Appendix B:

Supplemental Analysis on Costs and Benefits of Expanded E15 Availability, as Authorized by AB 30

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Overview

On October 2, 2025, Governor Newsom signed Assembly Bill (AB) 30,[1] which immediately allowed blends of gasoline containing 10.5% to 15% ethanol by volume (E15) to be sold in the State for use as a transportation fuel. AB 30 does not mandate the sale or production of E15. AB 30 allows E15 to be sold in addition to the previous standard maximum 10% ethanol gasoline blend (E10), providing fuel supply market participants with an option to supply E15 throughout the State.

This Appendix to the Staff Report: Initial Statement of Reasons supporting Proposed Amendments to the California Reformulated Gasoline Regulations (Proposed Amendments) discusses potential economic impacts and other impacts that may result from increased sales of E15 in California as authorized by AB 30. Because AB 30, rather than the Proposed Amendments, authorized the use of E15 in California, these impacts result from AB 30 rather than from the Proposed Amendments, but are explored here to assist public understanding of issues associated with varying levels of potential penetration of E15 sales in California. To better understand the potential impacts of AB 30 on the transportation fuel supply, staff identified both potential revenue and costs associated with increased E15 deployment. These revenues and costs are will vary across three different economic sectors: ethanol suppliers, transportation fuel suppliers who blend California Reformulated Gasoline Blendstock for Oxygenate Blending (CARBOB) and ethanol to produce finished fuel, and retail stations and consumers.

AB 30's authorization of E15 sales in California has the potential to increase the volume of ethanol concentration in gasoline blends, which in turn means potentially higher demand for ethanol and lower demand for fossil fuel blendstock (CARBOB) in California. For ethanol fuel suppliers, this possible shift in demand could result in increased revenue from ethanol sales, and potentially additional increases in revenue from the Low Carbon Fuel Standard (LCFS) and Renewable Fuel Standard (RFS) credits generated from those increased ethanol volumes supplied. The LCFS is designed to decrease the carbon intensity of California's transportation fuel pool and provide an increasing range of low-carbon and renewable alternatives, which reduce petroleum dependency and achieve air quality benefits.[2] The RFS is a federal program that requires transportation fuel sold in the United States to contain a minimum volume of renewable fuels to reduce greenhouse gas emissions and expand the nation's renewable fuels sector while reducing reliance on imported oil.[3]

Transportation fuel suppliers who provide finished gasoline to California (i.e., CARBOB blended with ethanol to E15) may see decreased CARBOB purchase or production

[1] Assem. Bill No. 30 (2025-2026 Reg. Sess.) Ch. 247, Stats. 2025, codified as Health & Safety Code, § 43013.7.
[2] Cal. Code Regs., tit. 17, §§ 95480-95503.
[3] RFS is administered by U.S. EPA under 40 C.F.R. Part 80, Subparts K and M.

costs and increased ethanol procurement costs associated with increased volumes of ethanol in the finished fuel and decreased concentrations of CARBOB. Beyond the costs to purchase additional ethanol volumes, transportation fuel suppliers and retail outlets may also incur costs to upgrade infrastructure and equipment to support E15 deployment. Transportation fuel suppliers may also see a decrease in compliance costs associated with California's Cap-and-Invest program, as ethanol use does not incur a compliance obligation under the Cap-and-Invest regulation.[4]

E15 adoption and penetration into the California fuel pool will also likely depend not just on the outcome of these competing economic considerations (fuel procurement costs, infrastructure/equipment costs, and environmental program costs/benefits) but also on individual consumer preferences for E15 vs other fuel blends, vehicle and engine compatibility and associated individual retail outlet decisions on whether to sell E15. On the retail side, additional time may be needed before E15 can be dispensed to consumers, as there are currently no California-compatible[5] E15 retail components, such as nozzles, hoses, etc. available for installation and use that would enable the retail sale of E15. On the consumer side, vehicle and engine compatibility and consumer decisions will also impact E15 uptake. In 2011, the United States Environmental Protection Agency (U.S. EPA) approved E15[6] use for vehicle model year 2001 and newer cars, light-duty trucks and medium-duty passenger vehicles. Under U.S. EPA requirements, vehicles and engines that are not compatible with E15 due to potential for damage to internal engine components, and that are prohibited from using E15 include conventional vehicles older than model year 2001, all motorcycles, vehicles with heavy-duty engines, such as school buses and delivery trucks, off-road vehicles, such as boats and snowmobiles, and all engines in off-road equipment such as chainsaws and gasoline lawn mowers.[7]

