



Comments on the Proposed Adoption of the Low Carbon Fuel Standard by the California Air Resources Board

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Summary of Comments

NRDC is pleased to submit the following comments regarding the California Air Resources Board (CARB) Staff's proposal to establish a Low Carbon Fuel Standard (LCFS). The Natural Resources Defense Council is a national environmental advocacy organization with over 1.2 million members and activists, 250,000 of whom are in Californians. As one of the co-sponsors of AB32 – California's Global Warming Solutions Act – NRDC has been active in working to promote and develop strategies that will reduce global warming pollution from our transportation fuels, vehicles, and development patterns. The LCFS was approved by the Board as an AB32 discrete early action measure in June 2007.

Findings

1. The LCFS is absolutely necessary for California to meet its 2020 emission targets under AB32 and its longer term 2050 goals. The LCFS ensures that the right incentives are provided to overcome barriers in the fuels market for renewable and alternative fuels, and that the oil industry is also doing its fair share to reduce GHG emissions associated with its products.
2. The Staff's inclusion of indirect land use emissions is essential for getting biofuels right. The science and CARB's analysis is clear: emissions from land use change are significant and need to be accounted for to ensure there are real carbon benefits.
3. CARB has accounted for the concerns from the ethanol industry in a fair and reasonable manner. Staff has conducted the necessary due diligence in addressing each of the industry's asks and have incorporated changes based on their requests.
4. The economic analysis by CARB is conservative. Using any number of reasonable forecasts of crude oil prices, Californian's will stand to benefit from significant fuel cost savings due to the LCFS. California's can no longer afford to gamble on crude oil prices. The LCFS provides the alternatives.
5. CARB's differentiation of high carbon-intensity fuels is necessary to preserve a level playing field among all fuels and to prevent a worsening petroleum baseline over time. High carbon-intensity fuels, including those produced from tar sands, oil shale, and liquid coal, pose a significant risk to undermining the GHG reductions of the LCFS program. CARB must continue providing pathways for both high-carbon *and* low-carbon intensity fuels.

Recommendations

It is critical to avoid pitfalls that would compromise the success of the regulation. Four additional components are needed to strengthen the LCFS, each of which is intended to ensure we obtain real reductions in carbon and achieve the full benefits of the LCFS, without sacrificing California's public lands, sensitive ecosystems, and air quality. We respectfully recommend that the Board consider the following amendments to strengthen the program:

1. **Ensure minimum land protections.** CARB should ensure minimum protections for sensitive lands and ecosystems that would otherwise be incentivized by the rule for

biomass production. Our study shows we do not need to sacrifice our national forests and other sensitive lands in California in order to produce biofuels.¹ California would need only 12 percent of the forest biomass stock - using our ecological screens - to meet the needs of the LCFS under their most aggressive biofuel scenario.

2. **Provide incentives or sustainable fuels.** The final regulation should direct ARB Staff to develop metrics to ensure the LCFS provides incentives for the development of broadly sustainable alternative fuels, while avoiding unintended support for fuels with negative impacts on our forests, agricultural lands, and other important natural resources.
3. **Ensure the LCFS ushers in a new generation of ultra-low carbon fuels.** The proposed regulations should be amended to ensure “ultra-low carbon fuels” will be part of the compliance mix in the early years.
4. **Protect Air Quality and Public Health:** The proposed regulations should be amended to ensure air quality and public health is not adversely impacted.

Attachment C provides a separate letter in support of these four asks from a coalition of environmental and health organizations.

We also highlight the letter from Environmental Entrepreneurs (E2) endorsing the LCFS and inclusion of indirect land use change. The letter (**Attachment D**) represents the viewpoints of individuals from the advanced, second-generation biofuels community and biofuel investment community. We urge CARB to adopt resolution language that would address the concerns voiced in the E2 letter, including expeditiously approving pathways for advanced biofuels and identifying feedstocks with zero indirect land use change.

Last, we urge CARB to adopt the resolution language (**Attachment E**) supported by environmental organizations, public health advocates, and utilities regarding transportation electrification. The recommendations simply ask that CARB give additional time and consideration to understand how to best develop a framework that will provide benefits to electric transportation customers.² We look forward to CARB’s adoption of this resolution language and continuing to work with Staff on these issues.

¹ *Assessing the Impact of Ecological and Administrative Considerations on Forest and Shrubland Biomass Projections for California*. March 2009, Prepared by James R. Strittholt and Jocelyn Tutak for NRDC.

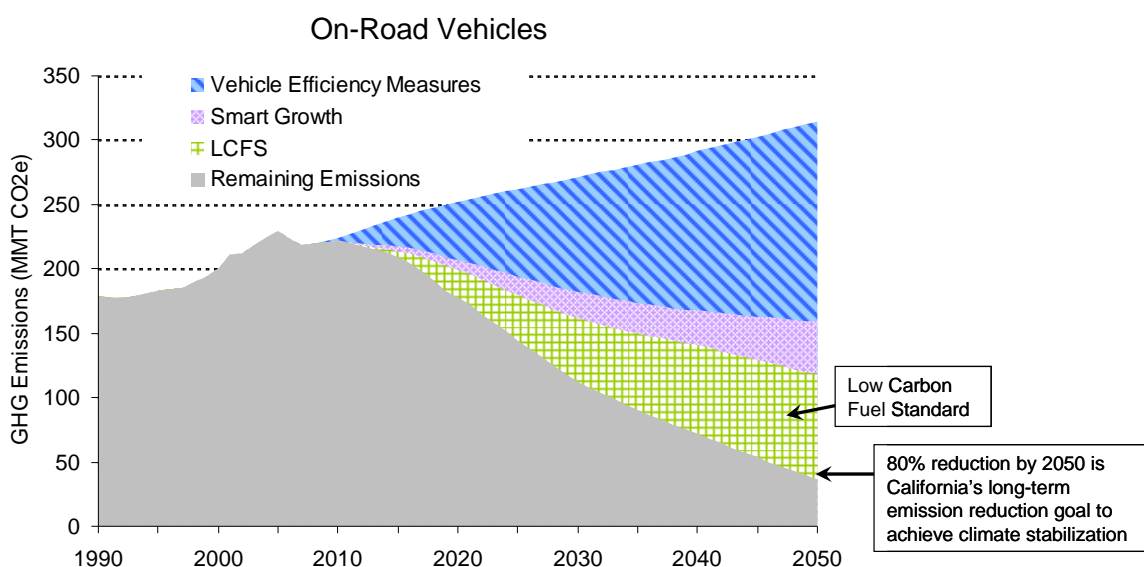
² April 14, 2009, “Re: Comments on the Low Carbon Fuel Standard relating to Transportation Electrification.” Submitted to Chairwoman Mary Nichols, Air Resources Board.

Comments

1. The Low Carbon Fuel Standard is necessary to allow California to meet its climate goals

CARB estimates that the LCFS will reduce 23 million metric tons of CO₂ by 2020, accounting for one third of the total reductions from transportation measures under AB32. The 10 percent reduction goal for 2020 is the bare minimum needed to ensure we are on a trajectory that decarbonizes our fuel supply by 60 to 80 percent by 2050, which is our estimate of what is needed to meet long term targets. This decarbonization is needed even if we include strong measures to address vehicle tailpipe emissions and reduce the demand for travel (see Figure 1-1).

Figure 1-1: The LCFS is needed to place California on a pathway to meet its 2020 and 2050 emission reduction goals. (Source: NRDC Analysis)



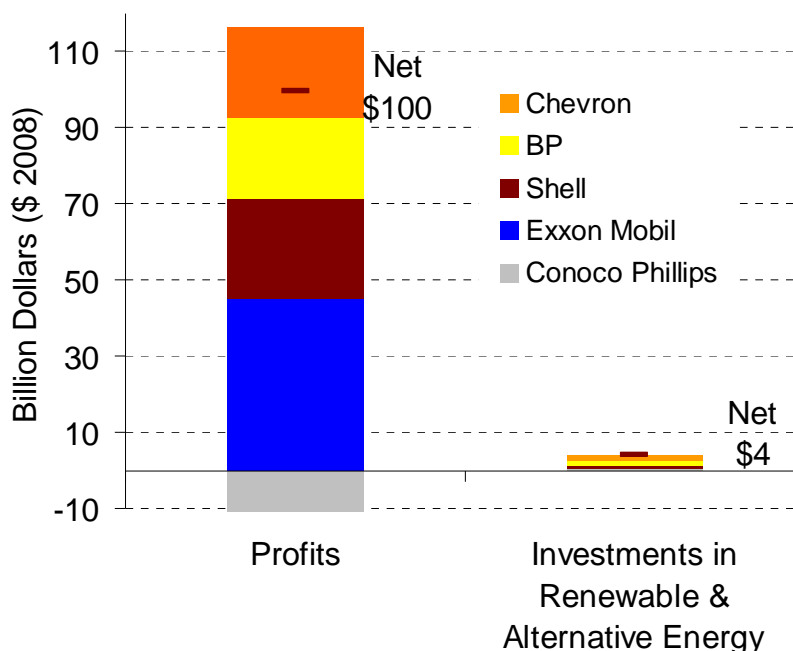
The main products from the oil industry – transportation fuels – are responsible for 28 percent of our nation’s GHG emissions, not including the upstream production emissions. The LCFS program is also needed to ensure that the oil industry does its fair share to address climate change. For example, according to the Center for American Progress, the five biggest oil companies recorded a combined profit of \$100 billion in 2008 alone yet invested less than 4 percent in renewable and alternative energy (Figure 1-2).³ The LCFS will require oil companies

³ Center for American Progress (2009), “ANALYSIS: Big Oil Misers Talk a Big Game on Renewables,” March 31, 2009.

to reduce the carbon intensity of their products through the purchase of low-carbon fuels, thereby encouraging investments in the cleanest ultra-low carbon fuels.

Numerous U.S. government studies have concluded that a cap-and-trade program alone will not result in significant reductions in transportation and will place a far larger burden on the electricity sector.⁴ Complementary policies, like the LCFS, are necessary to ensure that cost-effective reductions from the fuels market are available and market barriers, such as to alternative fuel infrastructure, are overcome. The LCFS is a fuel-neutral strategy that requires oil companies to reduce the carbon intensity of their products – helping incentivize the growing market for alternative, low-carbon fuels. California must move forward with the LCFS to reduce its oil dependency and jump-start the marketplace for clean transportation fuels.

Figure 1-2: The profits of the five largest oil companies versus their investments in renewable and alternative energy (including energy efficiency) in 2008.



