A Transparent Response to Questions about the Cost of the LCFS (prepared by James Duffy)

In a recent letter to CARB, California Legislative Republicans asked CARB to respond to the questions below. I do not know if or how CARB responded to these questions, and I certainly don't trust the motives of the Republican delegation, but I do believe in the importance of transparency and a vigorous discussion of price impacts, and therefore would like to contribute to the discussion. In 2022 I retired after working for CARB on the LCFS for over 13 years, including over a year as branch chief overseeing the program. My response below is entirely my own. I have not consulted anyone in writing this response, nor am I or have I worked for anyone related to the LCFS since retiring. Therefore, if I made any mistakes or improperly drew conclusions, these are entirely my own mistakes. I would appreciate any feedback that the reader would like to provide and am always available for a healthy, respectful discussion.

Questions (copied from a letter to CARB from California Legislative Republicans)
What are the anticipated costs of LCFS, and what should consumers anticipate paying per gallon if enacted? Will the proposed amendments to LCFS in fact cost consumers up to 47-cents per gallon in 2025 and 52-cents in 2026, or is the Cullenward study mentioned in the Skelton column more accurate in predicting that gas prices will increase by 65- to 85-cents? What direct or indirect impacts does the LCFS program have on the price of gas for consumers?

My Conclusions

- The maximum pass-through cost of the LCFS to gasoline consumers can be estimated and is a simple function of the LCFS credit price and the percent CI reduction target. This is the calculation that CARB staff performed in the Standardized Regulatory Impact Assessment or SRIA, which resulted in an estimated cost of 47 cents per gallon in 2025. The maximum pass-through cost estimate assumes that the oil companies comply with the regulation by purchasing credits at the current market value.
- The current, actual pass-through cost is relatively small at approximately 10 cents per gallon of gasoline. This actual cost has been acknowledged by CARB and is being reported by refiners to the California Energy Commission (CEC) as part of mandatory reporting under SB 1322. This reported cost is nearly identical to the maximum pass-through cost estimated using the current percent CI reduction target and credit price. Therefore, one can conclude that petroleum companies are passing the full maximum cost onto gasoline consumers, even if some of them comply at a lower cost through producing their own alternative fuels and generating their own credits. In other words, oil companies are at worst breaking even but are more likely generating a profit off the regulation.
- Why? Because they can. The California gasoline market is not competitive and with the recent conversion of two refineries into renewable diesel production and the imminent closure of a third, it is likely that petroleum companies will retain their current market power in the near and medium-term future. Therefore, it is highly

likely that they will continue to pass the full LCFS cost onto consumers.[1] This and the fact that the regulation provides such generous crediting for a host of technologies that actively perpetuate liquid combustion fuels (e.g., liquid biofuels, avoided methane crediting for dairies and swine feedlots, CCS and direct air capture) have oil companies expressing grudging support for the program, when only ten years ago they vehemently opposed it. Oil companies are currently some of the largest investors in these credit-generating opportunities that perpetuate internal combustion over the transition to zero emission vehicles.