It's this mix of factors, the potential costs, benefits, vehicle/engine compatibility, and consumer/retail considerations that make it difficult to predict how much additional gasoline ethanol will ultimately be used in California in the future. Given this uncertainty, staff are providing this analysis of AB 30 impacts utilizing three hypothetical levels of E15 deployment in California (i.e., 25%, 50%, and 75% of California Reformulated Gasoline volume dispensed as E15) to identify economic and air quality considerations for E15 deployment. These levels are meant to be hypothetically illustrative, are not predictions, and are not based on any fuel system supply/demand modeling.

[4] Cal. Code Regs., tit. 17, §§ 95800 et seq.

[5]State law requires approvals from four State agencies, depending on the component under review – the State Water Resources Control Board, California Office of Safety and Health Administration, California Department of Food and Agriculture, and Office of the State Fire Marshal (OSFM) and final component certification from CARB. The OSFM requires Underwriters Laboratories (UL) testing and approval of components from the manufacturers. As of May 2026, CARB was not aware of any manufacturers that have undergone UL testing.

[6] 76 Fed. Reg. 4662 (Jan. 26, 2011).

[7] 76 Fed. Reg. 44406 (July 25, 2011); 40 C.F.R. Part 80; 40 C.F.R. Part 1090.

Economic Considerations

The move from fossil fuels to cleaner fuels presents complex economic impacts, especially in the case of voluntary E15 adoption by retail sellers. The *Draft California Transportation Fuels Transition Plan, May 1st, 2026*, (CEC/CARB, 2026) includes a listing of numerous recent studies evaluating economic impacts of the transition from a fossil fuel economy and recognized the range of local and regional impacts as well as those that have broader statewide effects. The analysis here provides estimates of monetary benefits that could be realized with increased ethanol participation in the LCFS and federal RFS programs, as well as estimates of potential equipment costs required for retail sellers to additionally or alternatively offer E15 for sale. There is substantial uncertainty about actual benefits that could be realized. In 2011, the U.S. EPA approved E15 use for vehicle model year 2001 and newer cars, light-duty trucks and medium-duty passenger vehicles.[8] Notwithstanding that federal authorization, E15 use in California was still prohibited by California law until AB 30 came into effect in 2025.

Volumes of CARBOB, Ethanol, and Finished Fuel

To illustrate the potential impacts of E15 deployment in California in response to AB 30, this analysis considers three scenarios: 25%, 50%, and 75% penetration of E15 in the marketplace. As noted, the actual rate of future penetration of E15 cannot now be known and will depend not only on each retail outlet's individual decisions about participation in providing E15 but also consumers' decisions on the use of E15. Table 1 below identifies the volumes used for this analysis. All calculations are based on 2025 fuel volume data as publicly reported by CDTFA.

Table 1. Percentage Volumes of CARBOB, Ethanol, and Finished Fuel

	CARBOB Volume (gallons)	Ethanol Volume (gallons)	CaRFG Volume (gallons)
E10 *Actual 2025 values	11,986,334,650	1,331,814,961	13,318,149,611*
E15 at hypothetical 25% penetration	11,819,857,780	1,498,291,831	13,318,149,611
E15 at hypothetical 50% penetration	11,653,380,910	1,664,768,701	13,318,149,611
E15 at hypothetical 75% penetration	11,486,904,039	1,831,245,572	13,318,149,611

[8] 76 Fed. Reg. 4662 (Jan. 26, 2011).

LCFS Program

Ethanol suppliers may increase volumes of ethanol to California in response to AB 30 in order to generate more credits under California's LCFS program. Under the LCFS program, fuels that have a lower carbon intensity (CI) than the annual benchmark generate LCFS credits. Providers of transportation fuels must demonstrate that the mix of fuels they supply for use in California meets the LCFS carbon intensity standards, or benchmarks. LCFS credits can be monetized through independent market transactions. The potential value or benefit of additional LCFS credits generated through additional E15 sales cannot be predicted, however, a general basis for understanding additional value that could be created is described below.