All told, the LCFS will reduce California’s petroleum dependence by up to 20 percent by 2020. Replacing the use of gasoline and diesel is critical to meeting the State's Bioenergy Action Plan (Executive Order S-06-06) and Alternative Fuel Plan (AB 1007). As oil prices continue to shift

⁴ EIA. *Energy Market and Economic Impacts of S.280, the Climate Stewardship and Innovation Act of 2007*; Energy Information Administration, U.S. Department of Energy: Washington, DC, 2007; <http://www.eia.doe.gov/oiaf/servicert/csia/index.html>.; EIA. *Energy Market and Economic Impacts of S. 2191, the Lieberman-Warner Climate Security Act of 2007*; Energy Information Administration, Office of Integrated Analysis and Forecasting, U.S. Department of Energy: Washington, DC, April, 2008; U.S. EPA. *United States Environmental Protection Agency’s Analysis of Senate Bill S.280 in the 110th Congress: The Climate Stewardship and Innovation Act of 2007*; Washington, DC, 2007; <http://www.epa.gov/climatechange/economicanalyses.html>. Also see S. Yeh et al. (2008), *Environmental Science and Technology*, Vol. 42, No 22. 8202- 8210.

dramatically, California will be better protected against future oil price shocks and ensure that its residents have options to move beyond oil.

2. Inclusion of Indirect Land Use Emissions is Essential to Getting Biofuels Right

The California LCFS sets a critical precedent as the world's first regulation to require reductions in greenhouse gas emissions from transportation fuels. To achieve these reductions, the LCFS must account for the full lifecycle inventory of greenhouse gas emissions caused by biofuel production, including both direct emissions and indirect emissions from land use change (iLUC). Succumbing to the ethanol industry's call to exclude these emissions from the regulation would effectively ignore, or result in a zero value, for these real emissions. Ignoring the iLUC emissions will undermine the environmental benefits of the LCFS and set a poor precedent for any future policies attempting to reduce global warming pollution from transportation and other sectors. Moving ahead with a rule but delaying or omitting the inclusion of indirect land use effects in the model would imply that farmland is limitless, and would ignore the major impact of agriculture and deforestation on the climate. California has an opportunity to help get biofuels right by differentiating between poor-performing, conventional biofuels and the best-performing, advanced biofuels that all-together avoid these tradeoffs.

2.1 The ethanol industry's demand to ignore indirect land use change contradicts the science.

Numerous scientific, peer-reviewed publications have shown a carbon debt is incurred due to land use change from biofuels. To date, not a single peer-reviewed study has concluded that the indirect land-use effect does not exist or is zero. One hundred and seventy-seven (177) Ph.D. scientists from academic and research institutes (with backgrounds directly related to biofuels, land use change, and climate change) also support inclusion in the LCFS:

“Failure to include a major source of pollution, like indirect land use emissions, will distort the carbon market, suppress investment in truly low carbon fuels, and ultimately result in higher emissions.”⁵

The ethanol industry has portrayed the overall science and modeling as too uncertain to develop an estimate, arguing that the iLUC factor is not ready for prime-time. There is general agreement among scientists that the impact is real and significant. The body of scientific evidence supporting iLUC is also increasing, and all indications are that CARB's proposal has been conservative in its estimate.⁶

⁵ Scientist Letter to CARB on Biofuels, Indirect Land Use Change and the LCFS, Submitted to Chairwoman Mary Nichols, CARB on April 21st, 2009 by Union of Concerned Scientists.

⁶ M. O'Hare, R.J. Plevin, J.I. Martin, A.D. Jones, A. Kendall, and E. Hopson (2009), “Proper accounting for time increases crop-based biofuels' greenhouse gas deficit,” *Environ. Res. Lett.*, Vol. 4.

CARB is addressing uncertainty through sensitivity analysis, periodic review of the science, updating of the modeling to incorporate the best-available data, and providing producers with the opportunity to develop customized lifecycle pathways based on their own individual data. The uncertainties are generally with respect to the magnitude, rather than the direction of the effects due to iLUC. While iLUC is an “inconvenient truth” for the ethanol industry, there is no reason for industry to deny that it exists.

2.2 Other governments have recognized the real problem from land use change and are moving to account for indirect land use change emissions.

Other government agencies, such as the U.S. EPA and the EU, are incorporating indirect land use change into their estimates. For example, the U.S. Environmental Protection Agency, which is required by law to evaluate indirect land use change, has spent over two years estimating the indirect land use change factor by relying on agricultural-sector and macroeconomic modeling. The European Union, despite claims by ethanol lobbyists suggesting otherwise, is currently developing an EU “Low Carbon Fuel Standard” with clear Directives to address indirect land use change:

The Commission shall, by 31 December 2010, submit a report to the European Parliament and to the Council reviewing the impact of indirect land use change on greenhouse gas emissions and addressing ways to minimise that impact. The report shall, if appropriate, be accompanied by a proposal, based on the best available scientific evidence, containing a concrete methodology for emissions from carbon stock changes caused by indirect land use changes, ensuring compliance with this Directive, in particular Article 7b(2). (Fuel Quality Directive, Article 7d, para 6).⁷

In addition, the environmental commissioners from eleven (11) Northeast and Mid-Atlantic states have also voiced their support for inclusion of iLUC.⁸

As documented in the literature, there is a risk that biofuels can inadvertently cause adverse climate impacts by inducing significant land use changes that increase greenhouse gas emissions and reduce critical carbon “sinks”. Including direct and indirect land use impacts in its accounting is a key to getting biofuels policy right and achieving our mutual greenhouse gas mitigation goals.

Even China, concerned over impacts from crop-based biofuels on food supplies, has moved to limit production of ethanol from corn. China’s State Council states that non-staple crops, rather than corn, will be used to make ethanol and that arable land would not be used to grow crops to produce ethanol.⁹

⁷ Clarification e-mail from Ian Hodgson, Clean Air and Transport Unit, Environment Directorate General, European Commission. April 15, 2009.

⁸ Submitted to Mary Nichols and CARB Board members, April 17, 2009.

⁹ Sun Xiaohua, “China: biofuels boom won’t compromise food security.” July 6, 2007, *Science and Development Network*. <http://www.scidev.net/en/news/china-biofuels-boom-wont-compromise-food-securit.html>.

These agencies are also acting in response to the science showing that some biofuels can have real and large impacts on agricultural lands and forests. The remedy – accounting for these emissions -- is not only precautionary in nature, but representative of proper accounting of significant life cycle emissions from biofuels. CARB is taking a fair and reasonable approach to addressing these impacts, and its efforts are aligned with the direction other government bodies are taking.

3. CARB has responded in a fair and reasonable manner to the ethanol industry's requests and have incorporate many of their concerns

CARB has considered the concerns of the Renewable Fuels Association (RFA), representing members from the corn ethanol industry. Concerns have been raised by the RFA which generally fall into one of three categories: crop yields, carbon crediting, and model specifications.¹⁰ We provide further background information in **Attachment A** and a table of these concerns in **Attachment B**. Five of the RFA's major concerns are listed below, based on RFA's own comments at public workshops as well as CARB's sensitivity analysis. These five concerns by RFA include a request for CARB to incorporate:

- Higher values for corn yield
- Higher values for crop yields on converted lands
- Higher carbon crediting for distiller dry grains with solubles (DDGS), an ethanol co-product that is used as a replacement for traditional animal feed
- Indirect effects of other fuels in the modeling
- An RFA sponsored study showing no indirect land use impacts from corn ethanol

3.1 CARB has considered and incorporated higher values for corn yield.

CARB has fairly and adequately accounted for yield increases. The RFA argues that CARB's baseline corn yield forecasts are too conservative and that higher yield values should be assumed. Based on the RFA comments, CARB adjusted the baseline to account for actual, *observed* yield increases, resulting in an 8 percent decrease in the initial iLUC estimates. In addition, no other existing fuel producers have received explicit credit for theoretical or future improvements. Future, theoretical improvements are more properly accounted for in periodic updates and Method 2b, which allows for producers to submit their individual data to receive customized pathways. CARB has committed to updating the iLUC estimate as data on yield improvements become available. In addition, ethanol producers, like all other renewable and alternative fuel producers, have the option to submit actual data to create their own customized

¹⁰ Renewable Fuels Association Letter Comments submitted to CARB on October 16, 2008; December 2, 2008; and February 19, 2009.

and unique pathway. As Sperling and Yeh (2008) state in an article on the design of low carbon fuel standards,

“California is using a “default and opt-in” approach, borrowed from a voluntary system developed in the United Kingdom whereby fuels are assigned a conservative default value...The fuel producer can accept that estimate or provide evidence that its production system results in significantly lower emissions.”¹¹

Last, CARB has included a wide range of crop yields in its sensitivity analysis and scenarios. RFA has also argued that the model does not include an adequate increase in corn yield with increased prices, but the range has captured both historical changes in corn yields as well as more recent changes. CARB has assumed values that are supported by the range observed. CARB and researchers at Purdue University have also committed to further refining the model to internally account for yield response to prices.

3.2 CARB has considered and incorporated a higher range of values for crop yields on converted lands

RFA argues that CARB underestimates the productivity of converted lands. CARB observes that new acreage almost always has lower yields than lands already in use, simply because the best lands for crops have already been utilized. CARB’s approach has been to consider a range of sensitivities reflecting estimates that marginal land is 25 to 75 percent as productive as land currently used for agriculture, with 50 percent being the best professional judgment of experts.

However, based on feedback from RFA, ARB Staff and GTAP modelers have updated the range used to 50 to 75 percent. CARB has also committed to continued analysis of the available data and evidence, and to update its results as appropriate. CARB’s changes have resulted in an additional decrease of 6 percent from the initial iLUC estimate.

3.3. CARB is already providing credit for DDGS, but finds little justification to provide even greater credits.

RFA has asked that CARB give a higher credit for the use of DDGS (and also wet DGS) as a replacement for animal feed. The current carbon credit given by CARB to corn ethanol assumes that 1 lb of DDGS produced displaces 1 lb of feed corn. RFA argues that based on an Argonne National Laboratory study, that 1 lb of DDGS could displace 1.27 lbs of feed corn.

CARB has acknowledged and reviewed the Argonne study, but has also relied on other literature on the potential suitability for DDGS as a replacement feed. CARB believes it has provided a reasonable credit for DDGS already and believes that Argonne’s limited findings on potential suitability of DDGS cannot be generalized across the entire industry. CARB also has considered the expansion of ethanol production and the likelihood of significant additional DDGS entering the marketplace. CARB believes that significant market barriers exist to the widespread adoption

¹¹ Dan Sperling and Sonia Yeh, “Low Carbon Fuel Standards,” *Issues in Science and Technology*, Winter 2008, 57-66.

of DDGS by livestock managers, including (1) the highly variable nutrient content of DDGS, (2) challenges to handling, storing, and transport of dry and wet DGS, and (3) informational and educational barriers to using DDGS. As noted by several studies, livestock are only able to digest and metabolize a fraction of the higher protein content of DDGS. The higher sulfur and phosphorus content of DDGS can also lead to neurological problems in cattle and manure management issues, respectively.

Finally, other studies have recently raised additional concerns over using DDGS, raising questions regarding future marketability. A number of studies have linked DDGS to elevated rates of *E. coli* in cattle. The Food and Drug Administration (FDA) has also found that DDGS often contains antibiotics left over from producing ethanol, raising concerns regarding the use of antibiotics by ethanol producers finding their way to humans through the food chain.¹² This issue is currently being evaluated by the FDA. Given these concerns, CARB's decision appears to be well justified and fair.

3.4 CARB is evaluating whether there are other significant effects for other fuels. Preliminary estimates suggest these will be insignificant in comparison to the iLUC emissions factor.

