EMC Cement

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BY EMAIL ONLY
(hyperlinks below in blue)

February 20, 2024

Innovating the Low Carbon Fuel Standard Regulation ("LCFS") for SB596

Dear California Air Resources Board:

We write in response to CARB's invite, encouraging "members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action", our having noted that despite SB596's clear mandate—and Senator Becker's address to the UNFCCC at COP 26 heralding its purpose—nonetheless SB596 is not mentioned once in the documentation supporting CARB's proposed regulatory action. Even Appendix D, Attachment A ("Environmental and Regulatory Setting For the Proposed Low Carbon Fuel Standard Regulation") fails to mention SB596.

Context in Brief

This letter is sequential to our public letters to CARB dated 09.04.23 (here | PDF here) and 11.01.23 (here | PDF here). By our November 2023 letter, we requested an LCFS rule-innovation having in mind SB596's clear and present impetus, in the context of the *energy paradox* identified by the U.S. EIA (here) and California's energy supply.

We believe a fair reading of California's *primary* statutes confirms that CARB shoulders a number of specific duties formed from express demands over cement and concrete's decarbonization. Moreover, the LCFS has evolved into a flexible tool to deliver legislators' Climate Action priorities. Our November 2023 request was made in that context only and this letter demonstrates *why*. After all, by comparing our own EPD (here) with the PCA's (here), at its intended capacity EMC California would save >1.87 TWh energy annually, across LCA Zones A1-A3. That's before energy-intensive CCS is factored-in that will *at least* double those savings!

Purpose and Structure of this Letter

We respect the work and commitment of CARB in meeting its statutory duties. Having noted the many comments made already in this 45-day process, it is clear there is a sense of urgency. For example, we note the exhortations per the January 11, 2024 letter endorsed by over 2,600 individuals (here):

> "The world has changed a lot since the implementation of the LCFS in 2009. Unlike the 2000s, we have a north star goal for our climate and the air we breathe: zero emissions transportation. Continuing to invest the billions in revenue from the LCFS into harmful and polluting biofuels that end up combusted, instead of electric vehicles powered by clean energy, hampers our efforts to fight the climate crisis while enriching oil companies and industrial agriculture."

We agree: much *has* changed since 2009! So, what is the "North Star goal"? This letter will not engage in pages of legal argument to assert our answer, as we believe the opportunity speaks for itself. Instead, the purpose of this letter is to lay-out the basis for the annex that sets out our "suggestions for modification of the proposed regulatory action". **First**, we set out a succinct compendium to record various Californian legal sources having in mind Title XVII's 2021 innovations (per 42 U.S. Code §16513, here) and the DOE LPO's recent rule changes (here) in the context of California's §38561.2 Health and Safety Code (b)(6) set out below at line number 73. **Second**, we set out a brief digest. **Finally**, we set out a brief conclusion.

Californian Code: A Succinct Compendium *(grouped thematically)*

The Global Warming Solutions Act of 2006 (AB32), required California reduce its greenhouse gas emissions to 1990 levels by 2020. This has been missed. The current 2030 target is 40% below 1990 levels.

CARB Statutory authority per AB32/Global Warming Solutions Act of 2006 (here):

- 38510. The State Air Resources Board is the state agency charged with monitoring and regulating sources of emissions of greenhouse gases that cause global warming in order to reduce emissions of greenhouse gases.
- 38560. The state board shall adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective greenhouse gas emission reductions from sources or categories of sources, subject to the criteria and schedules set forth in this part.

Macro CO2 Reduction Targets:

- Executive Order S-3-05: 1 of 2006 (here):

  That the following greenhouse gas emission reduction targets are hereby established for California: by 2010, reduce GHG emissions to 2000 levels; by 2020, reduce GHG emissions to 1990 levels; by 2050, reduce GHG emissions to 80 percent below 1990 levels;

- Executive Order B-30-15 of 2019 (here):

  1. A new interim statewide greenhouse gas emission reduction target to reduce greenhouse gas emissions to 40 percent below 1990 levels by 2030 is established in order to ensure California meets its target of reducing greenhouse gas emissions to 80 percent below 1990 levels by 2050.
  2. All state agencies with jurisdiction over sources of greenhouse gas emissions shall implement measures, pursuant to statutory authority, to achieve reductions of greenhouse gas emissions to meet the 2030 and 2050 greenhouse gas emissions reductions targets.

