Low Carbon Fuel Standard Issue Brief:

A Comprehensive Analysis of Current Research and Outlook for the Future
INTRODUCTION

The world’s first Low Carbon Fuel Standard (LCFS) mandate was enacted in January 2007 by Executive Order of California Governor Arnold Schwarzenegger to reduce carbon intensity in transportation fuels as part of an overall strategy to reduce greenhouse gas emissions (GHG) to meet the requirements of AB 32. California’s LCFS reduction targets represent about 15-20% of overall AB 32 GHG reduction targets.

Supporters view the LCFS as a technology-forcing policy designed to target greenhouse gas emission reductions and advance climate policy objectives in the transportation sector specifically, rather than broader climate change policies such as carbon taxes or cap-and-trade programs. The LCFS does not require specific volumes of any fuel, and fuel suppliers have flexibility to choose the most cost-effective, efficient compliance options. Skeptics view the LCFS as infeasible in its current form due to supply constraints leading to much higher fuel costs and resulting negative impacts to jobs and the California economy. For California consumers, business, and the California economy, the LCFS does more harm than good.

The main purpose of California’s LCFS is to decrease carbon dioxide emissions associated with transportation fuels by defining carbon-intensity standards that suppliers must achieve across all fuels they provide to the market. These reductions include not only tailpipe emissions but also all other associated emissions from production, distribution and use of transport fuels, considering the entire life cycle (“well to wheels” or “seeds to wheels”), in order to reduce the carbon footprint of transportation fuels. The LCFS directive calls for a reduction of at least 10 percent in the carbon intensity of California’s transportation fuels by 2020. LCFS targets are back loaded in terms of mandated carbon reductions in the California fuel supply, starting slowly and ramping up quickly starting in 2015.

The LCFS is aimed at:

- Reducing the state’s dependence on petroleum
- Reducing carbon dioxide emissions from the transportation sector
- Creating a market for clean transportation technology
- Stimulating the production and use of alternative, low-carbon fuels in California
- Creation of “green jobs”

The California Air Resources Board’s (CARB) is responsible for developing implementation plans, rulemaking, and timelines to apply the LCFS. The CARB board adopted LCFS regulations in April 2009 and continues to administer and review the program by convening workgroups, developing LCFS reporting tools, monitoring and regulating the program, and researching and assessing various aspects of the LCFS plan.

Variations of the LCFS policy have also been adopted by the European Union (Fuel Quality Directive) and British Columbia (Renewable and Low-Carbon Fuel Requirement Regulation).
Twenty-two other U.S. states are in the process of considering or developing similar LCFS policy standards, including states in the Midwest, the Northeast/Mid-Atlantic region, and the states of Oregon and Washington.

Most recently, the U.S. District Court in Fresno ruled that the California LCFS was unconstitutional because it violates the Commerce Clause of the U.S. Constitution. U.S. District Judge Lawrence O’Neill in Fresno, California denied the CARB’s motion on January 24, 2012 to stay a decision he issued on December 29, 2011 halting implementation of the Low Carbon Fuel Standard. Judge O’Neil ruled that California’s LCFS discriminates against interstate commerce when it assigns a higher carbon intensity score to ethanol produced in the Midwest over the identical ethanol produced in California. On April 23, 2012, the Ninth Circuit granted CARB’s motion for a stay of the injunction while it continues to consider CARB’s appeal of the lower court’s decision.

As California’s LCFS is being looked upon and referenced by many supporters as a potential model for a national LCFS, understanding the true impacts of California’s LCFS from a California fuel user perspective may be a helpful guide to understanding the potential effect of a national standard, including lessons learned from California’s LCFS experience so far, potential ramifications to fuel supply and cost, and/or unintended consequences. Most agree that the success or failure of the California LCFS hinges on the feasibility of implementation, especially impacts on fuel supply, and the true costs associated with the program, including fuel costs and impacts on economic growth and job creation.

Recently, several research organizations and industry groups have studied and reported on potential impacts of the LCFS from a variety of geographical perspectives, including a national LCFS, regional LCFS such as the Northeast-Mid Atlantic region, and California’s LCFS. The goal of this issue brief is to review and highlight, using a balanced approach, the best and most recently available research and analysis on all sides of the LCFS issue to consider whether this policy and its implementation schedule are on the right track or should be reconsidered in light of the recently released research reports. This issue brief aims to analyze the work of respective research organizations on LCFS impacts, and, in this report, presented the information as plainly, and in as fair and balanced a manner, as possible.

This report is designed to assist policymakers, elected officials, business leaders, and the general public in understanding the range of most recent and best available LCFS research in a transparent, balanced manner.

This issue brief will be framed by the following issues and questions regarding the LCFS from the fuel user’s perspective:

1. What are the impacts of the LCFS on California fuel users?
   a. What impacts will the LCFS as proposed have on California’s fuel supply?
   b. Will the LCFS as proposed cause higher fuel costs?

2. What are the potential impacts of the LCFS both positive and negative, to:
   a. Overall economic growth in California
   b. Job Creation and employment impacts in California

3. Overall, is the LCFS feasible as currently framed?
LCFS supporters cite the LCFS as a promising tool to make a better California: cleaner, more efficient fuels, leading to a healthier environment, a more robust economy, less dependence on foreign oil, supporting California’s belief in the value of inspiring innovation and progress by encouraging development of alternative fuels, spurring new technological advances, investing in the future, and paving the path as responsible world leaders.

The LCFS was specifically designed on the following underlying premises and intentions:

- **Technology neutrality** – the LCFS is not prescriptive with regard to compliance pathways, there is no “one size fits all” and no mandates for any particular fuel or technology and as such the LCFS does not attempt to pick winners or losers.

- **The intent of harnessing market forces through performance targets and credit trading, and currently LCFS credits are being generated that can be used for future compliance obligations and this is an integral part of the flexible nature of the LCFS.**

- **Providing industry with flexibility** – the LCFS is a performance-based standard – many options, scenarios, and pathways exist for complying with the standard and fuel suppliers are free to employ any combination of strategies that suits their particular circumstances and perspectives – including the purchase of credits from other companies.

- **Foster innovation, technological, process, and market development of low-carbon transportation fuels.**

- **Stimulate investment in new fuels and green technologies leading to job creation.**

- **Help level the playing field for alternative fuels by ensuring that fuel providers invest in these fuels.**

In short, the LCFS is an ambitious, first-of-its-kind policy, but as designed by CARB the regulation will not be effective, economically efficient, and implementable.
However, early into the implementation of the LCFS, many stakeholders and LCFS skeptics have concluded that California’s LCFS is unrealistic and likely to become infeasible and unworkable well before the 2020 compliance date because the LCFS technology is unproven and experimental, LCFS fuels will be too costly and lead to economic loss, and the LCFS timeline is too aggressive. They believe that there are already strong indications that the LCFS is neither cost-effective nor feasible as currently being implemented, and that the current projected timeline is unrealistic and infeasible, primarily due to concerns about fuel supply, fuel cost, as well as projected negative economic impacts. Coupled with the realities of the projected alternative fuels market, those concerned believe the LCFS pushes the California fuel supply system past the maximum availability of low carbon fuels during the current regulatory timeline, leading to supply constraints and significantly higher fuel prices. These higher costs and supply risks will translate into lower economic activity, job losses, and lower tax revenues, harmful to the California economy just started attempting to recover from a severe recession.

