RFA RENEWABLE FUELS ASSOCIATION

April 23, 2018

Mr. Sam Wade, Chief
Transportation Fuels Branch
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Dear Mr. Wade,

The Renewable Fuels Association (RFA) appreciates the opportunity to submit these comments in response to the California Air Resources Board's (CARB) proposed amendments to the Low Carbon Fuel Standard regulation (Staff Report: Initial Statement of Reasons; March 6, 2018).

RFA is the leading national trade association representing U.S. fuel ethanol producers. Its mission is to advance the development, production, and use of low-carbon fuel ethanol by strengthening America's ethanol industry and raising awareness about the benefits of renewable fuels. Founded in 1981, RFA serves as the premier forum for industry leaders and supporters to discuss ethanol policy, regulation, and technical issues. RFA's 300-plus members are working daily to help America become cleaner, safer, more energy secure, and economically vibrant.

Since the inception of the LCFS, liquid biofuels like ethanol have played a key role in the program's success. In fact, CARB data show that ethanol is responsible for reducing greenhouse gas (GHG) emissions by 14.5 million metric tons (CO2-equivalent), or 45% of the total reductions achieved under the LCFS to date.

As CARB now considers expanding the LCFS through 2030 and ramping up the required fuel carbon intensity reduction to 20% below 2010 levels, we want to express our support for actions that can help facilitate achievement of future LCFS goals by accelerating and maximizing the decarbonization of remaining liquid transportation fuels. Indeed, RFA's support was commemorated in a recent letter to Gov. Brown and Chair Nichols, included as Attachment A to these comments.

Many of our member companies produce low-carbon ethanol that is consumed in California and they participate in the LCFS program as "fuel pathway holders." Thus, our member companies would be directly affected by many of the proposed amendments outlined in the ISOR, and we offer detailed comments on those provisions below. Our comments are meant to respect the intent of the planned amendments while minimizing costs and reducing regulatory inefficiency and redundancy.

We are concerned that some of the regulatory text modifications proposed by CARB could create unnecessary administrative burdens and increased cost with little or no additional regulatory benefit. Further, we believe some of the planned amendments could have the unintended consequence of stifling the innovation and investment that could lead to additional carbon intensity (CI) reductions under the LCFS. As such, we encourage CARB to seriously consider the recommendations below prior to promulgating the proposed regulatory amendments.

I. 2019-2030 CARBON INTENSITY REDUCTION BENCHMARKS

CARB proposes to both strengthen and smooth the CI reduction curve through 2030. As part of the smoothing, CARB intends to slightly relax near-term CI benchmarks for 2019 and 2020, while strengthening longer-term targets (e.g., 2025-2030) beyond the levels initially discussed during the informal stakeholder process. The proposal includes a straight-line trajectory for annual CI reductions, as opposed to the "back-loaded" trajectory originally adopted for 2010-2020.

RFA agrees with CARB's recommendation to slightly ease short-term CI benchmarks. While the revised short-term benchmarks remain quite stringent, they will give the marketplace more "breathing room" and flexibility, ultimately enhancing the sustainability of the program. We also support the use of a straight-line CI reduction trajectory rather than a back-loaded curve. Using a straight-line approach results in more predictable and stable market conditions for both low carbon fuel producers and regulated parties.

II. MAINTAINING A TECHNOLOGY-NEUTRAL APPROACH TO THE LCFS

Since its inception, the LCFS has been promoted as a performance-based standard that is technology neutral. RFA is concerned that certain proposed amendments potentially undermine the program's technology neutral design. Specifically, CARB is proposing to allow a credit accounting framework that assumes electricity used for electric vehicle (EV) charging and hydrogen production came from renewable power generation, even if there is no direct linkage of the EV charging or hydrogen production system to renewable power generation systems. CARB states that it is allowing this unique indirect accounting benefit to "promote the expansion of zero-emission vehicle infrastructure" because, to date, "we have seen very little interest in such pathways under the current rule."[1]

Meanwhile, biofuel producers are not allowed to claim credit for reducing the carbon intensity of biofuel processing through the purchase and indirect use of biogas injected into common carrier pipelines or renewable electricity put onto the grid, even if the producer is able to present documentation verifying the purchase of biogas or renewable electricity. Thus, ethanol producers have very little incentive under the LCFS to stimulate the use of biogas or renewable electricity as

[1] ISOR, at EX-5.

process energy sources unless they can generate the energy onsite, which is rarely feasible from a technology or economic standpoint.

RFA believes these proposed amendments potentially undercut the technology neutrality principles of the LCFS program, inevitably resulting in the picking of technology "winners and losers." We strongly recommend that if indirect accounting is allowed for renewable energy use in EV and hydrogen pathways, then indirect accounting should also be available for biofuel producers who can present evidence that they have purchased renewable electricity or biogas transmitted through the grid or common carrier pipeline.