LCFS enabling:

- Executive order S-01-07 for LCFS (here):

  WHEREAS greenhouse gas ("GHG") emissions pose a serious threat to the health of California's citizens and the quality of the environment; and

  WHEREAS Assembly Bill 32 (Chapter 488, Statutes of 2006) requires a cap on GHG emissions by 2020, mandatory emissions reporting, identification of discrete early action measures, achievement of the maximum technologically feasible and cost-effective emission reductions from sources, and authorizes the development of a market-based compliance program; and

  WHEREAS California's dependence on a single type of transportation fuel whose price is highly volatile imperils our economic security, endangers our jobs, and jeopardizes our industries; and

  WHEREAS alternative fuels can provide economic development opportunities and reduce emissions of greenhouse gases, criteria pollutants, and toxic air contaminants.

LCFS **(here):**

- § 95481. Definitions and Acronyms.

  (150) "Transportation Fuel" means any fuel used or intended for use as a motor vehicle fuel or for transportation purposes in a non-vehicular source.

- § 95484. Annual Carbon Intensity Benchmarks.

(f) Carbon Intensity Benchmarks for Biomass-Based Diesel Fuel. The benchmark for diesel fuel, set forth in section 95484(c), applies to biomass-based diesel fuel is used or intended to be used in any:

(1) light-, medium-, or heavy-duty vehicle;
(2) off-road transportation application;
(3) off-road equipment application;
(4) locomotive or commercial harbor craft application; or
(5) non-stationary source application not otherwise specified in subsections (1) through (4) above.

SB 596:

- Generally, see, CARB (**here**):

"In September 2021, Governor Newson signed Senate Bill 596 (Becker), which requires CARB, by July 1, 2023, to develop a comprehensive strategy for the cement sector in California to achieve a greenhouse gas (GHG) emissions intensity 40% below baseline levels by 2035 and net-zero GHG emissions by 2045. The bill also requires CARB to establish interim targets for reductions in the GHG intensity of cement used within the state relative to the average GHG intensity of cement used within the state during the 2019 calendar year, with the goal of reducing the GHG intensity of cement used within the state to 40% below the 2019 average levels by December 31, 2035."

- Bill (**here**):

(a) The Legislature finds and declares all of the following:

(1) Climate change is an urgent threat to the health and well-being of California's residents and economy.
(2) California is a global leader on climate action and has committed to achieve carbon neutrality as soon as possible, and no later than 2045, in line with the latest climate science.
(3) Achieving this objective will require advance planning, coordination, outreach, and development of a robust set of policies tailored to the needs and opportunities of every major emitting sector, including cement and concrete.
(5) A wide range of commercially available technologies and practices exist to reduce and remove emissions of greenhouse gases throughout the life cycle of cement and concrete production and use, but these technologies and practices face a series of market and regulatory barriers hindering their deployment.
(6) Implementing complementary strategies to both reduce the greenhouse gas intensity of cement production and grow the demand for low-carbon concrete will also reduce air pollution and improve public health in California communities.
(7) Positioning California's cement and concrete sector to thrive in a low-carbon economy will enhance the sector's long-term competitiveness, support high-quality jobs, and enable resilient infrastructure development.

(b) It is the intent of the Legislature that attaining net-zero or net-negative emissions of greenhouse gases from the cement and concrete sector in a manner that enhances California's competitiveness, supports high-paying jobs, improves public health, and aligns with local community priorities becomes a pillar of the state's strategy for achieving carbon neutrality.