These concerns have been magnified in view of recent reports and analyses by several respected research organizations such as Boston Consulting Group, Charles River Associates, Science Applications International Corporation, academic experts, and others which have separately and independently studied the LCFS and related AB 32 programs and come to the conclusion that the LCFS will:

- Put California at risk because LCFS technology needed to comply by 2020 is currently undeveloped, therefore experimental and unproven. There is no certainty that low-carbon fuels will be ready to meet demands within the current LCFS timeline

- Most alternative fuels have real technological, market, and practical challenges to the kind of full-scale adoption outlined in the current LCFS timelines and targets

- Generate significant supply issues because of the lack of a sufficient supply of alternative fuels

- Raise already high California fuel prices significantly

- Cut economic growth

- Cost California jobs

- Lead to lower state and local tax revenues

- Increase the cost-of-doing-business in California at a time when the state’s economic recovery is fragile and the state’s business competitiveness is in question
WHO’S INVOLVED?

This issue brief will review and analyze reports and materials developed by or for the following references:


California Energy Commission (CEC):


University of California, Davis – Institute for Transportation Studies (UC DAVIS-ITS):

Yeh, Sonia, Sperling, Daniel, Batka, Miroslav, Griffin, Michael, Heres, David R, Huang, Haixiao, Khanna, Madhu, Kocoloski, Matt, Leiby, Paul, Mishra, Gouri Shankar, Msangi, Siwa, Mullins, Kimberle R., Onal, Hayri, Parker, Nathan C., Rhodes, James, Rubin, Jonathan, Venkatesh, Aranya, Witcover, Julie and Yang, Christopher, “National Low Carbon Fuel
SUPPLY
What impacts will the LCFS have on California’s Fuel Supply?

Much of the current discussion regarding the costs and ultimate feasibility associated with California’s LCFS revolve around differing estimates of low-carbon fuel supply and availability projections versus the current LCFS compliance timelines and targets.

CARB’s latest LCFS program review (Low Carbon Fuel Standard 2011 Program Review Report) concludes that “supply is not currently an issue” and that there will be a sufficient amount of low carbon fuel available to meet projected demand and comply with the LCFS targets. This conclusion is based upon several factors, including:

- A net surplus of LCFS credits in 2011
- Because the LCFS as designed does not require specific volumes of any fuels, stakeholders have various plausible options to meet LCFS targets/obligations
- That the LCFS in combination with other policies such as the Renewable Fuel Standard (RFS2) will increase the amount and supply of low carbon fuels such as sugarcane and cellulosic ethanol, biodiesel, renewable diesel, and other biofuels and renewable fuels in California, with a corresponding decrease in petroleum as a transportation fuel
- That the advanced biofuel industry is receiving new sufficient investment to drive innovation and process improvements

However, CARB’s LCFS program review report also concludes that:

- It is not possible to entirely accurately predict the impact that LCFS will have on state fuel supplies
- There is concern amongst stakeholders regarding LCFS fuel supply issues, especially as the LCFS targets ramp up over time
- That the answers to concerns about supply depend almost entirely on projections about the likelihood of future development of alternative fuels from such diverse perspectives as economic, technology advancement, production process advancement, and scaling up of production facilities to produce fuel in the quantities necessary to meet the LCFS targets, each of which are subject to several factors and assumptions occurring:
  - Technology and production process innovations must continue to advance at increasingly rapid rates
  - Production capacity must be scaled up to supply the needed volumes of low-carbon fuel, requiring more new capital investment
  - Current and future government actions such as fuel standards, tax credits, subsidies, and
related policies must assist and be complementary to the California LCFS

- In order to continue technology innovation and development of production capacity, more investment in low-carbon biofuels will be necessary to produce the higher volumes associated with the increased LCFS targets that occur over time through 2020. According to CARB, this investment can come from either the government or private sector.

- Future estimates about the cost and availability of conventional transportation fuels such as gasoline and diesel are important factors. Abundant supplies and low costs of traditional transportation fuels will make low-carbon fuels more expensive in comparison, while shortages of conventional fuels will make them more expensive, making low-carbon fuels more cost-competitive.

In short, to meet CARB’s LCFS fuel supply estimates and projections, the LCFS design as a “forcing” policy requires positive outcomes regarding a number of factors, including:

- Continuing advancements in LCFS technology, innovation, and new production processes
- Expanding capital investments in LCFS innovation and production capacity
- Efficient market development for LCFS fuel and credits

In order to meet the LCFS targets by 2020, positive developments need to occur in each of these sectors. CARB, in their 2011 LCFS program review, is optimistic about the outcome of each of these issues as it relates to the LCFS. CARB states that the LCFS regulation itself has been the driving force in spurring private investments made to date, but that more investments will be necessary in order to enable low-carbon fuels to be produced at the high volumes needed to meet the LCFS targets through 2020 as currently proposed. CARB and other LCFS supporters are confident that the “forcing factors” and assumptions built into the LCFS will create positive advancements and increasing levels of investment will occur within the current proposed LCFS timelines.

However, this very “forcing” nature fundamental to the LCFS framework and associated timeline has created uncertainty and concern amongst both California fuel suppliers and fuel consumers in terms of their varying projections and estimations about the realistic likelihood of positive outcomes to each of these “forcing” issues highlighted above. While technology neutral, LCFS is inherently premised on stimulating innovation and driving costs lower through new technology, processes, innovations, and production and distribution systems. Each of these will likely require significant additional innovation, technology, and increasing new investments beyond the current state of affairs. Therefore many stakeholders are concerned as to whether there will be a sufficient amount of low carbon fuel available to meet projected demand under the LCFS. Much of the concern is due to the LCFS’s assumption that technological advancement will have developed enough to provide the necessary amount of low carbon fuel needed to comply with the LCFS and provide for demand by California fuel consumers.

Recent Studies Question LCFS Supply Assumptions and Projections
Several recent research studies and reports have explored the LCFS’s program assumptions, pathways, and timelines and come to very different conclusions regarding the LCFS’s impact on fuel supply, challenging some of the assumptions built into the LCFS program and citing that several LCFS assumptions do not currently appear to be reasonable. Most of the reports analyzing the LCFS estimate that there is a currently a very limited supply of biofuels in California, and that the production of biofuel would have to greatly increase in very short order in order to comply with regulations. Most recent studies conclude that there will not be enough low carbon fuel supplies to comply with
the LCFS’s reduction goals by as early as 2014-2015. For example, the Charles River Associates (CRA) report “Economic and Energy Impacts Resulting from a National Low-Carbon Fuel Standard,” estimates that alternative fuels will be in limited supplies even into the 2020’s, and states that implementation of LCFS will strain the current supplies of alternative fuel to their absolute maximum. CRA’s model is based off of the implementation of a nationwide LCFS program that would begin in 2015 and take 10 years to be fully implemented. This program model assumes a 10% reduction in the carbon intensity of transportation fuels relative to the base year. The article assumes a decrease in fuel supply due to the inability to provide enough ethanol to bring fuel mixtures to the 10% carbon reduction goal. Based on CRA’s, a national LCFS would create a deficit of 4-5.8 million barrels per day.

Charles River states “it is fair to say that by the year 2025, it is impossible to bring to market sufficient quantities of new fuels with sufficiently low-emission factors to meet the low carbon fuel standard without reducing the total amount of transportation fuel consumed,” and describes the standard as “a policy that in effect rations gasoline until the required improvement in emissions per gallon is met.”