III. DETERMINING FUEL PATHWAY CARBON INTENSITY VALUES

CARB is proposing a number of important changes to the fuel pathway application process and determination of carbon intensity (CI) values. In general, we appreciate the efforts undertaken by CARB staff to further streamline and simplify the tools used for determining CI values. Our specific comments on fuel pathway application issues and CI determination are detailed below.

A. CA-GREET 3.0 and Simplified CI Calculator:

a. We are pleased that CARB has added the capability to separately account for denatured and undenatured ethanol production. Because denaturant can have considerable effects on the overall pathway CI, it is appropriate for the calculator to account for only the actual amount of denaturant used for denatured fuel ethanol.

b. We support CARB's requirement that "beginning corn inventory" be recorded in bushels *with 15% standard moisture included* and "not to be reported on a dry basis." Additionally, we agree with CARB's decision to allow alternate approaches to recording corn inventory only if the applicant provides all appropriate conversion factors to CARB. This will eliminate potential errors and uncertainties regarding ethanol yield per bushel.

c. It appears the new CA-GREET 3.0 and the CI Calculator continue to use outdated assumptions regarding grain sorghum production from the latest version of GREET from Argonne National Laboratory. We encourage CARB to reconsider the agricultural assumptions regarding grain sorghum production and we believe more current and robust data is available to support updating key default values.

d. CARB's default values for corn transportation distance by truck from the farm to the ethanol plant are inappropriate and unrealistic. The proposed default value of 80 miles is not supported by other analyses and empirical data. For example, a recent analysis by the U.S. Department of Agriculture found that "corn moves by truck relatively short distances to nearby ethanol plants," and that "the average distance to

market ranges from about 14 miles for Iowa to 23 miles for Ohio."[2] Thus, even with back-haul miles included, the USDA mileage estimates are less than half, on average, of what CARB is proposing to use for a one-way value. We recommend that CARB adopt a conservative default farm-to-plant corn transportation distance of no more than 40 miles.

e. We understand that the goal of the simplified calculator is to reduce the number of user-defined input variables and simplify the calculations used to derive CI values. However, we believe users should have the ability to enter unique, non-default data for chemical usage.

f. RFA continues to believe that all emissions associated with corn distillers oil (CDO) production (including an appropriate share of upstream corn production and land use change emissions) should be allocated to the CDO pathway, not the corn starch ethanol pathway. CI values for corn starch ethanol remain overly inflated due to the allocation of certain CDO-related emissions to corn starch ethanol.

B. Indirect Land Use Change (ILUC) and Soil Carbon Sequestration:

a. RFA again encourages CARB to adopt the ILUC values from the latest Argonne GREET model, as Oregon DEQ has done for its state's Clean Fuels Standard. We continue to believe the science underlying the Argonne GREET model ILUC factors is more robust and current than the science supporting CARB's current ILUC factors.

b. RFA encourages CARB to work with experts from Argonne, USDA, academia, and other entities to ensure that both the Argonne GREET and CA GREET modeling frameworks appropriately characterize all soil carbon effects associated with corn production, including the opportunity for net carbon sequestration in certain corn production systems.

C. Substantiality Requirements:

a. While we appreciate the intent of the proposed substantiality requirements (i.e., to reduce CARB staff workload related to processing pathway applications), RFA believes the proposed requirements will discourage innovation and improvement under the LCFS. The LCFS was designed in such a way that low-carbon fuel producers can potentially be rewarded for any meaningful reduction in CI, even if those reductions may at first appear to be small. This is how the program has encouraged investment and innovation. We believe the proposed substantiality threshold of a 5% reduction versus the reference pathway is too large and will result

[2] USDA. February 2016. "The 2015 Energy Balance for the Corn-Ethanol Industry." https://www.usda.gov/oce/reports/energy/2015EnergyBalanceCornEthanol.pdf

in the marketplace forgoing low-cost, near-term CI reduction opportunities at existing facilities. For example, an ethanol producer that could achieve a 2.5-3 g/MJ reduction in its CI value versus the reference pathway likely would be prevented from applying for a new pathway because of the level of the proposed substantiality threshold. At current LCFS credit prices, this producer would be forgoing 3-4 cents per gallon in additional CI premium value, reducing the incentive to invest in further improvements and efficiencies.[3]

b. We encourage CARB to revise the substantiality requirement to 1 g/MJ for *all* proposed pathway applicants, not just those with source-to-tank CI values of 20 g/MJ or less.

