

A Path to a Carbon-Neutral Oil Industry in California*

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Abstract

The California (CA) oil industry faces several huge challenges – oil reserves that are carbon intensive and costly to produce, low commodity prices, extensive environmental regulation, and a subset of environmental advocates who seek to have CA be ground zero for the “leave it in the ground” movement. However, the love affair between CA and the automobile will likely demand a continued supply of gasoline and diesel well into midcentury even as the uptake of batteries or fuel cells deepens. Recent amendments to the Low Carbon Fuel Standard (LCFS) extended eligibility for credits to some carbon capture and sequestration (CCS) projects. Hence, the LCFS could provide sufficient financial incentives to build a robust CCS industry in the State, with the oil and gas industry supplying geologic repositories and the technical know-how to store millions of tons of CO₂ a year underground – and make a profit doing so. Development of this industry would preserve oil industry jobs and turn them to helping the state meet its aggressive carbon goals. The LCFS sets the stage for CA to create a first-of-its-kind carbon-neutral oil industry by the end of the next decade.

A Path To A Carbon-Neutral Oil Industry In California

April 2, 2019

Steven Bohlen
Program Manager, Energy and Homeland Security



- Hydraulic fracturing
- Safe Drinking Water Act, aquifer exemptions
- Limited electronic record-keeping
- Idle wells
- Aliso Canyon well failure



Political uproar over oil permitting resurfaces



Oil wastewater dumped into shallow Central Valley well



California oil regulator under fire for aquifer injections

**Regulator lodged complaint
over work for Brown**

Whistleblower wronged?

**Pipeline
Leak**

**Fracking, Benzene, and Public Health:
A California Nightmare**

Aquifer mess

**Controversy over oil study on
Brown ranch is mainly bull**

Injection Lawsuit

Is fracking harmful?



How Can Progress Be Made When:

- Every party is aggrieved?
- Rhetorical volume is high?
- Fear is a primary tool
- Undermining trust is a weapon

