

June 19, 2018

# Overview of the Low Carbon Fuel Standard

---

LEGISLATIVE ANALYST'S OFFICE

Presented to:

Assembly Select Committee on California's Energy Future

Hon. Rudy Salas, Chair





## Background

---

- ☑ **Low Carbon Fuel Standard (LCFS) Created by California Air Resources Board (CARB) in 2009**
  - Regulation adopted as part of strategy to meet state goal of limiting greenhouse gases (GHGs) to 1990 levels by 2020.
  - Strategy included other policies to reduce GHGs include cap-and-trade, renewable portfolio standard, and energy efficiency.
  
- ☑ **Goal to Reduce the Lifecycle Carbon Intensity (CI) of Transportation Fuels**
  - CARB establishes two CI benchmarks—one for gasoline and its substitutes, and one for diesel and its substitutes. Current benchmark for 2018 is to be 5 percent below the 2010 average CI levels, and the benchmark for 2020 is to be 10 percent below the 2010 average CI levels.
  - CARB measures the CI of each type of fuel—expressed as grams of carbon dioxide equivalents per megajoule—on a lifecycle basis. This includes the emissions related to producing, transporting, and consuming the fuel.
  - Substitutes for conventional gasoline include ethanol, electricity, and hydrogen fuel. Substitutes for conventional diesel include biodiesel, renewable diesel, fossil fuel natural gas, and renewable natural gas (biomethane).



## Market System for Reducing Carbon Intensity of Fuels

<b>2017 Carbon Intensities and Benchmarks</b>	
<i>In grams of carbon dioxide equivalent per megajoule</i>	
<b>Fuel</b>	<b>Average Carbon Intensity</b>
Conventional diesel	102
Conventional gasoline	100
Diesel benchmark	98
Gasoline benchmark	95
Fossil-LNG	98
Fossil-CNG	89
Ethanol	70
Bio-LNG	55
Hydrogen	51
Biomethane <sup>a</sup>	44
Biodiesel	34
Renewable diesel	30
Electricity	29

<sup>a</sup> Bio-CNG.  
LNG = liquefied natural gas and CNG = compressed natural gas.



### **Program Creates a Market System of Deficits and Credits for Compliance**

- The overall goal is to reduce statewide carbon intensity of fuels. The program achieves this goal by getting a standard that conventional fuel suppliers, such as refineries, must meet each year. Compliance is demonstrated through a system of credits and deficits.
- Supplying fuel with a CI that is higher than the benchmark creates deficits; fuel with CI that is lower than the benchmark generates credits. Each credit or deficit reflects one metric ton of carbon dioxide equivalent.
- Suppliers of conventional fuels such as gasoline and diesel (“regulated parties”) must comply by obtaining enough credits to cover their deficits each year. Other entities (“opt-in parties”) can voluntarily participate in the program by supplying lower CI substitute fuels to generate credits to sell to regulated parties.



## Market System for Reducing Carbon Intensity of Fuels

*(Continued)*

---



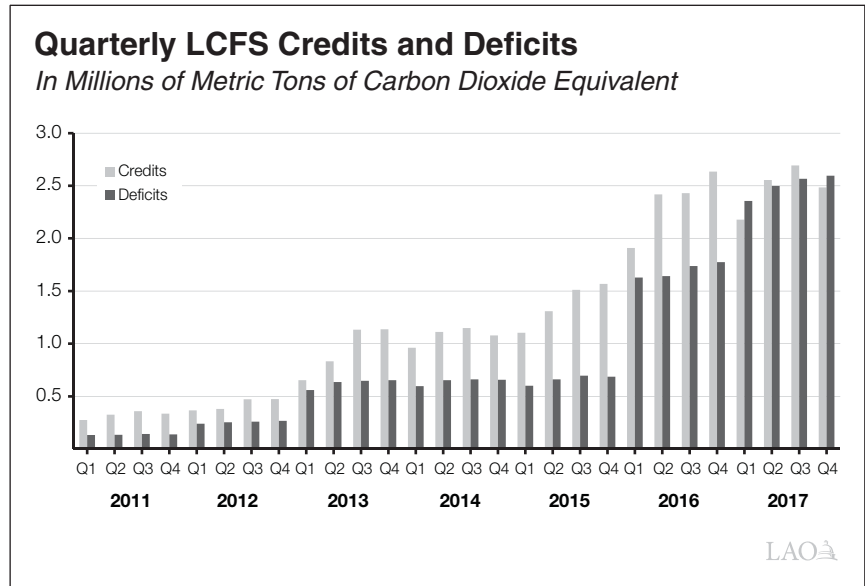
### **Conventional Fuel Suppliers Have Different Compliance Options**

