Union of Concerned Scientists

FACT SHEET

Clean Fuel Standards

A Proven Approach to Fuel a Low-Carbon Future

HIGHLIGHTS

Replacing petroleum with renewable electricity and other clean transportation fuels is among the most critical steps to stave off the worst impacts of climate change. Clean fuel standards are a proven part of the solution, holding the oil industry accountable for its actions while steadily driving down emissions. By connecting a fuel's value to its pollution, well-designed standards make clean fuels less expensive and dirty fuels more expensive. This supports the lowest-carbon fuels and drives down emissions from all fuels: from electricity to biofuels and even gasoline and diesel. As we scale up clean fuels and transportation electrification, it's essential that costs are shared equitably and that all communities benefit, especially those disproportionately burdened by transportation pollution.

Grappling with climate change requires transforming how we power our economy, and no sector requires more fundamental change than transportation, which accounts for the largest share of US global warming pollution. Most of the gasoline and diesel that power cars and trucks today must be quickly replaced with low-carbon alternatives. Given the size and complexity of the transportation system, this will require a variety of clean fuels, from electricity to hydrogen and liquid biofuels. In order to keep global temperature rise well below 2°C and aiming for 1.5°C, most vehicles must be electrified and the remaining combustion fuels must be nearly carbon neutral by 2050.

After a half century with petroleum as the only significant source of transportation fuel, post-2000 biofuel growth and post-2010 progress with electric vehicles (EVs) have persuaded even the auto and oil industries that change is real and accelerating. But replacing petroleum in transportation is a big job, and time is running out to avoid increasingly catastrophic outcomes from unchecked climate change. Meeting this challenge will require transformative changes and major investments throughout the economy, with implications for drivers, vehicle manufacturers, transportation fuel producers, and distributors. A comprehensive approach to climate policy will ensure that all of these industries and stakeholders are working toward a common objective.

A clean fuel standard is a proven policy approach to reducing transportation emissions that complements support for EVs and emissions standards for cars, trucks, and electricity generation. After being introduced in California in 2007, clean fuel standards have been implemented in Oregon and British Columbia and are being considered in Minnesota and other parts of the Midwest. A clean fuel standard focuses accountability on the oil industry and demands steady reductions in transportation fuels' carbon intensity (CI): the life cycle global warming pollution per unit of energy, from production to consumption.

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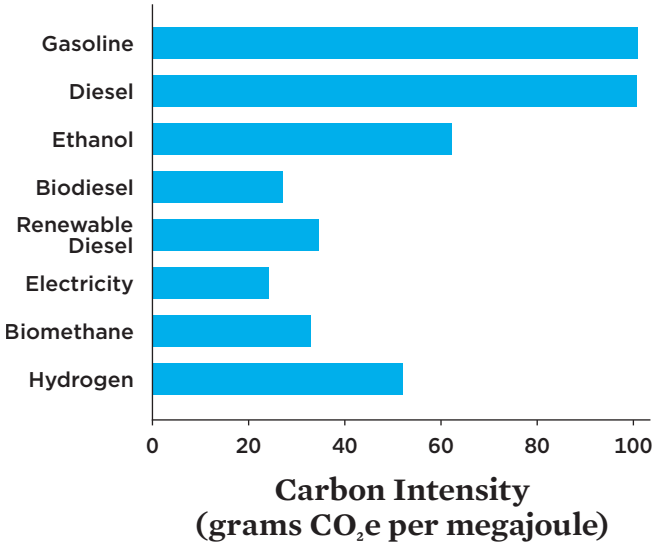
Transit buses are just one of the growing number of vehicles on today's roads powered by electricity instead of petroleum fuels. A clean fuel standard provides financial support for transit agencies operating electric buses, speeding the transition away from diesel.

What Is a Clean Fuel?

A clean fuel is an alternative transportation fuel or energy source with a CI lower than petroleum-based fuels (see Figure 1). For example, a small but growing share of the gasoline and diesel sold in the United States is composed of biofuels, principally ethanol, biodiesel, and renewable diesel. Today ethanol accounts for 10 percent of the gasoline sold in the United States and biodiesel is about 3 percent of diesel (EIA 2020b). Electricity is another clean fuel. As EV use increases, a small but rapidly growing share of transportation energy comes from a plug rather than a pump. Electricity will become a much more significant part of the transportation sector over the next several decades. Gaseous fuels like hydrogen, used in fuel cell EVs, and biomethane also power transportation without petroleum.

Assessing how clean a fuel is requires calculating its CI. For gasoline, this includes pollution related to oil extraction and refining operations alongside its tailpipe pollution. For electricity, this includes pollution from coal and natural gas power plants. For biofuels, additional factors include emissions associated with farming biofuel crops, biofuel production, and any emissions attributable to land use change (Martin 2017).