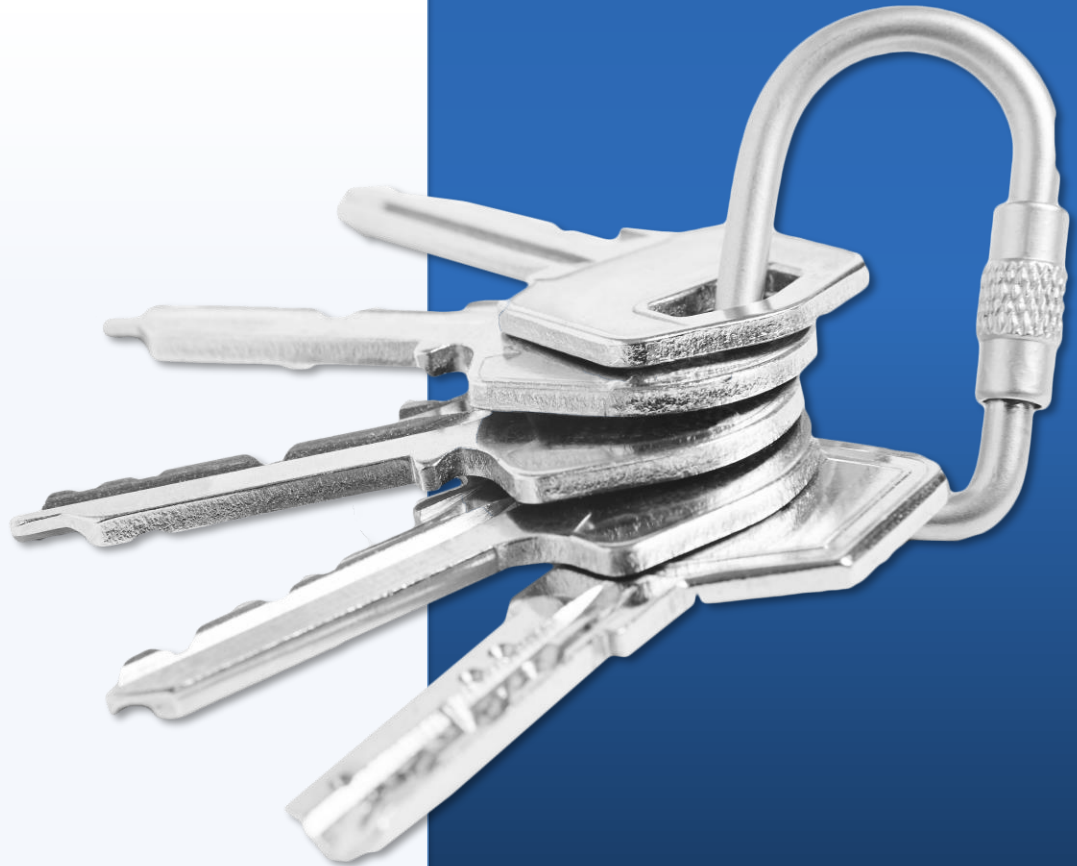


MAKING
PROGRESS

The text "MAKING PROGRESS" is rendered in a 3D, blocky font. Each letter is a thick, white-outlined cube. The interior of each letter is filled with a black wireframe grid, resembling a mesh or a structural framework. The letters are arranged in two rows: "MAKING" on top and "PROGRESS" on the bottom. The perspective is slightly angled, giving the text a three-dimensional appearance.

Keys to Survival (?)

- Acknowledge the issues
- Meet, repeatedly with stakeholders
- Develop and publicize a plan
- Endure abuse
- Don't give up

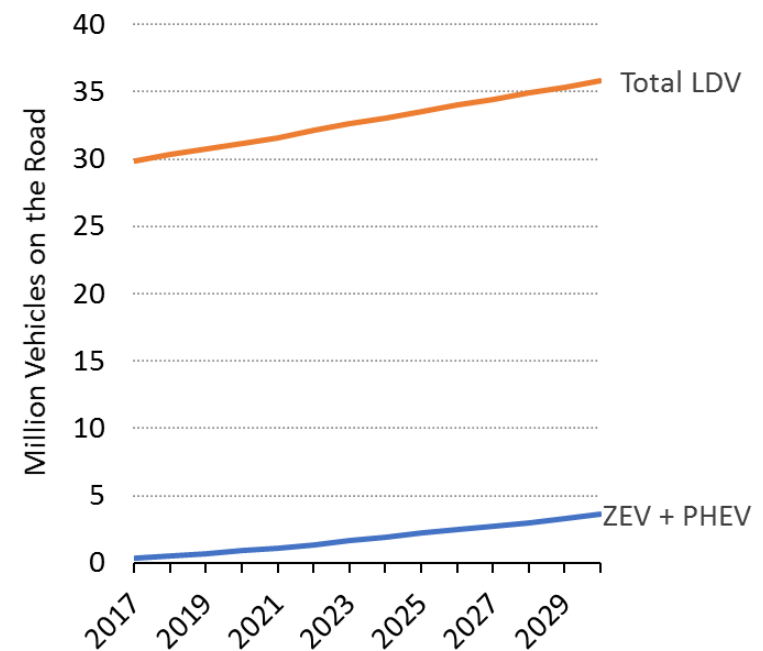
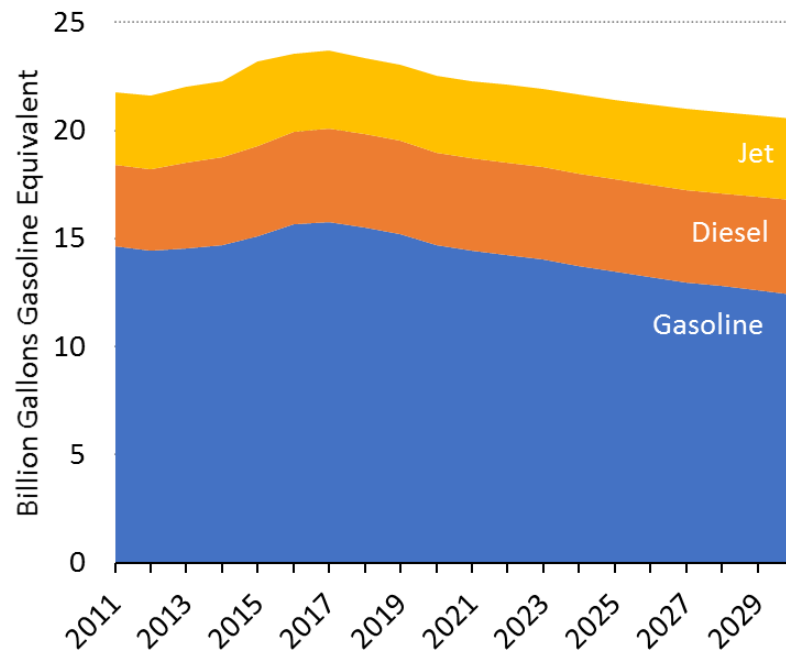