Both RFA and New Fuels Alliance (NFA) have argued that CARB should consider indirect effects of other fuels, most notably petroleum, electricity, and natural gas. CARB has begun studies through the University of California to evaluate whether there are other *significant* indirect GHG emissions associated with other fuels. CARB has stated that the only significant indirect emission it has found to date is the land use impacts from some types of biofuels. CARB has already evaluated the direct land use change from conventional petroleum-based fuels, as requested by NFA, and has found that the impact to be insignificant (i.e. on the order of less than 1 percent, as shown in Figure 2-1). CARB has also asked stakeholders to provide additional data or modeling work showing significant indirect effects.

CARB has sought include significant impacts caused by incenting the production of renewable and alternative fuels in their program. The increased production of corn ethanol has shown to have a significant impact on corn prices and land use. In contrast, as a first-order estimate the increase in electricity and natural gas would likely not have a significant impact on demand with respect to their overall market. Figure 3-2 below compares the additional demand for alternative fuels potentially created, including the additional electricity, propane, natural gas, and corn. The results show that the increased demand corn ethanol is significant relative to U.S. production. Secondary impacts on the energy market for electricity and natural gas, by comparison, are likely to be insignificant to very small.

¹² Mark Steil, April 4, 2009, "Antibiotics pose concern for MN ethanol producers," Associated Press <http://www.forbes.com/feeds/ap/2009/04/04/ap6255845.html>

Figure 3-1: Comparison of land conversion requirements to produce one billion gallons (of gasoline equivalent). The bars (from left to right) show the land impacts from California crude oil, Canadian tar sands, and corn ethanol. Sources: CARB LCFS ISOR. Estimates for tar sands are based on preliminary estimates from the Canadian Boreal Initiative.

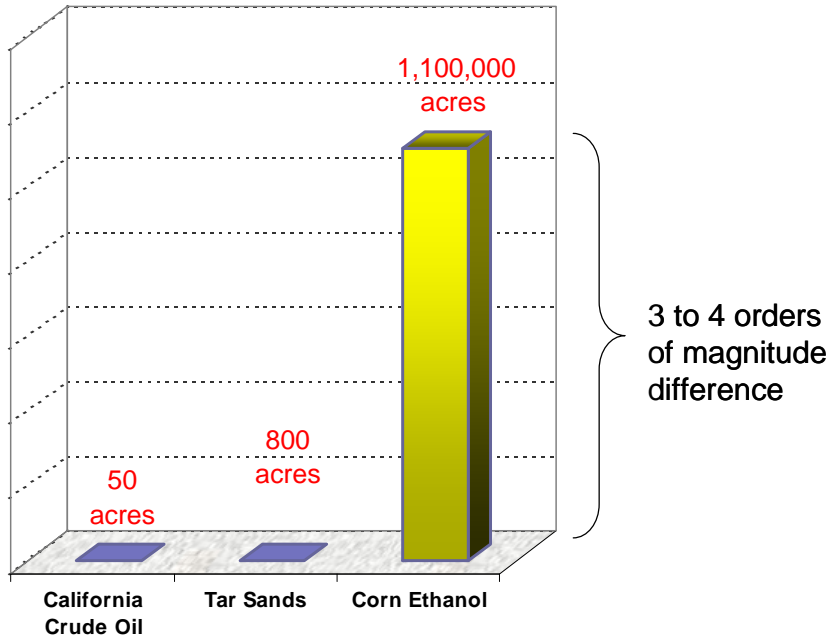
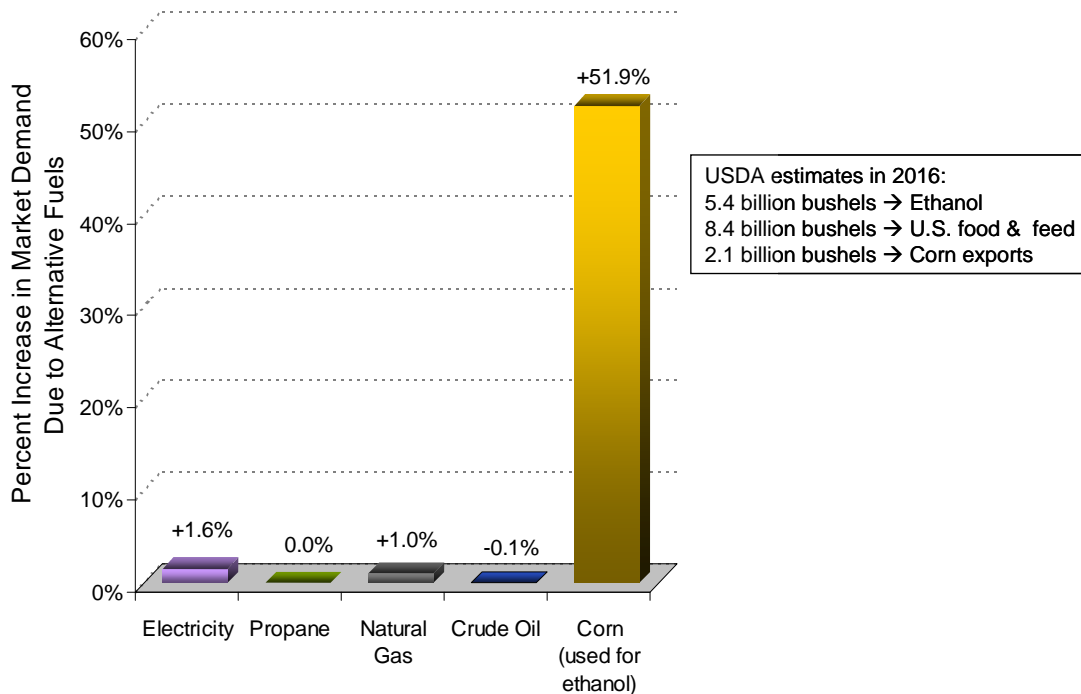


Figure 3-2: Comparison of alternative fuel demand relative to market size. Sources: CARB LCFS Initial Statement of Reasons; USDA (2007), *Ethanol Transport Backgrounder: Expansion of U.S. Corn-Based Ethanol from the Agricultural Transportation Perspective*. Agricultural Marketing Service, September 2007.



There have also been questions raised by NFA regarding the potential for greater use of electricity and natural gas indirectly causing increased use of coal by other sectors. As shown above, this is likely since the price of electricity and natural gas would not be expected to be affected in any significant manner. In addition, California has three policies that will result in greater use of low-carbon intensity electricity sources over time. These include:

- SB 1368 (Perata) which requires that new long-term financial investments in baseload generation resources be from clean energy sources (i.e. GHG emissions at least equal to natural gas).
- AB32 which places a cap on the economy, including the electricity sector, and will lead to reduced GHG emissions from the grid. In comparison, the agricultural sector is not covered by the cap.
- The Governor's Executive Order S-14-08 which requires a State Renewable Portfolio Standard that achieves 33 percent renewable generation by 2020.

Electricity GHG emissions from the electric sector are capped under AB32 and are expected to be capped federally soon. The same is true for most other significant sources of GHG emissions except land-use. As a result, the potential for economic factors to induce indirect emissions is greatly reduced. A complementary approach could be to place a cap on the agricultural sector. However, to date there are no plans to do so for the foreseeable future.

In comparison to the large effects from iLUC, NRDC's analysis shows that potential indirect, or market-mediated impacts, from these other fuels are likely small or insignificant as a first order estimate. That said, ARB Staff has reasonably committed to further evaluation and study of the potential indirect effects of other fuels.

4. Californians cannot afford to gamble on crude oil. Alternatives are needed.

Californian can no longer afford to gamble on crude oil prices. The LCFS will help diversify our fuel supply and help protect consumer pocketbooks from oil price swings. Oil price shocks, including those experienced in 1973-74, 1979-80, 1990, and most recently in 2007-2008, have all been followed by recession.¹³ With California's transportation system over 95 percent dependent on petroleum fuels, these oil price shocks will continue to disrupt our economy unless we provide a marketplace for alternatives. The LCFS helps provide consumers with alternatives by helping spur investments in clean alternative fuels. Once again, California is poised to lead the nation in developing clean energy solutions.

CARB has estimated that, through spurring alternatives to crude oil, the State may save as much as \$11 billion over the 2010-2020 timeframe. CARB's economic analysis is conservative. Using any number of reasonable forecasts of crude oil prices, Californian's will stand to benefit from

¹³ California Energy Commission (2007), *Integrated Energy Policy Report*. p. 204

significant fuel cost savings due to the LCFS, particularly during the next round of oil price shocks.

4.1 Cost estimates by the oil industry are highly overstated. CARB has been conservative in its estimates.

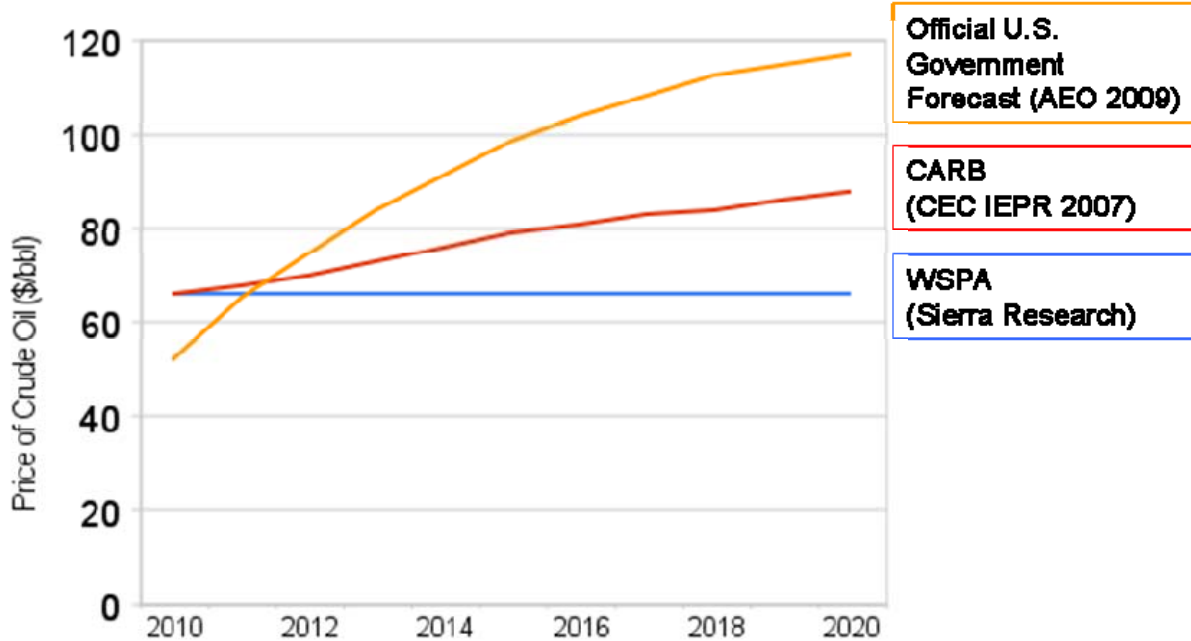
We strongly disagree with claims by the Western States Petroleum Association (WSPA) that CARB has been unrealistic or overly optimistic in its assumptions.¹⁴ In its Sierra Research study, WSPA contends that CARB should assume a price forecast of \$66 per barrel (\$/bbl) crude oil throughout the 2010 to 2020 time period.¹⁵ However, WSPA provides no rationale for why CARB should assume this value versus relying on official government forecasts. CARB has conservatively relied on assumptions from the 2007 California Energy Commission's Integrated Energy Policy Report (IEPR), which forecasts \$66 in 2010 to \$88/bbl by 2020.¹⁶ The official U.S. government forecast, the Energy Information Administration's (EIA) *Annual Energy Outlook (2009)* assumes a reference price case of \$52 in 2010 growing to \$117/bbl by 2020. As shown below in Figure 4-1, CARB's assumptions are well below even the EIA's reference oil price case. These conservative assumptions on crude oil price are the primary driver behind the cost estimates for the LCFS program.

