movers Coalition (FMC).⁷ For cement, the FMC requires that companies commit to procuring at least 10% (by volume) of annual cement/ concrete as "near-zero cement/ concrete inclusive of any SCMs by 2030 and excluding fossil-based SCMs by 2035."⁸ Near zero-emissions cement is defined as cement with embodied carbon below 184kg CO₂e/ton. Near zero-emissions concrete is specified based on compressive strength (f'c in psi).⁹ A bill modeled after FMC was recently taken under consideration in the California legislature but failed to pass. It would've have encouraged Caltrans to enter into advanced purchase commitments with ultra-low carbon cement suppliers who met the same stringent thresholds as FMC. If enacted, it would've been an important piece of the policy puzzle where the state would directly drive the local market penetration of SB596-compliant cement and provide a level of granularity and accountability that FMC can't meet.

Zero Emissions Cement (ZEC) Standard

Goal: Build first-of-a-kind near-zero cement plant by 2028

SB596 requires all cement used in California to reach net-zero GHG emissions by 2045. The work of demonstrating and de-risking technologies that can produce near-zero emissions cement needs to start today to ensure that they are widely available for deployment before 2045.

Near-zero emissions cement will rely on technologies or production processes that are not currently commercially available at scale. California's cement plants are relatively old (built

⁷ <https://www.state.gov/launching-the-first-movers-coalition-at-the-2021-un-climate-change-conference/>

⁸ https://www3.weforum.org/docs/WEF_FMC_Cement_Concrete_Commitment.pdf

⁹ See [Commitment details](#) for more concrete embodied carbon limits.

between 1906-1981) and have undergone significant retrofits in the past 15-43 years. Cement plants usually operate between 25-40 years between major retrofits so most of California’s facilities are likely currently assessing major investment decisions to modernize and decarbonize their operations. The time is ripe for CARB to consider policies that encourage companies to make capital intensive, potentially risky investment decisions to install first of a kind near-zero emissions cement technologies like carbon capture which can cost hundreds of millions of dollars. One such policy could be a Zero Emissions Cement (ZEC) standard, modeled after California’s long-standing Zero Emissions Vehicle (ZEV) Standard.

Company	Air Districts	2019 Clinker Capacity (1000 mt/year)	2019 Facility Emissions (mt CO ₂ e) ¹⁰	Year built	Last Retrofit	Years since last retrofit
CalPortland, Redding	Shasta County AQMD	509	293,213	1981	N/A	N/A
National Cement Company of California Inc, Lebec	Eastern Kern APCD	1,033	795,657	1966	1999	24
CalPortland, Tehachapi ¹¹	Eastern Kern APCD	970	553,980	1906	1992	31
Mitsubishi, Lucerne Valley	South Coast AQMD	1,544	1,063,584	1957	1982	41
CalPortland, Mojave	Eastern Kern APCD	1,384	1,124,098	1956	1981	42
CalPortland, Oro Grande	Mojave Desert AQMD	1,728	1,250,996	1907	2008	15
CEMEX, Victorville	Mojave Desert AQMD	2,701	1,907,920	1916	2001	22

A ZEC standard would be designed to instigate the construction of first-of-kind, large-scale near-zero clinker production facilities in the near-term (2025-2030) that achieve 90% carbon intensity below current best available technologies. A key benefit of a ZEC is that it incentivizes a first-mover, through its role as a supplier of credits during the initial years of the policy as other facilities have yet to adopt transformational technologies. Initial analysis¹², indicates there should be at least one standard-sized, near-zero emissions clinker plant by 2030, producing roughly 0.75-1.5 million tons per year. Net emissions reductions from a ZEC may be tepid in the

¹⁰ Excluding biogenic emissions.

¹¹ CalPortland has entered an agreement to buy the Tehachapi plant from Martin Marietta. The deal is pending regulatory review.

¹² Analysis conducted by Dr. Chris Bataille, Seton Stiebert P.Eng and Dr. Francis Li

near term since the benefits primarily lie in reducing mid-term and long-term risks and costs of decarbonizing clinker. A ZEC standard would send a strong signal to producers to invest in near zero clinker below the expected average cost of compliance with the regulation.

A ZEC policy would comprise of a mandatory credit system which would establish a portion of near zero clinker production credits for every ton of clinker embodied in the cement sold in the state. Companies would then either produce credits through the adoption of decarbonization technologies or acquire credits from the other companies (inter-firm tradability). ZEC would likely need to be stacked on top of California's cap and trade and is likely to drive emission reductions beyond the cap-and-trade program alone.

Even though the purpose of ZEC is to drive investments in near-zero clinker, policy makers could consider temporary partial crediting for the use of significant amounts of SCMs and then transition to full ZEC credits once projects have had a few years to site, permit, and start construction on near zero clinker projects. Crucially, ZEC or any other policy intended to incentivize innovation must remain technology agnostic and allow for unanticipated compliance pathways that may emerge in the future.

