

A Low Carbon Fuel Standard for the Eastern United States

Primer for Policy Makers and Advocates

August 2009

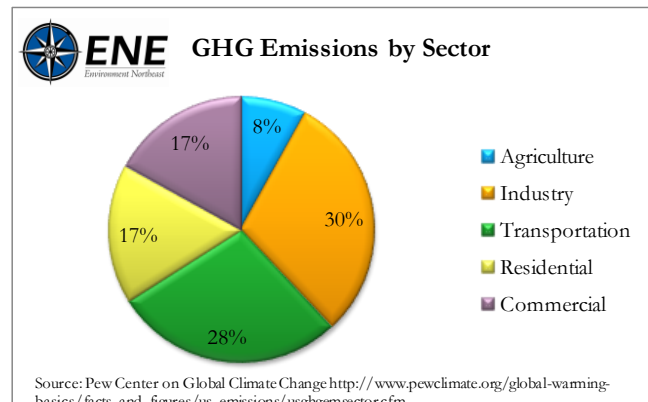


Overview

In December 2008, the 11 states from Pennsylvania to Maine signed a Letter of Intent committing them to develop a framework for a regional Low Carbon Fuel Standard (LCFS). In April 2009, California adopted an LCFS that takes effect in 2011. An LCFS reduces global warming, shrinks reliance on foreign oil, and uses market-mechanisms to transition to more sustainable fuels and economies. This ENE Primer for Policy Makers and Advocates explains the purpose of an LCFS, how it works, how it complements other policies, and the benefits that will result.



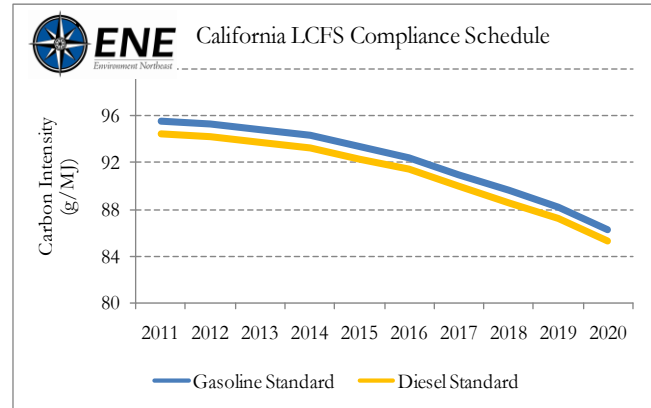
Vehicles in the United States operate almost exclusively on gasoline or diesel fuel derived from petroleum. Our current reliance on a petroleum-fueled transportation system contributes to harmful climate change and air pollution and leaves consumers vulnerable to price shocks from an unstable global energy market. The transportation sector is now the second largest source of U.S. greenhouse gas (GHG) emissions, accounting for 28% of all anthropogenic GHG emissions in the U.S., and nearly 40% in the northeast states.



Strategies to reduce transportation emissions must include: 1) improving vehicle fuel economy; 2) reducing vehicle miles traveled (VMT); and, 3) transitioning to low carbon fuels such as electricity, hydrogen, and advanced biofuels and away from conventionally made gasoline, high carbon ethanol, and petroleum products derived from oil sands. An LCFS will be a critical policy tool to achieve the transition described in the third of these strategies, provided that the LCFS employs robust lifecycle GHG accounting system and sustainability standards.

What is a Low Carbon Fuel Standard?

