Appendix E

Additions and Amendments to Product-Based Benchmarks in the Cap-and-Invest Regulation

Proposed Amendments to the Regulation for the California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms

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Introduction

For an overview of product-based industrial allocation, product benchmarks, the one-product one-benchmark approach, and electricity benchmarks see Appendix J: Allowance Allocation for the Cap-and-Trade Regulation (CARB 2010).

Staff propose to establish new product-based benchmarks for crude oil production, transportation fuel production asphalt and anhydrous milkfat production. Where data from five or more facilities were used to calculate a benchmark, staff include a chart plotting the emissions efficiency per unit product for each facility. Facility names are not included to protect confidential business information. A chart is not produced where data from fewer than five facilities were used to calculate a benchmark, as this could reveal confidential business information.

Consistent with the development of existing benchmarks within the Regulation, newly calculated product benchmarks are calculated using Mandatory Reporting Regulation (MRR) data reported by California entities and reflect the greenhouse gas (GHG) emissions intensity of California production. The sector-wide GHG emissions intensity is calculated as direct on-site GHG emissions per unit of specific product including emissions associated with net steam purchases and deducting emissions associated with electricity sales.

$$Product\ Benchmark = 0.9 \times \frac{Total\ Adjusted\ Emissions}{Total\ Product\ Amount}$$

Where:

Adjusted Emissions = Facility Emissions + (Steam Purchased – Steam Sold) x 0.06244 [$MTCO_2e$/MMBTU Steam] - Electricity Sold × 0.431 [$MTCO_2e$/MWh electricity]

For each product, the benchmark is set at 90% of the sector's production-weighted average emissions intensity during a base period. The proposed benchmarks thus reflect the emissions intensity of efficient, low-emitting facilities within each sector.

An electricity benchmark is also calculated for each product. Electricity benchmarks are used to calculate allowance allocation to minimize the emissions leakage risk from Program costs embedded in purchased electricity, as described in the Initial Statement of Reasons (ISOR).

I. Sector-by-Sector Benchmark Product Proposal

A. Crude Oil Extraction

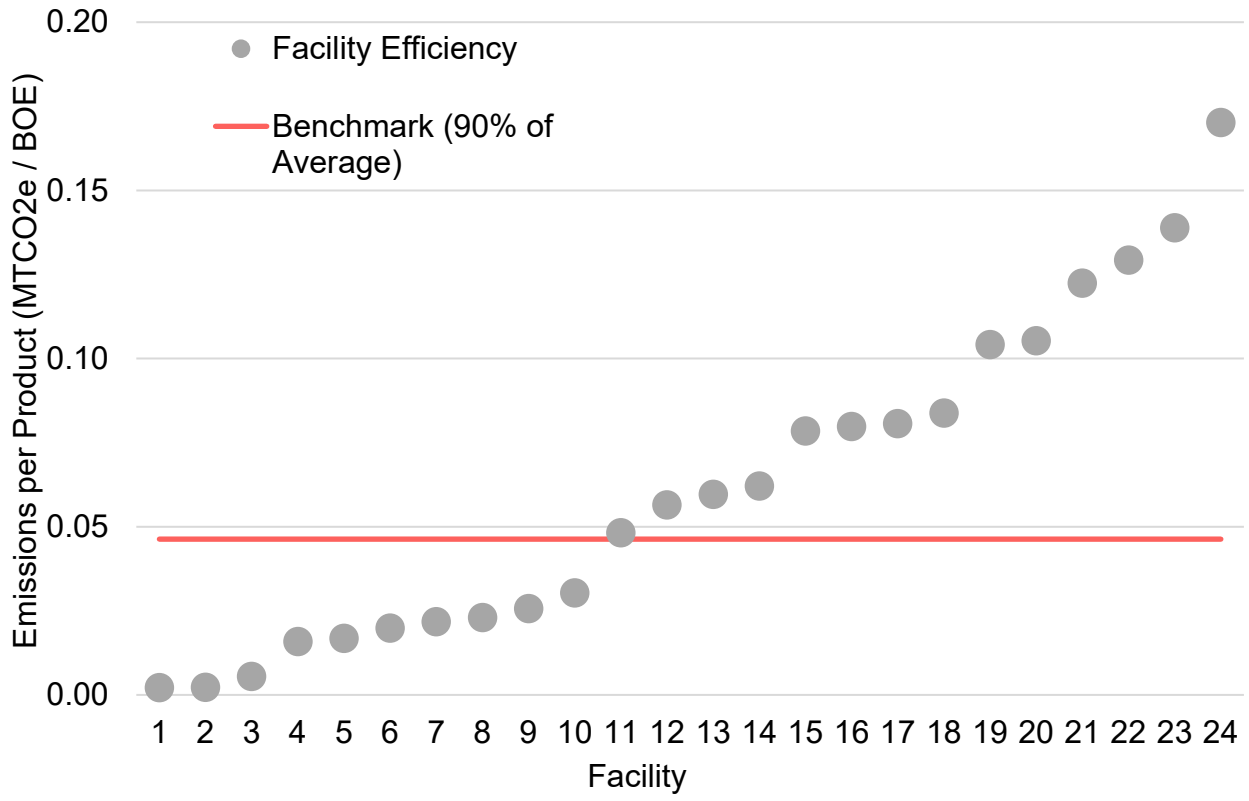
Beginning with vintage 2031 allowance allocation, staff propose to allocate for crude oil extraction using a single-benchmark for produced barrel of oil equivalent (BOE). Staff has calculated the new single benchmark for crude oil extraction using high-quality verified data reported by California producers pursuant to MRR for 2011, the same data year used to calculate the existing benchmarks for thermal enhanced oil recovery (EOR) crude oil extraction and non-thermal crude oil extraction, which were established during the 2013 Rulemaking (CARB 2013).