- Statute: Section 38561.2 Health and Safety Code (**here**)

(b) In developing the comprehensive strategy pursuant to subdivision (a), the state board shall do the following:

(1) Define a metric for greenhouse gas intensity and evaluate the data submitted by cement manufacturing plants to the state board for the 2019 calendar year and other relevant data about emissions of greenhouse gases for cement that was imported into the state to establish a baseline from which to measure greenhouse gas intensity reductions.
(2) Assess the effectiveness of existing measures, identify any modifications to existing measures, and evaluate new measures to overcome the market, statutory, and regulatory barriers inhibiting achievement of the objectives described in this section.
(3) Identify actions that reduce adverse air quality impacts and support economic and workforce

development in communities neighboring cement plants.

(4) Include provisions to minimize and mitigate potential leakage and account for embedded emissions of greenhouse gases in imported cement in a similar manner to emissions of greenhouse gases for cement produced in the state, such as through a border carbon adjustment mechanism.

(6) 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.

(7) Evaluate measures to support market demand and financial incentives to encourage the production and use of cement with low greenhouse gas intensity, including, but not limited to, consideration of all of the following measures:

(A) Measures to expedite the adoption for use in projects undertaken by state agencies, including the Department of Transportation, of Portland limestone cement and other blended cements.

(B) Measures to provide financial support and incentives for research, development, and demonstration of technologies to mitigate emissions of greenhouse gases from the production of cement with the objective of accelerating industry deployment of those technologies.

(C) Measures to facilitate fuel switching.

(D) Measures to create incentives and remove obstacles for energy efficiency improvements and waste heat recovery at cement manufacturing facilities.

Academic:

Farrell, A. E; Sperling, D.; Arons, S.; Brandt, A.; Delucchi, M.; et al. (2007). A Low-Carbon Fuel Standard for California Part 1: Technical Analysis. UC Berkeley: Transportation Sustainability Research Center (here), at p.175:

"Jackson (2005) evaluated two applications at ports: the use of shore power instead of ships' engines for electricity and heat (a practice called "cold ironing") and the use of electric-drive cranes instead of diesel-powered cranes. Two truck-related electric applications were also evaluated: electric truck refrigeration units (e-TRUs) instead of diesel-powered devices, and the supply of electricity at truck stops as a substitute for engine idling. Large off-road vehicles include airport ground service equipment, electric forklifts (class 1 and 2), and tow tractors/industrial tugs. Small off-road vehicles include small electric lawn and garden equipment, electric golf carts, electric sweepers/scrubbers, burnishers, electric forklifts (class 3), electric personnel and burden carriers, and turf trucks. Jackson (2005) does not consider light rail, high-speed rail, electric freight rail, electric trolley buses, electric boats, electric bikes, commercial walk-behind mowers, riding mowers, leaf-blowers or other applications."

Digest

"If CCUS is applied on an industrial scale, the power demand of cement manufacturing will increase significantly. As described, carbon capture technologies will require high power consumption to e.g. supply consumables like oxygen, pump solvents, operate power driven separation devices like membrane or cryogenic units and purify and compress the CO_2 in order to meet the required conditions of downstream processes. **Therefore, CCUS will *increase* power consumption by 50 to 300% at plant level**."

ECRA | State of the Art Cement Manufacture: Current Technologies & Future Development (2022) | **here**

This letter's purpose is not to set out the *minutiae* of Title XVII's requirements. Instead, let us focus on this gnawing simplicity: an EMC plant delivering 1mn tonnes annual CO_2 abatement will likely yield upwards of 1.87 TWh savings when compared to a PCA-declared cement plant (here). This is equivalent to more than 375,000 Californian apartments that on average each use 5 MWh/yr (here). Even if CCS only *doubled* the energy needs of Portland cement production as it stands now (which is likely *conservative* according to ECRA's conclusion above), that number would balloon to 750,000 Californian apartments.