FIGURE 1. Average Life Cycle Emissions for Major Fuel Categories



Carbon intensity varies across fuel types, as shown above for major fuel categories. There is also variation within each fuel category, not shown, depending on how the fuel is produced.

Note: Emissions values represent volume-weighted average carbon intensity for each fuel category and are based on 2019 fuel sales in California.

DATA SOURCES: CARB 2020A; CARB 2020B.

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A clean fuel standard supports transportation fuels with carbon intensities below the standard, such as renewable power and low-carbon biofuels, based on a scientific assessment of the climate benefits they deliver.

This means alternative fuels will vary in their CI both between and within fuel types, depending on production details. For example, driving an EV charged primarily with renewable sources of power such as wind and solar will cause far fewer emissions than the same car charged on a grid powered primarily with coal and natural gas. Likewise, biofuels produced from waste products or a sustainably produced crop will have less climate impact than biofuels produced from palm oil, which is linked to deforestation. Even emissions from petroleum-based fuels can vary widely based on the source of the oil, how dirty it is, and how it is refined (Martin 2017).

How Does a Clean Fuel Standard Work?

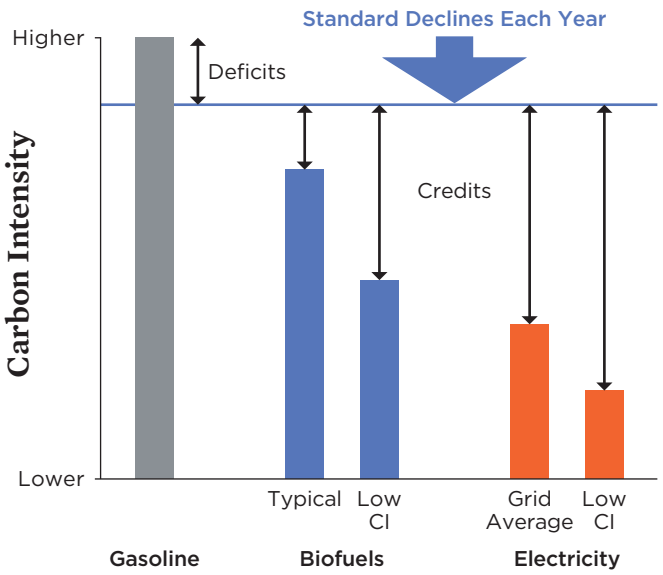
A clean fuel standard is analogous to existing standards requiring automakers to make cars more efficient and reduce tailpipe emissions, or those requiring utilities to reduce carbon emissions from electricity generation or to increase the share of renewable energy. Under a clean fuel standard, sellers of transportation fuel are accountable for reducing the CI of their products, regardless of where in the life cycle the emissions occur.

Yet the transportation fuel system is fragmented, with different types of companies selling different types of fuel. Even within a single fuel supply chain, different companies contribute to a fuel's life cycle emissions (e.g., oil extraction, refining, and blending with ethanol and biodiesel). A system of credits and deficits helps connect the different parts of the fuel marketplace to support the use of cleaner fuels, whether they are blended into the gasoline and diesel used by internal combustion vehicles, or are supplied by utilities over electrical lines and used by electric or other alternative-fuel vehicles.

A clean fuel standard relies on a complete and accurate life cycle assessment of each transportation fuel, based on up-to-date science. The standard sets a ceiling that applies to the *average* CI of all fuels sold for transportation use. Fuels with a CI *higher* than the standard generate deficits, and fuels *lower* than the standard (and therefore cleaner) generate credits. Over time, this ceiling is lowered (see Figure 2).

Sellers of fuels with a CI higher than the standard, such as gasoline and diesel, must either lower the CI of the fuels they sell or buy credits generated by suppliers selling fuels with a CI below the standard. This market for credits provides financial support for low-carbon fuels and creates an economic incentive for all fuel producers to reduce emissions in their supply chains. Any participant in the fuel marketplace and supply chain can benefit by lowering the CI of transportation fuels. For fuels such as ethanol and biodiesel that are blended with gasoline and diesel, a lower CI biofuel will have greater value because it provides more credits than a higher CI biofuel. Users of alternative fuels such as a public transit agency operating electric buses can also generate and sell credits to sellers of gasoline and diesel, creating a revenue stream to help transit agencies move quickly to electric buses.

FIGURE 2. Deficit and Credit Generation within a Clean Fuel Standard



A steadily declining standard for carbon intensity generates credits for fuels cleaner than the standard, and deficits for more polluting fuels. Clean fuel producers can sell credits to deficit holders, and all parties in the fuel supply chain have an incentive to seek lower-carbon fuel sources and production practices.

