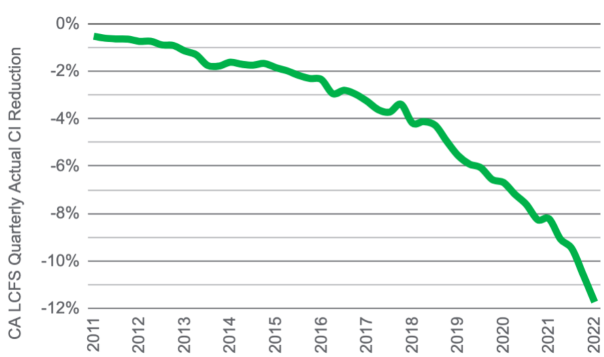
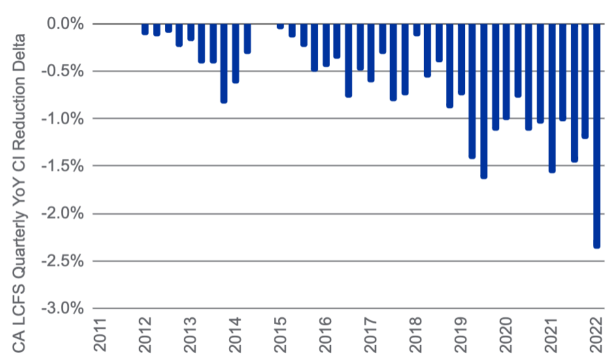
Mission

The mission of this whitepaper is to better inform the California Air Resources Board (CARB), market participants, industry groups, and the general public by presenting a systematic approach to setting the Low Carbon Fuel Standard (LCFS) carbon intensity (CI) compliance curve from 2024 to 2030.

Current CI Reduction Momentum

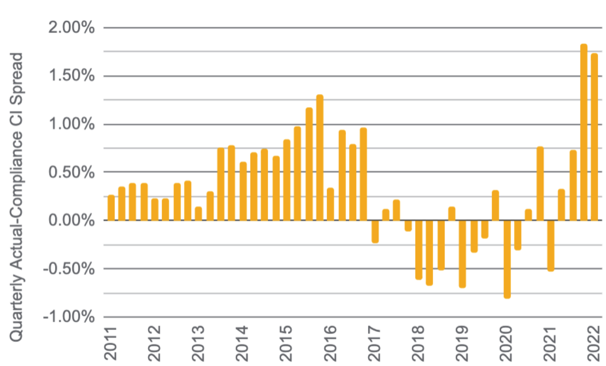
With the expansion of RD production and distribution, growth of negative-CI RNG, increased ZEV sales, and declining gasoline demand, CI reduction progress has turned exponential within the past 3 years. Before 2019, CI reduction progress was typically <1 percentage point year-over-year, as seen in the blue bar chart below. However since 2019 CI reduction has accelerated to >1 percentage point YoY with Q1-2022 being close to 2.5 percentage points better YoY and already exceeding the 2023 compliance target of 11.25%, a full year in advance[1].

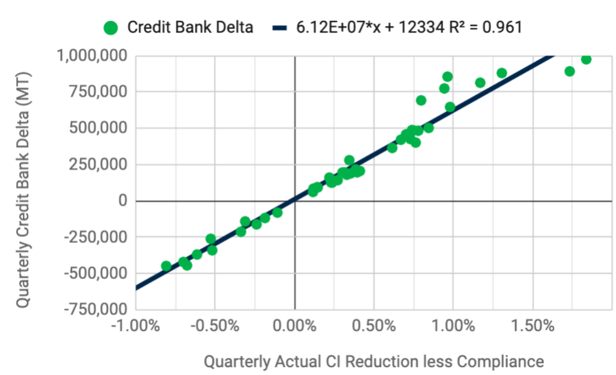




Actual Carbon Intensity Reduction vs Credit Bank Build Relationship

In any given quarter when actual CI reduction exceeds compliance by 1% point, roughly 612,000 MT are added to the LCFS credit bank and vice versa if actual CI reduction is short of compliance by 1% point. This relationship has a 96% linear correlation as shown in the scatter plot below.





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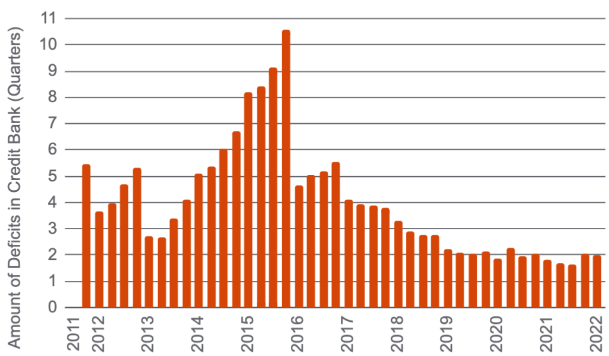
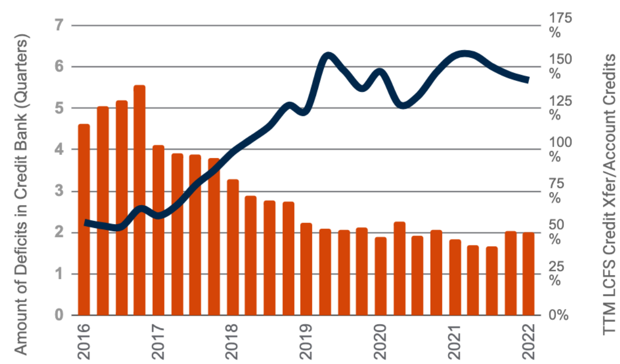
[1] CARB LCFS Reporting Tool Quarterly Summaries