Carbon Capture Policy Framework

Goal: Support the measured and safe deployment of carbon capture on cement plants.

The cement industry faces a unique challenge to decarbonize in an economically viable way. Carbon capture will be necessary to reach net-zero, in large part due to the inevitable process emissions when producing OPC. Yet unlike some other industrial emitters, cement plants face a more challenging path to economically viable carbon capture due to low CO₂ concentration of the flue gas. Other factors that influence the economic viability of carbon capture include distance to a permanent storage site and the geographical characteristics of the transport path. A recent study specific to California with high capture cost assumptions, estimated that the total cost of CO₂ capture, transport, and storage for a representative cement plant was \$169/ton (\$84/ton inclusive of 45Q).

While technological advances may lower future costs, it becomes immediately clear that the 45Q maximum tax incentive of \$85/tCO₂ is not sufficient to build first of a kind carbon capture on California's cement plants. Additional policy support such as a ZEC standard, grants, advanced market commitments, and stackable tax credits for carbon capture on cement plants can provide a much-needed tailwind to help cement producers reach the targets set by SB596. California can take the global lead by showing clear intent of building a first-of-a-kind cement project through additional state-level policy support.

SB905, enacted in September of 2022, directs CARB to adopt a unified permit application for the construction and operation of carbon capture, removal, and sequestration programs while also

establishing robust safeguards against local pollution, seismicity, and other potential concerns.¹³ Expedient implementation of the law with proper consultation amongst relevant stakeholders can streamline permitting for cement carbon capture projects while maintaining proper and robust safeguards and help alleviate a commonly cited systematic barrier of difficulty accessing safe and permanent storage sites.

Proactively engaging with local communities and fostering active community communication and participation related to permits and safeguards, as well as in the design and implementation of workforce development programs, will be key to success. Community benefit plans and agreements, like the ones currently required for several federal industrial demonstration programs, must also be encouraged, and will help ensure that strategies to minimize local impacts and maximize benefits are agreed upon in an inclusive and comprehensive manner, aligned with the intent of SB905.

As CARB considers ways to support the deployment of carbon capture in cement facilities, the agency should deliberate on ways to leverage promising opportunities to spur local jobs through accessible workforce training programs that provide equitable pathways to employment for community members.

Research, Grants, and Incentives

Goal: Support California companies access grants and funding aligned with the goals of SB596

IRA & BIL Programs: CARB should consider how California can leverage new federal programs funded under the Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA) to help with implementation of SB596.

BIL and IRA included significant new investments to support decarbonizing heavy industry, including cement and concrete. These investments include the \$6.3 billion Industrial Demonstrations Program, the \$2.5 billion Carbon Capture Demonstration Program, and the \$10 billion 48C Advanced Manufacturing Tax Credit.

CARB should work with relevant partner agencies to help develop and support quality applications from private firms for relevant federal funding opportunities. Many private firms in the cement and concrete sector lack the awareness of federal programs or the capacity to interface with the federal Department of Energy on grant applications. The state can bridge this gap with extension services aimed at advertising opportunities to support projects with the potential to support deep decarbonization of cement production.

For its competitive funding opportunities, DOE will highly weigh the benefits that firms offer to local communities. As one example, under the Industrial Demonstrations Program, an applicant's Community Benefits Plan will account for 20% of ultimate score.¹ Tribal and labor

¹³ https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB905

engagement will be key in this effort. The State should help firms develop significant and binding Community Benefit Agreements that can help attract federal spending to California and ensure the benefits are widely and justly shared.

Additionally, because federal agencies are working against tight statutory time frames, an indication that state and local leaders support cement decarbonization projects can help build confidence that applicants will not face lengthy delays over issues like permitting. CARB or other state agencies should consider writing letters of support for applicants seeking federal funding for SB596 aligned projects.

CEC INDIGO program: CARB can leverage existing programs like California Energy Commission's (CEC) Industrial Decarb and Improvement of Grid Operations (INDIGO) grant to assist implementation of SB596. Supporting California companies' access to grants and funding through the INDIGO program aligns with the intent of SB596.¹⁴ CEC's INDIGO grant, released in March 2023, provides \$90 million in funding for industrial projects over the course of 6 years.¹⁵ The program provides financial incentives for projects that significantly benefit the electrical grid enabling the state to achieve its clean energy goals and reduce greenhouse gas emissions and local air pollution in under-resourced communities.¹⁶ It is important that CARB works with CEC to ensure that some of the funded projects are for cement (which is eligible under the program) and further SB596's goals of deep decarbonization in the sector.