IV. THIRD-PARTY VALIDATION AND VERIFICATION

While we understand the intent behind the draft provisions requiring that fuel pathway holders submit to third-party validation and verification services, we are concerned by several aspects of these planned amendments. An overarching concern with the proposed fuel pathway and fuel transaction verification program is that it appears to be based primarily on the mandatory GHG reporting regulation (MRR) and California GHG cap-and-trade program. These are very different programs with different regulated entities, and the reporting/verification regimes that may work well for MRR and cap-and-trade may not be appropriate for the LCFS. Our specific concerns are outlined more fully below.

A. The proposed verification body rotation requirements are unwarranted and may actually lead to more—not less—verification errors and uncertainty.

There are a limited number of firms with the necessary expertise and experience to perform quality verification and validation services for low-carbon fuel pathway holders. The proposed verifier rotation requirements may force ethanol producers to periodically switch away from using qualified, knowledgeable verifiers to using verifiers with less experience regarding the LCFS program and ethanol production processes.

We believe frequent switching of verification bodies could increase the opportunity for auditing errors, as new verification bodies will be less familiar and less informed on the operations of fuel pathway holders. We recommend that CARB eliminate the requirement to entirely rotate verification bodies, as the requirements for verifier accreditation, training, and submittal of a verification plan already mitigate against verification errors and non-compliance. That said, CARB's proposed accreditation requirements appear excessive and may further reduce the pool of available qualified verifiers, thus reducing efficiency and raising costs for fuel pathway holders.

[3] Assumes CI value of 50-60 g/MJ (without ILUC penalty) and LCFS credit value of $150.

In lieu of requiring rotation of the firms performing verification services, CARB could instead require rotation of the lead auditor. We believe CARB could accomplish its goals by allowing the same verification body to be used without rotation, but requiring that the person in charge of the audit must periodically rotate.

B. CARB's proposed conflict of interest requirements are excessive and may disqualify reputable and experienced firms from serving as verification bodies.

CARB's draft provisions require potential verification bodies to conduct a conflict of interest (COI) self-assessment and submit it to CARB for review prior to offering verification services. Among the activities considered by CARB to constitute a "high conflict of interest" are providing bookkeeping, other accounting services, or accounting software/automation support to the company requiring verification services. We do not believe firms that serve as verification bodies should be barred from providing financial accounting or other related services to the pathway holder, as numerous safeguards and independence requirements are already in place to mitigate against any potential conflicts of interest. At a minimum, CARB should reclassify these situations as "low" or "medium" risk and allow verification body applicants to provide a mitigation plan explaining how potential COIs will be mollified.

C. CARB's verification program should be designed in a way that maximizes synergies with existing reporting, recordkeeping, and auditing requirements under the Renewable Fuel Standard (RFS).

Much of the information that must be verified under CARB's draft verification program is already reviewed and verified by third-party auditors for the RFS program. Specifically, every renewable fuel producer undergoes an annual RIN attest engagement, which requires auditors to verify operational data and other information. Further, EPA has approved RIN generation pathways for many ethanol producers through the Efficient Producer Pathway and conventional pathway petition processes. Monitoring plans related to these pathways are reviewed by third-party auditors annually to ensure valid RIN generation.

Further, some biofuel producers (particularly advanced and cellulosic) use third parties to administer EPA-approved RIN Quality Assurance Plans (QAPs) to provide additional assurance and validation to counterparties. CARB should strive to ensure its verification program capture synergies with these existing verification programs rather than "re-creating the wheel."

V. BUFFER ACCOUNTS AND ADDRESSING DISCREPANCIES BETWEEN *REPORTED* CARBON INTENSITY AND *VERIFIED* CARBON INTENSITY

As many commenters have pointed out through the stakeholder process, low-carbon biofuel producers face a number of uncontrollable factors that may cause the actual (i.e., verified) CI of their fuel to be slightly different than the reported CI in the fuel pathway approved by CARB. For

example, extreme weather conditions in a given growing season may impact feedstock yields and quality, or changing market conditions may cause feedstock and fuel transportation distances to deviate slightly from the values in the pathway. These sorts of changes may result in minor variations in the actual CI performance of the pathway. Due to these operational uncertainties, ethanol producers often use conservative operational values for the fuel pathway applications they submit to CARB for approval, leading to slight overestimation of CI performance and leaving a margin for slight variance in actual CI performance.

However, it is not uncommon for a plant's actual CI performance to be better (i.e., lower) than the reported pathway CI, meaning the ethanol pathway is generating more actual GHG reduction than is indicated by the certified pathway. This is typically due to more efficient operation of the biorefinery, but also may result from higher-than-expected feedstock yields and quality.