¹⁴ Catherine Reheis-Boyd, Western States Petroleum Association Comment Letter to CARB, April 21, 2009.

¹⁵ *Preliminary Review of the CARB Staff Analysis of the Proposed Low Carbon Fuel Standard (LCFS)*, prepared by Thomas Austin et al., Sierra Research, Inc. April 8, 2009.

¹⁶ California Energy Commission (2007), "Transportation Energy Forecasts for the 2007 Integrated Energy Policy Report."

Figure 4-1: Comparison of crude oil price forecasts, including the U.S. Energy Information Administration’s Annual Energy Outlook (2009) reference price case; California Energy Commission’s 2007 IEPR, and WSPA/Sierra Research estimates.



Furthermore, WSPA claims CARB’s assumed feedstock costs for cellulosic ethanol are too low. Future technology costs are difficult to forecast, but CARB has relied on the best-available estimates including Department of Energy estimates. WSPA also argues that CARB assumes the federal RFS in its baseline when assigning costs. Staff has been reasonable however to account for existing government policies that already mandates biofuels nationwide. Doing so prevents falsely double-counting for both monetary costs and benefits that are already accounted for by the federal RFS program.

Finally, WSPA argues that CARB credits electric and fuel cell vehicles with greater efficiencies versus gasoline than warranted, resulting in overestimates of cost savings for consumers. While the Pavley rule will improve the performance of conventional vehicles, CARB has already accounted for this explicitly in adopting conservative energy efficiency ratios. There is also no reason to believe that plug-in electric vehicles or fuel cell vehicles will not improve as fast as (or faster) than their mature, conventional technology counterparts.

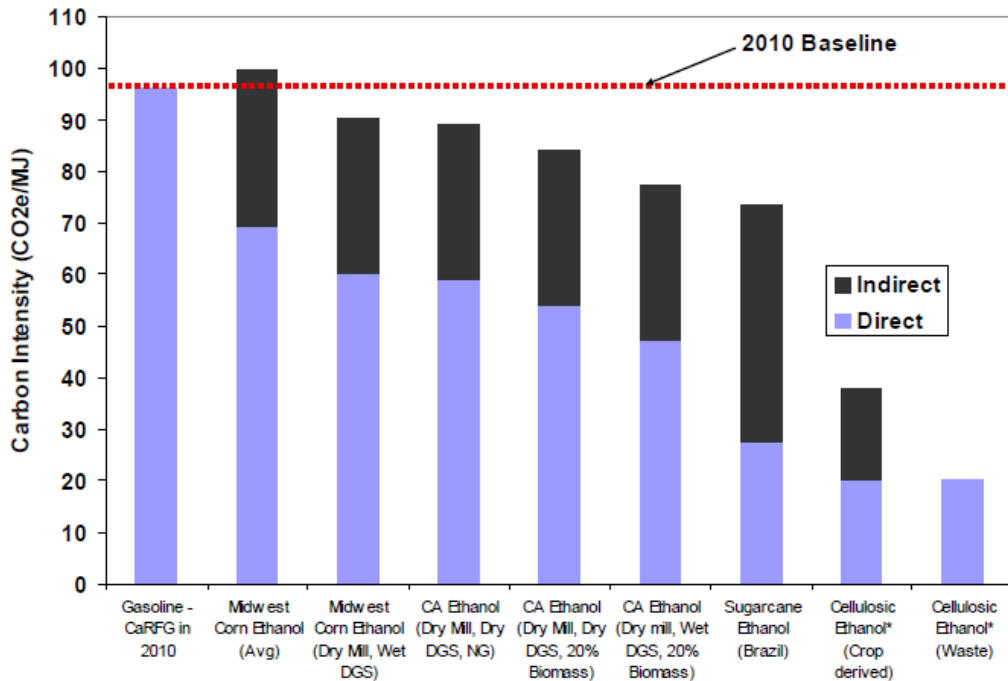
Once again, the oil industry has overstated the costs of one of California’s critical and vital programs -- which places greater responsibility on the industry to provide cleaner fuels.

4.2 The LCFS rewards and incentivizes investments in the cleanest low carbon fuels, including efficiently produced corn ethanol

Not all fuels are created equal. Some are clearly superior to others. The LCFS distinguishes between the alternatives by providing greater value for the cleanest, low carbon fuels. Next-generation fuels with the lowest lifecycle greenhouse gas emissions—such as electricity, natural gas, hydrogen, and superior advanced biofuels made from waste, non-food crops, and new sources such as algae—will thrive and advance under the standard. The LCFS will help biofuels get on the right path by incentivizing the types that avoid indirect land use change.¹⁷

Despite claims by the corn ethanol industry, the California LCFS will not damage their business because national law mandates a market for corn ethanol that will grow 2.5 times over the next six years to 15 billion gallons. Instead, the LCFS helps to even distinguish between better, more efficiently produced corn ethanol. As shown in Figure 4-2, even with inclusion of an iLUC, some corn ethanol will still be significantly incentivized.

Figure 4-2: Average fuel carbon intensity, as proposed by ARB. Fuels with lower carbon intensity values than the 2010 gasoline baseline will benefit under the LCFS. (Source: CARB LCFS ISOR, March 5, 2009)



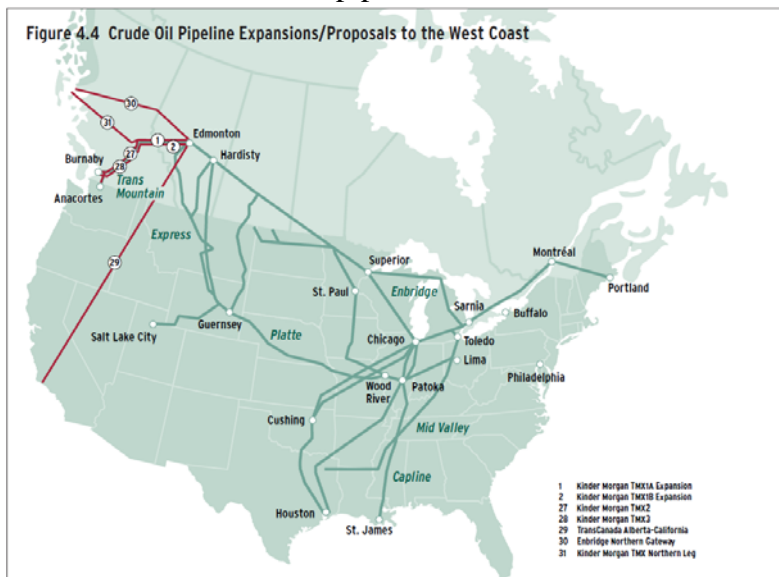
¹⁷ Christine Luong, Environmental Entrepreneurs and Jamie Knapp, J. Knapp Communications, *California's Low Carbon Fuel Standard: Investing in California's Future*. April 2009.

5. CARB’s differentiation of high carbon-intensity fuels is a fair, equitable approach and is necessary to preserve a level playing field among all fuels

High carbon-intensity fuels -- including those produced from Canadian tar sands, oil shale in the interior West, and liquid coal in various parts of the country -- all pose a significant risk to undermining the GHG reductions of the LCFS program. For instance, construction of pipelines to increase the flow of tar sands into the U.S. is already underway in the Midwest, with current construction of the Keystone pipeline expected to carry nearly 600,000 barrels per day (“bpd”) of Western Canadian heavy crude oil, including tar sands, into the U.S. Efforts are also underway to increase shipments of tar sands to the West Coast including California. The Canadian Association of Petroleum Producers state that:

TransCanada is in discussion with parties to ship 400,000 b/d of Western Canada crude oil by pipeline to California. The estimated in service date is 2014.¹⁸

Figure 5-1: Planned crude oil pipelines from Canada to the West Coast



As shown in Figure 5-1, additional pipelines to the coastline of British Columbia and to Washington State are also being planned and would likely allow additional heavy-crude oil supplies to be shipped and used in California.

The construction of a TransCanada pipeline alone would potentially allow 400,000 barrels per day of Canadian tar sands or bitumen to be shipped into California, representing nearly a quarter of California’s crude oil mix. This influx of dirty crude oil would result in significant backsliding in the carbon intensity of the petroleum baseline. The impact would be enormous: nearly half the emission reduction benefits of the LCFS would be eliminated by 2020.

¹⁸ *Crude Oil Forecast, Markets & Pipeline Expansions*, Canadian Association of Petroleum Producers, June 2008.

Due to these enormous risks, NRDC strongly supports CARB's intent to provide additional pathways that distinguish between both lower carbon intensity fuels and higher carbon intensity fuels. Doing so will help ensure accurate accounting of emissions and establish a level playing field for all fuels. CARB must continue its efforts to address high-carbon intensity fuels by including provisions to differentiate these fuels, including the addition of land use change values associated with the production of these fuels. Doing so will allow for more accurate assessments to be made and the correct market signals to be placed on both low and high-carbon intensity fuels.

NRDC supports the approach CARB has developed as an equitable one. The approach does not distinguish between crude oil origin, source, or type and instead uses carbon-intensity as the basis, which is consistent with the intent of the regulation. Doing so will allow higher carbon intensity crude oils and fuels, whether produced domestically or internationally, to be equally accounted for and treated in the LCFS.

6. Recommendations for improving the LCFS

To ensure we obtain real reductions in carbon and achieve the full economic benefits of the LCFS without sacrificing California's public lands and sensitive ecosystems, it is critical to avoid pitfalls that would compromise the success of the regulation. Six issues warrant particular attention (also see **Attachment C**):

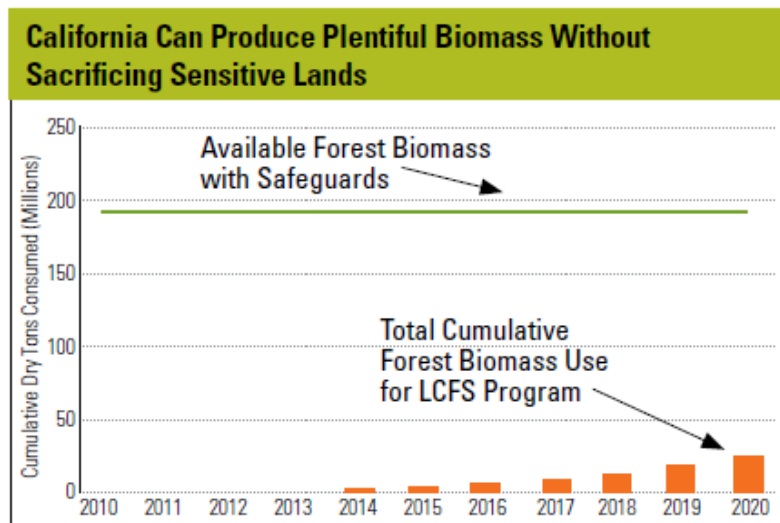
6.1 Adopt minimum protections for sensitive lands and ecosystems as part of the regulations.