The Consumer Energy Alliance/SAIC (CEA/SAIC) report, “Analysis of the Economic Impact of a Regional Low Carbon Fuel Standard on Northeast/Mid-Atlantic States,” using assumptions identical to those used in the California LCFS, finds that despite best efforts, an LCFS for the Northeast/Mid-Atlantic States region if started in 2012 would fall well short of the 10 percent carbon-reduction goal by the year 2021, reaching only 4.9% in the most aggressive scenario, and with reaching only 7.1% even by 2035.

Similarly, Boston Consulting Group’s (BCG) report “Understanding the Impact of AB 32” finds that, due to a lack of commercially available cellulosic ethanol and limited available quantities of low carbon-intensity sugarcane ethanol, California’s LCFS is unlikely to be able to be implemented by the second compliance period. This will result in refineries exporting their fuels to avoid penalties due to their inability to comply with regulations, eventually causing a shortage as early as 2015 in the first compliance period. After 2015, the second compliance period will create tighter regulations, likely resulting in the closure of 4-6 refineries; representing 20-30% of California’s refining capacity. In the third compliance period when LCFS measures are fully implemented, it will result in the closure of an additional 1-2 refineries; representing an additional reduction in 5-10% of California’s refining capacity.

In “The Fiscal and Economic Impact of the California Global Warming Solutions Act of 2006,” by Andrew Chang & Company (Chang) finds that:

- California and Midwest ethanol and electricity all have carbon intensities that are above the 2020 standard. Other potential sources, such as cellulosic ethanol, are not currently developed enough to the point where they could be adequately used by 2020. Brazilian ethanol is the only commercially available fuel with a low enough carbon intensity that would be feasible under the 2020 standard.

- Due to the increasing demand for Brazilian ethanol within Brazil and other countries with renewable/low carbon standards, the ethanol market is projected to be in deficit before even considering the LCFS program in California. When the California LCFS is factored in, the world ethanol market becomes extremely out of balance.
Sierra Research (Sierra) “Preliminary Review of the ARB Staff Analysis of “Illustrative” Low Carbon Fuel Standard (LCFS) Compliance Scenarios,” finds that, based on biofuel forecasts by the U.S. Energy Information Administration, California biofuel supplies will be inadequate for compliance with the Low Carbon Fuel Standard (LCFS) by 2015 when LCFS requirements start to become much more aggressive, and specifically that:

- CARB’s analysis of the LCFS assumes up to 2.73 billion gallons of ethanol per year from sugarcane will be available for use in California by 2020. Virtually all sugarcane ethanol, which has lower carbon intensity than corn-based ethanol, comes from Brazil and according to CEC (California Energy Commission) data no Brazilian ethanol has been exported to the U.S. since 2009. The Brazilian government’s own export projections, cited by the CEC, suggest only 500 million gallons of sugarcane ethanol will be sent to the entire U.S. market in 2020.

- CARB also assumed that as much as 2.35 billion gallons of cellulosic ethanol will be available each year for use in California. Sierra notes the U.S. Department of Energy estimates just 12.6 million gallons of cellulosic ethanol will be available in 2012 and only 2 billion gallons available for the entire United States by 2020 and that CEC forecast the cost of cellulosic ethanol to be approximately 2.75 times that of gasoline blend stocks.

- Cellulosic ethanol is made from wood fiber or other waste plant materials and therefore has a much lower carbon intensity than corn ethanol. However, production of cellulosic ethanol is more difficult and has not yet reached commercial scale.

- The LCFS also depends on a significant increase in vehicles able to operate on 85 percent ethanol, called flex fuel vehicles (FFV). CARB’s analysis of the LCFS assumes the number of FFVs will increase to 4.6 million vehicles by 2020. Sierra notes only 400,000 FFVs are operating in California today and changes in federal incentives to build more FFVs will phase out starting in 2015.

- California currently restricts the ethanol content of gasoline to not more than 10 percent. However, CARB’s own analyses of the LCFS program assume in some cases that 15 percent ethanol blends will be available. Sierra noted CARB has not initiated any of the actions that would be required to change the current 10 percent blend limit.

Based on forecasts by the California Energy commission (CEC) and the Energy Information Administration (EIA), Sierra found that the availability of low carbon biofuel supplies will not be plentiful enough to achieve the carbon intensity reductions required by the LCFS past 2014. If there are not enough supplies to meet the LCFS standard’s current timeline, there will be a large shortage of fuel available to consumers after 2014.

“The Impact of the Low Carbon Fuel Standard and Cap and Trade Programs on California Retail Diesel Prices” by Stonebridge Associates (Stonebridge) projects that fuel shortages are expected to occur when the alternative fuels needed to achieve the program’s objectives are not available at the times needed and/or in the qualities and quantities required, expecting this shortage will occur by 2015.
"Greenhouse Gas Reductions under Low Carbon Fuel Standards?" by Holland, Hughes, and Knittel (Holland, Hughes, and Knittel) find that the amount of fuel supply will be heavily affected by the average emissions rate set under the proposed LCFS and in general would take the form of fuel shortages. Outlined below are their three scenarios based upon proposed emission rates:

- Emission Rates equal to the average of low carbon and high carbon fuels – If demand and supply for high carbon fuel is elastically flatter than low carbon fuel, then the implicit tax decreases production of the high carbon fuel more than the subsidy increases production of low carbon fuel. This would result in a shortage (lower carbon emissions).

- Emission rates closer to low carbon standard – In this case, production of low carbon fuel increases less than the production of high carbon fuel decreases. This would create a fuel shortage (though it would lower emissions).

- Emission rates closer to high carbon standard - In this case the production of low carbon fuel will increase more than the production of high carbon fuel will decrease, creating a scenario with an adequate fuel supply (though higher emissions).

"Some Inconvenient Truths About Climate Change Policy: The Distributional Impacts of Transportation Policies," by Holland, Hughes, Knittel, and Parker (Holland, Hughes, Knittel, and Parker) found that, based on the simulation performed by the authors of this article, the impact of the LCFS created a 14.7% decrease in the amount of fuel supplied under business as usual conditions.

"Low Carbon Fuel Standard Analysis & Compliance Costs" by Transportations Committee Workshop – California Energy Commission (CEC) data and projections in 2011 points to a potential deficit taking place from 2019-2024 due to the inability of fuel producers to address demand (in CEC’s low-demand scenario). Projections also show a potential deficit portion of the program taking place from 2019-2027 due to lack of available alternative fuels (in CEC’s high-demand scenario). In either case there may not be enough alternative fuels to achieve the LCFS standard.

The next section takes a closer look at estimates and projections about potential LCFS impacts on California fuel costs.
COST

What is the impact of the LCFS on fuel costs?

Similar and related to the differences of opinion about the potential effects of the LCFS on California fuel supplies, there is a related divergence of opinion on the potential impacts of the LCFS on projected fuel costs.

CARB’s “Low Carbon Fuel Standard 2011 Program Review Report” estimated the impact of the LCFS on California fuel costs, projecting that estimated production costs of LCFS gasoline substitute fuels may have little impact on the cost of the LCFS program, but the production costs of alternative diesel fuels could somewhat increase costs to the LCFS in the later years of the regulation. CARB also finds that the LCFS could even save Californians by reducing driving and fuel consumption.

In order to compare the LCFS with a non-LCFS baseline, CARB researchers constructed 11 different illustrative fuel production and Distribution Cost Scenarios for gasoline. The scenarios were structured to attempt to capture reasonably foreseeable variations in the potential California fuel mix through 2020.