Unfortunately, CARB's proposal for addressing these slight discrepancies is inequitable and fails to incentivize more efficient practices that would drive actual CI performance below the certified pathway CI. CARB is proposing that if the actual verified CI is lower than the certified CI, the pathway holder can either: 1) retain the originally certified CI; or 2) request to replace the previously certified CI with the updated (verified) CI on a go-forward basis, assuming the improvement meets the substantiality requirements. In either case, the ethanol producer is forced to forgo the additional CI credit generated below the certified CI level, meaning actual GHG reductions are not being recognized.

On the other hand, if the actual verified CI is found to exceed the previously certified CI, the fuel pathway holder is deemed "out of compliance" and "may be subject to credit adjustment and possible enforcement investigations." Thus, ethanol producers are not rewarded for actual CI performance that is lower than the certified CI, but face enforcement penalties if the actual CI performance is higher than the certified CI.

We strongly recommend that credit "buffer accounts" be adopted in a way that allows producers to generate and store CI credits when actual verified CI performance is lower than the certified pathway CI. These credits would then be available to the producer to offset potential credit invalidation in the event that a future verification audit finds that the producer's actual CI performance is above the certified CI.

As a matter of general fairness, we encourage CARB to implement buffer accounts in a manner that truly serves as a "buffer" for credit generators, allowing surplus credit to be generated when verified CI performance is lower than the reported CI.

VI. ETHANOL'S ROLE IN THE CONTINUED SUCCESS OF THE LCFS

As described elsewhere in these comments, domestically produced ethanol has played an important role in the success of the LCFS to date. We look forward to working with CARB to ensure the full

potential of ethanol to help decarbonize the state's remaining liquid fuels can be realized. To that end, we ask that CARB consider the following actions that would enable ethanol to make even greater contributions to the achieving the goals of the LCFS moving forward.

A. Expeditious approval of new pathway petitions for cellulosic ethanol produced from grain kernel fiber

RFA applauds CARB's expeditious approval of recent pathway petitions for the production of cellulosic ethanol from corn kernel fiber, and we encourage the Agency to act swiftly on pending and upcoming pathway petitions. Dozens of existing corn ethanol plants have adopted, or are in the process of adopting, new technologies that enable the low-cost production of low-carbon ethanol from the cellulosic fibers found in the corn kernel. If adopted broadly across the industry, these technologies could result in the production of 500 million to 1 billion gallons of low carbon ethanol, much of which may be available to the California market.

B. Revise default CA-GREET agriculture-related emissions values for grain sorghum pathways

RFA continues to encourage CARB to work with Argonne experts to revisit greet model assumptions regarding grain sorghum production. We believe more current and robust data is available to update key default assumptions regarding grain sorghum fertilization practices, yields, and other key variables. Disparate treatment of corn and sorghum ethanol pathways creates inefficiencies and disturbances in the marketplace, where the two feedstocks are generally treated interchangeably.

C. Amend current regulations to allow the sale of E15 (15% blends) in California

Current state regulations preclude the sale of E15 in California, despite the facts that 1) the fuel has been legally registered at the federal level since 2011; 2) E15 is currently sold in 30 other states; and 3) more than 90% of the existing light-duty automotive fleet is legally approved to consume E15.

A recent study by Life Cycle Associates (summarized in Attachment B) shows that introduction of E15 would significantly increase credit generation, reduce gasoline consumption, and enhance the near- and long-term sustainability of the LCFS.[4] If California allows the sale of E15 beginning in 2020, the study shows cumulative GHG reductions achieved under the LCFS increase by 15-19 MMT CO2e by 2030, depending on the mix of ethanol sources.

[4] The January 2018 Life Cycle Associates study, previously shared with CARB staff, examined scenarios based on a 2020 CI reduction benchmark of 10% and a 2030 CI reduction benchmark of 18%, as discussed during the 2017 stakeholder process. While the CI benchmark curve proposed in the ISOR leads to slightly different credit/deficit results than those presented in the Life Cycle Associates study, the GHG reductions achieved under the study's E15, high octane fuel, and E85 PHEV scenarios remain valid directionally and in terms of magnitude.

D. Begin a formal process to consider other pathways for further decarbonizing liquid transportation fuels

While E15 would provide additional low-cost CI reductions in the near term, RFA also believes CARB staff should initiate a more formal dialog with stakeholders—including automakers, fuel producers, fuel retailers, and others—to examine other options for further decarbonizing the remaining liquid fuels in the California market.

Several of these options, including the use of mid-level ethanol blends in high-octane fuel vehicles and the use of E85 flex fuels in plug-in hybrid electric vehicles, could provide substantial GHG reductions under the LCFS. However, certain regulatory and marketplace barriers need to be properly identified and overcome in order for ethanol-based fuels to play an even larger role in transforming the state's liquid fuels pool.

We encourage CARB to work with stakeholders to begin identifying the regulatory and marketplace actions necessary to enable biofuels like ethanol to play a bigger role in decarbonizing California's transportation fuels.