We recommend that the Board direct Staff to add minimum protections for sensitive lands and ecosystems that would otherwise be incentivized by the rule for biomass production.

We must develop clear, strong rules to ensure that the unique natural heritage Californians are so justly proud of is not sacrificed to biofuels production. A recent analysis commissioned by NRDC proves that our state's ambitious greenhouse gas goals can readily be met without putting these areas at risk.¹⁹ California would need only 12 percent of the forest biomass stock - using our ecological screens - to meet the needs of the LCFS under CARB's most aggressive biofuel scenario (Figure 6-1). We look forward to working with the Air Board to adopt these important land safeguards.

¹⁹ <http://www.nrdc.org/energy/CAbiomass.asp>. *Assessing the Impact of Ecological and Administrative Considerations on Forest and Shrubland Biomass Projections for California*. March 2009, Prepared by James R. Stritholt and Jocelyn Tutak for NRDC.

Figure 6-1: Comparison of the forest biomass needed to meet the most aggressive biofuel scenario under the LCFS program to the biomass available with land safeguards applied.



6.2 Provide incentives for sustainable fuels.

The final regulation should direct ARB Staff to develop metrics to ensure the LCFS provides incentives for the development of broadly sustainable alternative fuels, while avoiding unintended support for fuels with negative impacts on our forests, agricultural lands, and other important natural resources. Such action is critical to promoting the sustainable development of low carbon fuels - including sustainable biomass-based alternative fuels - over the long-term, and preserving our public forests, agricultural systems, waters, and critical ecosystems.

NRDC is committed to working with CARB to develop sustainability metrics and a reporting system for the LCFS that is practical, meaningful and could provide the basis for a future incentive-based framework. Several sustainability frameworks have been and continue to be developed, such as the Roundtable on Sustainable Biofuels.

Emerging technologies are improving our ability to produce transportation fuels with significantly lower greenhouse gases than the fuels in use today. However, these technological advancements also increase the potential to degrade biodiversity, habitat, water quality, and soil quality, if fuels and feedstocks are grown, harvested, or produced in an unsustainable manner. Incorporating basic sustainability metrics into a LCFS reporting system that could then be used to provide marketplace differentiation – on a voluntary basis - would indicate to investors that there exists a future opportunity for the commercialization of alternative fuels that would be deemed highly desirable in the marketplace.

6.3 Ensure the LCFS ushers in a new generation of ultra-low carbon fuels

We request that CARB ensure that ultra-low carbon fuels are sufficiently incentivized to be brought into the LCFS market in the early years. To do this, the proposed regulations should be amended to ensure that different options are considered, including conducting periodic reviews on the effectiveness of the LCFS in driving ultra-low carbon fuel usage; increasing the stringency of the LCFS reduction requirements; exploring preferential terms for ultra-low carbon credits; evaluating how the design of the credit market will specifically affect ultra-low carbon producers; and reconsidering the ultra-low carbon carve-out.

6.4 Protect air quality and public health

To avoid an unintended worsening of air quality and threats to public health from new fuel production or fueling infrastructure, the LCFS should include requirements for state and local review to ensure that the appropriate mitigation measures are taken. In addition, the LCFS should require a comprehensive public health analysis of the fuels and infrastructure used to comply with the regulation using updated tools and data.

6.5 Ensure that the right signals are sent for development of advanced, second-generation biofuels

We also highlight the letter from Environmental Entrepreneurs (E2) endorsing the LCFS and inclusion of indirect land use change. The letter (**Attachment D**) represents the viewpoints of individuals from the advanced, second-generation biofuels community and biofuel investment community. We urge CARB to adopt resolution language that would address the concerns voiced in the E2 letter, including expeditiously approving pathways for advanced biofuels and identifying feedstocks with zero indirect land use change.

6.5 Further time and consideration is needed by CARB, along with interested stakeholders, to determine how to best incentivize electric transportation

Last, we urge CARB to adopt the resolution language (**Attachment E**) supported by environmental organizations, public health advocates, and utilities regarding transportation electrification. The recommendations simply ask that CARB give additional time and consideration to understand how to best develop a framework that will provide benefits to electric transportation customers. We look forward to CARB's adoption of this resolution language and continuing to work with Staff on these issues.

**Attachment A:
NRDC Backgrounder on LCFS and CARB's Approach to Addressing
Indirect Land Use Change**



April 17, 2009

Contacts: San Francisco: Simon Mui, Roland Hwang at 415/875-6100
New York: Nathanael Greene at 212/727-2700

NRDC Backgrounder

California's Low Carbon Fuel Standard:

A Fair and Reasoned Approach to Addressing Indirect Land Use Change

On March 5, the California Air Resources Board (CARB) issued its proposed Low Carbon Fuel Standard (LCFS). The LCFS establishes performance-based standards for oil companies to reduce the greenhouse gas from the transportation fuels sold in California. As part of the rulemaking process, CARB evaluated the global warming footprint associated with fuels, including significant direct and indirect emissions caused by the production and use of renewable, alternative, and petroleum-based fuels.

As part of their evaluation, CARB estimated the impacts from direct and indirect land use change (iLUC) from biofuels. The scientific community has widely recognized that some types of biofuel production can cause emissions due to indirect land use change, specifically those biofuels which cause land diversion from food and feed production. To account for these emissions, CARB has worked with a team of researchers from University of California and Purdue University to estimate the magnitude of these emissions.

To vet their technical analysis, CARB chose to use a publically available, peer-reviewed model and has made their methodology, assumptions, and data sources available to stakeholders for review. In addition, the CARB regulatory analysis has undergone peer review by a group of independently selected reviewers.¹ Over 19 public-stakeholder workshops were also held over the course of two years, giving stakeholders the opportunity to provide public testimony, comments, provide presentations, and to have meetings with CARB staff. Throughout this process, CARB has engaged the ethanol industry and considered their requests regarding treatment of iLUC. California has considered and incorporated many of the ethanol industry's requests in a reasoned and deliberative manner, as shown below.

¹ A blind peer review process is required under Health and Safety Code section 57004.
<http://www.arb.ca.gov/fuels/lcfs/peerreview/peerreview.htm>

CARB Has Determined Emissions from Land Use Change Are Significant and Must Be Included in the Accounting

An emerging and growing body of peer-reviewed research has indicated that biofuels production can cause diversion of land from food and feed production. As a result, additional conversion of forests, grasslands, and other croplands occurs, resulting in the loss of carbon stored in soil and the existing biomass (e.g. trees, roots). There is general agreement among scientists that the impacts are real and significant and clearly non zero. CARB has conducted a process to evaluate and assess the magnitude of these impacts, relying on the best-available science as well as peer-reviewed modeling tools and best-available data.

Based on its own analysis, CARB has also concluded that these impacts are significant and need to be accounted for in the LCFS. For example, CARB estimates that a new conventional petroleum refinery would disturb on the order of approximately 200 acres of land due to oil wells used for crude oil extraction. By comparison, to produce the equivalent amount of corn ethanol would require over 4 *million* acres of converted land, or four orders of magnitude larger than oil.² An LCFS that excludes or ignores these significant land use impacts is not supported by the science or by a reasoned decision-making process.

CARB Has Addressed Concerns from the Ethanol Industry and Incorporated Many of Their Requests

CARB has considered the concerns of the Renewable Fuels Association (RFA), representing members from the corn ethanol industry. At least ten (10) concerns have been raised by the RFA which generally fall into one of three categories: crop yields, carbon crediting, and model specifications. Five of the RFA's major concerns are listed below, based on RFA's own comments at public workshops as well as CARB's sensitivity analysis. These five concerns by RFA include a request for CARB to incorporate:

- Higher values for corn yield
- Higher values for crop yields on converted lands
- Higher carbon crediting for distiller dry grains with solubles (DDGS), an ethanol co-product that is used as a replacement for traditional animal feed
- Indirect effects of other fuels in the modeling
- An RFA-sponsored study showing no indirect land use impacts from corn ethanol

CARB Has Considered and Incorporated Higher Values for Corn Yield

Higher corn yields will generally reduce the amount of indirect land use change, since less land is necessary for a given amount of corn grown. RFA has argued that CARB's baseline corn yield forecasts are too conservative and that higher yield values should be assumed. RFA has also argued that the model does not include an adequate increase in corn yield with increased prices. Based on the RFA comments, CARB adjusted the baseline to account for actual, *observed* yield increases, resulting in an 8 percent decrease in the initial iLUC estimates. In addition, CARB has

² This first-order estimate assumes CARB's estimates of land converted for ethanol production and compares this figure to CARB's evaluation of land disturbed for crude oil production in California. (ISOR, IV-33 and IV-37). The amount of ethanol production was normalized, on an energy equivalent basis, to a 250,000 bpd oil refinery size.

included a wide range of crop yields in its sensitivity analysis and scenarios. The range has captured both historical changes in corn yields as well as more recent changes. CARB and researchers at Purdue University are also currently refining the model to internally account for yield response to prices.

It is important to note that as a practical matter, no other existing fuel producers have received explicit credit for theoretical or future improvements. However, CARB has committed to updating the iLUC estimate as data on yield improvements become available. In addition, ethanol producers, like all other renewable and alternative fuel producers, have the option to submit data to create their own customized and unique pathway. As Sperling and Yeh (2008) state in an article on the design of low carbon fuel standards,

“California is using a “default and opt-in” approach, borrowed from a voluntary system developed in the United Kingdom whereby fuels are assigned a conservative default value...The fuel producer can accept that estimate or provide evidence that its production system results in significantly lower emissions.”³

CARB Has Considered and Incorporated a Higher Range of Values for Crop Yields on Converted Lands

Similar to the above argument, RFA has argued CARB underestimates the productivity of converted lands. CARB observes that new acreage almost always has lower yields than lands already in use, simply because the best lands for crops have already been utilized. CARB’s approach has been to consider a range of sensitivities reflecting estimates that marginal land is 25 to 75 percent as productive as land currently used for agriculture, with 50 percent being the best professional judgment of experts.

However, based on feedback from RFA, CARB staff and GTAP modelers have updated the range used to 50% to 75%. CARB has also committed to continued analysis of the available data and evidence, and to update its results as appropriate. CARB’s changes have resulted in an additional decrease of 6% from the initial iLUC estimate.

CARB Has Provided Credit for DDGS, But Finds Little Justification to Provide Even Greater Credits.