- One of the goals of the current LCFS amendments is to restore a more robust credit price in order to drive further decarbonization of the transportation sector. CARB is proposing to accomplish these goals by rapidly increasing the CI reduction targets from the current 12.5% to a minimum of 30% in 2030, 52.5% in 2035, and 90% in 2045. As the credit price and percent CI reduction targets increase, the maximum estimated pass-through cost also increases. For example, if the percent CI reduction target doubles and the credit price increases from $67 to $100, which is very possible by 2027[2], the maximum pass-through cost will triple to nearly 30 cents per gallon. So, we can reasonably conclude that approving the LCFS amendments will increase the pass-through cost above the current 10 cents per gallon.
- Future LCFS credit prices are highly uncertain but can be bounded based on historical prices in the program. Over the past eight years, prices have ranged from a recent low of about $60 to a high in 2020 just below the program price cap. So, I propose a reasonable bound for future credit prices would be a low of $60 to a high at the current program price cap, which is approximately $260. Using this credit price range and the minimum targets to be set by the proposed amendments, **I estimate pass-through ranges of $0.15 to $0.64 in 2025, $0.19 to $0.84 in 2030, and $0.34 to $1.47 in 2035**.[3]
- The Auto Acceleration Mechanism (AAM), as revised by CARB in the 2nd 15-day Change Notice, is both poorly written and poorly designed. If triggered at the wrong time, the AAM could result in a rapid increase in program stringency and a concurrent rapid increase in credit prices. Under such a scenario, **pass-through costs near $1.50 per gallon by 2032 are quite possible**.[4]
- If it were only high-income Californians paying the cost of the program, then I would be much less opposed to high pass-through costs. The truth of the matter is that, over time, those driving gasoline cars and paying the LCFS cost are likely to be increasingly lower income. Unless the State can somehow ensure that lower-income drivers purchase EVs at a faster rate than higher income drivers, the LCFS will become more regressive over time.
- Claims that the regulation does not and/or will not increase the cost of gasoline are, in my opinion, absurd. CARB staff increasingly use a graphic that shows no statistical relationship between LCFS credit price and gasoline prices. CARB's implication that this graphic is somehow relevant to the discussion of LCFS pass-

---

[1] The estimated pass-through cost of the LCFS and Cap-and-Trade programs is reported daily to oil companies in widely used petroleum market newsletters published by OPIS, Argus, and others.
[2] In 2027 the proposed percent CI reduction target is 25.65%, more than double today's 12.5% target.
[3] Please note that these values are in 2024 dollars and have not been indexed for future inflation.
[4] Please see the last page of this document for a more thorough discussion of this conclusion.

through cost is simply sophomoric. The existence of pass-through costs means that gasoline prices are higher than they otherwise would have been without the regulation, not that there should be a statistical relationship between credit prices and gasoline prices. CARB's use of this graphic is akin to Senator Inhofe bringing a snowball to the US Senate floor and implying that climate change is not real because it snowed in Washington DC.

- Fortunately, there are many actions that CARB can take to reduce the pass-through cost to consumers of gasoline. These actions, many of which were also proposed in the "EJ Scenario" put forth by the EJAC, involve limiting credit generation that does not advance California's long-term zero-emission transportation goals, eliminating excessive credit generation that only provides excessive profits, eliminating LCFS subsidies that do not result in additional global GHG emission reductions beyond what would already occur through other State and Federal programs, and minimizing the potential for credit price spikes through more effective program design. Cutting out unnecessary and ineffective credit generation will allow for less stringent targets and lower pass-through costs, without sacrificing real, additional GHG reductions achieved by the program. Unfortunately, CARB has decided not to take these actions.

A More Thorough Discussion

The maximum pass-through cost to a gallon of gasoline from the LCFS regulation can readily be estimated. This cost is a function of the LCFS credit price and the percent carbon intensity (CI) reduction target for that year. The equation to estimate the maximum cost is based on the program concept that an entity, who generates LCFS deficits (i.e., the refiner or importer of gasoline) or receives the LCFS deficits through purchase of fuel from the refiner or importer (i.e., a gasoline distributor at the rack), will purchase LCFS credits from an alternative fuel producer/importer to offset those deficits. One then assumes that the producer or distributor passes the cost of purchasing credits on to the consumer of gasoline. To estimate the maximum pass-through cost, one simply calculates the number of deficits generated by a gallon of gasoline and multiplies that by the current market price of a credit. The number of deficits generated by a gallon of gasoline is directly proportional to the percent CI reduction target for that year.

For example, in April 2024 the percentage CI reduction mandated by the program was 12.5% and the average credit price was $67. At a 12.5% CI reduction target, a gallon of gasoline will generate approximately 0.00134 deficits. Multiplied by the cost of a credit needed to offset the deficit ($67 in April 2024) results in a maximum pass-through cost of approximately $0.09 per gallon of gasoline. California SB 1322 requires refiners to report cost data to the California Energy Commission (CEC) and the LCFS pass-through cost is one of the items required to be reported. In April 2024, refiners reported an LCFS cost of $0.10 per gallon of gasoline, which indicates that refiners were passing on the maximum cost of the LCFS to consumers. In other words, refiners were not absorbing some of the LCFS cost by reducing their profit margin, nor were they graciously passing a reduced cost to consumers because they are generating credits at lower than the market value (e.g., through producing liquid biofuels or reducing refinery emissions). It makes sense that they pass the full maximum cost (and likely profit off