Develop a Shared Vision

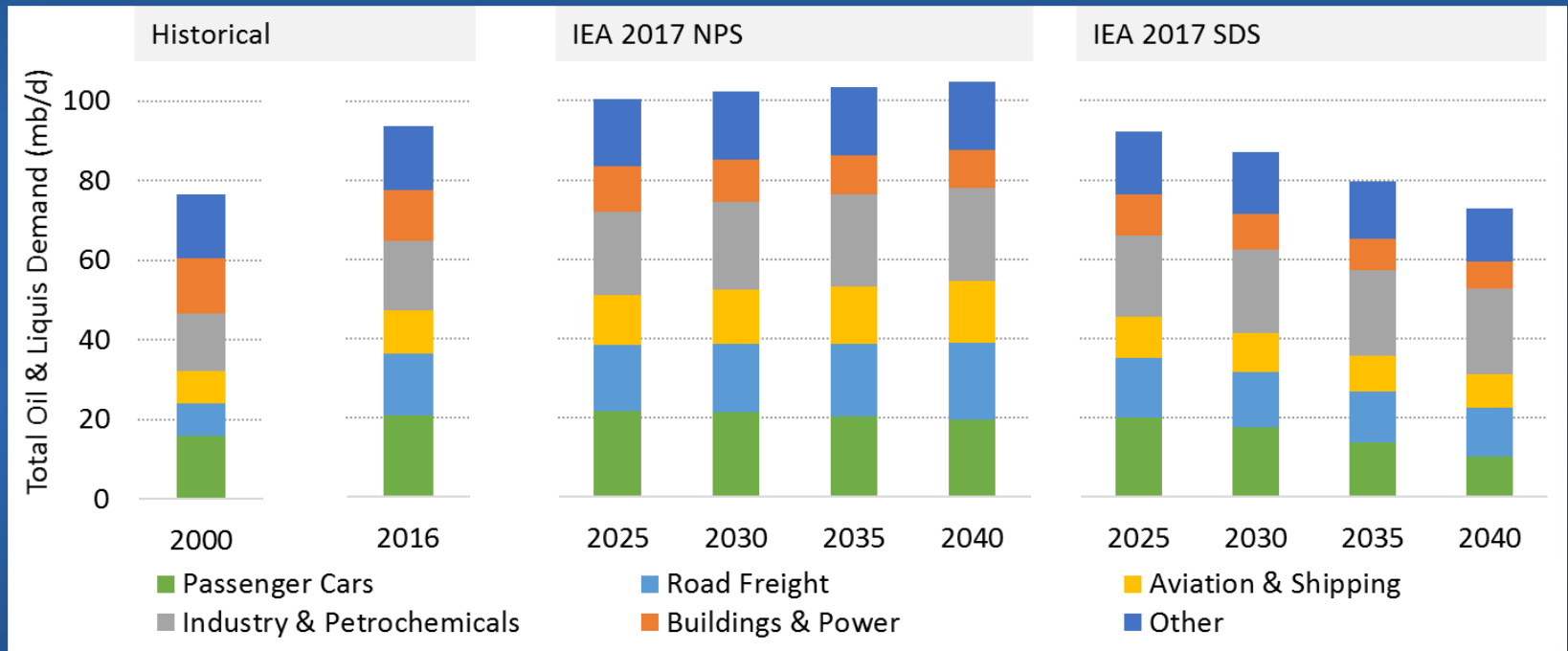
The Industry California Loves to Hate... But Needs Every Minute of Every Day