RFA has asked that CARB give a higher credit for the use of DDGS (and also wet DGS) as a replacement for animal feed. The current carbon credit given by CARB to corn ethanol assumes that 1 lb of DDGS produced displaces 1 lb of feed corn. RFA argues that based on an Argonne National Laboratory study, that 1 lb of DDGS could displace 1.27 lbs of feed corn.

CARB has acknowledged and reviewed the Argonne study, but has also relied on other literature on the potential suitability for DDGS as a replacement feed. CARB believes it has provided a reasonable credit for DDGS already and believes that Argonne’s limited findings on potential suitability of DDGS cannot be generalized across the entire industry. CARB also has considered

³ Dan Sperling and Sonia Yeh, “Low Carbon Fuel Standards,” *Issues in Science and Technology*, Winter 2008, 57-66.

the expansion of ethanol production and the likelihood of significant additional DDGS entering the marketplace. CARB believes that significant market barriers exist to the widespread adoption of DDGS by livestock managers, including (1) the highly variable nutrient content of DDGS, (2) challenges to handling, storing, and transport of dry and wet DGS, and (3) informational and educational barriers to using DDGS. As noted by several studies, livestock are only able to digest and metabolize a fraction of the higher protein content of DDGS. The higher sulfur and phosphorus content of DDGS can also lead to neurological problems in cattle and manure management issues, respectively.

Finally, other studies have recently raised additional concerns over using DDGS, raising questions regarding future marketability. A number of studies have linked DDGS to elevated rates of E. coli in cattle. The Food and Drug Administration (FDA) has also found that DDGS often contains antibiotics left over from producing ethanol, raising concerns regarding the use of antibiotics by ethanol producers finding their way to humans through the food chain.⁴ This issue is currently being evaluated by the FDA.

CARB Is Analyzing Whether There Are Other Significant Indirect Effects For Other Fuels.

Both RFA and New Fuels Alliance (NFA) have argued that CARB should consider indirect effects of other fuels, most notably petroleum, electricity, and natural gas. CARB has begun studies through the University of California to evaluate whether there are other *significant* indirect GHG emissions associated with other fuels. CARB has stated that the only significant indirect emission it has found to date is the land use impacts from some types of biofuels. CARB has already evaluated the direct land use change from conventional petroleum-based fuels, as requested by NFA, and has found that the impact to be insignificant (~ 1%). CARB has also asked stakeholders to provide additional data or modeling work showing significant indirect effects.

Review of the process shows that CARB is evaluating impacts caused by incenting the production of renewable and alternative fuels in their program. Increased production of corn ethanol has shown to have a significant impact on corn prices and land use. In contrast, as a first estimate the LCFS or federal RFS would likely not have a significant impact on world crude oil prices, given the much larger size of the market.

Electricity GHG emissions from the electric sector are capped under AB32 and are expected to be capped federally soon. The same is true for most other significant sources of GHG emissions except land-use. As a result, the potential for economic factors to induce indirect emissions is greatly reduced. A complementary approach could be to place a cap on the agricultural sector (but this of course would be unlikely to address international agricultural emissions). However, to date there are no plans to do such for the foreseeable future.

⁴ Mark Steil, April 4, 2009, "Antibiotics pose concern for MN ethanol producers," Associated Press <http://www.forbes.com/feeds/ap/2009/04/04/ap6255845.html>

CARB, while recognizing the potential for other indirect effects for other fuels, and is reviewing the potential for these effects. To date, it has not received any reasonable analysis that can associate indirect or market-mediated effects caused by the LCFS.

Considering the RFA Study: Asking the Wrong Question

The RFA recently provided CARB with their study conducted by Air Improvement Resource, Inc (herein, Darlington study).⁵ The study assumes that if corn exports remain constant in the future, then no land use change abroad can be attributed to increased ethanol. Unfortunately, the Darlington study asks the wrong question by not considering how much corn exports would have increased absent increased corn ethanol production. The study states, “Of course, exports could theoretically be higher without an increase in ethanol from corn, but we do not know how much higher.” By ignoring this central question, and by not incorporating the appropriate modeling tools to analyze this issue, the study effectively presupposes no land use change abroad. In effect, the study is assuming that world population will not change and that the amount of food needed will remain constant in the future, which they will not.

In addition, the Darlington study recognizes that “additional corn production in the U.S. could come from soybeans, wheat, cotton, and some land currently in the Conservation Reserve Program.” However, the study again does not consider that these displaced crops will likely be made up for (i.e. grown) elsewhere. In fact, it ignores the entire indirect land use effect by assuming that U.S. soybean exports will continue to increase. Again, this ignores the question of how soybean export markets will *change* from business-as-usual because of displacement by corn ethanol. Overall, the study asks the wrong question and effectively ignores the question of how much corn exports (as well as other crops) would have grown absent corn ethanol production.

On review, CARB has conducted a reasoned analysis and decision-making process

CARB has considered all the concerns raised by the ethanol industry. Where CARB has found the ethanol industry’s concerns to be justified and supported, CARB has made changes to its analysis. CARB has responded to the major concerns raised by RFA, taking into account the scientific literature, government and industry data and reports, and expert judgment. In cases where considerable uncertainty exists, CARB has relied on sensitivity analysis and has attempted to base their assumptions on the best-available data or expert judgment. The process has resulted in improved values for the industry in some cases, and in all cases, has resulted in CARB undertaking efforts to improve the model or to conduct additional study on the issue.

⁵ Thomas L. Darlington, “Land Use Effects of U.S. Corn-Based Ethanol,” Air Improvement Resource, Inc. February 24, 2009.

**Attachment B:
Table Listing RFA Concerns, CARB's Responses, and NRDC's
Comments**

Top Issues Raised by Ethanol Industry Regarding iLUC

Issue	Argument	CARB's General Response	NRDC Comments and Responses
1. Overall Scientific Uncertainty	Overall science and modeling is too uncertain.	<ul style="list-style-type: none"> • CARB has relied on the best-available information and science and peer-reviewed models. • CARB believes it has conducted a fair and balanced process for determining reasonable values for land use change carbon intensity. • CARB will continue to investigate the many issues through discussion with stakeholders and analysis of current and new scientific data. 	<ul style="list-style-type: none"> • Scientists and economists generally agree that the impact is real and significant, but generally are not in consensus as to the magnitude of the land use change emissions and specific methodologies. • There are methods to manage and incorporate uncertainty (i.e. modeling tools). • There are numerous studies that identify significant impacts from LUC for food crop based biofuels. • Indications are that CARB estimates are conservative and the potential impact of iLUC is even larger. • The precautionary approach requires that CARB include iLUC. • There have been no alternatives offered by the Industry on how CARB could address iLUC other than assigning it a zero value, which is inconsistent with the best science and fundamentally unsafe.
2. Crop Yields	CARB should give higher values for corn yields, including potential improvements beyond business as usual.	<ul style="list-style-type: none"> • Adjustments have been made to account for <i>observed</i> increases in crop yields, resulting in a 2.9 g/MJ improvement. • CARB has also considered a wide range of crop yields (i.e. yield price elasticity) in its sensitivity cases and scenarios, with its main estimate being based on historical trends in the U.S. • CARB has committed to better refining the modeling to account for yields internally. 	<ul style="list-style-type: none"> • Ethanol producers can, through the Method 2b process, receive a custom value by providing yield data. • No other fuel producers get explicit credit for theoretical or future improvements.

Issue	Argument	CARB's General Response	NRDC Comments and Responses
3. Crop Yields	CARB should give higher productivity values for converted lands in the U.S.	<ul style="list-style-type: none"> • CARB has taken RFA concerns into account and narrowed the potential ranges, resulting in an improvement of 2.1 g/MJ for corn ethanol. • CARB has considered a range of sensitivities to account for a variety of yield assumptions which has the same effect. • Converted acreage is almost always lower in yields than existing lands already converted, simply because the best lands are almost always already in use. • CARB has relied on experts to provide an initial value. 	
4. Credits	CARB should give ethanol higher carbon credits for distiller dry grains (DDGS) used as a replacement feed.	<ul style="list-style-type: none"> • CARB has provided a reasonable credit already and believes, based on the literature, that DDGS faces significant market barriers to widespread adoption. • CARB has acknowledged the Argonne National Lab study on the potential suitability for DDGS as a replacement feed. • There are concerns regarding the variability of nutrient content and properties, availability of DDGS, and resulting animal performance. • Handling, storing, and transport of DDGS is also a concern. • Education barriers exist for livestock producers and managers. • Rising corn prices have led to increased prices for DDGS, rendering them less cost-effective compared to traditional feed. • CARB will review and account for actual market data as ethanol and DDGS production continue to grow. 	<ul style="list-style-type: none"> • Other factors may reduce the attractiveness of DDGS as a replacement feed, including: <ul style="list-style-type: none"> ➤ A growing number of studies linking DDGS to elevated rates of E. coli in cattle. ➤ FDA findings that DDGS often contains antibiotics left over from producing ethanol. The findings raise concerns regarding the use of antibiotics as a potential human food additive and the growth of bacteria that are resistant to the antibiotics (i.e. superbugs).¹

¹ <http://www.forbes.com/feeds/ap/2009/04/04/ap6255845.html>

Issue	Argument	• CARB's General Response	NRDC Comments and Responses
5. Credits	CARB should give credit for reduced fermentation emissions, or methane released from cattle.	<ul style="list-style-type: none"> • CARB is evaluating whether DDGS fed cattle have a shorter time to market and reduced methane emissions. • CARB recognizes they have not included an adjustment for reduced enteric fermentation and will review the data and make adjustments as deemed necessary, taking into account concerns over DDGS over-crediting in general. 	
6. Credits	CARB should give credit for forest lands cleared and used for building products and paper, which should be counted as “sequestration” of carbon.	<ul style="list-style-type: none"> • CARB recognizes that carbon may be stored temporarily in these products or landfills. • Credit has already been given for a fraction of the below <i>and</i> above ground carbon being stored. • CARB is considering other data sources and will update the assumptions as appropriate. 	<ul style="list-style-type: none"> • Credits given for the carbon inherent in products that will eventually decay appears to be faulty logic and would set a poor precedent. • By comparison, credits for CCS would need to include long-term management, measurement, and monitoring and account for leakage rates. • Even if proper time accounting were included, conservative values should be used because of the large uncertainty.
7. Modeling	CARB should account for the indirect market effects of other fuels.	<ul style="list-style-type: none"> • CARB has already assessed land use changes from petroleum-based fuels which has been found to have an effect on the order of 1%, but has not seen data or modeling work showing significant indirect land use impacts. • CARB has undertaken some studies considering whether there are other <i>significant</i> effects associated with fuels. • CARB has requested that stakeholders provide additional information or studies that have identified indirect effects on other fuels. • CARB is committed to continue to evaluate indirect effects associated with fuels that are incentivized by the LCFS. 	<ul style="list-style-type: none"> • The LCFS is not expected to change world crude oil prices. Even so, any avoided petroleum impacts would be credited back to the fuels displacing petroleum, not petroleum itself. • GHG emissions from the electric sector are capped under AB32 and are expected to be capped federally soon. The same is true for most other significant sources of GHG emissions except land-use. As a result, the potential for economic factors to induce indirect emissions is greatly reduced. • A complementary approach could be to cap the agriculture sector. However, there are no current plans to do such in the foreseeable future.

