

Biofuels and Transportation Decarbonization Under the CLCPA

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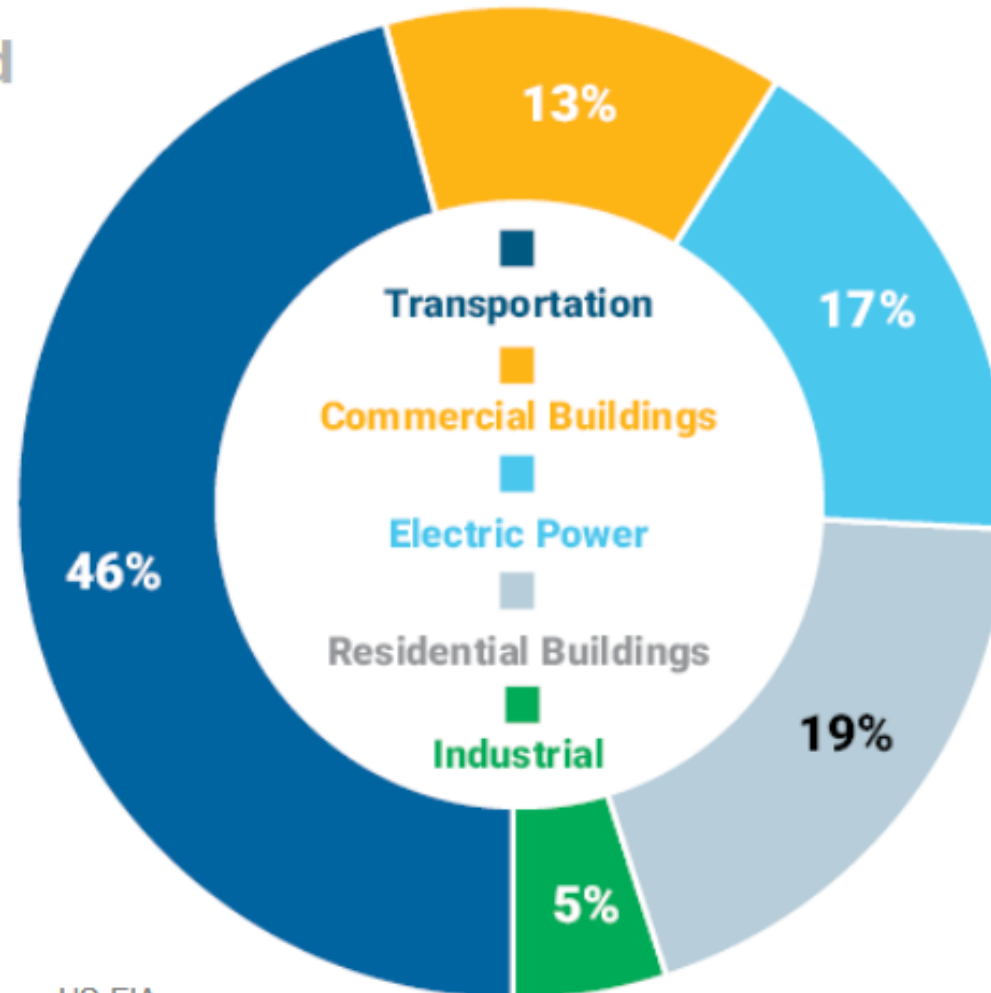
The CLCPA and transportation

- The Climate Leadership and Community Protection Act (CLCPA) requires NYS to achieve the deep decarbonization of its economy by 2050
 - 100% decarbonization of power sector by 2040 on an absolute basis
 - 85% decarbonization by economy on an absolute basis
 - 15% decarbonization by economy via offsets (optional)
- Unlike past state policies, the CLCPA requires the deep decarbonization of the NYS transportation sector on an absolute basis

CO₂ Emissions by Sector

NYS Energy-Related CO₂ Emissions by Sector

A sizeable fraction of building emissions are also from a refined fuel, distillate heating oil (which is very similar to ULSD)