- Regulated parties have a few different options for complying with the program, including (1) supplying lower CI fuel, such as by blending lower CI ethanol into gasoline; (2) implementing projects that reduce CI associated with extracting or refining fuels; and (3) purchasing credits from parties that produce low CI fuels.
- Excess credits can be “banked” and used to comply in future years.
- Program is intended to be fuel-neutral, meaning it does not require any particular fuel be used to meet the standard. Instead, the market determines which mix of fuels is least costly to reach the CI targets.



# Market System for Reducing Carbon Intensity of Fuels

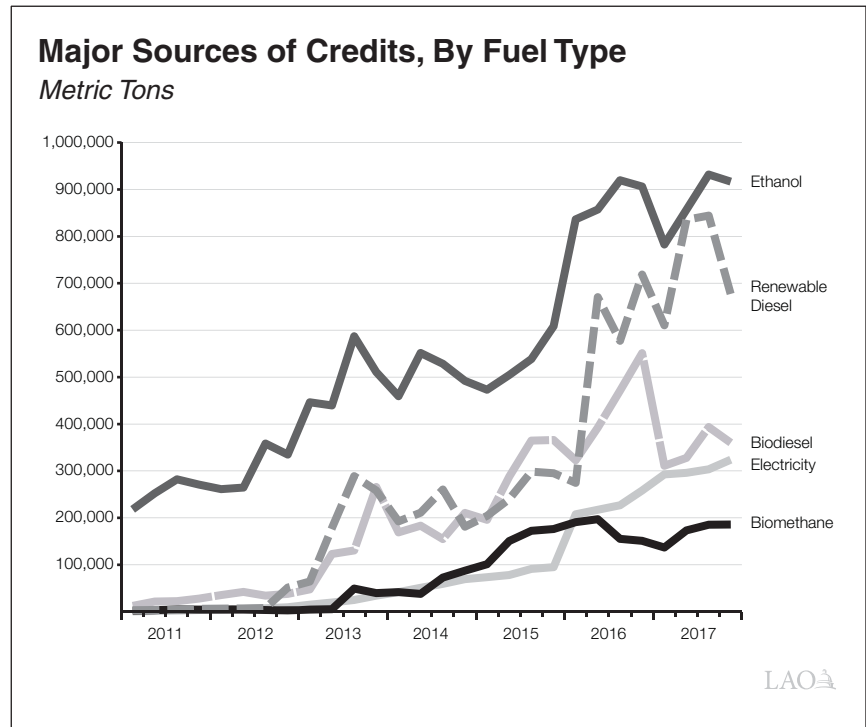
(Continued)