* * * * *

Thank you for considering our comments as you prepare to advance amendments and modifications to the LCFS program. Please contact me at 636.594.2284 with any questions or comments.

Sincerely,

Geoff Cooper
Executive Vice President

ATTACHMENT A

RFA RENEWABLE FUELS ASSOCIATION

March 28, 2018

The Honorable Edmund G. Brown, Jr.
Governor
State Capitol, Suite 1173
Sacramento, CA 95814

Mary Nichols, Chair
Air Resources Board
1001 I Street
Sacramento, CA 95814

Dear Governor Brown and Chair Nichols,

Under your leadership, the California Low Carbon Fuel Standard (LCFS) has been a remarkable success. It has driven technology innovation, stimulated investment in clean energy, reduced climate change emissions from the transportation sector, and decreased fossil fuel consumption.

Since the inception of the LCFS, liquid biofuels like ethanol have played a key role in this success story. In fact, the California Air Resources Board (ARB) reports that ethanol is responsible for reducing climate change emissions by 14.5 million metric tons CO_2-equivalent, or 45 percent of the total reductions achieved under the LCFS to date.

As the ARB now considers expanding the LCFS through 2030 and ramping up the required fuel carbon intensity reduction to 20% below 2010 levels, we want to express our support for actions that can help facilitate achievement of future LCFS goals by accelerating and maximizing the decarbonization of remaining liquid transportation fuels.

By the state's own assessment, full penetration of zero emission vehicles – while progressing – is still decades away. We believe that biofuels like ethanol can help further decarbonize the use of the remaining passenger cars and light-duty trucks still using internal combustion engines as the state continues to increase adoption of zero emission vehicles. For example, use of fuels containing higher levels of high-octane ethanol in the state's growing fleet of hybrid vehicles could cut the greenhouse gas (GHG) emissions of those automobiles by 50% or more.

For that to happen, however, the state should better encourage the use of low-cost, consumer-friendly climate solutions that are commercially ready today, like higher ethanol blends. We ask that you support efforts to maximize the use of low-carbon liquid fuels in vehicles with internal

combustion engines. Specifically, we seek your help in convening discussions that bring together biofuel producers, automakers, and ARB staff to identify options for decarbonizing the remaining liquid transportation fuel used in the state.

There are a range of solutions that could provide low-cost access to lower-carbon fuel options in the existing internal combustion engine fleet. Collaboration with the auto sector is necessary to enable fuel choices above and beyond gasoline blended with 10% ethanol (E10), which is the highest level of ethanol currently allowed for use in conventional automobiles by California regulations. We have had initial conversations with ARB staff regarding regulatory changes that may be necessary to allow expanded use of commercial-ready low-carbon liquid fuel solutions, like higher ethanol blends (15% ethanol or more), and we look forward to more expansive and regular dialog on these issues.

We believe that efforts to further decarbonize liquid fuels are entirely consistent with California's leadership in climate solutions. It is reasonable to expect that other states may not adopt zero emission vehicles at the same rate as California. However, by increasing the use of low-carbon liquid fuels, California will not only accelerate its own GHG emission reduction efforts, but it will also add to the menu of decarbonizing options that other states might consider adopting based on California's example.

Thank you again for your leadership, and we look forward to working with your staff and the ARB to expand the role of low-carbon biofuels in the near term to further decarbonize the state's remaining internal combustion engines.

Sincerely,

Bob Dinneen
President & CEO

ATTACHMENT B

Summary: The Role of Ethanol in Compliance with a 2030 California LCFS

A Study by Life Cycle Associates
for the Renewable Fuels Foundation

BACKGROUND

The California Low Carbon Fuel Standard (LCFS) requires transportation fuel suppliers to annually reduce the carbon intensity (CI) of the fuels they distribute from 2010 levels, culminating with a 10% reduction in 2020. Parties demonstrate compliance by turning in credits generated by fuels that have lower CI than gasoline and diesel. The California Air Resources Board (CARB) is currently considering extending the LCFS schedule to require an average fuel CI reduction of 18% or more by 2030.

Several observers have asserted that achieving the required 10% CI reduction in 2020 (and more stringent reductions in the next decade) will be extremely difficult without rapid and radical changes in the California marketplace.[i] To support claims of impending difficulties and a "credit crunch" for the LCFS, some observers have pointed to recent record LCFS credit prices and the fact that carbon deficit generation has recently outpaced credit generation.[ii] Some argue that the sizeable bank of credits that has been amassed from overcompliance in the early years of the LCFS program will be entirely exhausted as the stringency of CI reduction requirements increases in 2018-2020.