The additional ethanol in E15 displaces a portion of CARBOB with lower CI ethanol within each gallon of gasoline, reducing the CI of E15 as compared to E10. The volume-weighted average of ethanol supplied to California in 2025 has a lower CI than CARBOB:

CI CARBOB = 99.15 gCO_2e/MJ (megajoule)
CI Ethanol = 58.59 gCO_2e/MJ (CARB, 2026b)
CI difference = 40.56 gCO_2e/MJ

CARB staff have estimated an average reduction from 90% down to 85% CARBOB would result in roughly a 5.6% reduction in CARBOB. The formula below calculates the additional ethanol energy in each gallon of E15 as below:

$$Incremental\ Ethanol\ Energy = 0.056 \times Energy\ Content\ of\ CARBOB$$

Using CARBOB energy content = 119.53 MJ/gal (CARB, 2025b), this yields 6.69 MJ/gal of displaced gasoline energy.

The E15 avoided metric tons (MT) of CO_2 emissions per gallon can be calculated using the formula below:

$$Avoided\ CO_2\left(\frac{MT}{gal}\right) = Incremental\ Ethanol\ Energy\ \left(\frac{MJ}{gal}\right) \times (CI_{CARBOB} - CI_{Ethanol}) \times 1\ \left(\frac{MT}{1{,}000{,}000}\right)$$

Monetizing the LCFS Benefit:

The avoided CO_2 can then be multiplied by an illustrative LCFS credit price and gallons of gasoline sold:

$$LCFS\ Benefit = Avoided\ CO_2\left(\frac{MT}{gal}\right) \times LCFS\ Credit\frac{price}{MT} \times Gallons\ of\ Gasoline\ Sold$$

These are not actual estimates of expected value that will be realized. These estimates are theoretical and illustrative, and any actual benefits are uncertain and depend on broader market dynamics.

RFS Program

The RFS is a federal program that requires transportation fuel sold in the United States to contain a minimum volume of renewable fuels. Under the RFS program, each gallon

of ethanol generates one D6 Renewable Identification Number (RIN) (U.S. EPA, 2026a). Because E15 contains 5% more ethanol than E10 by volume, each gallon of E15 generates 0.05 more RINs than a gallon of E10. Therefore, the RFS benefit of switching from E10 to E15 can be expressed in the following formula:

$$E15\ Benefit = 0.05 \times (D6\ RIN\ Price) \times Gallons\ of\ Gasoline\ Sold$$

Table 2 provides comparative theoretical estimates for LCFS and RFS benefits under hypothetical scenarios where 25%, 50%, and 75% of gasoline sales transitioned to E15 based on the historical LCFS credit prices from 2013 through May of 2026 of the lowest and midpoint value (CARB, 2026a) and lowest and midpoint RIN credit prices from 2020 through May of 2026 (U.S. EPA, 2026a) in conjunction with the 13,318,149,611 gallons of gasoline (E10) that were sold in the State in 2025 (CDTFA, 2026). Note that these benefits are stackable, i.e., ethanol suppliers are able to generate both LCFS credits and RINs for the same volume of ethanol. This rough analysis does not take into account all of the practical considerations on adoption and is intended to be illustrative only. It is inherently uncertain because it involves conducting estimates and speculative projections around what may happen in the future. It also does not purport to forecast the value of future LCFS or RIN credit prices. Due to forecast uncertainty, CARB cannot predict actual LCFS or RIN credit values and is using a base set of assumptions for this analysis. In providing this analysis, CARB also makes no assumption on whether any credit generation benefit would be passed along to the consumer.

Table 2. LCFS and RFS Annual Credit Revenue to Ethanol Producers at Different Levels of E15 Penetration in the Total Gasoline Fuel Used in California*

Program	Illustrative Credit Price	Est. Annual Credit Revenue at 25% E15	Est. Annual Credit Revenue at 50% E15	Est. Annual Credit Revenue at 75% E15
LCFS	$22.00	$19,800,000	$39,500,000	$59,200,000
LCFS	$115.00	$103,200,000	$206,400,000	$309,600,000
RFS	$0.05	$8,300,000	$16,600,000	$25,000,000
RFS	$1.08	$179,800,000	$359,600,000	$539,400,000

* Values are illustrative estimates and have been rounded.