Petroleum Fuels Aren't Going Away in the Near Future... Even in California



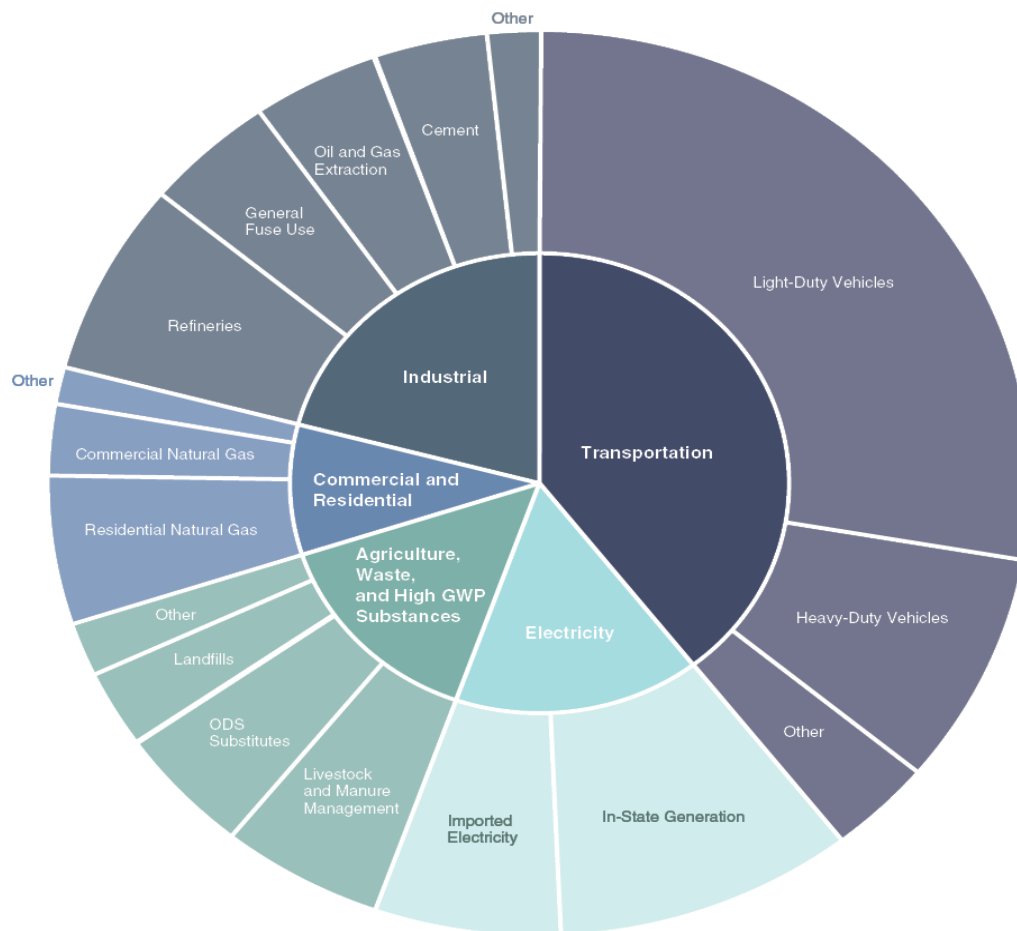
A Similar Picture Emerges in the Rest of the World



Challenges and Opportunities for the Oil Industry in CA

Figure 1

GHG Emissions Come From a Wide Variety of Sources



GHG = greenhouse gas; GWP = global warming potential; and ODS = ozone depleting substance.