As part of its process to examine options for extending the LCFS to 2030, CARB itself has modeled an illustrative scenario in which carbon deficit generation significantly outpaces credit generation in 2018 through 2021, resulting in liquidation of the credit bank.[iii] Notably, however, this scenario assumes no improvement in the average CI of ethanol pathways, no growth in California ethanol consumption beyond current levels, and no allowance for E15 (15% ethanol blends) or high octane mid-level ethanol blends (e.g., E20-E40).

These assumptions seem at odds with the LCFS experience to date. CARB data show that low-carbon ethanol has made a significant contribution to LCFS compliance so far. In fact, CARB data show a 21% reduction in the average CI of ethanol consumed in California since the beginning of 2011, and many current ethanol pathways offer CI reductions of 30-50% versus gasoline.[iv] Further, ethanol has been responsible for 45% of total carbon credits generated to date under the LCFS, and more than 95% of the credits generated for gasoline replacement fuels.[v]

STUDY PURPOSE

To examine the potential future role for ethanol in an extended and expanded LCFS, the Renewable Fuels Foundation (RFF) commissioned California-based Life Cycle Associates to conduct a scenario modeling study. The analysis examines the potential implications for LCFS credit and deficit generation of different scenarios in which various assumptions are used regarding ethanol blend rates, ethanol feedstock and process technology, average ethanol CI, vehicle/engine technology options and population, and other key factors.

The study's baseline scenario assumes ethanol is limited to a 10% blend (E10), with small amounts of E85 also used in flex fuel vehicles (FFVs)—this is the current ethanol consumption situation in California.[vi] Scenarios incorporating the phased-in use of E15 fuels, high-octane E30 in dedicated vehicles, and plug-in hybrid E85 vehicles are also examined. Life Cycle Associates used the California VISION model and CARB's illustrative compliance scenario calculator for this analysis.

KEY FINDINGS & CONCLUSIONS

Under Business as Usual, LCFS Compliance "Very Challenging" in the Near Term

In the baseline case, which reflects a business-as-usual continuation of current restrictions on ethanol blending, the LCFS credit bank nears exhaustion in 2021.

- *"Fuel use patterns combined with vehicle technology commercialization timelines and the supply of low carbon fuels make near-term compliance (2018-20) with the LCFS very challenging."*
- *"Deficits rapidly accumulate in 2019-2021 in the gasoline pool. Compliance is challenging in the near term as the credit bank is depleted to zero."*

The Average Carbon Intensity of Ethanol Pathways Will Continue to Fall

The average CI of ethanol has already fallen by 21% since 2011. This study shows the average CI of starch ethanol falls another 15-20% by 2030 as facilities continue to innovate and adopt new technologies. With modest growth in advanced and cellulosic ethanol, the average CI of the ethanol mix in 2030 is near 50 g CO2e/MJ, a 50% GHG reduction versus gasoline.

Approval of E15 Would Generate 15-19 MMT of Additional GHG Reductions by 2030

The study shows that introduction of E15 would significantly increase credit generation, reduce gas consumption, and enhance near- and long-term sustainability of the LCFS. If California allows the sale of E15 beginning in 2020, the cumulative GHG reductions achieved under the LCFS increase by **15-19 MMT CO2e by 2030**, depending on the mix of ethanol sources.

E15 Helps Avert Near-Term Credit Bank Depletion

In the study's E15 cases, the phase-in of E15 increases credit generation in the near-term and allows the credit bank to avoid exhaustion in 2021. The bank grows even more over time as E15 more fully penetrates the market, potentially setting up the LCFS to deliver CI reductions beyond 18% in 2030.

- *"Adoption of E15 beginning in 2020 helps avert complete exhaustion of the LCFS credit bank and ensures the bank remains positive in the near term."*
- *"E15 is a helpful near-term option with growing CI benefits for decades."*

High Octane E30 and E85 in Plug-in Hybrids Provide Substantial Longer-Term CI Reduction

The study found that other higher ethanol blend options paired with certain vehicle technologies can deliver even greater CI reductions under the LCFS in the longer term.

- *"High efficiency options such as E30 and E85 plug-in hybrid vehicles (PHEVs) can also support further future CI reductions; however, the time required to roll in vehicles even under rapid commercialization scenarios results in more significant benefits beyond 2030."*
- *"Growth in plug in E85 PHEVs as well as other low CI technologies could support a 20% reduction or more in GHG emissions by 2030."*
- *"E30 high-octane fuel vehicles (HOFVs) can also result in an increase in credit generation but the savings do not occur as quickly as the other fuel options examined here."*

Changes Needed to Allow Greater Flexibility and Ensure LCFS is Technology Neutral

According to the study, the LCFS cannot be truly technology-neutral until changes are undertaken to allow the sale of higher ethanol blends, which provides more compliance flexibility and lower cost.