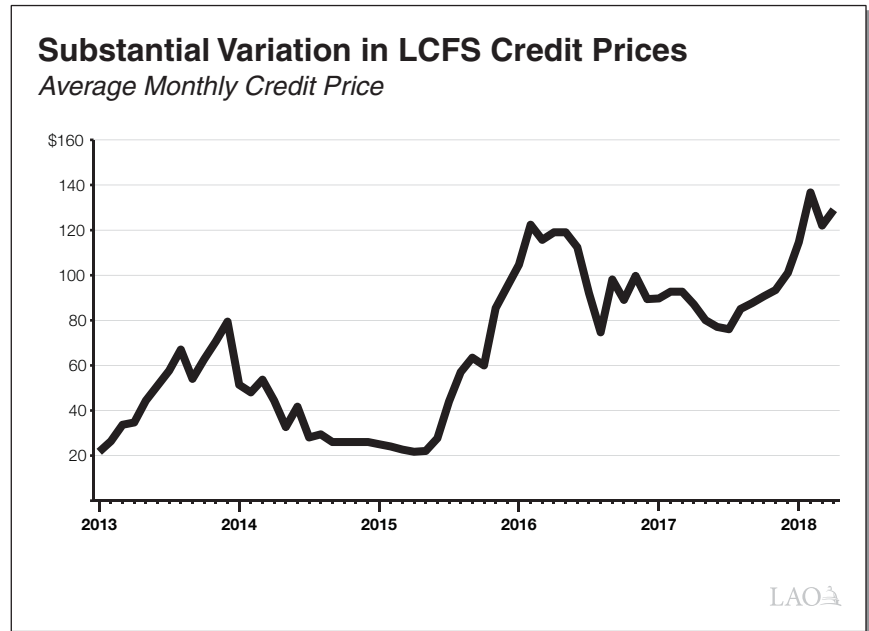
# Market System for Reducing Carbon Intensity of Fuels

(Continued)



## Market System for Reducing Carbon Intensity of Fuels

(Continued)



### Various Factors Affect Market Price for Credits

- In theory, credit price reflects cost of providing last unit of low carbon fuel needed to meet the CI standard.
- Factors that increase demand for credits include a more stringent CI benchmark and an increase in the amount of conventional fuel produced and consumed. All else equal, these factors increase credit prices.
- Factors that increase the supply of credits include technological advancements that increase the amount of low carbon fuels available for a given cost. All else equal, such advancements reduce credit prices. On the other hand, as the benchmark becomes more stringent, a given low carbon fuel generates fewer credits.
- Since credits can be banked and used to comply in future years, current prices also reflect some expectations about future prices.



## Market System for Reducing Carbon Intensity of Fuels

*(Continued)*

---



### **Credit Clearance Market Intended to Limit Costs.**

- Generally, two parties enter into agreements with each other to buy and sell credits.
- However, if a regulated party does not have enough credits to comply, it must purchase additional credits in the Credit Clearance Market established by CARB.
- Opt-in parties have the option to sell credits through the Credit Clearance Market at a maximum price of \$200 (2016 dollars) plus inflation, but they are not required to.





## Economics of LCFS

---



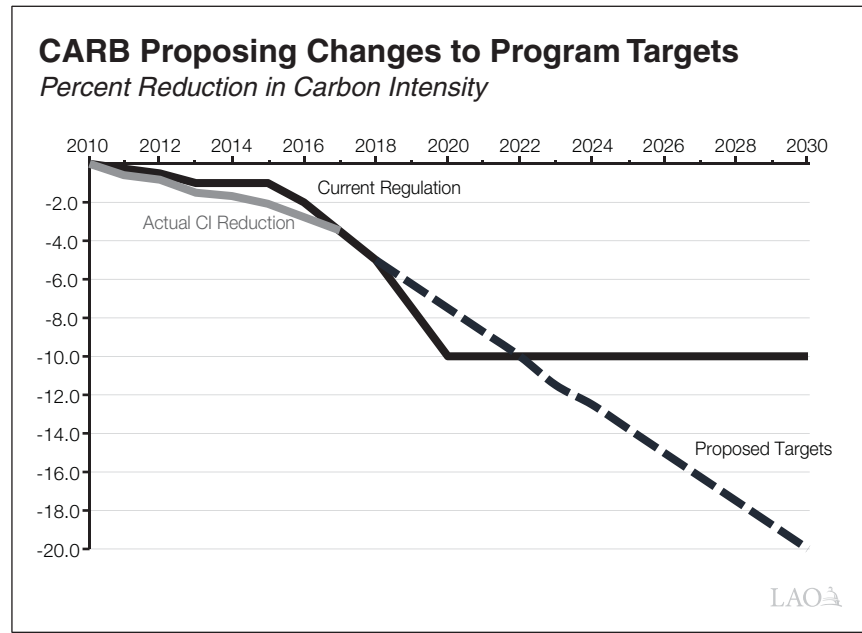
### **LCFS Increases Costs for High Carbon Fuel Suppliers and Reduces Costs for Low Carbon Fuel Suppliers**