LAOA

How can Industry Reduce Emissions While Continuing to Produce Oil & Gas?

Upstream	Downstream
<ul style="list-style-type: none">• Reductions in flaring and fugitives• Increasing use of renewables• Reduced energy intensity recovery methods• Storage via CO₂-flood enhanced oil recovery	<ul style="list-style-type: none">• Cogeneration• Alternative hydrogen generation• Carbon capture and storage (CCS)

Shell Quest Project



The CCS and CO₂-EOR Opportunity

CO₂ captured from fuel production and stored in a permitted CCS or CO₂-EOR project generates:

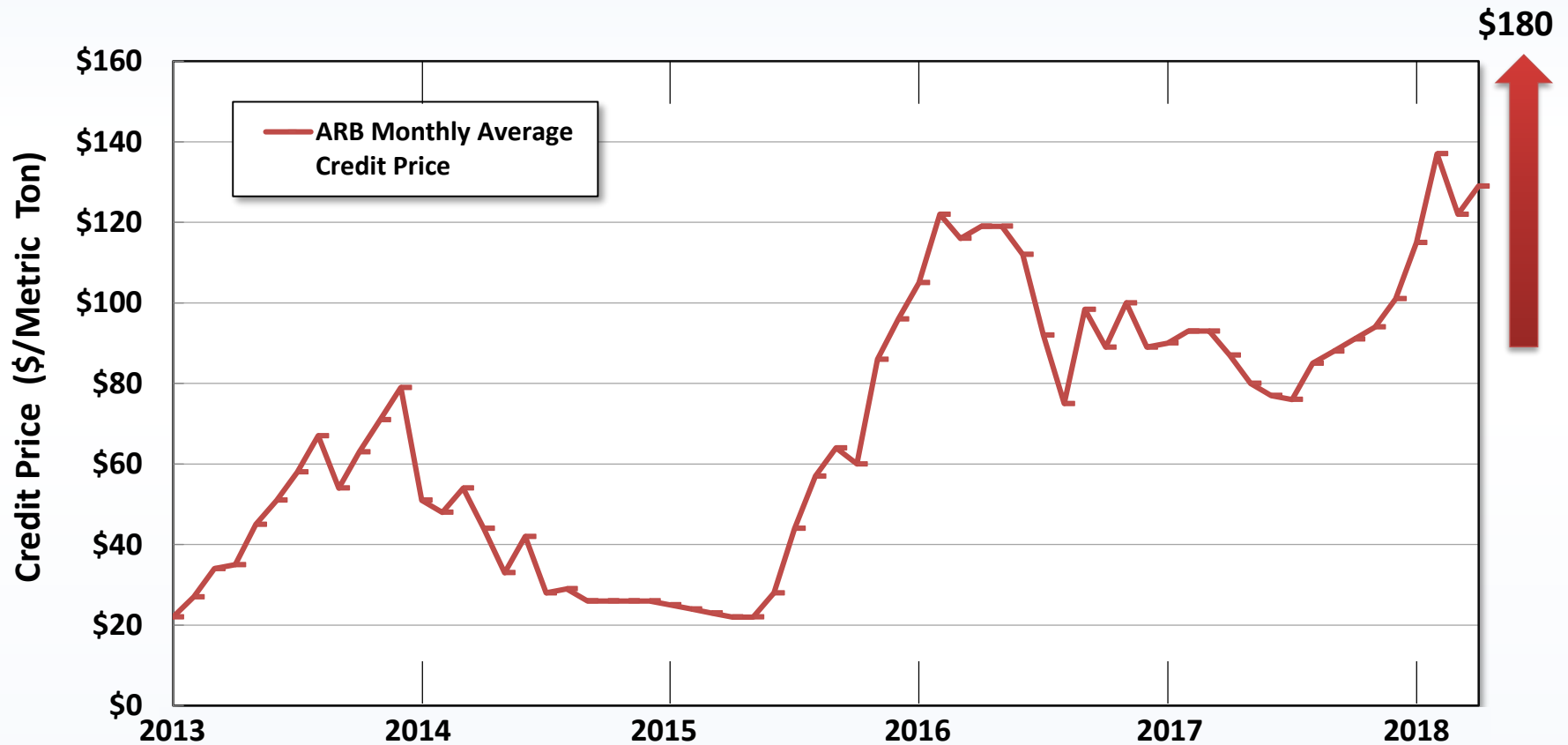
1. **Oil:** Depending on the reservoir and stage of the project, typically between 1 and 3 bbl/t stored
2. **Section 45Q Tax Credits:** \$13/t stored in 2018, growing to \$50 in 2026
3. **California LCFS Credit:** Proportional to the amount of CO₂ avoided, which is currently trading around \$180/t