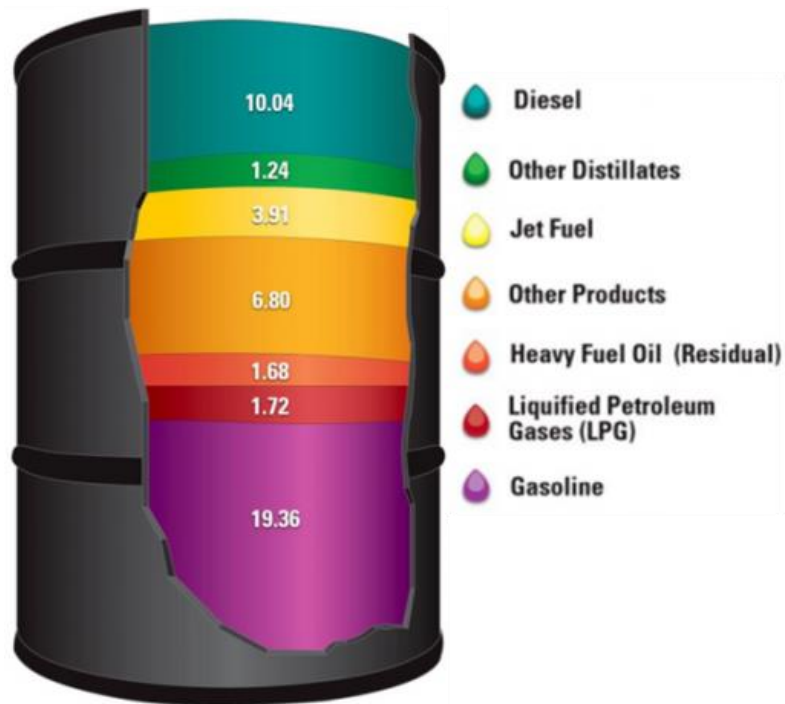


Source: US EIA

Almost half the CO₂ emissions come from the Transportation sector

The limitations of vehicle electrification

Products Made from a Barrel of Crude Oil (Gallons)
(2009)



- 2020s vehicle technologies will largely limit electrification to gasoline vehicles
 - Only 43% of every barrel of petroleum produces gasoline
 - Only 67% of NYS's transportation sector GHG emissions come from gasoline vehicles
 - Diesel fuel, residual fuel, and jet fuel are unlikely to be replaced by electricity before the 2040s (if not later)
- The CLCPA's targets will only be met if the transportation sector is decarbonized via other means

Low Carbon Fuel Standards

2011-2018 Percent



STATE OF NEW YORK

4003--A

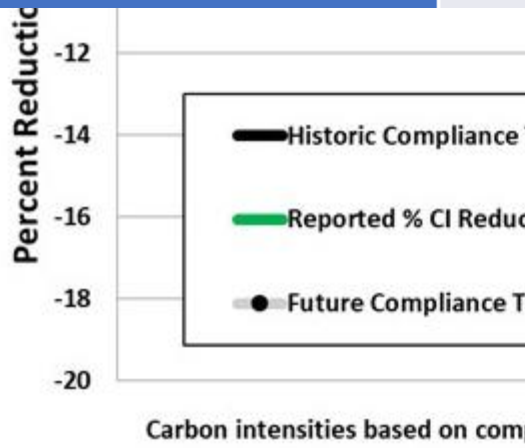
2019-2020 Regular Sessions

IN SENATE

Mitigation Strategy – Clean Fuel Standard Overview

Description:

Implement a Clean Fuel Standard to support electrification of transportation, achieve near-term emission reductions while the transition to electrification is underway and provide cleaner fuels for hard-to-electrify subsectors such as aviation; freight and passenger rail; and long-haul trucking. A clean fuel standard generally considers total fuel cycle emissions.



amended and recommitted to said committee

AN ACT to amend the environmental conservation law, in relation to establishing the "low carbon fuel standard of 2019"