Costs for Infrastructure and Equipment Upgrades

There were an estimated 10,469[9] gasoline retail outlets in California at the end of 2024 referencing the California Energy Commission data (CEC, 2026b). To offer E15 at their retail outlet, owners and operators may incur additional costs to retrofit or replace tanks, dispensers, pumps, hoses, nozzles and other equipment with equipment specifically manufactured and certified for compatibility with E15. The average retail outlet has approximately 60 pieces of equipment that work together to handle fuel and vapor (USDA, 2022). Although retail outlets routinely replace equipment based on the usable

[9] CARB staff calculation based on CEC 2024 annual estimates adjusted for response rates.

life of each component with some components lasting as little as two years, and more durable equipment lasting as long as 15 years, should a retail outlet choose to retrofit existing tanks and equipment to offer E15, they would need to ensure E15 compatibility in all components at one time regardless of remaining usable life of individual components.

The most significant costs would be incurred if a new underground storage tank (UST) was needed. However, for this analysis, staff recognize that existing USTs in California are nearly all E15 compatible as the State Water Resources Control Board (SWRCB) required E15 compatible tanks as of January 1, 2026. The small percentage of non-compliant tanks yet to be replaced already require replacement, so costs would not be related to E15 use. Therefore, retail outlets will only incur costs for tank installation if they choose to add a new tank to support E15 sales.

Many retail outlets in California use two storage tanks for gasoline sales, one containing 87 octane and the other 91 octane. To dispense 89 octane, they draw from both tanks and blend to produce 89 octane gasoline. In this two-tank configuration, it's possible that a retail outlet choosing to sell E15 could replace one tank, reducing the availability of E10 fuel options available. However, a retail outlet may choose to install an additional storage tank to maintain current options while also offering E15. This option could incur high capital expenditures and operational restrictions. It is estimated by the SWRCB that the installation of a new tank and lines would cost roughly $400,000.

As noted above, in addition to tank installation there are many additional pieces of equipment a retail outlet may need to replace or retrofit for E15 compliance. State law[10] requires CARB to certify components that accept or transfer gasoline at dispensing facilities. Before CARB certifies such components State law also requires prior approvals from four state agencies – the SWRCB, California Office of Safety and Health Administration, California Department of Food and Agriculture, and Office of the State Fire Marshal, depending on the equipment. Currently, there are no components certified as E15 compatible. CARB has published the steps that manufacturers must take to expeditiously certify E15 compatible equipment.[11]

Without current certified equipment available for a general cost estimate calculation, staff relied on national information to estimate potential retail outlet equipment costs. A study conducted for the USDA in 2022 explored barriers and opportunities to expand the use of higher blends of ethanol in the U.S. gasoline market including estimated costs to upgrade retail outlet equipment (USDA, 2022). This study provides a reference for potential costs; however, it is important to recognize that costs outside of California may not be directly comparable as California requires specific certification and also has State-specific laws applying to retail outlets.

On a national level, the USDA study estimated three levels of retail outlet conversion costs to enable sales of gasoline with ethanol blends between 11% and 25%. A

[10] Health & Saf. Code, §§ 25290.1.2, 41955, 41957.
[11] CARB. February 24, 2026. AB 30 Legislation Passage and Steps to Obtain E15 Certification of Vapor Recovery Components and Eco Nozzle/Low-Perm Hoses. *https://ww2.arb.ca.gov/sites/default/files/2026-02/E15CertProcess.pdf*

summary of this information is provided in Table 3. The lowest, the light conversion scenario, assumes the retail outlet already has some higher ethanol compatible equipment and will not need upgrades to dispensing pumps or underground lines needed. While this is unlikely for a California retail outlet adding E15, this scenario provides a very conservative value for comparison purposes. The second, medium conversion scenario additionally includes costs to upgrade dispensing equipment. The third scenario, the extensive conversion case, additionally includes the costs for a new tank and underground lines, which as noted would likely only occur if an additional E15 specific tank was installed.

In addition to the costs provided in Table 3, a retail outlet may experience additional costs associated with rewiring, replacing related control systems, and impacts on general operations.

It is also reasonable to anticipate some potential costs to upgrade the fuel distribution terminals located throughout the State. There are 59 terminals in California (CEC, 2019). As E15 demand increases, penetration in terminals is likely not to be proportional to overall rates of retail sales penetration. Rather, terminals may choose to offer E15 to ensure geographic availability throughout the State. Some of the costs specific to terminal upgrades may include additional fueling lanes, increased storage tank capacity, and software upgrades for metering and dispensing tracking. It is uncertain what if any upgrades will be needed. However, one report estimated incremental cost for each terminal upgrading could be roughly $1,500,000 in 2012$ US dollars (Stillwater, 2012) inflation adjusted to roughly $2,200,000 in 2025$ (CDIR, 2026).