the LCFS) because they can. Producers and importers of gasoline in California have a lot of market power, a conclusion readily acknowledged by many economists as well as the State in its efforts to control gasoline prices. Moreover, the market power of refiners and gasoline distributors will remain strong as more refineries shut down or convert to renewable diesel production and stop producing gasoline.

CARB, in a recent FAQ document posted at the LCFS website, acknowledged the current, actual pass-through cost of $0.08 to $0.10 per gallon. However, what CARB does not acknowledge in the FAQ is the relationship between pass-through cost and both LCFS credit price and percent CI reduction targets. They also do not acknowledge that the amendments will definitely increase the percent CI reduction target and likely increase the credit price. So, if the percent CI reduction doubles and the credit price increases to $100 (which is very possible by 2027), a 10-cent per gallon pass-through becomes a 30-cent pass-through. If the percent CI reduction target quadruples and the credit price quadruples (which is possible by the early 2030s as discussed below), a 10-cent per gallon pass-through becomes $1.50 per gallon.

So, at this point we can conclude that the maximum pass-through cost can be readily estimated from knowledge of the percent CI reduction target and the LCFS credit price. We can also conclude that refiners are currently passing this maximum cost on to consumers, as reported to the CEC and acknowledged by CARB. And we can also presume that passing the maximum cost onto consumers continues in the near to medium term future as several California refineries stop producing gasoline, the market for gasoline in California remains very tight, and oil companies retain the upper hand over consumers.

So, most of what I have previously discussed regards the program as it exists today. In order to answer the question about the anticipated cost of LCFS (should the amendments get approved by the Board), one needs to know the future percent CI reduction targets for each year and estimate future credit prices. The minimum percent CI reduction targets for each year are set by CARB in the LCFS regulation amendments, so those data points are known. However, future LCFS credit prices are not known. This is after all a market-based program. Future credit prices can, however, be reasonably bounded by historical ranges in credit price. Over the past eight years, credit prices have ranged from a recent low of about $60 (a period of significant credit oversupply) to a high of $210 in 2020 (a period of moderate credit undersupply). This $210 credit price was near the program price cap in 2020 of $217 and is the equivalent of more than $250 today. The price cap is indexed for inflation and is currently $261.52. So, I argue that a reasonable bound for future credit prices is $60 to $260. Please note that over the period from 2013 to 2015, credit prices were often lower than $60, but during this period the targets were frozen by court order and the program future was in doubt. So, I have disregarded this price data as not being representative of potential credit prices in a program that is not legally threatened, targets are annually becoming more stringent, and a significant oversupply of credits, should one occur, will be corrected by the proposed Auto Acceleration Mechanism.

If approved by the Board, the amendments will set the percentage CI reduction target at 22.75% in 2025. Assuming a credit price range of $60 to $260 results in a maximum pass-through cost range of approximately $0.15 to $0.64 per gallon in 2025.

By 2030, the minimum percent CI reduction target is proposed to be 30%, by 2035 this increases to 52.5%, and by 2045 this increases to 90%. Assuming a credit price range of $60 to $260, this equates to a maximum pass-through cost range of $0.19 to $0.84 per gallon in 2030, $0.34 to $1.47 in 2035, and $0.58 to $2.51 in 2045. Please note that these values are in 2024 dollars and have not been indexed for future inflation. Also note that I use the term "minimum percent CI reduction targets" here as the proposed LCFS regulation allows the percent CI reduction targets to be automatically adjusted upwards (without a concurrent Board vote or review) if the LCFS market becomes oversupplied with credits. This feature, the Auto Acceleration Mechanism, is not in the current regulation.