Consistent with the current nonthermal and thermal EOR crude oil extraction benchmarks, the recalculated benchmark for crude oil extraction is established for production of BOE calculated as:

BOE = barrel crude oil + (MMBTU associated gas + MMBTU dry gas) / (5.8 MMBTU/barrel)

The proposed single benchmark for crude oil extraction does not integrate a new product into the Regulation. There are currently two benchmarks for BOE dependent upon method of production. As described in the ISOR, the staff proposal eliminates the previous distinction between non-thermal extraction and thermal EOR extraction and instead calculates a single benchmark. Staff calculates the revised benchmark as 0.0463 allowances/BOE and the electricity benchmark as 0.0112 MWh/BOE.

Figure 1. Facility emissions intensity and benchmark for BOE



B. Transportation Fuel Production

beginning with vintage 2031 allowance allocation, staff propose to allocate to transportation fuel producers using a "liquid hydrocarbon fuel" (LHF) framework based on the total production volume of motor gasoline blendstocks, diesel, jet fuel, hydrocarbon gas liquids, and any functionally equivalent non-fossil hydrocarbon fuels or non-fossil hydrocarbon blending components, such as renewable diesel, renewable naphtha, and sustainable aviation fuel. Facilities may transition from allocation under the CWB benchmark to allocation under the LHF benchmark before vintage 2031 allowance allocation but cannot at any time transition from allocation under the LHF benchmark back to allocation under the CWB benchmark.

The LHF benchmark would replace the existing complexity weighted barrel (CWB) benchmark that is currently used to allocate to petroleum refineries. The proposed LHF benchmark is a technology-agnostic method and provides consistent treatment of fossil and non-fossil transportation fuel producers.

For purposes of developing a LHF benchmark, staff used on-site production of fuels as reported by petroleum refineries to MRR. Under MRR section 95113(l)(1), petroleum refineries

currently report on-site production as non-covered product data, following procedures used in monthly reports to the Energy Information Agency (EIA, Form EIA-810). Table 1 shows all of the refinery products with non-zero reported onsite production by covered facilities that were included in the LHF benchmark calculation. For purposes of benchmark development, staff multiplied reported volumes of "Finished Motor Gasoline blended with Fuel Ethanol" by 0.9, to account for the 10% volume of ethanol, which is not produced by refineries, in the reported fuel volume.