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CARB’s analysis projects that the estimated cost impacts of the LCFS on gasoline and gasoline-substitute fuels are likely to range between a cost increase of $0.09 per gallon, and a cost decrease of $0.13 per gallon by 2020. Overall, the scenario results lead CARB to conclude that the cost of producing lower-carbon alternative fuels to comply with the LCFS is unlikely to drive a significant cost changes over the 2011-2020 time horizon.
Using a similar method, CARB constructed five different scenarios for projections of the impacts of the LCFS on California diesel prices.

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CARB’s estimates of the diesel fuel cost impacts of the LCFS range from a cost decrease of $0.04 (all scenarios in 2012) to a cost increase of $0.26 (scenario 5 in 2017). CARB believes that the actual cost changes will most likely fall somewhere in the middle of these estimates. This result indicates that the cost of producing renewable diesel and biodiesel to comply with the LCFS may increase California diesel costs somewhat over the LCFS timeline through 2020, reflecting trends of slight cost declines early on, cost increases ramping up through 2017, and a leveling off of cost increases through 2020.

Additionally, CARB and LCFS supporters believe that increasing investment in low-carbon fuels will lead to reduced costs due to new innovations, technology, process improvements, and cost efficiencies associated with “scaling up” will drive LCFS costs lower over the intermediate and long-term. LCFS supporters also believe that cellulosic biofuel costs will drop significantly similar to what happened to corn ethanol.

UC Davis—ITS recently released National LCFS Technical Analysis report concluded that a key outcome of imposing a national LCFS to the existing Renewable Fuel Standard (RFS2) would be to reduce petroleum consumption and lower fuel prices for consumers due to reduced gasoline consumption by 8% and diesel consumption by 1%. The addition of the LCFS would lead to modestly larger reductions in gasoline and diesel consumption by 9% and 3% respectively.

UC Davis-ITS projected that by lowering demand for fossil fuels, LCFS policies will lower the market price of fuel, estimating that consumer price of gasoline and diesel would decrease by about 10% under the RFS2. The addition of an LCFS to the RFS2 would result in the price of gasoline blends being lower by 7% and the price of diesel blends by 13%. However, UC Davis ITS projects that the cost of fossil fuels will drop, but be offset by the higher cost of the alternative low-carbon fuels. Overall, weighted costs of blended gasoline and diesel are still projected to be lower for both consumers and producers in the RFS2+LCFS scenario by 2035. The blender’s cost of gasoline blends will increase by about 2% under both policy scenarios while that of diesel blends will decrease.
Caveats that UC Davis-ITS points out to their forecasted fuel prices for consumers and producers under LCFS are sensitive to a variety of factors, including:

- Feedstock mix
- Feedstock prices
- Demand for gasoline and diesel fuel
- Demand for plug-in electric vehicles and fuel cell vehicles
- Future production costs of biofuels and other alternative fuels
- Future production costs for cellulosic biofuels are also uncertain

However, most of the other recent studies project that California’s LCFS policy will significantly increase the cost of transportation fuels to consumers and business and will end up costing the California fuel user at the pump.

For example, the Charles River report estimates that a national LCFS “will dramatically increase the cost of transportation fuels to consumers and business,” estimating that a national LCFS will cause fuel costs to increase between 30% and 80% within five years after implementation, and by 2025 an increase in the cost of transportation fuels to consumers by as much as 90% to 170% relative to the baseline. By 2025, the higher cost of transportation fuels will cause drivers to reduce their driving by 9% to 14% relative to the baseline and drive trucking ton-miles down by 9% to 13%:

“The LCFS will increase the cost of transportation to consumers and business. The LCFS pushes the fuel system to the maximum availability of low carbon fuels...and only additional reductions in transportation fuel consumed can make it possible to meet the standard. This reduction occurs by destruction of travel demand represented as reductions in personal travel and ton-miles of freight. The reason for this greater demand destruction is that greater fuel costs and high emission factors for alternative fuels make it very expensive to meet the carbon-intensity standard without reducing the total amount of motor fuel demanded. This leads to motor fuel prices rising to levels that drive total fuel consumption down to a level such that the available low carbon fuels are sufficient to meet the standard.”

CEA/SAIC found that the cumulative results of an LCFS for the Northeast/MidAtlantic region of 11 states would increase gasoline prices by 11.1% between 2012-2021, diesel prices by 18.4%, and jet fuel prices by 21.7% between 2012-2021, resulting in a projected fuel expenditure increase of $156 billion in current dollars.

The CEC presentations project an increase in the price of fuels regardless the type of biofuel that is used to achieve the standard. Prices will rise regardless of what type of biofuel is used, some are more expensive than others, but all are more expensive than business as usual (BAU) fuels. This assumes that the biofuels used can match the demand for fuel under BAU conditions. If/when they can’t match demand and there is a shortage, then the price of fuel will rise even further.

The CEC LCFS analysis was intended primarily to “evaluate compliance feasibility using various types of biofuels and costs,” using certain cases with varying assumptions, including two separate scenarios — one with high petroleum prices and the other with low petroleum prices. Under CEC’s high petroleum price scenario, the LCFS could cost fuel providers nearly $3 billion in 2018, nearly $4 billion in 2019 and about $4.5 billion in 2020. Further, overall costs could be higher depending on the price of various fuels if and when government subsidies end. CEC’s analysis also indicated that if other states in the U.S. adopt LCFS regulations, the costs are likely to rise even further, because advanced biofuels will be in higher demand.
Sierra found that, even if biofuel supplies are large enough to fulfill LCFS requirements, the price of transportation fuel will increase dramatically. Based on CEC biofuel price forecasts, even if the biofuel supplies are available, transportation fuel costs in California could increase dramatically, and the total cost of acquiring special biofuels in California in order to comply with the LCFS, could, based on CEC biofuel price forecasts, be as much as $54 billion between now and 2020. The Sierra Research review estimates that compliance could cost anywhere between $22 and $42 billion cumulatively through 2020 for California gasoline. Sierra projects that LCFS effects on fuel costs ramp up over time, reaching a range of $7.4 to $12.1 billion in extra gasoline costs due to LCFS in the year 2020.

### Estimated Annual Incremental LCFS Compliance Costs for CARB Gasoline Scenarios Relative to RFS2

*(Based on CEC Cost Data; billions of $)*

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Sierra also found around $12 billion of cost increases for California diesel consumers during the same time period.

### Estimated Annual Incremental LCFS Compliance Costs for CARB Diesel Scenarios Relative to RFS2

*(Based on CEC Cost Data; billions of $)*

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<td>2.7</td>
<td>3.6</td>
<td>12.0</td>
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BCG’s study reports that, if the regulations of AB 32 are fully implemented there will be an increase in the range of $0.49-$1.83 per gallon increase. Of that range, the LCFS will account for $0.33-$1.06 per gallon of the increase. The cost of compliance could end up being much higher if the price per ton of carbon increases and becomes volatile (increasing to a total of $2.70 per gallon based on a $150/ton estimate) or if other states or the nation adopt similar LCFS policies. As well, the cost of compliance can fluctuate due to the availability of biofuels.

Chang states that while there is substantial uncertainty regarding the price California will pay for fuel under the LCFS program, even if there is enough supply of low-carbon fuel (an assumption that the report thinks is “generous”) costs will rise at least 16.5% from 2012-2020 due to the LCFS, or $7.4 billion in additional fuel costs by 2020. Considering the combined impact of all components of AB 32, Chang finds that California's businesses and consumers will cumulatively pay an additional $135.8 billion for energy and goods by 2020. On an annual basis, Chang estimates total AB 32 costs would exceed $35 billion per year by 2020, an average of $2,500 per California family.