- An LCFS is a regulation that requires fuel providers to ensure that the mix of fuel they sell does not exceed a standard for GHG emissions. The standard is measured in grams of CO₂ equivalent per unit of fuel energy sold (gCO₂e/MJ). The standard is generally set initially at or just below a “baseline” average of the carbon intensity of gasoline (about 96 g/MJ) or diesel sold in the jurisdiction. Each year, the standard declines. Carbon intensity is measured on a “lifecycle basis,” meaning that all direct and significant indirect emissions from fuel production to consumption are counted.
- Fuel providers must report the total volume of gasoline, diesel or alternative fuel they sell and the carbon intensity of that fuel. The providers must hold enough credits (from lower alternative fuels) at the end of each period (*e.g.*, one year) that the fuel intensity of all fuels they provided, averaged together, does not exceed the standard.
- An LCFS does not “pick winners and losers” through a bias toward any particular fuel or technology, but instead accommodates and encourages the entry of cleaner alternative fuels (and their associated propulsion systems and infrastructure). The transportation sector urgently needs targeted policies to overcome market barriers confronting advanced technologies and low carbon fuels. Electricity, hydrogen and advanced (but not all) biofuels are examples of low carbon transportation fuels that would receive credits for their lower carbon intensity relative to the average for gasoline or diesel fuel. The makers of these low carbon fuels can sell their credits to high carbon fuel producers and importers and use the funds to support activities or investments that reduce or even eliminate market barriers, such as by building new infrastructure or lowering the cost of buying or operating electric vehicles.
- An LCFS discourages the development of high carbon fuel pathways such as liquid coal, oil sands, and high carbon corn ethanol that may reduce our reliance on foreign oil but would continue to increase GHG emissions.



Benefits of a Low Carbon Fuel Standard

- Technology neutral: does not “pick winners” by specifically favoring certain fuels.
- With proper accounting and sustainability standards, will discourage use of high carbon corn ethanol and petroleum products derived from oil sands.
- Creates a growing market for low carbon fuels.
- Uses a flexible and extended phase-in time to allow for the development of low carbon fuels and infrastructure.
- Increases regional energy independence and builds sustainable economies and communities.

Who has adopted or is considering an LCFS?

The California LCFS: In April 2009, the California Air Resources Board adopted a regulation to implement an LCFS in 2011 and reduce the carbon intensity of transportation fuels 10% by 2020. The CA LCFS is projected to result in a reduction of roughly 16 million metric tons of global warming pollution.

See details of the CA process, analysis and full text of the regulation at:

<http://www.arb.ca.gov/fuels/lcfs/lcfs.htm>

An eastern regional LCFS: In December 2008, officials from 11 eastern states signed a Letter of Intent to craft a regional LCFS.¹ The Letter of Intent committed these states to draft a Memorandum of Understanding (MOU) on the development of a regional LCFS by December of 2009 or as soon thereafter as possible.

See states' Letter of Intent to establish an eastern regional LCFS at:

<http://www.env-ne.org/resources/open/p/id/893>

Significant research and program design have begun. It is anticipated that the eastern LCFS will be broadly compatible with California's LCFS, but it will account for unique regional circumstances such as local emissions factors for electricity, and differences in fuel transportation and distribution infrastructure.

In July, 2009, Northeast States Center for a Clean Air Future published extensive analysis and findings in its report, *Introducing a Low Carbon Fuel Standard in the Northeast: Technical and Policy Considerations*, available at:

<http://www.nescaum.org/documents/lcfs-report-final.pdf>

The 11 states' commitment to develop an LCFS represents an important advance for the region's efforts to combat global warming, and is a key companion piece to the Regional Greenhouse Gas Initiative (RGGI) that requires GHG emission reductions in the utility sector. A LCFS on par with California's could reduce GHG intensity in the northeast and mid-Atlantic regions by 10% over 10 years, making a significant contribution to reducing GHG emissions from the transportation sector.

A federal LCFS: The federal climate bill (*American Clean Energy and Security Act of 2009* or ACES) currently does not include an LCFS provision. The legislation also does not allocate carbon allowances to low carbon fuel producers, which means less funding will be available to address market barriers for these fuels. Moreover, in the negotiating process for ACES, indirect land use change impacts were exempted from the lifecycle GHG accounting of biofuels delivered under the U.S. Environmental Protection Agency's (EPA) emerging Renewable Fuel Standard. (See more below.)

Why is indirect land use change important?

To be effective, an LCFS must account for indirect land use change (ILUC) impacts – the GHG emission impacts that occur when biofuel crops replace forestlands or push food crops to be cultivated on previously undisturbed land.