Table 1. Products included in LHF benchmark development

EIA Product Code	Name
118	Reformulated Blendstock for Oxygenate Blending (RBOB)
246	NGPL and LRG* – Propane/Propylene, TOTAL (includes EIA Product Codes 632 and 642)
245	NGPL and LRG* – Isobutane/Isobutylene, TOTAL (includes EIA Product Codes 247, 634 and 644)
244	NGPL and LRG* – Butane/Butylene, TOTAL (includes EIA Product Codes 249, 633, and 643)
138	Motor Gasoline Blending Components – All Other Motor Gasoline Blending Components
213	Kerosene-Type Jet Fuel, TOTAL (includes EIA Product Codes 217 and 218)
311	Kerosene
125	Finished Motor Gasoline – Reformulated, Blended with Fuel Ethanol
130	Finished Motor Gasoline – Conventional, Other
166	Finished Motor Gasoline – Conventional, Blended with Fuel Ethanol (Ed55 and Lower)
111	Finished Aviation Gasoline
465	Distillate Fuel Oil – Ultra Low Sulfur (sulfur content < 15 ppm)
466	Distillate Fuel Oil – Low Sulfur (15 ppm ≤ sulfur content ≤ 500 ppm)
467	Distillate Fuel Oil – High Sulfur (sulfur content > 500 ppm)
139	Conventional Blendstock for Oxygenate Blending (CBOB)
112	Aviation Gasoline Blending Components
854	Lubricants, TOTAL (includes EIA Product Codes 852 and 853)

Staff analysis shows that volumes of gasoline, diesel, and jet fuel reported pursuant to MRR correspond closely to volumes reported and verified by the California Energy Commission (CEC) according to the Petroleum Industry Information Reporting Act (CEC 2024). For 2017 through 2019, the total volume of diesel, gasoline, and jet fuel reported to MRR is within 0.5% of the volume reported to CEC.

For purposes of allocation, corresponding updates to MRR are proposed for facilities to report on-site production by individual product (similar to Form EIA-810 reporting and current reporting of supplied transportation fuels under section 95121 of MRR) and to exclude any blendstocks brought onsite or fuel produced from blending operations.

As indicated in Table 1, staff propose to include produced lubricants within the LHF framework. Reported lubricant production makes up approximately 1% of total sector-wide LHF volume annually. Including lubricant production impacts the calculated LHF benchmark by less than 1%. Due to the complexity of refining operations and data and lubricant production, staff are unable to propose a distinct lubricant benchmark. Incorporation of lubricant production within the LHF framework enables allocation to the small number of facilities that currently report lubricant production while having minimal impacts on benchmark development or total allocation provided.

Staff propose to use LHF production as described above for 2017, 2018, and 2019 data years to develop the LHF benchmark. Refinery production was first reported per MRR section 95113(l)(1) in 2014. Data years 2017-2019 were chosen as they:

- Exclude potential impacts of the pandemic and ongoing refinery conversions during and subsequent to 2020;
- Allow several years of reporting before use of production data for benchmark development, helping ensure consistency and reliability of data;
- Avoid potential sector-wide impacts from the 2015 Torrance Refinery explosion; and
- The Form EIA-810 approach to product reporting in MRR also started with the 2017 data year. The reporting of refinery product volumes pursuant to MRR in prior years was less consistent.

When developing the LHF benchmark, staff included data from all covered petroleum refining facilities, using reporting years 2017-2019, excluding the few facilities that exclusively or primarily produced non-transportation products, such as asphalt, during those years. This approach includes 99.9% of LHF production reported to MRR for 2017 through 2019 in the benchmark calculation.