California's Low Carbon Fuel System – a National Means to Monetize Negative Carbon

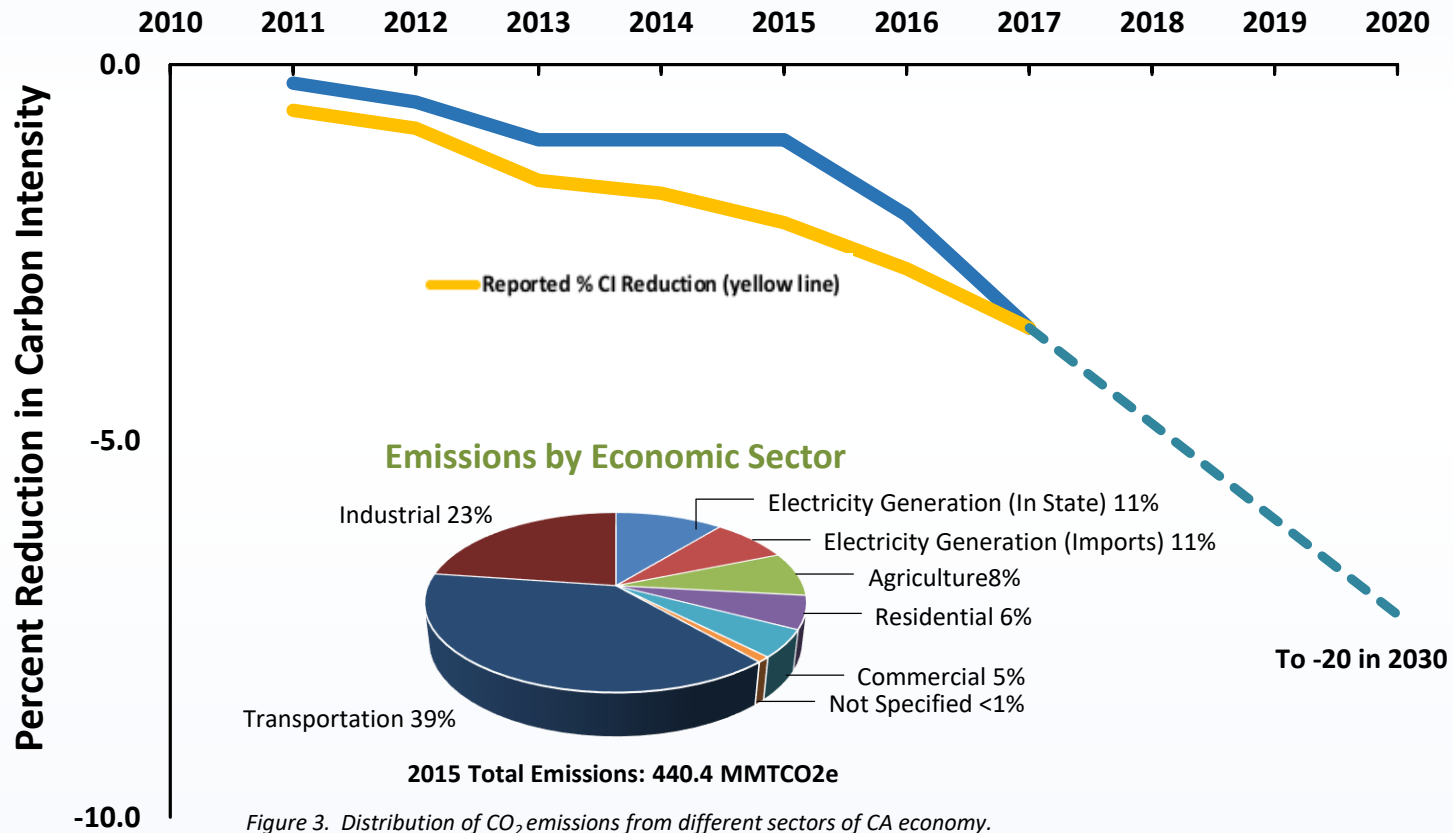
- Caps the 'carbon intensity' of motor fuels sold in California – today 3.5% less than original, ultimately 20% reduction.
- Biofuels are used to reduce carbon intensity.
- Excess reductions are sold as credits.
- Applies to any fuel origin – credits bought and sold privately.
- Today credits are selling for ~\$190/ton CO₂