Issue	Argument	CARB's General Response	NRDC Comments and Responses
8. Modeling	The model does not represent CRP or idle/unmanaged lands.	<ul style="list-style-type: none"> • CARB is evaluating the possible inclusion of CRP land into the analysis but CRP and other lands will still have carbon emissions associated with their conversion. • CARB is currently characterizing in greater detail the land use types that are subject to conversion (forest, grassland, idle and fallow croplands). 	<ul style="list-style-type: none"> • The model also does not include carbon rich public lands in developing countries that are under some of the most severe conversion pressure. Inclusion of these lands is likely to greatly increase the emissions from indirect land-use change.
9. Modeling	There is no international land use change from increasing corn ethanol production. (Darlington, et al)		<ul style="list-style-type: none"> • The study presupposes an outcome by assuming that if exports are at least constant, than it can be assumed there is no land use change abroad. This is effectively the same as assuming world population and diet are constant, which they are not. • The right question to ask is, in the absence of the increased ethanol production, how much corn exports would have grown and how much more land would have been converted?

**Attachment C:
Environmental Coalition Letter and Requests**

American Bottom Conservancy • American Lung Association of California
Audubon California • Breathe California • California League of Conservation Voters
Calumet Project • Center for Biological Diversity
Center for Energy Efficiency and Renewable Technologies • Clean Water Action
Clean Wisconsin • Coalition for Clean Air • Corporate Ethics International • Earthworks
Ecology Center • Energy Independence Now • Environment America • Environment California
Environmental Protection and Information Center • Environmental Working Group
ForestEthics • Fresh Energy • Friends of the Earth • Indigenous Environmental Network
International Indian Treaty Council • Klamath Forest Alliance • Michigan Environmental Council
Natural Resources Defense Council • Planning and Conservation League • Public Citizen
Red Rock Forests • Save Union County • Southern Alliance for Clean Energy
Union of Concerned Scientists • Valley Watch • WildEarth Guardians

April 15, 2009

Mary Nichols
Chairman, California Air Resources Board
P.O. Box 2815
Sacramento, CA 95812

RE: The California Low Carbon Fuel Standard

Dear Chairman Nichols:

To avoid the worst consequences of global warming, California must not only make our cars and trucks more fuel-efficient and less polluting—we must also cut greenhouse gas emissions from the transportation fuels that power our vehicles. We applaud the California Air Resources Board for its work in developing the proposed Low Carbon Fuel Standard regulation which can spur the creation of a whole new generation of clean transportation fuels and is a critical component of the state's plan for meeting its 2020 greenhouse gas reduction goals under AB 32.

To ensure we obtain real reductions in carbon and achieve the full economic benefits of the LCFS without sacrificing California's public lands and sensitive ecosystems, it is critical to avoid pitfalls that would compromise the success of the regulation. Five issues warrant particular attention:

- **We strongly support ARB including in its proposed regulation the impacts of using land to produce biofuels.** For California to be a global leader in reducing pollution from fuels, the LCFS must account for all major sources of emissions. For some biofuels, emissions from indirect land use change (iLUC) are a major source of pollution; California must include these emissions for the LCFS to be credible. We therefore appreciate that ARB has accounted for iLUC in the proposed regulation.

- **Ensuring the LCFS provides real pollution reductions and ushers in a new generation of ultra-low carbon fuels.** California must ensure that the LCFS generates true reductions in global warming pollution beyond current state and federal laws, and puts the state on a trajectory towards meeting our long-term emission reduction goals. If fuel providers meet federal fuel requirements by merely shuffling low carbon biofuels into California, no real carbon reductions will result from the LCFS, and fuel providers may have little incentive to develop ultra-low carbon alternatives. The LCFS must be a platform for bringing ultra-low carbon fuels into the state's energy system. Therefore, we request that ARB either affirmatively include ultra-low carbon fuel requirements or ensure sufficient incentives for innovation are embedded in the LCFS market structure.
- **Ensuring minimum land safeguards.** The LCFS should include a definition of renewable biomass to help prevent unintended incentives for fuel production that result in ecological harm to our federal lands, forests, and other sensitive native ecosystems. To ensure maximum consistency between state and federal biofuels policy, the definition of renewable biomass should be the same as that set forth in the RFS.
- **Providing incentives for sustainable fuels.** The final regulation should direct ARB staff to develop metrics to ensure the LCFS provides incentives for the development of broadly sustainable alternative fuels, while avoiding unintended support for fuels with negative impacts on our forests, agricultural lands, and other important natural resources.
- **Protecting air quality and public health.** To avoid an unintended worsening of air quality and threats to public health from new fuel production or fueling infrastructure, the LCFS should include requirements for state and local review to ensure that the appropriate mitigation measures are taken. In addition, the LCFS should require a comprehensive public health analysis of the fuels and infrastructure used to comply with the regulation using updated tools and data.

Thank you for your work to make California a leader in reducing the pollution that causes global warming, and for your consideration of these comments and suggestions.

Sincerely,

Kathy Andria
President
American Bottom Conservancy

Bonnie Holmes-Gen
Senior Policy Director
American Lung Association in California

Dan Taylor
Director of Public Policy
Audubon California

Andy Katz, MCP
State Government Relations Director
Breathe California

Warner Chabot
Chief Executive Officer
California League of Conservation Voters

Steve Kozel Sr.
President
Calumet Project

Bessie Dent
Program Coordinator
Calumet Project

Brian Nowicki
California Climate Policy Director
Center for Biological Diversity

John Shears
Research Coordinator
Center for Energy Efficiency and Renewable
Technologies

Lynn Thorp
National Campaigns Coordinator
Clean Water Action

Peter J. Taglia, P.G.
Staff Scientist
Clean Wisconsin

Shankar Prasad, M.D.
Senior Research Fellow
Coalition for Clean Air

Michael Marx
Executive Director
Corporate Ethics International

Bruce Baizel
Director, No Dirty Energy Program
EARTHWORKS

Charles Griffith
Clean Car Campaign Director
Ecology Center

Remy Garderet
Energy Independence Now

Timothy Telleen-Lawton
Global Warming Advocate
Environment America

Caitlyn Toombs
Global Warming Associate
Environment California

Scott Graecen
Executive Director
Environmental Protection and Information
Center

Kari Hamerschlag
Senior Analyst
Environmental Working Group

Aaron Sanger
Senior U.S. Energy Campaigner
ForestEthics

Michael Noble
Executive Director
Fresh Energy

Danielle Fugere
Regional Program Director
Friends of the Earth

Tom Goldtooth
Executive Director
Indigenous Environmental Network

Andrea Carmen
Executive Director
International Indian Treaty Council

Kimberly Baker
Forest and Wildlife Protection Coordinator
Klamath Forest Alliance

David Gard
Energy Program Director
Michigan Environmental Council

Debbie Hammel
Senior Resource Specialist
NRDC

Matt Vander Sluis
Global Warming Program Manager
Planning and Conservation League

Tyson Slocum,
Energy Program Director
Public Citizen

Harold Shepherd
Issues Director
Red Rock Forests

Ed Cable
Save Union County

Colin Hagan
Federal Policy Associate
Southern Alliance for Clean Energy

Patricia Monahan
Deputy Director for Clean Vehicles
Union of Concerned Scientists

John Blair
President
Valley Watch

Jeremy Nichols
Climate and Energy Program Director
WildEarth Guardians

Cc: Governor Arnold Schwarzenegger
California Air Resources Board Members
James Goldstene, Executive Officer, ARB

**Attachment D:
Environmental Entrepreneurs Letter**



April 15, 2009

Mary D. Nichols, Chairman
California Air Resources Board
Headquarters Building
1001 "I" Street
Sacramento, CA 95812

Dear Chairman Nichols,

The undersigned endorse the California Air Resource Board's (CARB's) March 5, 2009 proposal for the Low Carbon Fuel Standard because of its prioritization of an environmentally responsible approach to the LCFS and indirect land use change (ILUC). Our shared goal is the development of highly productive biomass generation with maximized co-benefits, including the avoidance of conflicts with food production, minimization of adverse environmental impacts, enhanced local economic development, and the promotion of suitable animal feed.¹

We agree with CARB's stance that a policy that defers regulation of ILUC is not aligned with the long-term interests of the biofuels industry or that of the greater private and public stakeholder communities concerned. In short, we support CARB's decision to act now in motivating market activity that heeds both LCFS and ILUC concerns, and view a "zero" policy approach to be one that mistakenly offers inadequate direction for the market. Even if indirect land use effects are difficult to precisely predict, the regulation can be designed to encourage the right behaviors by the industry.

However, we do believe the proposal should be strengthened in the following ways to ensure that our shared goals are met. In particular, the program should provide clear incentives for producers to invest in techniques that result in additional carbon reductions. In general, such techniques will require a higher upfront capital investment in exchange for a higher return-on-investment than the value of the fuel alone. The program should also provide a clearer statement about preferred approaches to land use. We believe that even the current corn ethanol industry would benefit from this approach by being rewarded for improved corn production practices. This would help their ability to raise funds with current and prospective investors by sending a clear market signal that value will be created by advancing their current practices towards these goals. Specifically, we recommend the following:

1. CARB Should Expediently Approve Pathways for Advanced Biofuels

¹ See "Rethinking Biofuels" at <http://www.e2.org/jsp/controller?docId=16033§ion=biofuellanduse>

We support an LCFS that creates economic signals that will result in better feedstocks, agronomic practices, and conversion processes being developed over time. To help accomplish this, CARB should work with advanced biofuel producers to ensure timely certification of specific processes under Method 2B (Section 95486(d) of the proposed regulations.

CARB's pathways need to ensure that 2nd generation biofuel producers receive fair and accurate carbon accounting for their feedstocks on a timely basis. These pathways will help promote investment in environmentally sustainable energy solutions while correctly managing both unseen and foreseen externalities accompanying the growth of the biofuels industry. We believe that the industry requires a level of certainty and direction even at this early stage.

Critically, the default pathways for advanced biofuels should quantify the benefits of advanced biofuels by including the following:

1. Feedstock specific ILUC impacts – Advanced biofuels should not simply be assigned the same ILUC factor as corn ethanol. The ILUC factor should be specific to the feedstock source and how it was grown. In general, advanced biofuels should have much lower ILUC impacts than corn ethanol. In some cases, a zero impact should be credited for, if, for example, a biofuel is derived from waste materials.
2. Higher productivity of biofuel per acre of land utilized – The ILUC values should reflect the impact of what is likely to be higher productivity for advanced biofuels due to a combination of higher yielding dedicated crops and advanced processing techniques.
3. Efficiency of water use – Reward the use of non-irrigated land and water reduction below prior use. We recognize that this may create a need to equate water usage and GHG production. Fortunately, in California, there are models for the embedded GHG effects of water utilization, and we assume that these or comparable models can be applied in the rest of the country where irrigation is used.
4. Low carbon agricultural practices– Recognize practices that improve the carbon sequestration in soil, including non-till practices and biomass systems, and include appropriate credits in the lifecycle analysis.
5. Creation of protein as well as other feed products such as forage materials and electricity co-products – Recognize the creation of protein/animal feed and electricity, and include appropriate credits in the lifecycle analysis.