- Incentives—provided in the form of credit prices—discourage the production and consumption of high carbon fuels and encourage the production of low carbon fuels.
- In economic terms, the program can be thought of as a charge on high carbon fuels that is used to subsidize low carbon fuels. Suppliers of gasoline and diesel substitutes can obtain significant value from the credits they generate in the program.
- For example, at credit prices at \$150 in 2018, the program likely adds several cents per gallon to the cost of supplying conventional diesel. On the other hand, at the same credit price, a supplier of a diesel substitute with CI of roughly 30 caps generate over one dollar per gallon from LCFS credits.
- Fuel producers generated nearly 10 million credits in 2017. At credit prices of \$100, the total value of those credits is roughly \$1 billion.



## Major Regulatory Change Being Considered

---





## Other Major Proposed Regulatory Changes

---

- Create Zero-Emission Vehicle (ZEV) Fueling Infrastructure Credits**
  - Credits for new hydrogen and certain electric vehicle-fueling infrastructure (DC fast chargers) based on unused capacity.
  
- Change Which Fuels Are Subject to the Regulation**
  - Adding alternative jet fuel suppliers as an opt-in party.
  - Making suppliers of fossil fuel natural gas and hydrogen regulated parties, rather than opt-in.
  
- Establish Carbon Capture and Sequestration Protocol**
  
- Add Third-Party Verification of Fuel CI**
  
- Additional Analysis of Environmental Effects of Biodiesel**



## Issues For Legislative Consideration

---



### **Carbon Intensity Has Reduced Since Program Began**

- Average CI of fuels decreased by more than 3 percent from 2010 to 2017.
- Difficult to determine how much of CI decrease is attributable to LCFS. Program interacts with cap-and-trade and the federal Renewable Fuel Standard.



### **LCFS Likely Not the Most Cost-Effective Strategy to Reduce GHGs**

- Only targeted at certain types of reductions—carbon intensity of fuel—and does not encourage other low-cost opportunities to reduce GHGs that might exist elsewhere in the economy. Also, program subsidizes the production and consumption of fuels that still generate some GHGs.
- Current LCFS credit prices (over \$150) are much higher than cap-and-trade allowance prices (about \$15).



### **Other Criteria to Consider When Assessing Program**

- LCFS also aims to diversify the transportation fuel mix, encourage innovation and low carbon fuel technologies that can be adopted elsewhere, and reduce co-pollutants.
- When evaluating the program, the Legislature will want to consider the degree to which the LCFS achieves these additional benefits, and whether the magnitude of these benefits outweigh the higher costs associated with the program.



## Issues For Legislative Consideration

*(Continued)*

---



### **Credit Clearing Market Does Not Cap Program Costs**

- Likelihood of market prices reaching or exceeding \$200 is unclear.
- Price ceilings (and floors) make sense as a tool to increase market certainty and provide more stable incentives. Regulators typically implement price ceilings by offering additional compliance instruments at a predetermined price.
- Since, no additional supply of LCFS credits would be issued in the Credit Clearance Market, and credits can be purchased outside of the Credit Clearance Market. The mechanism does not prevent market prices from exceeding the maximum \$200.