Recent scientific studies have cast doubt on the ability of certain pathways for production of biofuels, such as corn ethanol, to reduce greenhouse gas emissions when compared to fossil fuels. Devoting large areas of land to biofuels production can displace crop production and

¹ The 11 states include each state participating in the Regional Greenhouse Gas Initiative (CT, DE, MA, MD, ME, NH, NJ, NY, RI, VT) as well as PA.

raise food prices.² This may lead to either the clearing of forest and grassland for crops, or increased cultivation of marginal agricultural lands that would otherwise have been allowed to revert back to forest or grasslands. Because forest and grasslands store more carbon than cleared or cultivated land, these conversions result in large releases of greenhouse gases and reduce the future carbon sequestration potential of those lands.

Research shows that although cellulosic ethanol³ could reduce greenhouse gas emissions as much as 88% compared to a gallon of gasoline,⁴ conventional production of corn ethanol that results in the conversion of forests and grasslands to new cropland can *increase* net greenhouse gas emissions.⁵

A number of recent studies look at this issue in some detail. One study published in *Science*, done in cooperation with The Nature Conservancy and the University of Minnesota, found that the increase in GHG emissions from large-scale cultivation of biofuels in the tropics is 17 to 420 times greater than the GHG reductions these biofuels could provide by displacing fossil fuels.⁶ A second study found that replacing fossil fuels with corn ethanol would double GHG emissions over 30 years.⁷ EPA analyses also found that certain biofuels increase GHG emissions over both 30-year and 100-year timeframes, compared to fossil fuels.⁸

The California Air Resources Board (CARB) conducted its own modeling, and established “carbon intensity values” for different fuels and “pathways” for producing those fuels. The values include ILUC emissions values that are significant and yet considered by some to be very conservative. When indirect land use impacts were calculated, the estimated carbon intensity values of corn ethanol for several pathways of production, including the representative “Midwest Average,” actually exceeded the total carbon emissions for fossil fuels. (By comparison, both Searchinger and EPA estimates place the indirect emissions at much higher levels than CARB).



Photo Credit: www.theautochannel.com

² The Congressional Budget Office estimates that increased use of ethanol accounted for 10-15% of the rise in food prices from 2007-2008, and will account for a \$600-\$900 million increase in the cost of 2009 federal nutrition programs. “The Impacts of Ethanol Use on Food Prices and Greenhouse Gas emissions,” Congressional Budget Office, April 2009. The *Wall Street Journal* estimated that this also translates into \$5.5 - \$8.8 billion in higher grocery bills for U.S. consumers during that period. <http://online.wsj.com/article/SB124389966385274413.html>

³ The federal definition of “cellulosic ethanol” provides that the ethanol is derived from renewable biomass materials including: planted crops and crop residue from land that was already cleared and used for agriculture; planted trees and tree residue from tree plantations on non-federal, previously cleared land; animal waste material and animal byproducts; slash and pre-commercial thinnings from non-federal forestlands; biomass cleared from lands for the sole purpose of protecting against the risk of wildfire; algae; and separated yard waste or food waste.

⁴ A.E. Farrell et al, 2006, “Ethanol Can Contribute to Energy and Environmental Goals,” *Science* V.311(506-508).

⁵ T. Searchinger et al., 2008, “Use of U.S. Croplands for Biofuels Increases Greenhouse Gases through Emissions from Land-Use Change,” *Science* Vol. 319 (1238-1237).

⁶ J. Fargione et al, 2008. “Land Clearing and the Biofuel Carbon Debt,” *Science* (10.1126/science.1152747).

⁷ T. Searchinger 2008.