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

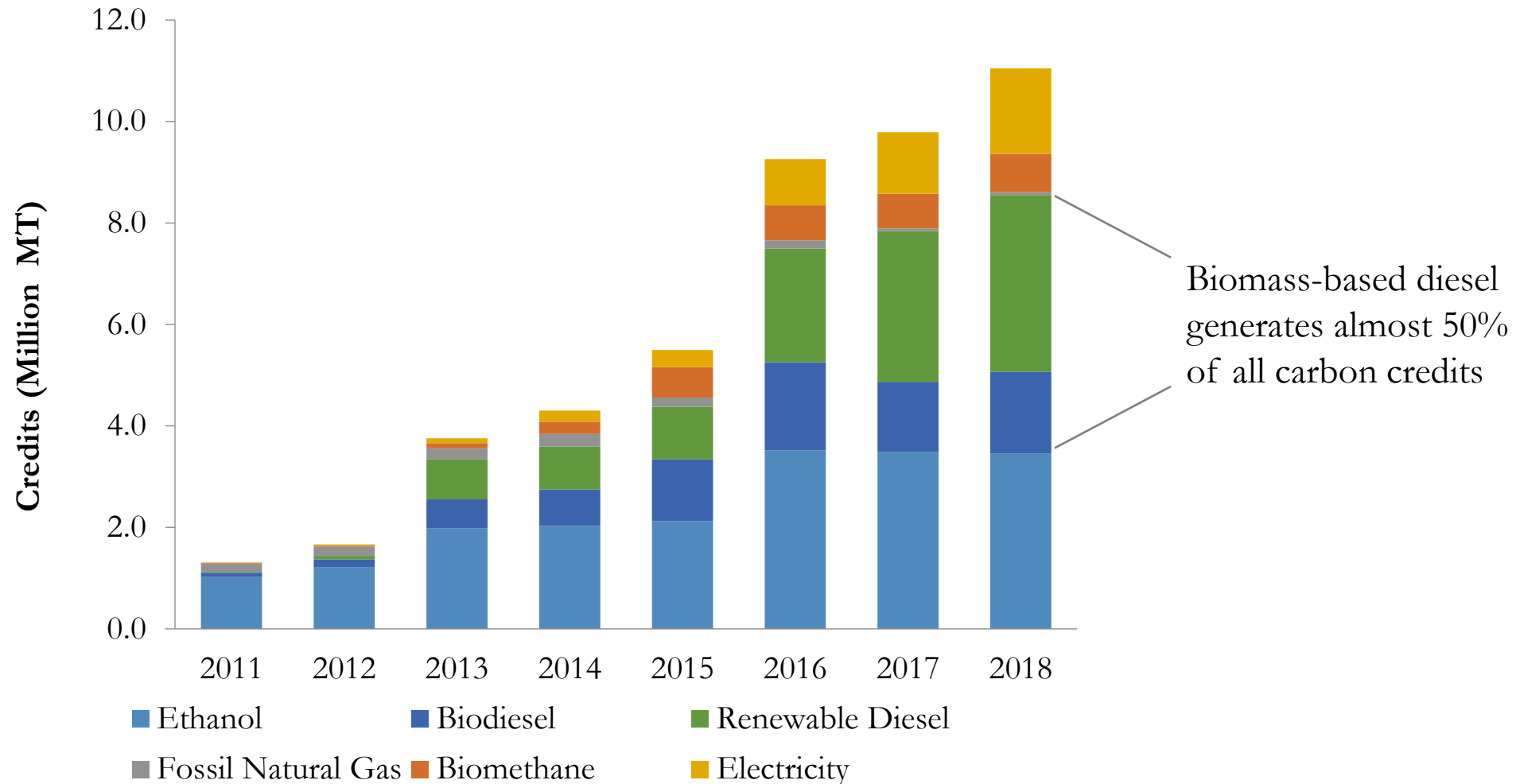
Section 1. Short title. This act may be known and may be cited as the "low carbon fuel standard of 2019".

§ 2. The environmental conservation law is amended by adding a new section 19-0329 to read as follows:

§ 19-0329. Low carbon fuel standard.