To assert our request, we had noted especially the assorted text as highlighted per the Compendium section above. Simply: on our reading, the LCFS is a powerful wide-ranging Climate Action tool, now

modified through the years. It now includes provision for CCS (and DAC) and (separately) also fuels made from such CCS systems. Per our 11.01.23 letter, as the rules are currently formulated a DAC plant can be installed anywhere on the planet to make its LCFS claim. Having in mind the controlling statutes empowering CARB—and that the primary legislation has been *turbocharged* per SB596—we assert the following points in support of our request:

- Noting our LCA diagram and EPD for California (here), in transportation terms an EMC plant can be justified also as a *transportation device* per LCA boundaries A2–A3. For example, as our LCA diagram confirms, Zone A3 is an all-electric *linear* transportation device. It will span over 1000 ft and hence will be of a dimension similar to the guide-rails of a portside crane.
- All of our Zone A3 could be powered by diesel. Indeed, when in 2014 we were asked by Cameroon's government to investigate an EMC installation there, such are the limitations of West African electricity supply, any such EMC plant would have used diesel across its entire A3 transportation device so as to cause both the necessary drying and processing. Instead, we demurred.
- Just like a portside crane, our Zone A3 plant is *captive*. It does not move from its intended site. Only the intended substrate is transported: again, just like a portside crane.
- §95483(c)(4) LCFS (here) rewards the usage of electric forklifts. LCFS Credits flow directly to the "fleet owner". Clearly, a forklift is also *captive*: it is not intended to move beyond its operation site.
- The LCFS' definition of "transportation fuel" speaks for itself and *per se* has no requirement for a device to be non-stationary. Per lines 25–26 above, the term "non-vehicular" is expressly included. UC Berkeley's 2007 technical report confirms non-vehicular equipment, including leaf blowers.
- Further, that same definition places no restriction for such *equipment* only to cause *transport*. Equally, that same definition makes no attempt to rank transport as the fuel's primary purpose. Simply put: the "transportation fuel" definition is agnostic in all such regards.
- In confirmation of such agnosticism, per lines 30–31 above, the LCFS expressly introduces the terms "off-road transportation application" and "off-road equipment application".
- The highlight at line 88 confirms the inclusion of portside electric cranes: *i.e.*, yet another type of wholly *captive* device.

Conclusion: Zero CO2 | Low Energy | Electrification

> "Though going from an 80% reduction to a 100% reduction might seem incremental, the effort to decarbonize the economy gets harder the closer we get to 100%. To deliver on the much more ambitious goal, CARB needs more technologies in the mix. The "net-zero" part is acknowledgement that, for some sectors of the economy, such as air travel, we won't have cost-effective solutions to cut emissions...CARB realized the technologies weren't sufficiently developed and needed government support to get there...any entity that captures and sequesters a ton of CO2 from the air (which traded at an average price of $160 in 2018), can claim a credit from California. And because it doesn't matter where the CO2 is captured and stored, any entity in the world can apply for the credit."
>
> **Akshat Rathi, Quartz** | A Tiny Tweak in California Law is Creating a Strange Thing: Carbon-Negative Oil (2019) | **here**

Per line 73 above, §38561.2(b)(6) expressly includes the word "prioritize". To such ends, our LCA diagram confirms A3's processing of raw material is impossible unless it is *transported*. Simply: transport is both inherent and necessary in absolute terms to an EMC's production. Today, the LCFS is a wide-ranging Climate Action toolkit. However, it has always comprised the means to directly deliver the *electrification* of legacy fossil-fuel transportation and equipment *applications*. Equally, a Portland cement plant is a legacy

application that is both fossil-fuel intensive and requiring its substrate to be transported in a linear fashion by its installed equipment system. Further, vast quantities of cement are used in California's transport infrastructure on which its economy depends. Concrete may not be a product used to power trucks, but without it? Concrete is a vital transportation *material*, whose decarbonization is now a statutory demand.

Our 11.21.23 letter noted that ECRA's CCS cost estimate (~€100/t) is corroborated by Canada's IISD report (**here**). Moreover, the glaring scale of the energy savings we have set out here, is such that the more CCS is progressed in California, the greater California's need for a low-energy solution such as ours. At the very least, and using ECRA's most conservative CCS energy-forecast, 1mn tonnes of electric CCS bolted to a Californian Portland cement plant can only be offset—in energy terms—by 1mn tonnes EMC *Californian* CO_2 abatement (an energy-saving equaling the needs of some 750,000 apartments *upwards*).