CEC has proposed allocating \$53 million to field tested technologies, \$8 million for technologies ready for demonstration, \$20 million for federal cost share, and \$9 million for technical assistance and administrative costs.¹⁷ Each applicant can receive up to \$16 million or up to 75% of eligible costs. CARB has an opportunity to work with CEC to ensure that the chosen INDIGO projects for cement support SB596's goals of achieving net-zero emissions of greenhouse gases for cement and creating incentives for the development and deployment of transformative technology for the cement sector. CARB should make sure that any potential cement projects selected for INDIGO align with the deep decarbonization goals of SB596. Funding should be commensurate with emissions reduction potential.

Secondly, in line with SB596's continuous feasibility assessments, CARB should encourage CEC to appoint project managers to assist with each project. CARB can work with CEC to support cement applicants in reaching their emissions reduction targets. New York State Energy Research and Development Authority (NYSERDA)'s Commercial & Industrial (C&I) Carbon Challenge adopted such an approach where each successful applicant is matched to a NYSERDA

¹⁴ Section 2(b)(6) of SB596 (2021): The state board shall [...] “prioritize actions that leverage state and federal incentives, where applicable, to reduce costs of implementing greenhouse gas emissions reduction technologies and processes and to increase economic value for the state.”

¹⁵ <https://www.grants.ca.gov/grants/cost-share-for-federal-funding-opportunities-industrial-decarbonization-and-improvement-of-grid-operations-indigo-program-and-food-production-investment-program-fpip/>

¹⁶ <https://efiling.energy.ca.gov/GetDocument.aspx?tn=249815>

¹⁷ <https://efiling.energy.ca.gov/GetDocument.aspx?tn=249815>

Project Manager who tracks progress and provides feedback to applicants to ensure that their projects are successful and that funding is used effectively.¹⁸ CARB should encourage CEC to offer similar capacity and lend its expertise where appropriate to guide applicants to INDIGO funding.

Lastly, CARB should urge CEC's INDIGO program to prioritize projects that serve disadvantaged communities which aligns with SB596's intent of improving public health and supporting local communities while achieving California's carbon neutrality goals.¹⁹ CEC encourages but does not require community benefit plans in the INDIGO program application. Impacts and benefits for low income, disadvantaged, and/or tribal communities are not required components in the INDIGO program's full proposal rubric.²⁰ To be compliant with SB596's Section (b), CARB should encourage CEC to only move forward with projects that have strong community benefit agreements, community buy in, and measures to reduce local air pollution.²¹

Carbon Leakage Measures

Goal: Reduce the risk of emissions leakage

As we've discussed in previous comments, unlike cap-and-trade, which regulates cement *manufacturing*, SB596's emission targets apply to all cement *used* in the state, and not just cement produced in the state. As a result, the law requires CARB to consider how to deal with embodied CO₂ emissions in imported cement, with the goal of ensuring a level playing field for in-state manufacturing and reducing the risk of carbon leakage. We urge CARB to consider establishing a border carbon adjustment, akin to the one currently being considered in Europe to protect against emissions leakage. A border carbon adjustment mechanism would also enable reconsideration of the free allowances allocated to cement manufacturing under the state's cap-and-trade program and give a competitive advantage to cleaner producers.²²

Since California imports cement from other states, any type of leakage prevention mechanism should be designed to be compliant with the Dormant Commerce Clause (DCC). Under the DCC, a state law is generally invalid (1) if it discriminates against out-of-state economic interests, either in purpose or effect, or (2) if it seeks to regulate conduct occurring entirely outside a state's borders. Importantly, a recent Supreme Court ruling (*National Pork Producers v. Ross*, 2023 WL 335628 (U.S. 2023)) rejected a DCC challenge to California's proposition to prohibit the sale of pork from pigs raised in crates (Proposition 12). This decision has important implications for state climate regulation and is expected to generally make it more difficult to challenge

¹⁸ <https://portal.nyscrda.ny.gov/servlet/servlet.FileDownload?file=00P8z000002kFouEAE>

¹⁹ Section 2(b)(3) of SB596 (2021): The state board shall, "Identify actions that reduce adverse air quality impacts and support economic and workforce development in communities neighboring cement plants".

²⁰ <https://efiling.energy.ca.gov/GetDocument.aspx?tn=249815>

²¹ Section 2(b)(3) of SB596 (2021).

²² <https://www.c2es.org/content/carbon-border-adjustments/>

climate regulations under the DCC. Policies akin to a ZEC standard or a Low Carbon Cement Standard are likely to be able to withstand DCC challenges.

Conclusion

A combination of policies like public procurement, advanced purchase commitments, and ZEC can set California's cement industry on track to meet the goals of SB596 and achieve carbon neutrality by 2045. The task ahead is challenging and will require close coordination and alignment among several agencies like Caltrans, DGS, and CEC under CARB's leadership. Near term action that incentivizes both readily available interventions and transformational technologies will be necessary and has the potential to transform not just California's cement industry but export policies and technologies around the world.

We appreciate CARB's continued work and leadership and are available for any questions and further discussions.

Sincerely,

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