Unlike carbon taxes or carbon caps with credit auctions, the government does not collect or disburse funds under a clean fuel standard. The government's role is to oversee the scientific assessment, reporting, and verification of the fuel CIs, and track fuel use and transactions.

Holding Oil Companies Accountable

Emissions from petroleum fuels in the United States, most of which are used for transportation, exceed those from coal or natural gas (EIA 2020b). And oil companies, aided by their trade associations, have played a major role in funding ongoing climate denial campaigns and efforts to block climate policies for decades (Mulvey and Shulman 2015). In addition to holding them accountable for past harms, it is also important for the oil industry to help pay the cost of transitioning to cleaner transportation fuels.

A clean fuel standard requires oil companies to cover part of the cost of replacing combustion fuels with clean electricity while also spurring them to decarbonize the fuel for internal combustion vehicles. Electric cars and trucks generate credits based on how much they reduce emissions. When oil companies buy these credits, they are helping to cover the costs associated with transitioning the transportation sector away from oil.

To decarbonize the gasoline and diesel used by existing internal combustion vehicles, oil companies can blend low-carbon ethanol, biodiesel, or renewable diesel with petroleum-based fuels, or they can diversify their own operations to produce cleaner fuels. For example, some oil refineries have switched from making petroleum fuels to making renewable diesel. Oil companies can also reduce emissions associated with producing petroleum products, for example by replacing the natural gas used in oil extraction or refining with solar energy or biomethane. Oil companies can also implement carbon capture and sequestration technology to reduce net emissions.

Consumer Transportation Costs and Equity

A clean fuel standard, including the schedule for increased stringency, cost containment mechanisms, and the interaction with other policies, must be managed to accelerate the transition to clean fuels while controlling costs and ensuring that the benefits of cleaner fuels are equitably distributed.

When evaluating the net impact of a clean fuel standard on consumers' transportation costs, it is important to consider total household costs rather than cents per gallon of petroleum fuel. Steadily improving efficiency and moving from petroleum to EVs coupled with investments in public transit

and more walkable neighborhoods can reduce overall consumer transportation costs.

A clean fuel standard makes cleaner fuels more affordable and polluting fuels more expensive. However, existing disparities will be amplified if low-income people are left driving older, inefficient and polluting cars while more affluent people move quickly to EVs. An equitable path to clean fuels and transportation electrification must ensure that that costs are shared equitably and that all communities benefit, especially those historically overburdened by transportation pollution and other impacts (Reichmuth 2019). Specific provisions of a clean fuel standard can help, together with other measures that target support for electrification to disproportionately burdened communities.

Proof of Concept: Clean Fuel Standards Already Delivering Meaningful Reductions

The California Low Carbon Fuel Standard (LCFS), established in 2009, has driven a 70 percent increase in the use of low-CI alternative fuels. While ethanol initially generated the largest share of credits, the largest growth in emissions reductions during the first decade came from bio-based diesel fuels (biodiesel and renewable diesel), biomethane, and electricity (CARB 2020b). The value of LCFS credits for electricity grew to over half a billion dollars in 2019, and over the next decade, this growth should continue as EV use increases (CARB 2020b; CARB 2020c). Provisions enacted in 2018 also allow for carbon capture and sequestration in the fuel supply chain to lower the CI of fuels.

Conclusion

A clean fuel standard creates accountability for global warming pollution by requiring that all transportation fuel producers, starting with the oil industry, contribute to the decarbonization of transportation. It connects a fuel's value to its pollution, driving down emissions from all fuels—from gasoline and diesel to low-carbon alternatives such as electricity and hydrogen. It sets a common standard based on a scientific assessment of the full life cycle CI of each fuel. A clean fuel standard, together with strong pollution standards for vehicle manufacturers, support for transportation electrification and renewable power, and policies that reduce dependence on personal driving, can set us on a course to a clean transportation future.

Jeremy Martin *is director of fuels policy and senior scientist in the UCS Clean Transportation Program.*

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NATIONAL HEADQUARTERS
Two Brattle Square
Cambridge, MA 02138-3780
Phone: (617) 547-5552
Fax: (617) 864-9405

WASHINGTON, DC, OFFICE
1825 K St. NW, Suite 800
Washington, DC 20006-1232
Phone: (202) 223-6133
Fax: (202) 223-6162

WEST COAST OFFICE
500 12th St., Suite 340
Oakland, CA 94607-4087
Phone: (510) 843-1872
Fax: (510) 451-3785

MIDWEST OFFICE
One N. LaSalle St., Suite 1904
Chicago, IL 60602-4064
Phone: (312) 578-1750
Fax: (312) 578-1751

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