Prices Have Hovered in the \$100/Ton Range



CA Faces an Enormous Challenge in Meeting its Own Carbon Reduction Goals



2018 Adds a New Wrinkle: CCS



- Most reductions in carbon intensity were already allowable (efficiency, renewable power, better feedstock).
- New in 2018, carbon capture and storage on any process that yields a fuel sold in California will generate a credit that can be traded or used.

The accounting and storage rules are rigorous.



Where are the early CCS opportunities for the LCFS?

- Nearly pure CO₂ streams from fermenters, digesters, crackers.
 - Cost is mostly compression and transport
 - Must be part of fuel path leading to California consumption
- Facilities near good storage sites
 - Truck or rail transport may be fine to start
 - Storage sites will be valuable due to permitting and accounting stringency
- A joint venture between the CO₂ source and the storage site will collect the LCFS credit.



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An Opportunity for Leadership

Change the Narrative: An industry that provides essential products and reduces carbon emissions to meet State emissions goals.

By implementing CCS + CO₂-EOR, the industry is being proactive and contributing to the state's emissions reduction goals

With direct air capture of CO₂ – and possibly capture of biogenic CO₂ – the industry could reduce atmospheric CO₂ concentrations



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**California's
Sustainable
Future: Water and
Energy Challenges
a Success!**

**Crews making
progress in stopping
gas leak near Porter
Ranch.**



**Regulators say
riskiest injection
wells have been shut
down.**

**Judge declines to
halt oil wastewater
injections.**

**BROWN'S LAST
CHANCE** _____

**TO PROTECT FAMILIES
AND COMMUNITIES**



**TO FIGHT FOR OUR
CHILDREN'S FUTURE**



**TO IMPROVE
OUR HEALTH**



“Everyone is entitled to his own opinion, but not to his own facts.”

-Senator Daniel Patrick Moynihan

■ Rand Corporation Study on Truth Decay

- Increasing disagreement about objective facts
- The blurring of the line between opinion and fact
- An increasing volume of opinion versus fact
- Declining trust in institutions as sources of facts

■ Vaccine Safety

- There are some risks associated with some childhood vaccinations, overall the evidence shows that vaccines are very safe
- There is strong evidence that the MMR vaccine is not associated with autism in children
- There is strong evidence that several common vaccines for children—MMR, DTaP, Td, Hib, and hepatitis B—are not associated with childhood leukemia
- Serious side effects associated with vaccines are extremely rare and must be weighed against the substantial protective benefits of vaccines

■ Human – Induced Climate Change

- Increases in greenhouse gases lead to a net effect of warming of the climate system
- Increased air and ocean temperatures
- Widespread melting of snow and ice
- Rising global average sea level