Stonebridge predicts an increased cost of $1.47 per gallon on California diesel prices by 2020 estimates because of the LCFS:

Comparison of LCFS Wholesale Price Impact Analyses: CTA study vs. CARB Report

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Stonebridge also finds that the 2020 retail impacts from the combination of LCFS and a “Fuels under the Cap” Cap and Trade programs would lead to a price increase of $2.22/gallon of diesel, or a 50% increase due to the 2020 wholesale impacts of the combined programs. This is due to the CARB programs increasing refiners’ costs of fuels and then taxing the additional costs.

The Impact of the Low Carbon Fuel Standard and Cap & Trade on California Retail Diesel Prices

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<tr>
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<td>$1.72</td>
<td>$1.85</td>
<td>$2.00</td>
<td>$2.22</td>
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Percent Increase 2% 3% 5% 20% 21% 39% 41% 45% 50%

Holland, Hughes, and Knittel find that, depending on the standard of carbon emissions that would be permitted under a LCFS, the price per gallon should vary, but that the most likely impact on fuel consumers would be fuel shortages and an accompanying rise in fuel prices. The underlining logic being that the higher the standard (less carbon allowed) the higher the price per gallon. Even a modest decrease in emissions of 13%, would more than double the price of gasoline.
ECONOMY
LCFS Impact on the California Economy

What are the potential impacts of the LCFS to:

- Overall economic growth in California
- Job Creation and employment impacts in California

Most of the divergence of opinion regarding potential economic impacts revolves around key assumptions on issues:

- Will the LCFS supply issues raise or lower California fuel prices? Lower fuel prices will mean Californians fuel consumers have more money to spend elsewhere, leading to economic growth, while higher fuel prices will cut spending and cause job loss.

- Will the LCFS spur high enough levels of innovation in the green sector to offset potential job losses in other sectors?

LCFS supporters believe that the LCFS will deliver significant benefits to the state and national economy. California is home to the world’s most advanced biofuel and electric car companies, hydrogen infrastructure, and transportation fuel research institutions. These entities operate here because California has created a policy framework and environment to encourage innovation and development of alternative fuels.

In 2010, California consumers and businesses spent $65 billion on gasoline and diesel, with over $40 billion of this being sent outside the state and overseas. The less California families are forced to spend on transportation fuels, the more they have to spend on other things. The LCFS will help Californians by driving investment in safe, domestic, cleaner energy sources like renewable, natural gas, and advanced biofuels to fuel cars and trucks within the state. As fuel suppliers, innovators, and potential investors consider where to allocate capital, time, and resources, they have the certainty that California will be a steadily growing market for low-carbon fuels, regardless of the price of oil. This will spur investment and let the marketplace decide on the ultimate winners.

CARB’s “LCFS 2011 Program Review Report” cites that California’s LCFS program is already having a positive impact on job creation and economic growth, citing an infusion of $1.8 billion of investment by venture capitalists into North American biofuel companies.

UC Davis-ITS finds that both RFS2 and LCFS lead to a small net increase of one percent economic growth over the 2007 to 2035 time period compared to not having a LCFS policy, also concluding that an LCFS policy will improve the US trade balance, by lowering fuel (import) prices and raising agricultural (export) prices. This report also states that their results differ from other studies such as Holland et al which focus only on the fuel sector in a closed economy and disregard the effects of lower global fuel prices on consumers in the US and the effect of higher agricultural commodity
prices on agricultural producers in the US. None of the rest of the LCFS studies have very optimistic predictions about the policy’s effect on jobs and the California economy. Higher fuel costs under the LCFS will directly translate to California job loss. Various studies indicated that the LCFS will have detrimental effects on the California economy. As energy costs increase, economic activity slows, creating job losses during a time when California suffers from the third-highest unemployment rate in the nation at 10.7 percent:

- Increase in costs of transportation fuels to consumers and for all goods/services
- Consumers will have to spend a larger percentage of their income to maintain their current level of household travel or reduce travel
- Loss in household purchasing power
- Increase costs in the trucking and commercial transportation sectors
- Reduce total consumption, employment, investment, and economic output
- While “green jobs” would be created, many more other jobs would be lost
- Poor households with long commutes to employment in locations such as the Central Valley and Inland Empire will be especially vulnerable and harmed
- Increase the already high cost of doing business in California
- Harm California’s already fragile business climate

Although their research does not come to conclusions about the specific numerical impacts the LCFS on economic growth, Holland, Hughes, and Knittel find that any industry dependent on carbon-based fuel will likely suffer, see business costs rise, and have a negative impact on employment. However, industries that are invested in development and production of low carbon fuels would benefit greatly from the implicit subsidy of the LCFS. The extent to which employment growth in low-carbon fuel centered industries would offset the loss of employment in conventional fuel centered industries was not explored.

Holland, Hughes, Knittel, and Parker find that, due to the large abatement costs associated with the LCFS, it is assumed that fuel dependent industries would suffer and overall economic health would worsen. Due to the large abatement costs associated with the LCFS, it is assumed that industries dependent on fuel production would probably be in a weaker position to create new jobs.

Charles River estimated the national impacts of an LCFS policy, concluding that it would cut GDP by $410 to $750 billion (2% - 3%) by 2025 and would lead to significant employment losses of at least 2.3 million jobs and as many as 4.5 million jobs by 2025, primarily in the manufacturing and service industries. These estimates factor in any gains in “green jobs” that would be created by a national LCFS. However, the losses will not be evenly distributed across industrial sectors. While some industries will gain jobs due to new “green jobs” and shifts in economic activities, most
of the industrial sectors will experience reductions in employment relative to the baseline. **Charles River** finds that a national LCFS would hit the U.S. refining sector especially hard, predicting that refinery operations would fall between 27% - 40% by 2025, or 4.0 to 5.8 million barrels per day, with a loss of 21,300-33,000 direct refinery jobs through the closure of 43-55 refineries and a reduction in ongoing refining investment by $2.1 to $3.2 billion per year.

**Charles River** additionally finds that a national LCFS would also reduce wages and significantly increase household costs. Overall, their economic impact forecasts show a reduction in household purchasing power by $1400 to $2400 by 2025. Due to the increased price in fuel, the article assumes a long term negative economic impact due to the rising costs for all goods. As well, due to increased fuel prices, consumers will limit their driving and ability to purchase goods:

“As the resources are diverted to more expensive energy sources, the productivity of labor will fall. The demand for labor would weaken because employers would need to spend less on labor in order to supply the reduced amount of goods and services demanded by consumers. As a result, payments to labor are projected to decline relative to that which would have prevailed without the higher energy costs. This will be reflected in a combination of less employment, and lower wages for those workers not losing their job. While “green jobs” would be created, a large number of other jobs would be lost.”

**CEA/SAIC**’s analysis of the Economic Impact of a Regional Low Carbon Fuel Standard on 11 Northeast/Mid-Atlantic States” estimated that cumulative costs of such an LCFS program from 2012-2021 of $306 billion leads to a prediction of aggregate negative economic impacts of magnitude in the following categories for the time period of 2012-2021:

- $27 billion decline in GDP
- $29 billion reduction in disposable personal income
- 146,700 loss in employment
- A total negative cumulative economic impact of $306 billion

Stonebridge finds that a California only $2.22 per gallon increase would cause a loss of nearly 617,000 jobs in the containerized import sector, $68.5 billion in lost state domestic product, $21.7 billion in lost income and $5.3 billion in lost state and local taxes.

