

Background Material

Low Carbon Fuel Standards in Other Areas

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State of Oregon
Department of
Environmental
Quality

California

In April 2009, California became the first state in the nation to adopt a Low Carbon Fuel Standard (LCFS). The new regulations are based on a study conducted by Alexander Ferrell of the University of California (UC) Berkeley and Daniel Sperling of UC Irvine.¹ The study found that a LCFS would stimulate innovation in the production of transportation fuels which is essential to achieving long-term climate stabilization.

The rules adopted by the California Air Resources Board (CARB) require fuel providers to reduce the average *carbon intensity* of gasoline and diesel fuel 10% by the year 2020. The LCFS does not limit the amount of fuel used. The program establishes average carbon intensity values for various fuel *pathways* such as gasoline, diesel, biofuels, natural gas, and electricity. Carbon intensity is calculated on the basis of a life-cycle analysis which accounts for all carbon emissions associated with a fuel's production, distribution and use—as opposed to a simple measure of the amount of carbon emitted when a fuel is burned. Because greenhouse gases caused by fuels differ in the degree of global warming they produce, carbon intensity is expressed as carbon dioxide equivalent per unit of fuel energy or CO₂e/Mega Joule. This standard unit of measurement also provides a way to compare liquid fuels with different energy content per gallon, e.g. gasoline and ethanol, and to compare liquid fuels to alternative fuels which are delivered in different formats, like compressed natural gas or electricity.

CARB's LCFS is a market-based program that offers fuel providers flexibility in the way they meet their carbon reduction targets. They can reduce the carbon intensity of the fuels they produce by increasing their use of low carbon ethanol, and low carbon biodiesel or by acquiring credits from providers of low carbon alternatives including electricity and compressed natural gas. The regulations allow surplus credits accumulated in one year to be banked and used in future compliance periods. The rules also allow fuel providers to establish custom carbon intensity values for their fuels if they can demonstrate the carbon intensity of their feedstock, production process, and transportation system is significantly lower than the industry average.

California's rules adjust the carbon intensity values of biofuels to compensate for the greenhouse gases generated by indirect land use changes caused by the new regulations. These adjustments acknowledge the greenhouse gases that are released when crops grown to produce biofuels indirectly lead to changes like deforestation to bring new land into cultivation or more intensive cultivation on existing agricultural land. The rules also make adjustments for drive train efficiency through the use of Energy Economy Ratios (EER). That adjustment allows the rules to reflect the differences between drive train technologies including the three-fold greater efficiency that electric motors have compared to internal combustion engines.

The new regulations attempt to be fuel-neutral in that all fuels are rated according to their effect on greenhouse gas emissions. However, the different carbon intensities of different fuel pathways suggest

¹ The study is available at http://www.arb.ca.gov/fuels/lcfs/lcfs_uc_p1.pdf and http://www.arb.ca.gov/fuels/lcfs/lcfs_uc_p2.pdf.

the LCFS will stimulate substantial increases in the use of advanced biofuels, electricity and natural gas for transportation.

California considered the cost effectiveness of the LCFS regulation, and found that it will achieve cost-effective greenhouse gas emission reductions. California estimates the economic effect of the LCFS to range from zero to a savings of \$0.08 per gallon.

Northeast States

Northeast and Mid-Atlantic States² are developing a LCFS for transportation fuels to be applied throughout the region. Working through the Northeast States Center for a Clean Air Future (NESCCAF), participants are developing a Memorandum of Understanding to be completed by the end of 2009 that will recommend how a LCFS may be implemented.

The approach being assessed by these states may include some requirements for home heating oil such as recordkeeping and reporting. Heating oil is being considered because it is prevalent in the region and because its similarity with diesel fuel allows the potential for fuel providers to engage in fuel switching. This group is also expected to adjust the carbon intensity of biofuels to offset increased greenhouse gas emissions due to indirect land use changes.

NESCCAF has evaluated technical and policy considerations of a LCFS and reported their findings in July 2009.³ The report concluded that a regional LCFS was feasible but would involve substantial changes in the markets for both vehicles and fuels. NESCCAF anticipates a LCFS would discourage the use of petroleum from tar sands and fuel from coal gasification, while stimulating the use of biofuels as well as electricity and hydrogen from renewable sources.

Washington State

Governor Christine Gregoire issued an Executive Order in May, 2009 directing the Department of Ecology to investigate whether a LCFS should be adopted to meet Washington's greenhouse gas emissions goals.⁴ To that end, Washington will conduct a series of public workshops from October, 2009 through June 2010 to discuss low carbon fuel issues with knowledgeable or potentially regulated parties. The department will report their recommendations to the Governor by July, 2010.

US Renewable Fuel Standard No. 2

While not a LCFS, the US EPA has proposed modifications to their existing renewable fuels program that would add greenhouse gas considerations to the regulation's requirements. The rule changes are mandated by the Energy Independence and Security Act of 2007 and would require fuel providers to increase the use of renewable fuels from 9 billion gallons in 2008 to 36 billion gallons in 2022. Of the 36 billion gallon total, 16 billion gallons must be cellulosic ethanol (ethanol derived from woody sources). In addition, renewable fuels must include increasing amounts of *advanced biofuels* that are not produced from corn and have life-cycle greenhouse gas emissions that are less than half the greenhouse gas emissions of gasoline or diesel fuel. The proposal would also make adjustments to the

² Participating states are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island and Vermont.

³ The NESCCAF report is available online at:

http://www.eenews.net/public/25/12072/features/documents/2009/08/10/document_cw_02.pdf

⁴ Additional information is available at: <http://www.ecy.wa.gov/climatechange/fuelstandards.htm>

carbon intensity of renewable fuels for the increased greenhouse gas emissions caused by indirect land use changes.

This regulation differs from LCFS regulations because it applies only to fuels from renewable sources. It does not affect or stimulate the development of other promising new alternatives including electricity, compressed natural gas, liquid natural gas or hydrogen. Information about the proposed standard is available online.⁵

European Union

European nations adopted changes to Fuel Quality Directive 98/70/EC in December 2008. The non-binding modifications aim to reduce the life-cycle greenhouse gas emissions per unit of fuel energy of transportation fuels by 10% from 2011 to 2020. At least six percent of the reduction should come from wider use of biofuels and alternative fuels, along with reductions in venting and flaring during petroleum production. An additional 2% reduction may be achieved through Carbon Capture and Sequestration, while a further 2% may come from offset purchases under the Clean Development Mechanism. The European Union is studying the potential effects of indirect land use changes and will report their findings to the European Parliament by the end of 2010.

Western and Midwest States

States participating in the Western Climate Initiative and the Midwestern Greenhouse Gas Accord are considering LCFS regulations as a complement to their proposed cap and trade programs, and have initiated conversations to explore the possible benefits from both intra-regional and multi-regional cooperation (along with the Northeastern and Mid-Atlantic states, mentioned above).

⁵ Information on EPA's Renewable Fuel Standard is at: <http://www.epa.gov/oms/renewablefuels/>