Credit Bank vs Market Liquidity Relationship

Prior to 2016 as the LCFS credit bank had typically >1 year worth of deficits[2], <10 credit transfers occurred in the average week making it difficult for producers to properly hedge future feedstock volatility along with operating costs[3]. Since then the amount of deficits in the credit bank has dropped to roughly 2 quarters worth of deficits as nearly 50 credit transfers or >500,000 MT happen per week with more than 80% of those transfers being Type 2 transfers, meaning the trade happens more than 10 days before the transfer giving the producers a better opportunity to hedge and a better predict future operating margin. Market liquidity has also increased significantly to over >100% of new credits entering the LCFS system every quarter as the credit bank dropped below 3 quarters worth of deficits as shown in the line chart below.

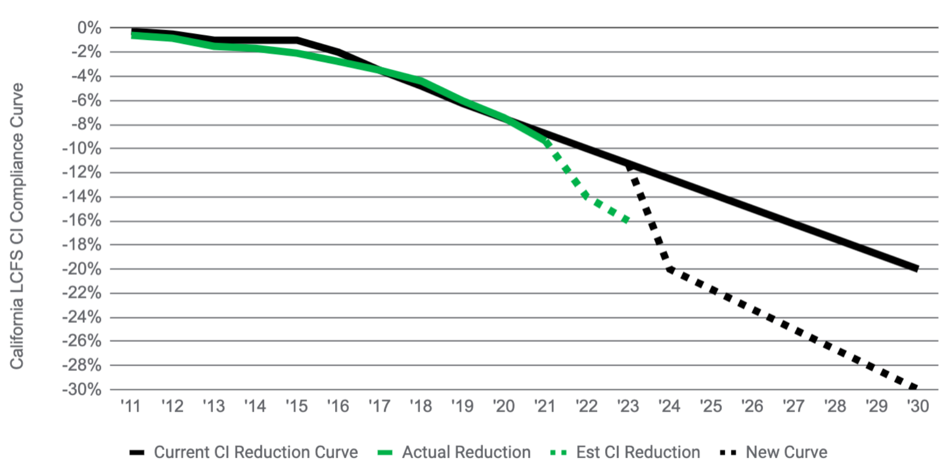
(note: time lag between credit generation and credits available to transfer has been taken into account)





2024 Compliance Target: The Step Down

Barring gasoline demand ramping back to pre-COVID levels and/or a majority of renewable diesel going elsewhere, the LCFS is expected to significantly outperform in 2022 and 2023 adding 10-15 million MT to the credit bank. A major 'step down' in CI compliance to roughly 20% will be needed to get the credit bank to under 3 quarters worth of deficits.



[2] CARB, Monthly LCFS Credit Transfer Activity Reports
[3] CARB Weekly LCFS Credit Transfer Activity Reports

Pull Forward Mechanism Metric & Implementation

It is going to be extremely difficult for CARB to accurately set CI compliance through 2030 accurately in order to to not strain the LCFS credit bank if the respective fuel does not show up or to decentivize further investments into low carbon fuel infrastructure so the LCFS can achieve its goals of lowering the CI of the fuel used in the state as well as reducing the dependency on petroleum.

Since the market has been the most robust since the credit bank has been below 3 quarters worth of deficits, the pull forward auto ratchet mechanism should focus on the quarterly bank/deficit ratio with the rules below:

- Credit Bank >3 quarters worth of deficits: pull forward 1 year
- Credit Bank >4 quarters worth of deficits: pull forward 2 years
- Credit Bank >5 quarters worth of deficits: pull forward 3 years
- Credit Bank >6 quarters worth of deficits: pull forward 4 years
- Only pull forward, not back to original compliance
- Mechanism is triggered using max quarterly credit bank/deficit ratio
- Mechanism is triggered for following compliance year using current calendar year reporting, not current calendar data due to data lag (see schedule below)
- Mechanism pulls forward the entire curve to 2030
- If 2030 compliance gets pulled forward, CI compliance continues at same annual progress as set in the 2024 to 2030 curve (ie 2024 at 20% and 2030 at 30%, annual progress is 1.67%, therefore 2030 compliance is 31.67% or higher depending on the amount of years pull forward)
- Compliance CI can be pulled forward multiple times (ie 2028 compliance can be pulled forward once by 2024 reporting data, once by 2025 reporting data, once by 2026 reporting data, and once by 2027 reporting data potentially having a CI reduction of 33.33% assuming 2024 and 2030 CI compliance at 20% and 30%, respectively)

Assuming a 'step down' CI compliance in 2024 and the lag in LCFS quarterly data, the table below outlines the data used for a potential pull forward scenario for 2025 and 2026-2030. Since the finalized RVOs for the Federal RFS are not published until November of each year, it is sufficient to use Q2 reporting data at the end of October for a potential pull forward scenario the following year.

Calendar Year	2024				n = 2025-2029			
Reporting Quarters			Q1 2024	Q2 2024	Q3 n-1	Q4 n-1	Q1 n	Q2 n
Pull Forward Compliance Year	2025				2026-2030			