Additionally, Stonebridge finds that the LCFS will disproportionately negatively affect California’s logistics industry due to fuel cost increases. The logistics industry consists of the industry groups responsible for the shipping, receiving, processing, and storage of goods. Many of the job losses in the economically significant logistics industry, an industry responsible for almost 14 % of the California economy, will occur in Southern California, where the industry is an especially important driver of the Southern California economy. The LCFS and other potential “California only” fuel programs such as Cap and Trade will increase fuel prices in California compared to other states and will competitively disadvantage the trucking and warehousing services of California logistics companies. This will cause logistics companies that can avoid the impact of more highly priced California diesel to have a competitive advantage over California companies that cannot. There would also be a damaging affect on the industries that rely on the logistics industry for the transportation of their raw and finished goods. Stonebridge also looked at the effects on warehouses and found that the effect of diesel price increases would cause warehouses to reevaluate their California locations.
Stonebridge also points out that the logistic and warehousing industries remain an important source of good paying entry jobs and a pathway to the middle-class for lower-educated workers. Job losses in the logistics industry have a social impact that is not typically reflected in the calculus of economic impacts. The logistics industry provides important blue collar employment pathways for workers to enter the state’s middle class. Logistics industry jobs especially provide critical employment opportunities for the 41% of Californians over the age of 25 who have a high school education or less. There are few educational training barriers to beginning employment in logistics, yet the annual salaries offered are significantly higher than those for other non-professional, non-blue collar jobs. The loss of these opportunities would have a particularly detrimental impact on those Californians who have been most severely disadvantaged by the current recession.

While BCG cites an increase in 2,500 to 5,000 jobs as a result of investments in energy efficiency due to AB 32, the study cites a net loss of 28,000 to 51,000 jobs in California, including many high paid manufacturing jobs, as well as additional indirect job losses due to multiplier effects. BCG’s estimate about the loss of jobs is accredited largely to the LCFS program. AB 32 and the LCFS will also discourage energy intensive industries from locating in California, and may incentivize existing industries to consider relocating outside of the state.

BCG finds that California could lose up to $4.4 billion per year in tax revenue by 2020, the majority of which will come from lost excise taxes on fuels. This could result in further reductions in employment in areas that depend on government revenue. Other losses in taxes will come from decreases in personal income tax, corporate tax, property and sales tax.

Finally, BCG finds that the LCFS and other AB 32 policies may generate a chilling effect on California’s economic competitiveness. Climate change regulations will discourage energy intensive industries from locating in California, while already present energy intensive industries will have incentive to consider relocating outside of California to other locations.

Chang forecasts that, due to the need to comply with all AB 32 regulations, California will suffer an economic loss of 5.6% in gross state product by 2020 under its optimistic scenario, or $153.2 billion. Chang finds that AB 32 will cost 262,000 California jobs and an annual average of $900 less in earnings per California household. This slowdown in economic activity is due to the increase in fuel prices and the decrease in employee earnings, as California households will pay an extra $1,300 to $4,500 per year for energy, with the average being $2,500. In the case of impacts to state and local revenues, AB 32 will reduce state and local tax revenues by over $7.4 billion annually by 2020 under the “low scenario.” Cumulatively, this amounts to $21.6 billion in lost state and local tax revenues. In respect to the impact on earnings, Californians will lose more than $12.3 billion in personal savings in 2020. This loss will total $48.9 billion
Finally, higher fuel costs will hit lower income families especially hard. For example, BCG also finds that California’s increased cost of living due to higher fuel costs will disproportionately impact low income households in California. Knittel notes that this increase in gas prices will disproportionately harm poor Californians, because increases in fuel prices are regressive, likely because it would force them to spend an even higher proportion of their income in gasoline.
TWO SCHOOLS OF THOUGHT
Is the LCFS feasible as currently framed?

As might be predicted from the material in previous sections on LCFS supply, cost, and impact on jobs and the California economy, there is substantial disagreement over the feasibility of California’s LCFS program.

In general, CARB’s “LCFS 2011 Program Review Report” demonstrates that CARB believes that the LCFS is working as designed and still on track to deliver on its goals, that progress is being made against the targets, and that CARB’s illustrative scenarios plausibly demonstrate that the LCFS targets can be feasibly achieved within the current timeline “though early, the program is working as intended.” CARB continues to see indications that the LCFS standards are feasible and achievable, such as:

- markets that appear to be responding
- credits are being accrued
- innovations are occurring
- and carbon intensities are progressively declining

CARB believes that the current state of low carbon fuel technology and production processes is advancing, and adequate investments have been made to date. CARB is confident that LCFS was developed using a transparent, open public process, has actively engaged stakeholders through workshops, posting of draft and final documents to CARB’s website, and stakeholder input has been documented, considered, responded to, and reported on. Additionally, CARB cites the LCFS’s flexible design when elaborating on illustrative scenarios and pathways to conclude that there are numerous options that can be employed by stakeholders to comply with the program. CARB believes that the LCFS needs to continue to be implemented as planned to send clear, consistent, and durable messages to California fuel providers and the fuel market to encourage a healthy and robust credit market system, and that this regulatory certainty and consistency is also key driver to maintain clear markets signals that will trigger continued LCFS related investments.

However, CARB acknowledges that California’s LCFS is still in its early stages. Because California’s LCFS is in its infancy, the 2011 CARB LCFS Program Review report has a limited amount of actual experience with the program’s implementation to date. 2010 was a reporting year only and 2011 is the first year that the LCFS required carbon intensity reductions in transportation fuels – with only a modest 0.25% reduction was mandated in 2011.

CARB also acknowledges that key actions need to continue to take place, such as:

- Technological innovation and the ability and capacity to produce LCFS fuels from different sources must continue to advance to levels that will provide for commercial demand
- Production process must also advance in a way that investors can profit while building the capacity to meet LCFS demand
Further and accelerating investments must continue to be made in the alternative fuels sector. Because of the newness of LCFS program, CARB has:

- Continued research and assessment
- Ongoing monitoring
- Being flexible and open to changing various aspects
- Harmonization with other policies

Many of the same optimistic sentiments and comments are echoed in the recent UC Davis-ITS Policy Design Recommendations report on a national LCFS, but the report concludes:

“The breadth and reach of an LCFS, and the challenge of implementing an innovative policy, means that adoption of a national LCFS will not be easy or straightforward and will require careful analysis and design. It is necessary to address the cost effectiveness of the policy (compared with other similar GHG policies) and to analyze ease of administration, fairness, equity, market flexibility, and impacts on energy security and sustainability.”