Table 3 shows a potential range of costs for upgrades to retail outlets in hypothetical scenarios where 25%, 50%, and 75% of the businesses upgrade to offer E15. These scenarios are very general estimates based on comparative national data offered to approximate costs but are not precise and do not reflect actual anticipated adoption rates which cannot be known. The light conversion scenario has been inflation-adjusted from $21,000 in 2022$ (USDA, 2022) to $25,000 in 2025$, the medium conversion scenario from $93,000 in 2022$ (USDA, 2022) to $110,000 in 2025$, and the extensive conversion scenario from $379,000 in 2022$ (USDA, 2022) to $449,000 in 2025$ (CDIR, 2026).

Table 3. Costs for California Retail Outlet Upgrades (10,469 Estimated Total) *

Per Retail Outlet	25% Offering E15 ≈ 2,617	50% Offering E15 ≈ 5,230	75% Offering E15 ≈ 7,852
$25,000 (Light Conversion Scenario)	$65,400,000	$130,900,000	$196,300,000
$110,000 (Medium Conversion Scenario)	$287,900,000	$575,300,000	$863,700,000
$449,000 (Extensive Conversion Scenario)	$1,175,000,000	$2,350,000,000	$3,500,000,000

*Values are illustrative estimates and have been rounded.

National Adoption of E15

From a federal standpoint, the ability to sell E15 has been in place for 15 years, although not all states have authorized it for that entire duration. For example, Montana became the 49th state to authorize E15 sales in 2024. California became the 50th state to authorize E15 in 2025 with the enactment of AB 30. At the end of 2024, there were approximately 3,751 retail outlets (U.S. EPA, 2026b) offering E15 outside of California out of approximately 122,620 nationwide retail outlets selling motor fuels (NACS, 2026).

The growth rate outside of California is not necessarily indicative of what could occur within the State. E15 was generally not allowed to be sold during summertime until recently. U.S. EPA approved eight Midwestern states to sell E15 year-round starting in 2025. U.S. EPA has waived the summertime E15 prohibition nationwide every summer since in 2022. California allows year-round sales of E15. California's unique fuel market dynamics also may encourage further adoption of E15 within the State as it can provide economic benefits to fuel suppliers that may not be available in other States.

Fuel Economy Impacts of E15

There is a decrease in energy content from going to E15 from E10. USDA estimated that the lower energy content is 1.75% (USDA, 2022), which means that it will take 1.78% more E15 fuel to make it equal on a per mile-driven basis as E10. All other things equal, at the hypothetical penetration levels identified in this analysis, the reduced energy content of E15 has the potential to have a net overall increase in statewide fuel consumption.

Table 4 shows the potential net overall increased fuel use that would have occurred, using 2025 State fuel volume values, if E15 was deployed and incurred a 1.78% energy penalty.

Table 4. Potential Net Overall Increased Fuel Use of E15

	E10 Baseline (gallons)	25% E15 (gallons)	50% E15 (gallons)	75% E15 (gallons)
Volume of Fuel	13,318,149,611	13,377,415,377	13,436,681,143	13,495,946,908
Difference from 2025 E10 consumption	0	59,265,766	118,531,532	177,797,297

Using the average 2025 retail price of California E10 gasoline as reported by EIA ($4.53 per gallon) (EIA, 2026), the additional consumer costs associated with the additional fuel purchases necessary to replace the lost energy density of E15 relative to E10 would range from $268.5M to $805.4M in the above scenarios.

Emissions Impacts of E15

As part of the multimedia evaluation (MME) for E15, research was conducted by scientists from the University of California, Riverside (UC Riverside, 2022). According to that research, the air quality impacts from E15 as compared to E10 are a weighted 18% reduction in vehicle exhaust emissions of particulate matter, a 17% reduction in vehicle exhaust emissions of carbon monoxide, a 5% reduction in vehicle exhaust emissions of total hydrocarbons, and a slight reduction in vehicle exhaust emissions of nitrogen oxides, but not statistically significant. Carbon dioxide vehicle exhaust emissions did not have a statistically significant difference. Evaporative emissions testing was also conducted as a part of the MME (CARB, 2025a). The evaporative emissions testing results show the use of E15 versus E10 has no statistically significant impact on evaporative emissions.

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