This letter demonstrates that the LCFS supports a variety of devices carrying, to whatever degree, some sense of a transportation *dynamic*. A leaf blower transports only a "substrate" (*i.e.*, leaves). A forklift truck is captive. A portside crane transports a variety of loads only within the confines of a rail-system set within the range of an EMC plant's length. Both are captive. Hence, whether a device is "non-stationary" is a red herring. There is no doubt that a hook-up towed conveyor used in (say) forestry management is an "*off-road equipment application*". However, that machine is likely sitting entirely stationary when doing its job — during which the only aspect delivering transportation will be the conveying *mechanism* itself.

SB596 compels innovation. Our future is only about *delivery*. Respectfully therefore, having in mind especially §38561.2(b)(6) and Title XVII, we repeat our request for an LCFS rule-innovation that favors SB596 industrial low-energy *electrification*. We fully accept any new rule must be open equally to others also delivering those same benefits in an SB596 setting. To such ends, we believe the innovations we have suggested could be easily implemented and require minimal change to California's existing code, while being linked expressly to the aims of SB596. Further, the suggestions we have made are designed also to concord with Title XVII, moreover so that only innovative *electrification* technologies may qualify under the LCFS (with the credits generated tied to verified carbon mitigation). Nevertheless, if it is demonstrated objectively that the LCFS cannot be innovated no matter the reasons as suggested by us here, then we would welcome any alternate rule-change given §38561.2(b)(7)'s express requirements, per lines 76–86 above which includes energy-efficiency improvements and "*Measures to facilitate fuel switching*".

Sincerely

Atle Lygren | C.E.O. EMC Cement BV

ENC: Annex

ANNEX

NOTES

The ***New Definitions*** suggested below are taken from 10 CFR 609.2 (here), duly modified.

The terms "ASTM", "Executive Officer", "Primary Product", "Verification Body" are already set out in §95481 and do **not** require modification in the setting as suggested below.

New Definitions:

"Commercial Technology" means a technology in general use in the commercial marketplace in the United States at the time the application is made to the Executive Officer. A technology is in general use if it is being used in three or more facilities that are in commercial operation in the United States for the same general purpose as the proposed project, and has been used in each such facility for a period of at least five years. The five-year period for each facility shall start on the in-service date of the facility employing that particular technology or, in the case of a retrofit of a facility to employ a particular technology, the date the facility resumes commercial operation following completion and testing of the retrofit.

"New or Significantly Improved Technology" means an electrical technology which produces a Primary Product and is intended to reduce both the generation of high-temperature heat and the greenhouse gas emissions associated from cement production, which that at the time the application is made to the Executive Officer either:

(i) Has only recently been developed, discovered, or learned; or

(ii) Involves or constitutes one or more meaningful and important improvements in productivity or value, in comparison to Commercial Technologies in use in the United States;

provided, always, such technology may still be considered a "New or Significantly Improved Technology" if no more than 6 projects employ the same or similar technology as another project, provided no more than 2 projects that use the same or a similar technology are located in the same region of the United States.

§95483(c)(5) ("For Electricity Used as a Transportation Fuel") amended as follows:

(5) *Other Electric Transportation Applications.* For electricity supplied to a transportation application not covered in subsection (1) through (5) above, any entity can apply to the Executive Officer to be ~~the fuel reporting entity and~~ the credit generator:

(A) and the fuel reporting entity for electricity supplied as long as it meets the requirements of section 95488.7(a)(3) and 95491;

(B) for any New or Significantly Improved Technology that is not a Commercial Technology at the time the application is made to the Executive Officer, as long as:

1. the deployment of any such New or Significantly Improved Technology meets the reasonable requirements as may be stipulated by Executive Officer;
2. the Primary Product is ASTM compliant; and
3. the carbon mitigation delivered by any such New or Significantly Improved Technology is verifiable by a Verification Body including for the purposes of the Executive Officer meeting the requirements of §95486(a)(3)(A).