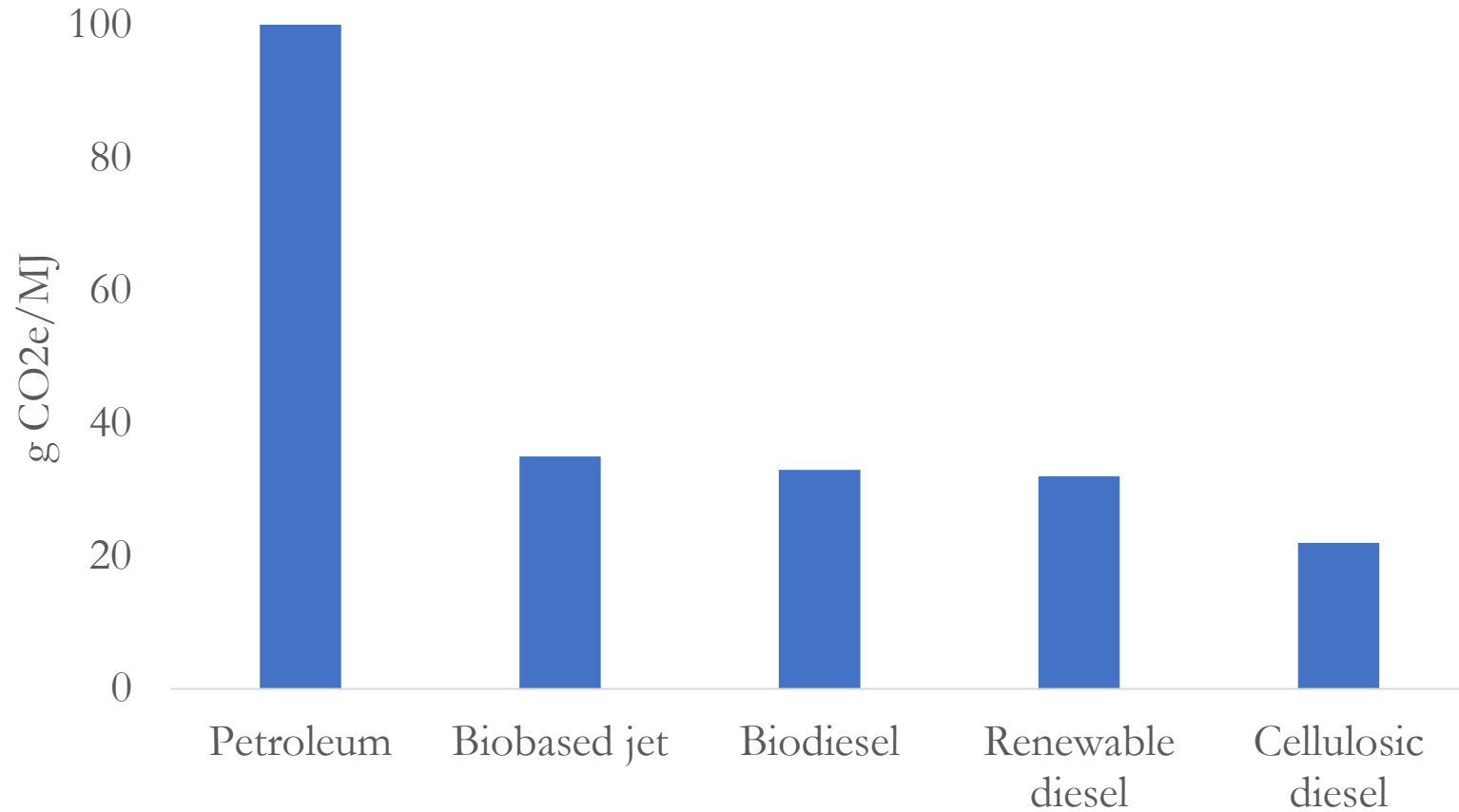
(1) A low carbon fuel standard is hereby established. The low carbon fuel standard is intended to reduce carbon intensity from the on-road transportation sector by twenty percent by two thousand thirty, with