- *"Importantly, different ethanol blend levels and vehicle technologies are not mutually exclusive and the technology-neutral structure of the LCFS is intended to allow the marketplace to determine the economically optimal mix of fuels that achieves compliance."*
- *"However, the LCFS cannot truly act as a technology-neutral program unless and until higher levels of ethanol are allowed in the gasoline pool."*

HOW MANY TONNES ARE BEING "LEFT ON THE TABLE"?

The Life Cycle Associates study shows that a failure to allow the sale of E15 means California is forgoing low-cost GHG reductions and petroleum displacement that could be achieved in the near term. Further, widespread use of E85 in PHEVs and/or high-octane mid-level blends in future HOFVs could greatly magnify GHG reductions in the longer term.

Figure 1. Additional Annual Net Credit Generation From Higher Ethanol Blends Over Study Baseline Case

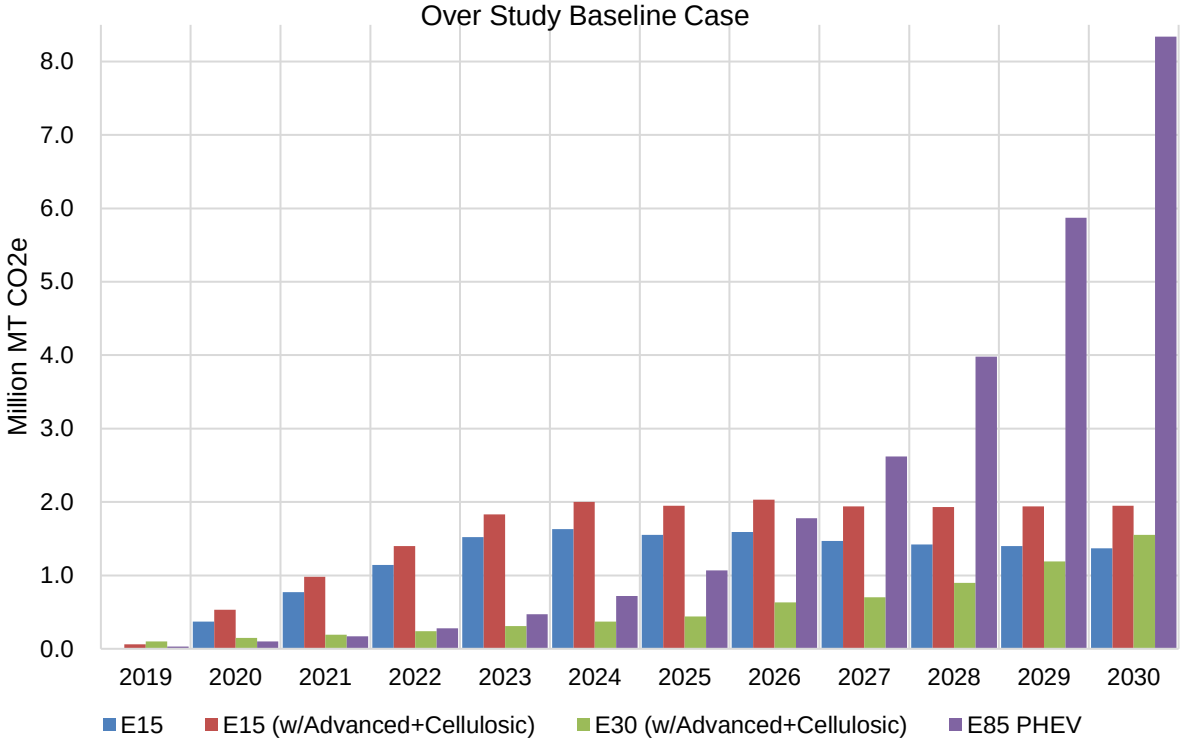

Figure 1 depicts additional annual net credit generation from various higher ethanol blend scenarios above and beyond the number of credits generated in the baseline case, which assumes status quo ethanol consumption (i.e., only E10 and a very small amount of E85).

- E15 provides a meaningful near-term boost in net credit generation, adding a total of nearly 3 million net credits to the bank in the 2020-2022 timeframe.
- By 2023, E15 is adding 1.5 to 2 million net credits annually, depending on the source of the ethanol. The immediate impact of E15 on credit generation is due to the fact that most vehicles on the road today are already E15-compatible.
- Using some advanced and cellulosic ethanol (in addition to starch-based ethanol) to make E15 slightly increases net credit generation over the case where only starch-based ethanol is used.
- As a greater number of E85 PHEVs penetrate the market in the 2026-2030 timeframe, credit generation for this fuel/technology pathway increases dramatically.
- Use of high-octane E30 in HOFVs does not result in significant net credits generation until roughly 2025 and beyond due to the time needed for HOFVs to significantly penetrate the fleet.

