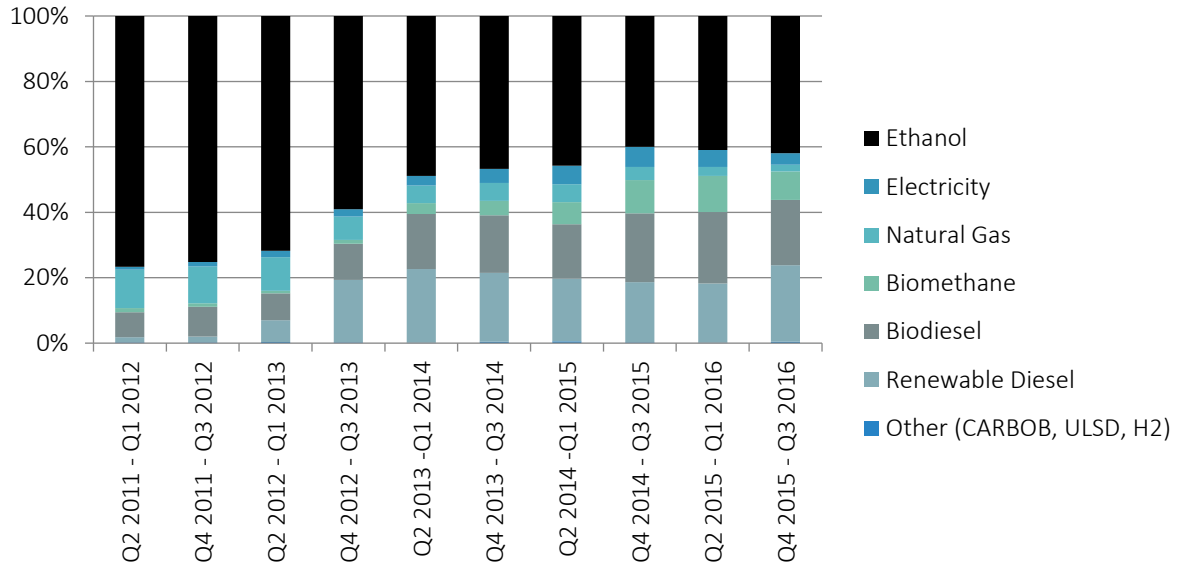
Fuels Policy Case Study

A Case Study on Incentives for Low Carbon Fuels for the "Learning from the California Experience Alternative Fuels, Vehicles, and Infrastructure" Workshop

Economists generally agree that lowering the carbon content of transportation fuel in a state requires applying a "polluter pays principle," such that higher carbon fuels become more expensive (and potentially lower carbon fuels become less expensive). How best to do this is the subject of great debate. Policy-makers tasked with operationalizing the polluter pays principle must balance a number of interlinked objectives: avoiding picking winners, ensuring long-term economic gains in their jurisdiction, maintaining voter support, reducing administrative burden on public agencies, remaining revenue neutral, accounting for equity concerns, and meeting long-term climate targets.

In California, the key policy used to decarbonize the state's fuel supply is the low carbon fuel standard (LCFS), a policy that mandates California's fuel providers to reduce the average greenhouse gas (GHG) intensity of all fuels in the state by 10 percent between 2011 and 2020. In January, 2017, CARB proposed extending the LCFS to 2030 and increasing the carbon reduction to 18 percent. In each year, fuel providers must meet an average intensity for all their fuel sold. Fuel producers can lower their average intensity in three ways: (1) selling more low-carbon fuel, (2) selling less high-carbon fuel, and (3) buying LCFS greenhouse gas credits from firms that have a surplus. To date, low carbon biofuels – such as biomethane, biodiesel, and renewable diesel – have accounted for more than 50 percent of the LCFS credits in the first three quarters of 2016 (Figure 1).

Figure 1 LCFS Credit Percentage by Fuel, Q1 2011 - Q3 2016. Source: ARB (2017)



The LCFS differs from a pure carbon tax in several important ways. Under the LCFS, high carbon fuels become more expensive and low carbon fuels become less expensive, whereas under a carbon tax, all fuels that contain carbon (even low quantities) see price increases. Additionally, a carbon tax generates revenue for the government which can then be re-invested anywhere the government chooses, whereas the LCFS is a transfer of revenue from high to low carbon fuel providers.

Other policies, such as tax credits, can similarly provide incentives for low carbon fuels and help firms make otherwise-impossible investments. This case study will compare three methods for incentivizing low carbon fuels: LCFS, tax credits, and carbon tax.

The Challenge

You are part of the Alternative Fuels Task Force advising Governor Brown on how best to decarbonize California's fuel supply. Your primary goals are to: (1) ensure that carbon intensity of the state's fuel supply continues to decrease out to 2050, and (2) ensure any proposed actions are palatable to the voters, protect California businesses from unreasonable costs or competition, and ensure broad sustainability objectives are met (e.g., non-climate objectives).

The governor wants you to compare the advantages and disadvantages of these fuel policies: LCFS, tax credits, and carbon tax. Your team has identified four tasks below to help you in this comparison. Complete each task and report back to the larger group.

Note: questions below use fictional narratives and data that is meant for exercise purposes only. In certain questions, there may be more than one "right answer."

Task 1. Calculate Incentives (About 20 Minutes)

Estimate the incentive offered by LCFS credits to fuel producers in dollars per gallon produced for two fuels: biodiesel from soybeans and renewable diesel produced from waste oil. Compare those incentives with incentives from a tax credit of $1.0 per gallon and a carbon tax of $20 per ton on transportation fuels.