Most other reports conclude that California’s LCFS is not achievable or feasible as currently framed for a variety of reasons, the most important of which is the likely inability of alternative fuel manufacturers to create enough fuel to match market demand while complying with LCFS standards and timelines unless fuel prices significantly increase, or driving significantly decreases in the state. To meet the goals of LCFS, it is clear that the supply of renewable fuels must be increased significantly by 2015 through a combination of technology advancement, process improvement, capacity building, and significantly increased investment in alternative fuels development and implementation. Most studies reviewed for this report conclude that the LCFS becomes infeasible to achieve by 2015. Research cited previously concludes that California’s LCFS is not feasible as currently framed due to a number of distinct but related reasons, including:

- Current targets are beyond reach with foreseeable fuel technology
  - The current 2015-2020 timelines do not allow enough time to develop the advanced lower-carbon technology needed at the scale to meet the targets
  - The LCFS simply encourages marginally less carbon intensive fuels made with conventional feed stocks and technology to kind of move around the globe, so called “shuffling”
  - Estimates show that California would need ten times its current number of flex fuel vehicles to use enough E85 to make compliance possible in 2020 with the currently technology

- Time frame is too short to develop the new transportation infrastructure and new vehicle technologies on a large scale

- Lack of feedstock in sufficient quantities
  - As the demand for biomass to meet goals of multiple environmental laws increase, so will competition, limiting availability and increasing costs
  - Without time for innovation, sufficient quantities of the biofuel feed stock will not be available at affordable costs, sending LCFS costs higher
The LCFS program will cause major renewable fuels market dislocations causing fuel cost increases that will hurt consumers and business. High LCFS costs translate directly to negative economic impacts:
- Reduced economic growth
- Job losses
- Lower tax revenues

Holland, Hughes, and Knittel generally find that LCFS standards are not feasible. Based on the stringency of the LCFS, there will be a case where the standard is low and the implicit tax will decrease the production of high carbon fuel more than the subsidy increases production of low carbon fuel and there will be a shortage of fuel. However, if the opposite occurs and the standard is high than there will be an adequate amount of fuel supply but a condition where the amount of carbon emissions can increase, thus defeating the purpose of such a program.

- The increase in carbon occurs when the ramping up of production of the low carbon fuel outweighs the reduction in carbon associated with decreasing output of high carbon fuel.
- The problem with the LCFS is that it regulates the amount of carbon in fuel, but not the amount of carbon that is emitted into the atmosphere.

Simulations by Holland, Hughes, and Knittel find that an LCFS is an ineffective carbon reducer compared to alternatives and creates significant economic inefficiencies and carbon reductions by an LCFS system can cost an amount 10 times greater than an equivalent carbon tax or cap and trade program. In short, they find that an LCFS is a carbon tax like others proposed, just an inefficient one in which the tax is “hidden.”

Looking at a national LCFS, Charles River concludes that it is highly unlikely that it will be possible to produce sufficient quantities of fuel with sufficiently low emissions to meet the standard without drastically reducing the total fuel consumed. The report also assumes the LCFS to be unfeasible due to the unreadiness of the market to provide new transportation infrastructure or new vehicle technologies on a large scale. One of the difficulties is the short 10-year time frame given to achieve the advances from R&D. Further the type of vehicles necessary to run on some low carbon fuels are not yet at a point to provide for large scale demand.

The CEA/SAIC study found that even under the most aggressive and optimistic scenarios, the goal of achieving a ten percent CI reduction in the ten year period of 2012-2021 could not be achieved in the New England/MidAtlantic LCFS region while sustaining the full energy needs of the region.

The September 9, 2011 and November 14, 2011 CEC presentations analyzed four different cases and scenarios and did not conclude that the LCFS as currently framed is infeasible, but did raise questions and concerns:

- a primary concern is plausibility of the assumptions
- concerns about a lack of progress with cellulosic fuels
- supply availability and cost for biofuels projections
*BCG* questions the feasibility of California’s LCFS:

- The main issue is the inadequate supply of low Cl biofuels to meet California’s demand. Under current scenarios, there is not enough low Cl fuel being produced to meet demand for the year 2020. As well, even if this demand could be met, E85 will be much more expensive than E10 and people may not have the vehicles to use the E85 fuel. Further, the infrastructure needed to transport this ethanol will need to be developed (trucks, terminals, ships, etc.)

- The low Cl fuels needed to meet the standards of the LCFS program do not have the transportation fleet to support them. CARB projects that the number of FFVs will need to increase from 30,000 in 2012 to 3 million by 2020.

- The technology for these vehicles is not yet developed for commercial use and may not be developed by 2020.

- These vehicles may not be purchased by consumers because they will cost much more than conventional vehicles.

*Chang* concludes that in order to achieve the goals of the LCFS program, it will require the development of second generation biofuels in America and the import of high grade foreign ethanol. These fuels are preferred because they can achieve the required carbon reductions in much lower volumes. However it has become clear that CARB’s assumptions for the development of these fuels to support the LCFS market cannot be achieved. The Organisation for Economic Co-operation and Development (OECD) has forecasted that the U.S. will make only one-third what is necessary to meet California’s LCFS program. As well, the EPA has revised its federal standards for second generation fuel to nearly zero due to the failure of the market to produce these needed fuels in quantity.

Further, in order to consume these fuels to meet the LCFS standard, California will need to greatly increase the amount of Flex Fuel vehicles used. Only these vehicles are capable of burning fuels with more than 10% ethanol. In order to achieve the goals of the LCFS program, the study estimates that 30% of all new passenger cars bought between 2012 and 2020 will need to be flex fuel capable to consume the amount of ethanol necessary to meet the standards of the program.

*Stonebridge* doubts California’s LCFS is feasible because of an Inherent structural flaw in the standard -- every year the difference between the carbon intensity of conventional diesel and the carbon intensity of the continually declining annual requirement gets bigger. This creates a situation where the credit deficit associated with each gallon of diesel will get larger and larger. This makes the program become increasingly more difficult to comply with as the possibility to gain more credits becomes harder to achieve.

Other issues regarding the feasibility of California’s LCFS that Stonebridge points out:

- If the price of diesel is $2.22 higher in California, the logistics industry would most likely attempt to undermine the fee hike by importing fuel (much cheaper) from Nevada and Arizona, who do not have to comply with CARB regulations. This ability to undermine CARB regulations would make the CARB program unfeasible.
The ability for the program to be feasible is based on very large improvements in the credit generating ability of renewable technologies. These very large improvements in carbon reduction, and the significant investments needed to make them possible, would have to take place in the next 10 years. The ability to develop technology in this time frame as a means to the program’s success is unfeasible.

The LCFS credit market will most likely become a target for speculators that will want to acquire carbon credits in anticipation of the program eventually becoming unfeasible. This problem will become amplified with the “lack of credit cost controls.”

Sierra concluded that a number of assumptions used by CARB to justify the LCFS “do not appear to be reasonable,” citing three issues in the feasibility of the LCFS program:

1) Lack of availability of sugarcane ethanol
2) Lack of availability of cellulosic ethanol
3) Lack of Availability of Flex Fuel Vehicles - the LCFS depends on a significant increase of vehicles able to run on 85% ethanol fuel, known as flex fuel vehicles. CARB’s analysis assumes an increase of 4.6 million of these vehicles by 2020. Sierra research notes that only 400,000 of these vehicles exist today and that federal incentives to build FFVs will stop in 2015.

Finally, BCG and other studies point out that if other states, regional coalitions of states, or the nation itself adopt similar LCFS policies, these will lead to more demand for low carbon intensity fuel and likely exacerbate LCFS related supply issues such as cost and economic impact. Indeed, CEC points out that the 22 other states considering implementation of LCFS like standards equate to 3.7 times the quantity of gasoline currently consumed in California and 7.2 times the quantity of diesel fuel.
CONCLUDING THOUGHTS

“Predicting the market availability and rate of deployment of low carbon fuels is difficult at this early stage of the LCFS compliance schedule. As regulated parties consider economic tradeoffs, the market will begin its transition to lower CI fuels. As such, the market may experience temporary periods when demand for low carbon fuels exceeds supply. This imbalance may then lead to temporary shortfalls which may hamper the ability of regulated parties to comply with the LCFS targets. For example, regulated parties may not be able to procure either enough fuel or credits to comply based on factors outside that parties control such as supply disruption or possibly credit hoarding or other unforeseen events. Because of these possible shortfalls, flexible compliance mechanisms may need to be considered in order to maintain market stability and reduce the risk of high LCFS credit prices.”