Figure 2. Cumulative Additional GHG Reduction From Higher Ethanol Blends Over Study Baseline Case

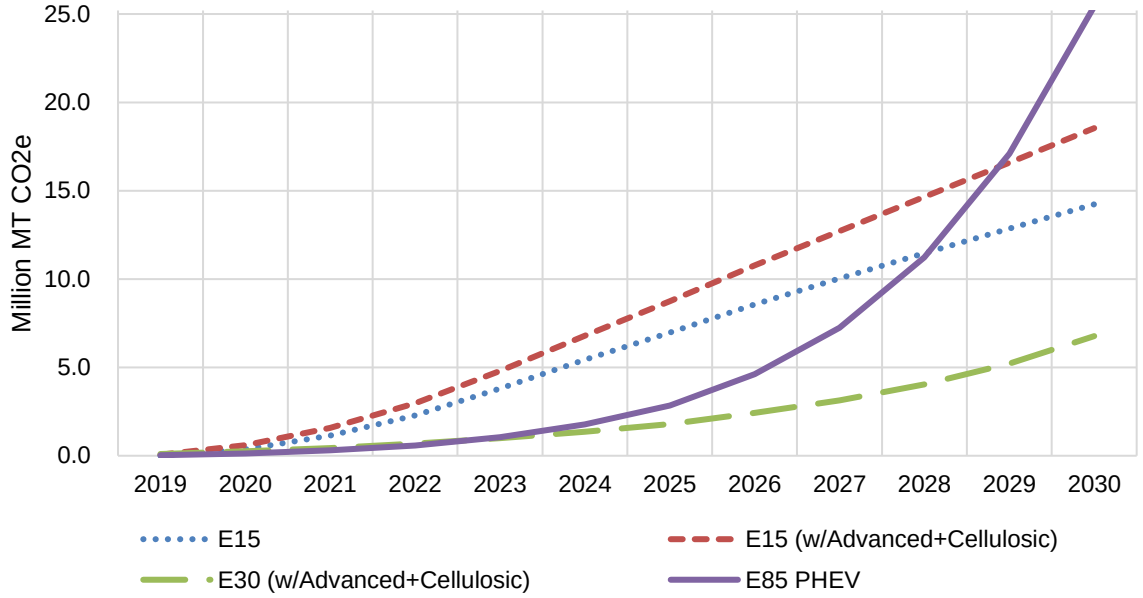

Figure 2 depicts cumulative additional GHG reduction from the various higher ethanol blend scenarios above and beyond the GHG reduction achieved under the baseline case.

- If California allows the sale of E15 beginning in 2020, it would increase the cumulative GHG reductions achieved under the LCFS by approximately **15-19 million MT CO2e by 2030**, depending on the mix of ethanol sources used to make E15. This is roughly equivalent to the *total* number of credits generated by *all* gasoline and diesel replacement fuels in the first five years of the LCFS program (2011-2015).
- E85 use in PHEVs could increase cumulative GHG reductions under the LCFS by more than **25 million MT by 2030**. However, most of the GHG reductions attributable to E85 use in PHEVs come later in the study period because of the time needed to significantly penetrate the fleet with E85 PHEVs. In fact, E15 provides more cumulative GHG reductions than E85 in PHEVs until the 2028-2029 timeframe.
- High-octane E30 in HOFVs modestly boosts GHG savings over the baseline case, hitting nearly 7 million MT CO2e by 2030. Most of the reductions from this fuel/technology pathway come later in the study period. Like E85 PEHVs, this is due to the time needed for HOFVs to significantly penetrate the fleet.

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[i] See, for example, Stillwater Associates. "Stillwater's View of the California Low Carbon Fuel Standard." Jan. 9, 2018. https://stillwaterassociates.com/stillwaters-view-california-low-carbon-fuel-standard/

[ii] Oil Price Information Service Biofuels Update. Jan. 8, 2018. "California LCFS Credit Prices Hit New High."; Oil Price Information Service Biofuels Update. December 7, 2017. "LCFS Credit Prices Could Exceed $200/Credit by 2020: Stillwater."

[iii] CARB. Aug. 7, 2017 "Draft Illustrative Compliance Scenario Calculator." https://www.arb.ca.gov/fuels/lcfs/lcfs_meetings/lcfs_meetings.htm

[iv] *Id.*

[v] CARB. "LCFS Reporting Tool Quarterly Summaries." https://www.arb.ca.gov/fuels/lcfs/lrtqsummaries.htm.

[vi] The state does not currently allow the sale of E15, even though the fuel is currently sold in 29 states and is legally approved for more than 90% of the auto fleet.