⁸ <http://www.epa.gov/oms/renewablefuels/420f09024.htm>

The table below presents is an excerpt of CARB’s “Lookup Table” for carbon intensity values:

Adjusted Carbon Intensity Values for Gasoline and Fuels that Substitute for Gasoline

Fuel	Pathway Description	Direct Emissions	Indirect Emissions from Land Use and other Effects	Total
Gasoline	CARBOB	95.86	0	95.86
	CaRFG-CARBOB (100% average Midwest ethanol to meet 10% ethanol by volume)	96.09	--	96.09
Ethanol	Midwest average	69.4	30	99.4
	California	50.7	30	80.7
	80% Midwest/20% California	65.66	30	95.55
	Brazilian sugarcane	27.40	46	73.40
Electricity	California average mix	124.10	0	41.37 ¹
	California marginal mix of natural gas & renewable energy	104.10	0	34.90 ¹
Hydrogen	Compressed H2 from central reforming of NG	142.40	0	61.83 ²
	Liquid H2 from central reforming of NG	133.0	0	57.83 ²

¹ Adjusted by an EER factor of 3.0 to account for power train efficiency improvements over gasoline engines.
² Adjusted by an EER factor of 2.3 to account for power train efficiency improvements over gasoline engines.

By these measures, increased production of or reliance on corn ethanol would not help move the region toward GHG emissions reductions. There are, however, biofuels that can make a positive difference in the fight against global warming, and these biofuels would be rewarded in a market-driven LCFS. Biofuels made from waste biomass or from abandoned agricultural lands planted with perennial crops offer immediate and sustained GHG benefits, and ethanol made from sugarcane can also reduce emissions.⁹

What is the difference between the Renewable Fuel Standard (RFS) and the LCFS?

In the Energy Policy Act of 2005, Congress directed EPA to design a program that requires the blending of renewable fuels into the country’s transportation fuel supply. Known as the Renewable Fuel Standard (RFS), this program focuses exclusively on biofuels and requires increasing the percentage of biofuel content in gasoline every year.¹⁰ In support of this quota, Congress also subsidizes the domestic biofuels industry, which receives a \$0.45 tax credit for each gallon of ethanol produced (costing taxpayers about \$3 billion per year), while levying tariffs on Brazilian and Caribbean ethanol.¹¹

Although the original RFS spurred the growth of domestic biofuels, it did not require reduction of GHG emissions. The Energy Independence and Security Act (EISA) of 2007 added new GHG emission thresholds and required EPA to consider lifecycle emissions

⁹ A.E. Farrell 2006; *See also* CA chart in text.

¹⁰ The volume standard for 2010 is 12.95 billion gallons. The required volume continues to increase over time, eventually reaching 20.5 billion gallons in 2015. The 2007 law requires specific increases for four different types of biofuels. Cellulosic ethanol and advanced biofuels must make up 23% and 26% of the total standard in 2010 and 2015, respectively.

¹¹ Congressional Budget Office, April 2009

including, “direct emissions and significant indirect emissions such as significant emissions from land use changes.”

As the first federal law requiring greenhouse gas reductions in the transportation sector, EISA set an important precedent for biofuels. However, as noted above, 2009 negotiations on the ACES bill introduced a moratorium on EPA’s accounting for ILUC emissions. Absent a change, the effect of the federal RFS will be an increase in GHG emissions.

Why is an eastern regional LCFS necessary?

An eastern regional LCFS is vitally important so that the northeastern and mid-Atlantic states may continue to implement innovative and effective strategies to reduce the GHG pollution they produce. An eastern LCFS will be a powerful companion regulation to RGGI – the first cap and trade utility emissions reduction program in the country – and it will help build a sustainable economy and energy future for our region and our local communities.

A market-driven LCFS approach will provide financial incentives for advanced biofuels and other innovative solutions, such as electricity, which shows increasing promise as a low carbon transportation fuel. An eastern LCFS will create a revenue stream that accrues directly to the businesses in the region seeking to develop and deploy such solutions. The businesses can use the revenue to address the market barriers they face.



As broader federal policies take effect to reduce GHG in the transportation sector, whether in the form of a federal LCFS or some other tool, states that have moved ahead through participation in a regional LCFS will have the advantage of established, low carbon fuel and vehicle supply chains and infrastructure.

Adoption of an eastern regional LCFS will also establish a precedent for ensuring integrity in the full lifecycle accounting of biofuels and sustainability standards. In so doing, it will help to advance adoption of a robust federal LCFS and demonstrate how to remedy aspects of the federal carbon cap and trade legislation (and federal RFS) that might fall short of or delay what is needed to achieve carbon reductions from the transportation sector.

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