Decarbonizing California's transportation sector

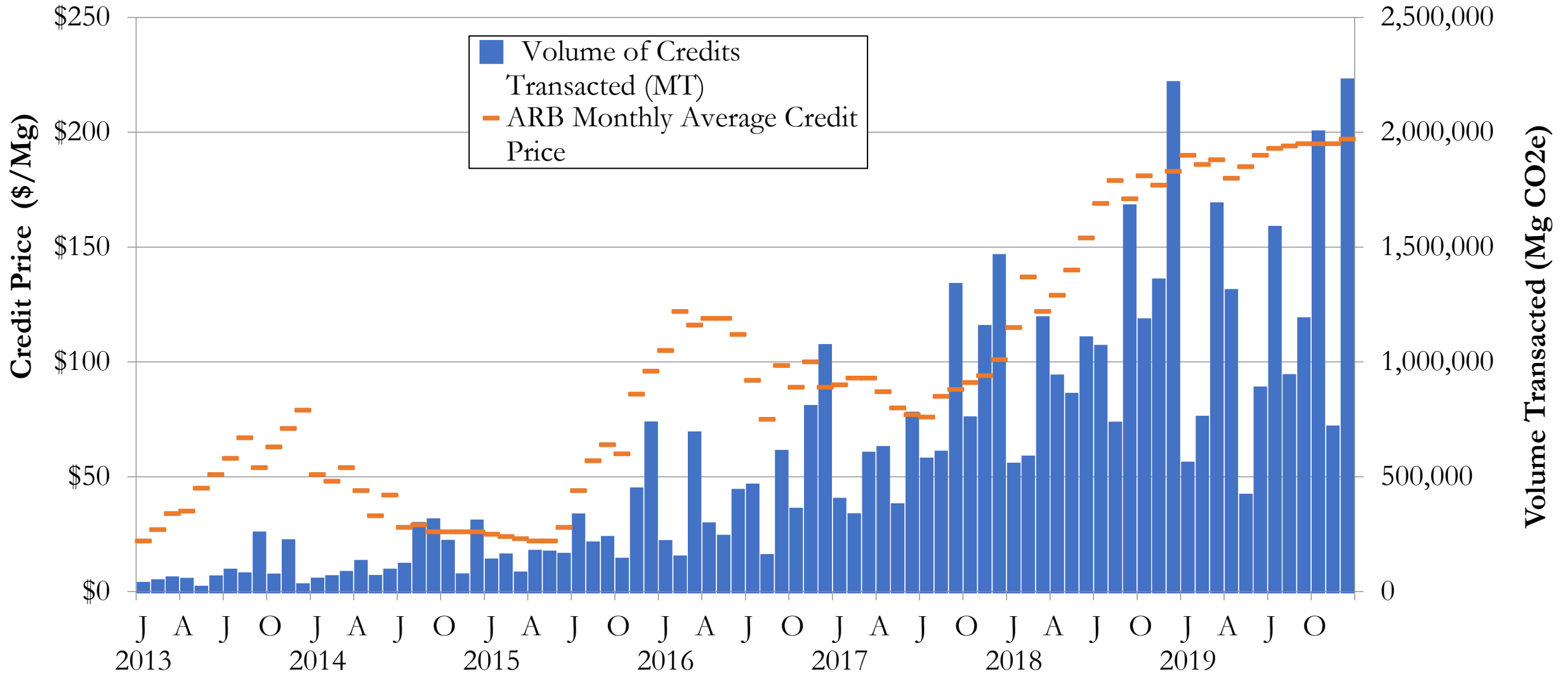


How California's low-carbon fuels contribute

Average carbon footprint of select low carbon fuels used in California

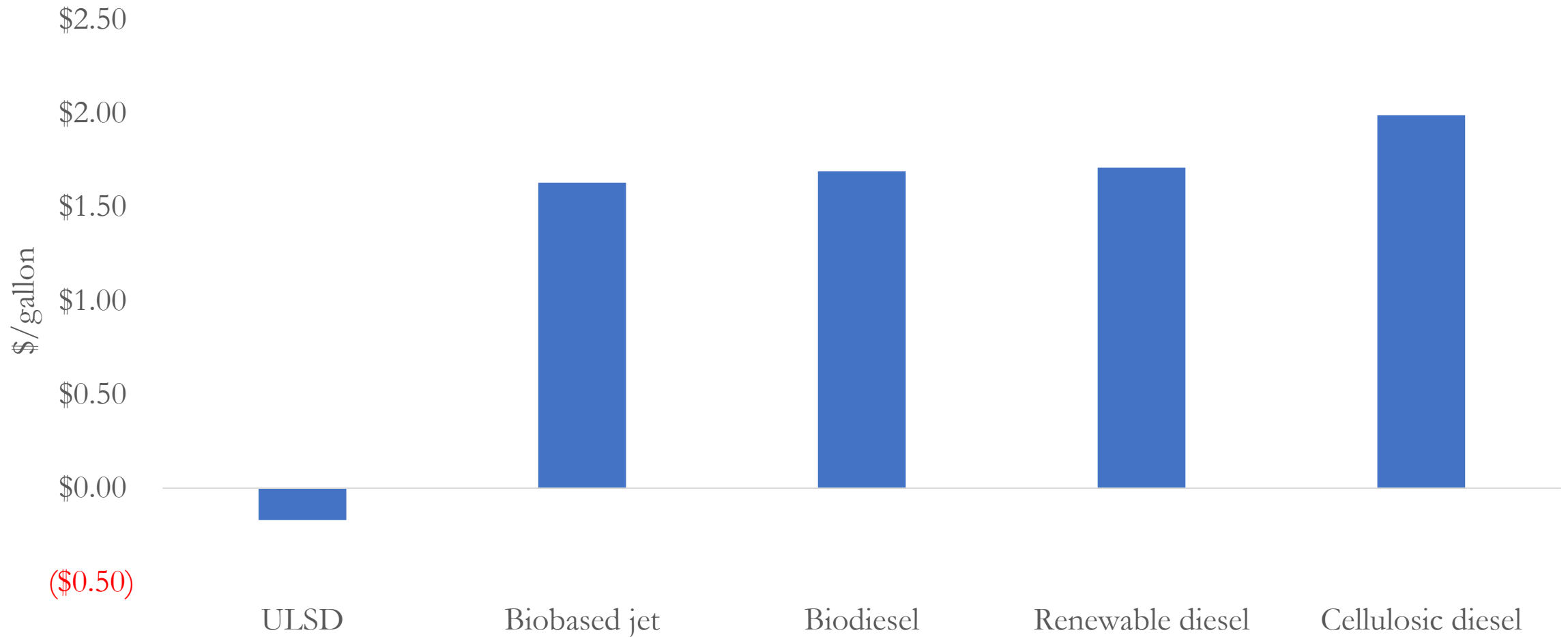


California's driver – carbon credit prices



California's driver – biofuel subsidy values

Average LCFS credit value



The effect

ExxonMobil
Energy Group
Clariant to
Biofuel Re

- Partnership to research into c
- Clariant's sunlit compatible cell
- Objective is to integrated bio

Demonstrating Autotherm

Iowa project (Redfield, IA)

- Privately financed by Stine Seed Fa
- Engineering, Procurement and Construction provided by Frontline Bioenergy
- Conversion of corn stover into suga phenolic oil and biochar

California project (El Dorado Hills, CA)

- Funded by CA Energy Commission
- Partnership with Lawrence Livermo National Laboratory and Frontline Bioenergy
- Feasibility of converting wood waste drop-in biofuels

Commercial time: Aemetis embarks on \$158 million cellulosic ethanol project in California

March 8, 2018 | Jim Lane

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The 60 million gallon Aemetis ethanol plant in Keyes, California

Conclusions

- The CLCPA requires the rapid and thorough decarbonization of NYS's transportation sector
 - NYS is currently far behind other states on transportation decarbonization progress
- Much of this decarbonization will require the use of biomass to mitigate emissions from “hard-to-electrify” sources such as diesel fuel and jet fuel
- California's LCFS has driven commercialization of 2nd-generation low carbon technologies, including biofuels from forest biomass
- Forest biomass will need to play an important role if NYS is to achieve the CLCPA's decarbonization targets

Questions?

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