Staff propose to calculate the LHF benchmark using the following calculation:

$$Liquid\ Hydrocarbon\ \ Fuel\ Benchmark = 0.9 \times \frac{Total\ 2017-2019\ Adjusted\ Emissions}{Total\ 2017-2019\ LHF\ Volume}$$

Where:

Adjusted Emissions = Facility Covered Emissions + Indirect Emissions - H_2 emissions - Asphalt emissions – SA Emissions

Indirect Emissions = (Steam Purchased – Steam Sold) x 0.06244 - Electricity Sold × 0.431

H_2 emissions = Reported Emissions Associated with Hydrogen Production

Asphalt Emissions = Asphalt Production × Avg. Asphalt emission intensity as calculated from benchmark

SA Emissions = Sulfuric Acid Production x Avg. Sulfuric Acid emission intensity as calculated from benchmark

LHF Volume = Total barrels of liquid hydrocarbon fuel produced

Facility emissions associated with hydrogen production are reported pursuant to MRR section 95114 and include any carbon dioxide (CO_2) from the hydrogen production unit captured and transferred off-site. Asphalt production is reported pursuant to MRR section 95113(l)(1). Sulfuric acid production is reported pursuant to MRR section 95115(n)(20). Facility emissions associated with asphalt and sulfuric acid production are calculated using the representative emission intensity data in this limited case because several covered facilities could not provide emission data for these specific processes and the small level of these adjustments.

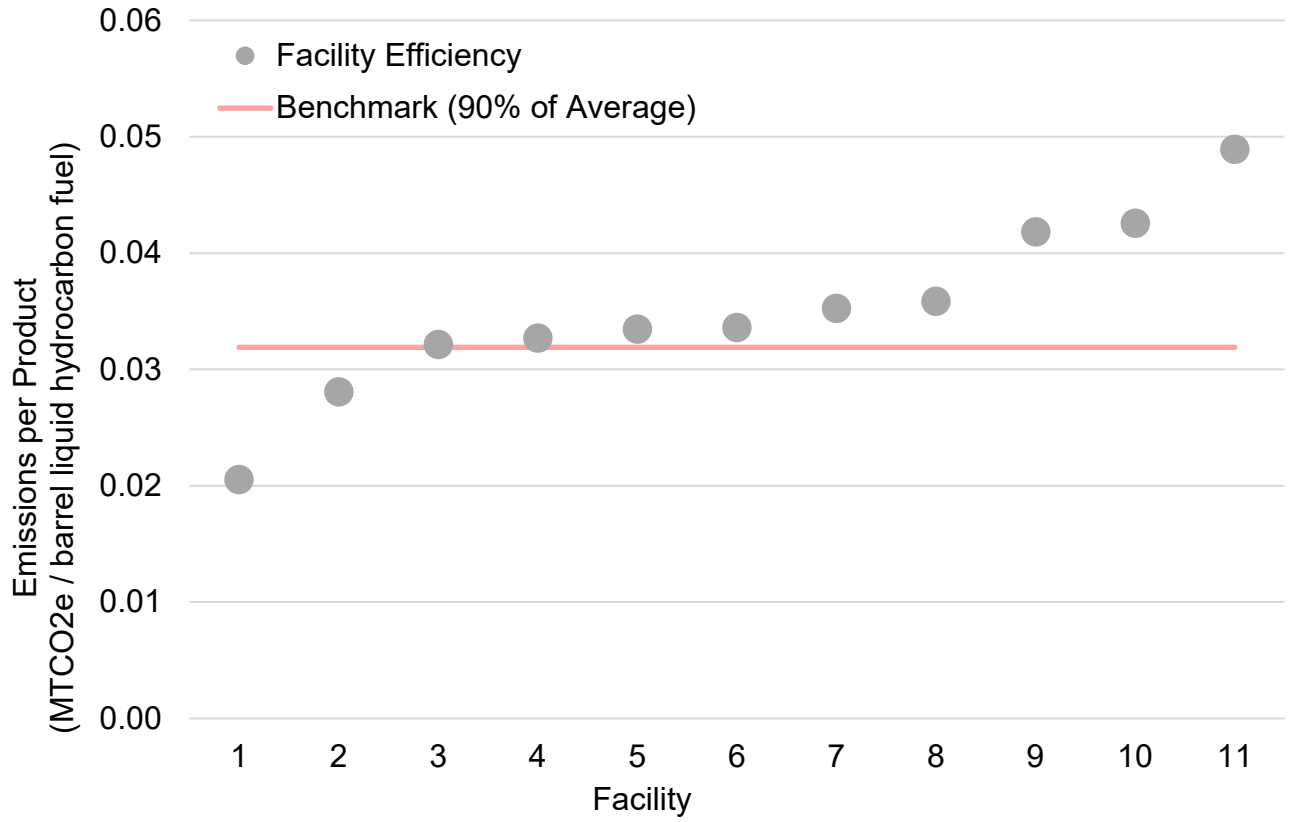
This approach:

- Uses the standard 90% of sector average approach for benchmark calculations;
- Provides the same treatment for indirect emissions as all other benchmarks;

- Allocates all facility indirect emissions to LHF production, which is the same approach used for developing the CWB benchmark when the CWB and hydrogen benchmarks were calculated in the 2013 Rulemaking;
- Subtracts emissions attributed to hydrogen production, sulfuric acid production, and asphalt production from facility emissions;
- Determines emissions associated with hydrogen production based on reported MRR data, consistent with the approach used in the CWB benchmark calculation in the 2013 Rulemaking; and
- Applies a representative emissions intensity to calculate asphalt and sulfuric acid emissions, which are a small fraction of total facility emissions.

Using this approach and the data described in the current section, staff have developed a proposed benchmark of 0.0319 allowances/barrel of LHF and an electricity benchmark of 0.00361 MWh/barrel of LHF.

Figure 2. Facility emissions intensity and benchmark for LHF



C. Asphalt Production

Beginning with vintage 2031 allowance allocation, staff propose to incorporate a new benchmark for asphalt production to replace the existing CWB allocation framework for asphalt production. For the purposes of the Regulation and this discussion, asphalt production is defined as production of asphalt and road oil, which are reported together as one product under EIA reporting. Some petroleum refineries in California exclusively or primarily produce asphalt and not transportation fuels. Facilities may transition from allocation under the CWB benchmark to allocation under the asphalt production benchmark before vintage 2031 allowance allocation but cannot at any time transition from allocation under the asphalt production benchmark back to allocation under the CWB benchmark.

Aligned with implementation of the LHF benchmark, staff propose to use emissions and on-site production of asphalt and road oil for data years 2017-2019 to develop the asphalt production benchmark. Staff used on-site production of asphalt and road oil (EIA code 931) as reported by covered petroleum refineries under MRR section 95113(l)(1) following procedures used in monthly reports to the Energy Information Agency (EIA, Form EIA-810). Staff worked with facilities to determine covered emissions associated with asphalt production.

Using this approach and the data described in the current section, staff have developed a proposed benchmark of 0.0185 allowances/barrel of asphalt and road oil and an electricity benchmark of 0.00493 MWh/barrel of asphalt that represent 90% of sector averages. Due to the limited numbers of facilities, in order to protect confidential business information, a figure of facility level emissions intensities is not provided.

D. Food and Beverage Sector

Staff proposes to add a new benchmark for anhydrous milkfat, as that product is now being manufactured within the California dairy sector. This new benchmark would be in effective once the Proposed Amendments are in effect. In developing the anhydrous milkfat benchmark, staff included data from one facility. Reporting years 2020-2022 were used, which were the first stable production years after the product was first produced. As only one facility produced this product, staff proposed to establish the benchmark at the best-in-class level, which is 0.335 allowances per short ton of anhydrous milkfat and an electricity benchmark of 0.247 MWh per short ton of anhydrous milkfat.

E. References

(CARB 2010) California Air Resources Board. Appendix J: Allowance Allocation. October 2010. https://www.arb.ca.gov/regact/2010/capandtrade10/capv4appj.pdf

(CARB 2013) California Air Resources Board. Appendix A: Additions and Amendments to Product-Based Benchmarks in the Cap-and-Trade Regulation. March 2014. https://ww3.arb.ca.gov/regact/2013/capandtrade13/2appabenchmarks.pdf

(CEC 2024) California Energy Commission. Refinery Inputs and Production. Accessed 28 June 2024. https://www.energy.ca.gov/media/6522