Data for calculations
Note: values are meant to be representative and may differ from reality

Credit value	*Required carbon intensity*	*Biodiesel carbon intensity*	*Energy density of biodiesel*	*Renewable diesel carbon intensity*	*Energy density of renewable diesel*
$100 per metric ton	95 grams CO_2e/MJ	80 grams CO_2e/MJ of fuel	126 MJ/gallon	30 grams CO_2e/MJ of fuel	130 MJ/gallon

$$Value\ of\ Incentive\left(\frac{\$}{gallon}\right) = (Carbon\ Insensity\ Target - \ Fuel\ Carbon\ Intensity) \times Credit\ Value \times Energy\ Density \times 1\ \frac{metric\ ton\ of\ CO_2}{10^6 grams}$$

Tax credit

Proposed value of $1.00 per gallon.

Carbon tax

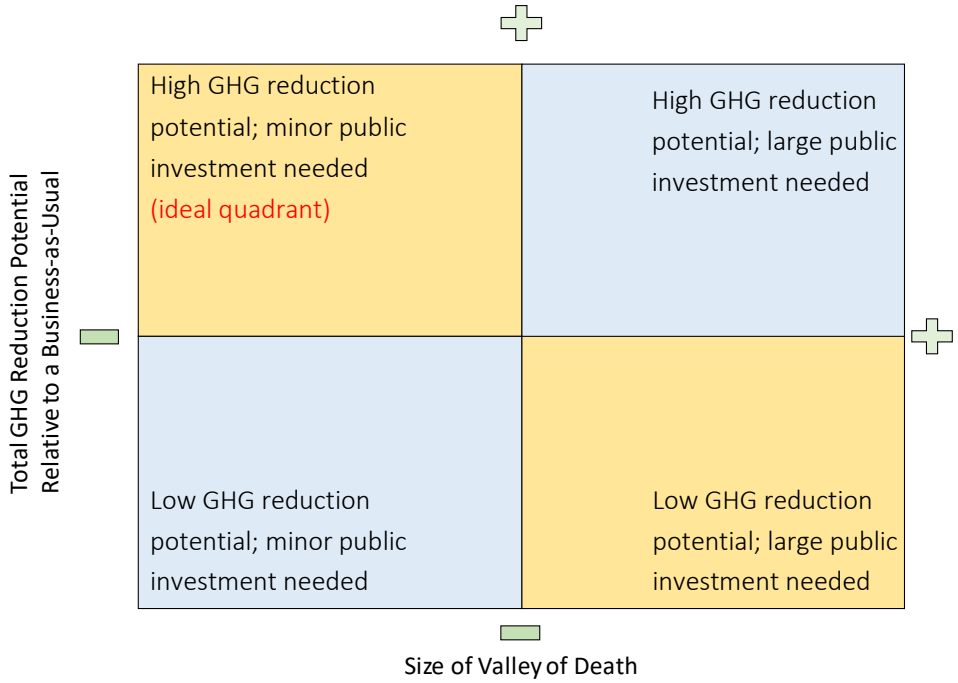
Proposed value	*Biodiesel carbon intensity*	*Renewable diesel carbon intensity*	*Conventional diesel carbon intensity*	*Required carbon intensity*
$20 per ton	80 grams CO_2e/MJ of fuel	30 grams CO_2e/MJ of fuel	100 grams CO_2e/MJ of fuel	95 grams CO_2e/MJ

$$Revenue\ generated\ \left(\frac{\$}{gallon}\right) = Fuel\ Carbon\ Intensity \times Value\ of\ Carbon\ Tax \times Energy\ Density \times 1\ \frac{metric\ ton\ of\ CO_2}{10^6 grams}$$

Task 2. Public Investment versus GHG Benefits (About 15 Minutes)

Below is a conceptual diagram showing long-term GHG reduction potential versus size of the "valley of death." Place the following fuels on the conceptual diagram: electricity, biogas, biodiesel, sugarcane ethanol, Midwest corn ethanol, renewable diesel, CNG, and hydrogen. These concepts are defined below:

- Long-term GHG reduction means the total amount of GHGs that could be reduced relative to business-as-usual scenario in which petroleum remains the dominant fuel type. This takes into account both **the relative carbon intensity of the fuel** compared to gasoline/diesel, as well as the **maximum fuel volume that could be produced** given a fully mature fuel industry (i.e., volumetric potential).
- Size of valley of death means the public funding needed to create a robust, self-sustaining industry.



Task 3. Innovation and Risk-Taking (About 15 Minutes)

Who benefits most from the policy? The producer? The blender? Another entity? To what extent does each policy signal the market to pursue major leapfrog innovations, which could push fuels over the valley of death? Fill in the table below.

	Does policy push us over the valley of death?
LCFS	
Tax credit	
Carbon tax	

Discussion Questions

- Discuss and compare the administrative burden placed on the state of the three policies above.
- The state's cap-and-trade program has credits that trade for less than $20 per metric ton. In contrast, LCFS credits have recently hovered above $100 per metric ton. What are the main reasons behind this difference?
- Compare the political feasibility of these three policies, from both the voter and industry perspectives.
- To what extent should policies prioritize major innovation (i.e., leapfrogging) versus incremental innovation?
- Are any of the three policies "fuel-neutral" or do they "pick winners"?