Now obviously these cost ranges are quite large, because it is hard to predict how the market will perform in the future. It is hard to predict how fast electric vehicles will be adopted, how much renewable diesel and jet fuel will be provided to the state, how quickly dairy digester projects will be built, how quickly direct air capture projects will be built, etc. The LCFS credit price reflects both the current supply and demand for credits as well as where market participants predict that supply and demand will be in future years. If electric vehicle adoption in the State lags the requirements in the Advanced Clean Cars (ACC) and Advanced Clean Trucks (ACT) regulations or if other alternative fuels are not supplied as quickly as anticipated, deficit generation may be greater than credit generation, and the credit price may increase to near the program price cap. This is what happened after the 2018 LCFS amendments when credit prices increased to near the price cap and stayed there for nearly two years. In this situation the pass-through cost would be near the top of the ranges shown above. Conversely, if future electric vehicle adoption exceeds expectations under the ACC or ACT regulations and/or if renewable diesel or dairy gas supply exceeds expectations, then the market may be oversupplied with credits and credit prices could be near the bottom of the range. Under such a scenario, a properly designed Auto Acceleration Mechanism (coupled with a properly designed CI target trajectory) will set an effective credit price floor by triggering periodically, accelerating the CI reduction target, and rebalancing the market.

So, where do I expect credit prices and pass-through costs to be in the future? What follows is admittedly educated guesswork but is informed by my over 13 years of experience working on the LCFS, supervising modeling efforts for the 2018 amendments, and acting as branch chief overseeing the program in 2019 and 2020. Many stakeholders, including both fuel producers and expert modelers, believe that CARB has not been aggressive enough in setting the minimum CI reduction targets in the proposed amendments. These market participants and modeling experts also believe that the Auto Acceleration Mechanism will be triggered by 2028 and perhaps multiple times by the early 2030s. If this is true, which I don't doubt because these are smart people, then I would expect credit prices over the next three years to remain

above but near the bottom of the historical range, perhaps between $80 and $120. If my crystal ball is accurate, pass-through costs will range from approximately $0.20 to $0.35 per gallon over the next few years.

But after 2028, I believe there is a good chance that credit prices increase and possibly increase rapidly. This expectation is based on the proposed trajectory for the percent CI reduction targets coupled with the potential of the Auto Acceleration Mechanism (because of a design flaw introduced in the 2nd 15-day Notice) to accelerate targets in consecutive years. Between 2025 and 2030, the minimum percent CI reduction targets increase at a low annual rate of 1.45% per year (i.e., the minimum percent CI reduction target increases from 22.75% in 2025 to 30% in 2030). But starting in 2031, the percent CI reduction targets increase at more than 3 times this rate (i.e., increase from 30% in 2030 to 52.5% in 2035, an annual rate of 4.5% per year). When this transition occurs from a low annual rate of target change to a high annual rate, the generation of deficits and therefore the demand for credits will increase much more rapidly. This alone may result in increasing credit prices and pass-through costs. Moreover, if the Auto Acceleration Mechanism is triggered at just the wrong time[5], the annual rate at which the targets increase could be 9% for not just one but two consecutive years. Under this scenario, it is quite possible that the percent CI reduction target accelerates to 50% by 2032 and the market could quickly shift from a position of being oversupplied with credits to a position of being significantly undersupplied. This would likely cause credit prices to increase rapidly. Therefore, a pass-through cost of $1.50 per gallon in the early 2030s is certainly not outside of the realm of possibility.

[5] In an analysis of the most recent regulation language that I emailed to CARB, I demonstrate that the revised AAM trigger timing (four quarter rolling trigger) can readily result in accelerations occurring in consecutive years. If this happens in the early 2030s, a single acceleration will result in a 9% stepdown and accelerations occurring in consecutive years would result in an 18% stepdown. Moreover, as discussed in the hypothetical scenarios presented in the analysis, the second 9% stepdown could be triggered before the first 9% stepdown goes into effect. In other words, there would be no feedback to determine whether the first acceleration corrects the market before the second is triggered. Making matters worse, both triggers could be based on market performance relative to the much lower slope of the 2025-2030 target decline (the 1.45% annual decline), but the acceleration could double the higher 4.5% annual decline. I will happily provide my analysis to those interested.