In conclusion, a serious and constructive discussion is clearly underway about the opportunities, as well as the realities and challenges, of implementing California’s LCFS. This report has attempted to capture and represent the many, often opposing views on California’s LCFS in an accurate, fair, and balanced manner. There is no doubt that the LCFS conversation, some would say debate, is alive and well in California and will certainly continue. That is probably to be expected, as California’s LCFS is a first-of-its-kind fuel policy with the potential far-reaching consequences, both positive and negative.

However, many fuel stakeholders who were on board and supported the original intents, aims, and objectives of California’s LCFS from the beginning -- to spur and stimulate new innovation and technology that would drive increased supplies of low-carbon fuels -- and have been helping to drive implementation by providing input and technical advice into the regulatory framework have come to conclude that while the goals and vision of the California LCFS are well-intentioned, even laudable, they are simply not achievable, at least in the timeframes currently proposed. The LCFS is unworkable due to technology, resource, or market limitations and can have significant negative economic consequences that stretch from the state’s economic growth down through negative employment effects and ultimately down to the household level in terms of greater costs and job losses. Most industry experts believe that the LCFS may become infeasible in 2015 because second generation biofuels will not be commercial by then and may in fact possibly take another 10 years to reach commercialization. Some have issues with individual policy components and especially the current LCFS timeline, including outstanding issues related to a perceived overly complex rulemaking design, questions about adequate volumes of low carbon biofuels during the current timelines, and potential high costs of designated low carbon intensity fuels or credits and resulting economic impacts. Given these concerns about fuel cost, supply, and feasibility of implementation, many fuel stakeholders believe that it is necessary and timely for California to reconsider whether this policy and its implementation schedule is the correct fuels policy path now for California considering the current economic climate.

LCFS supporters counter that the long-term overall benefits of AB 32 will eventually outweigh any near and intermediate term costs during these “adjustment phases.” The LCFS is intended to be “technology forcing,” that progress is being made, and advanced low-carbon fuels at affordable prices and at scale will eventually become achievable.
Many academic economists believe that the LCFS is just not economically efficient and point to such policies as carbon taxes and cap and trade systems as much more cost effective and efficient. For example, we have cited Holland, Hughes, Knittel, and Parker in this report, but other respected fuel and energy economists such as Dr. Severin Borenstein, E.T. Grether Professor of Business and Public Policy at the Haas School of Business at U.C. Berkeley, Co-Director of the Energy Institute at Haas and Director of the U.C. Energy Institute, concludes that current low-carbon options are expensive with unclear paths to becoming more cost competitive.

There is clearly diversity of opinion about the feasibility and economics of California’s LCFS -- and legitimate differences of opinion. Valid issues, genuine concerns, and even disagreements have been raised amongst varying expert opinions based on complex future projections and their related assumptions about the LCFS technology, fuel supply, production capacity, economic impacts, and other related aspects. For example, one man’s “unproven technologies” may be another’s “technology forcing of technologies,” depending on your position, assumptions, and projections.

A key balancing act to creating a robust, successful, and economically efficient LCFS is to balance both certainty and flexibility – the ability to continue to assess the feasibility and viability of regulations before and even after they are implemented within the current framework and timelines. Unfortunately, sometimes the desire to “get it done” eclipses the need to “get it done right.” Because of the newness, novelty, and complexity of California’s LCFS, and because of reasonable disagreements and real concerns about key uncertainties and risks, it seems important that the LCFS provide for “safety nets” if it becomes apparent to all that the LCFS will significantly affect California fuel supply, increase fuel prices significantly, and begin to really harm California’s economy in terms of employment and economic activity. Being open to periodic program reviews “course corrections” seems essential to avoiding any negative unintended consequences and potential issues with implementing portions of California’s LCFS.

CARB has expressed a commitment to just such ongoing review, evaluation, and monitoring. CARB’s ongoing engagement with stakeholders about acknowledged challenges and commitment to continuing monitoring and evaluation in a flexible, transparent manner is reason to be optimistic and beneficial to effective program implementation. CARB has acknowledged that there are concerns and risks to implementing the California LCFS the need to be considered and potentially dealt with. For example, CARB’s willingness to discuss and consider flexible compliance mechanisms, should regulated parties be unable to meet LCFS targets at key points on the timeline due to limited supplies of low carbon fuels or LCFS credits in the market, despite good faith efforts by all parties, is reassuring. This flexibility will pay dividends in the form of greater confidence by investors, fuel suppliers, and fuel consumers by providing multiple routes for companies and the California fuel market to comply, while still encouraging low-carbon fuels.

AN EXAMPLE OF FLEXIBLE COMPLIANCE: To address concerns about the potential for the LCFS to cause significantly higher fuel prices and possible price spikes, some LCFS supporters have recently suggested an example of just such an amendment/adjustment in the form of a willingness to consider “alternative compliance measures” or “flexible compliance mechanisms,” price control mechanisms that cap LCFS credit prices to avoid price spikes and therefore place a limit as to how much gas and diesel prices increase. Such a cap if enacted would ensure that gasoline and diesel prices will not soar if for some reason the LCFS market is somehow disrupted, but would limit the rise more than 30 cents per gallon due to the LCFS.
FINAL THOUGHTS

In the long run, most acknowledge that low carbon fuels will be a part of California’s future. However, the LCFS breaks new ground and is in its very early stages. LCFS supporters and skeptics both agree on a few key matters:

- More innovation, technology, and process improvement is necessary
- Substantial additional investment will be needed for long term LCFS success

The next formal review of the LCFS is required to be completed by January 2015, at which time many if not most aspects of the LCFS’s impact should be much clearer. However, the current intervening time period provides a real opportunity to step back and discuss legitimate concerns and make necessary adjustments to the LCFS where appropriate to avoid some of the major potential pitfalls reviewed and discussed previously in this report. If it becomes evident before 2015 that the LCFS is infeasible as currently framed, based upon new and/or additional data and real-world experience regarding the LCFS’s negative impacts on California fuel supplies, costs, and the economy, interim course corrections and changes will need to be considered before many of the negative impacts are already embedded in the economy.

The continuing and ongoing monitoring, research assessment, and evaluation of the LCFS is a worthy endeavor and critically vital to encourage further LCFS refinements, adjustments, improvements, and enhancements. CARB’s commitment to continue the dialogue by working with key stakeholders, such as major California fuel consumers, on an informal basis to discuss and make necessary adjustments to the LCFS in order to avoid significant negative impacts is encouraging and welcomed. This ongoing interaction will only pay dividends in the form of:

- Continued research about how to build effective LCFS monitoring, course corrections, and safety net mechanisms
- Consideration of linkages between the compliance period timeline and the availability of low carbon fuels needed for compliance
- Well thought through mechanisms and adjustments to mitigate supply, cost, and economic harm issues to California fuel consumers
- Continuing serious consideration about better approaches and alternatives to reducing carbon emissions from the transportation sector
Fueling California: Consumer Alliance for Responsible Fuel Policies, is a nonprofit organization that provides a united voice on behalf of major fuel consumers and engages actively in the debate on public policies impacting the cost, availability, and supply of fuel, as well as advancing alternative fuels and technologies.

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