

# On Designing and Analyzing Policies for Renewable Fuels

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Federal and state policies to reduce greenhouse gas emissions from the transportation sector have been focused on making use of many alternatives to increase the use of cleaner, more renewable inputs in production in recent years while avoiding the politically infeasible option of taxation. Many of the policies currently implemented and being proposed on a national level involve some variant of a mandate with the option for flexibility by allowing firms to generate and purchase credits for over- or under-consumption of clean inputs.

The two most prominent policy options currently implemented in the U.S. are the renewable fuels standard (RFS) and the California Low Carbon Fuels Standard (LCFS). The RFS was established by the Energy Policy Act of 2005 and expanded by the Energy Independence and Security Act of 2007, and establishes fixed amounts of ethanol to be blended into the U.S. gasoline supply. For 2012, the Environmental Protection Agency (EPA), the agency which administers the program, has required that 15.2 billion gallons of

renewable fuel be blended into the U.S. gasoline supply. This represents just under 10% of projected fuel supply for the U.S. transportation sector. This amount is set to increase significantly, reaching a goal of 36 billion gallons by 2022.

The LCFS, in contrast, is a mandate on the carbon emissions of output per unit of input. Thus, the fuel refining and blending industry in California is required to

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*The opinions in this article are presented in the spirit of spurring discussion and reflect those of the authors and not necessarily the Controller or his office.*

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reduce the weighted average of their carbon emissions rate by an increasing amount, set to reach a 10% reduction in California's carbon intensity by 2020. Currently, several proponents of the LCFS are proposing a national standard to either replace or complement the RFS. The key debate between the two policies is the favoritism of the RFS to ethanol. Proponents of the LCFS favor the program due to the fact that it does not specify which fuels must be used in meeting the standard.

The debate, however, does not focus on the relative efficiency of the standards, or of other possible standards. A policy is economically efficient if it maximizes the welfare, or total net benefits (which are total benefits net of total costs), to firms and consumers. Comparing the relative efficiencies of different policies, which requires comparing relative benefits and costs of different policies, becomes important to any analysis, and should be a part of the national debate.

A common feature among input mandate programs is the inclusion of credit trading programs in which firms which use more of the clean input in a given year receive credits for their overproduction which they can then sell to firms which cannot meet the mandate as easily. The inclusion of credit trading programs is motivated by the literature on permit and credit trading for pollution markets. Under a credit trading scheme, firms receive credits for any pollution reduction beyond the mandated amount, which they can trade with other firms.

In ongoing research with my Ph.D. student Gabriel Lade, we are developing and simulating a model to analyze the efficiency and cost-effectiveness of various policy instruments that mandate clean input use by firms, including those that allow for firms to trade credits, in order to design as efficient and cost-effective a renewable input mandate policy as possible. We are applying the model to the RFS and LCFS.

A key 'take-away' from our research thus far is to recognize that how a mandate is phrased has an important effect on the efficiency, or total net benefits, of the policy. Currently, several proponents of the LCFS are proposing a national standard to either replace or complement the RFS. A key argument in favor of the LCFS is that the RFS supports only ethanol as the qualifying renewable fuel. Proponents of the LCFS argue that it does not specify the fuel required to meet standard and aligns the incentives for refiners and

blenders to meet their carbon reduction requirements through a menu of alternative fuel options. It is important in the policy debate to make use of standard economic model in evaluating the efficiency (and therefore the benefits and costs) of these policies as the discussion moves forward.

Our research is significant because many policies currently implemented or being proposed at national and state levels to reduce greenhouse gas emissions from the transportation sector involve some form of a renewable input mandate since such policies have the potential for increasing the use of cleaner, more renewable inputs in production while avoiding the politically infeasible option of taxation. It is therefore important to develop theoretical and empirical models to analyze the efficiency and cost-effectiveness of renewable input mandate policies and to design as efficient and cost-effective a renewable input mandate policy as possible.

<b>California Economic Snapshot</b>		
<b>New Auto Registrations</b> (3rd Quarter)	<b>311,542</b> 2011	<b>418,086</b> 2012
<b>Median Home Price</b> (for Single-Family Homes)	<b>\$240,000</b> In October 2011	<b>\$285,000</b> In October 2012
<b>Single-Family Home Sales</b>	<b>34,087</b> In October 2011	<b>39,254</b> In October 2012
<b>Foreclosures Initiated</b> (Notices of Default)	<b>16,935</b> In October 2011	<b>13,585</b> In October 2012
<b>Total State Employment</b> (Seasonally Adjusted)	<b>16,399,000</b> In October 2011	<b>16,641,000</b> In October 2012
<b>Newly Permitted Residential (Single and Multifamily) Units</b> (Annualized)	<b>33,120</b> In July 2011	<b>60,533</b> In July 2012
Data Sources: New Car Dealers Association, DataQuick, California Employment Development Department, Census Bureau, State Department of Finance, Foreclosure Radar		