2. CARB Should Ensure Biofuel Pathways in CA-GREET Model Allow for Easy Modification of Key Inputs

CARB should ensure that the flexibility exists under Method 2A (“Customized Lookup Table”) to easily modify key factors so that producers have a clear understanding of how improvements can benefit their carbon score. This can be done by ensuring that under Method 2A (Section 95486(c) of proposed regulations) input factors exist for key

variables for the CA-GREET model used to generate the carbon intensity values in the Customized Lookup Table. The key input variables should mirror the above:

1. Feedstock specific ILUC impacts.
2. Pathway specific productivity of biofuel per acre of land (e.g., gallons of biofuel produced per acre of land).
3. Efficiency of water use (e.g., water per gallon of biofuel produced).
4. Low carbon agricultural practices that improve the carbon sequestration in soil (e.g., carbon credits for low-till practices).
5. Creation of protein and electricity co-products (e.g., appropriate crediting for co-production of protein/animal feed and electricity.)

3. CARB Should Identify Feedstocks with Zero Indirect Land Use Impacts

As CARB staff has repeatedly pointed out, there are many feedstocks with zero indirect land use impacts. We believe the industry would benefit from an early CARB signal and commitment to treat such feedstocks as zero for ILUC. This can be done by adopting a list of feedstocks that have zero or near-zero ILUC that includes but is not limited to those biofuels that:

- Derive from municipal or agricultural waste.
- Do not require arable land.
- Derive from crops grown on marginal agricultural lands or otherwise fallow farmlands, such as rotational and/or cover crops that are grown contra-seasonally to the primary crop.

Summary

We believe that CARB can encourage clean energy solutions for the medium- and long-term within a transparent market framework through (1) expeditiously developing advanced biofuel specific carbon certification pathways; (2) allowing fuel producers to easily modify key input parameters to receive an improved GHG score under the Customized Lookup Table method; and (3) clearly identifying in regulation which feedstocks have zero or near-zero ILUC emissions.

Thank you for your consideration. We look forward to working with your staff in the near future on our recommendations.

Sincerely,

Dr. Bob Epstein
Meera Balakumar
Environmental Entrepreneurs (E2)

Dan Adler, President
California Clean Energy Fund

Lee Bailey, Managing Director
Jim McDermott, Managing Director
US Renewables Group, LLC

Josh Becker, Partner
New Cycle Capital, LLC

Eric M. Bowen, President & CEO
Tellurian Biodiesel, Inc.

Dr. Jerry Caulder, Executive Chairman
Arama Kukutai, Managing Director
Finistere Ventures, LLC

Lawrence S. Gross, President & CEO
Edeniq, Inc.

J. William Haywood, CEO
LS9, Inc.

Kinkead Reiling, Co-founder and SVP Corporate Development
Amyris Biotechnologies, Inc.

Jim Macias, President & CEO
Ted Kniesche, VP Business Development
Fulcrum BioEnergy, Inc.

Jeffrey A. Martin, Director, President and CEO
Yulex Corporation

Jack Oswald, Founder and CEO
SynGest, Inc.

Tom Soto, Managing Partner
Craton Equity Partners

Sanjay Wagle
VantagePoint Venture Partners, Inc.

Steve Westly, Managing Partner
The Westly Group

Paul Zorner, President and CEO
Hawaii BioEnergy, LLC

**Attachment E:
Joint Letter From Utilities and Environmental Organizations**



April 14, 2009

The Honorable Mary Nichols
Chairman, California Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Comments on the Low Carbon Fuel Standard relating to Transportation Electrification

Dear Chairman Nichols,

We applaud the California Air Resources Board (CARB) for its work in developing the proposed Low Carbon Fuel Standard regulation that can spur the creation of a new generation of clean transportation fuels and is a critical component of the State's plan for meeting its 2020 greenhouse gas reduction goals under AB 32.

The undersigned organizations strongly support CARB's adoption of the Proposed Regulations to Implement the Low Carbon Fuel Standard (LCFS), dated March 5, 2009. We also recommend that the Board include the language described below as additions to the Board Resolution to adopt the LCFS.

The undersigned organizations are a diverse group, but are united by a twenty-year interest in the use of electricity as an ultra-low carbon fuel. We believe there are complex issues that need to be addressed to secure the very substantial greenhouse gas reductions from the use of electricity as a transportation fuel. As such, we recommend that CARB adopt three Board Resolutions which will allow for more time to work on these issues with stakeholders, including the California Public Utilities Commission (CPUC), and report back to CARB at its next hearing on the LCFS in December 2009.

We ask CARB to adopt the following three Board Resolutions. Our rationale for the three resolutions and our suggested language is provided below:

1. Resolution on Definition of Regulated Party for Electricity.

“BE IT FURTHER RESOLVED that the Board directs staff to continue to work with the CPUC and other stakeholders on the definition of Regulated Party for Electricity in Section 95484 (a)(6), and the appropriate recipient(s) and generator(s) of the LCFS credits, and return to the Board by December 2009 with recommended modifications to the regulation, as appropriate;”

The CPUC staff asked CARB staff for additional time to address this issue and recommended the language above, on March 5, 2009. The regulatory framework surrounding the electric sector makes electricity a challenging fuel to address. For example, both CARB and CPUC staff will need to determine how the LCFS definition can conform to (and not be in conflict with) existing regulations governing the electricity market, including those governing the sale and resale of electricity. Regulators and stakeholders will also need to understand how to best develop a framework that will provide benefits to electric transportation (ET) customers and facilitate the use of electricity as a transportation fuel. If given the additional requested time, we believe a cooperative framework can be developed that is superior to the current competitive framework in the proposed regulation. We recommend more time be taken to sort through the many issues to make sure the details are right.

2. Potential Cross-Sector Transfer of GHG Compliance Costs.

“BE IT FURTHER RESOLVED that the Board directs staff to: 1) conduct a study to evaluate if displacing petroleum transportation fuels with electricity leads to a cross-sectoral shift in GHG compliance costs and other costs, and the effect of any such shift; and 2) conduct a study and hold one or more public workshops to determine how the Low Carbon Fuel Standard should best work with other programs in the AB 32 Scoping Plan to ensure that the use of electricity as a transportation fuel is not discouraged, and to send the right price signals to consumers; and 3) return to the Board by December 2009 with recommendations, as appropriate;”

We are requesting this Board Resolution for staff to work with stakeholders on this issue to ensure that the appropriate price signals are conveyed to consumers, and that the State’s regulations, incentives, and programs are coordinated to facilitate electric transportation and the State’s carbon reduction goals. Because the LCFS for electricity needs to work with several regulations (most under CARB control) we recommend that a process be set up to address this big picture. We believe the goal should be that (1) any barriers be addressed, and (2) the regulations adopted by the CARB and the CPUC with respect to electricity work together. There are many moving parts to the State’s GHG reduction and electrification goals. More time is needed to understand and remove any barriers, to coordinate the market with existing and proposed programmatic measures, and to send the proper price signals to both electric and gasoline consumers.

3. Eligibility of Forklifts and other Non-Road Electric Transportation.

“BE IT FURTHER RESOLVED that the Board directs staff to develop a mechanism to allow generation of LCFS credits from new categories and applications of electric forklifts and similar electric non-road vehicles and equipment, and to further increase market penetration in existing categories and applications, and return to the Board by December 2009 with recommended modifications to the regulation, as appropriate;”

The LCFS Regulation currently provides that certain non-road applications such as electric forklifts and similar equipment are ineligible to generate LCFS credits. Our concern is that the proposed regulation misses an important opportunity to capture GHG emissions reductions by excluding electricity in much of the non-road sector, but allowing non-road fuels that produce more carbon than electricity to be eligible for LCFS credit. The non-road sector has potential for significant near-term greenhouse gas reductions using electricity for fuel. For example, the California Alternative Fuels Plan adopted by both CARB and the California Energy Commission estimated potential GHG emissions reductions of 2.2 million metric tons per year by 2022 from electric forklifts and electric truck refrigeration units alone¹. Clearly more time is needed to sort through the issues so that these reductions can be encouraged and secured.

Thank you for your work to make California a leader in reducing greenhouse gas emissions and air pollution, and for your consideration of these comments and recommendations.

Sincerely,

Will Barrett
Air Quality/Global Warming Policy Coordinator
American Lung Association in California

Dave Modisette
Director
California Electric Transportation Coalition

John Shears
Research Coordinator
Center for Energy Efficiency and Renewable Technologies

Tim Carmichael
Senior Policy Director
Coalition for Clean Air

Daniel Emmett
Executive Director
Energy Independence Now

Danielle Fugere
Regional Program Director
Friends of the Earth

Roland Hwang
Transportation Programs Director
Natural Resources Defense Council

Saul Zambrano
Director, Clean Air Transportation
Pacific Gas and Electric Company

¹ AB 1007 Scenarios, Electric Drive Technologies, California Energy Commission, proceeding for the AB 1007 California Alternative Fuels Plan, see “Aggressive Scenario” on pages ES-4 and ES-5, June 4, 2007.

Michael J. Gianunzio
Director, Legislative and Regulatory Affairs
Sacramento Municipal Utility District

William Zobel
Manager, Clean Transportation Programs
San Diego Gas & Electric Company

Michael M. Hertel
Director of Corporate Environmental Policy
Southern California Edison Company

Patricia Monahan
Deputy Director for Clean Vehicles
Union of Concerned Scientists

Cc: Governor Arnold Schwarzenegger



California Low Carbon Fuel Standard

CARB Board Hearing
April 23, 2009

Simon Mui, Ph.D.
Scientist, Clean Vehicles and Fuels

Peer Review: Has ARB staff been reasonable in developing a best-estimate of iLUC?

Valerie Thomas, Ph.D. (Georgia Institute of Technology)

*“Taken as a whole, the scientific portion of the proposed rule is based upon sound scientific knowledge, methods and practices. **Use of a non-zero positive value for the carbon intensity due to land use change for ethanol from corn and sugarcane is sound.**”*

John Reilly, Ph.D. (MIT)

“My judgment coincides with that expressed in the report, that **including an estimate of these indirect emissions is better than leaving this emissions source out completely because of uncertainty.**”

Denise Mauzerall, Ph.D. (Princeton)

“**These values for biofuels appear to me to be optimistic** and should be reevaluated in light of the new studies indicating lower reductions in GHG emissions derived from biofuel use...”

Linsey Marr, Ph.D. (Virginia Tech)

“**Ignoring land use change would be likely counterproductive** to the goals of the LCFS”

CARB has Addressed and Incorporated the RFA Concerns in a Fair and Reasonable Manner

RFA Arguments:

What Has ARB's Response Been?

1. Overall science and modeling is too uncertain to assign a value	Science has shown these emissions are real. Staff and university researchers have spent 2 years to develop a best estimate of these emissions and have conducted an open process (peer-reviewed, public models; best-available data)
2. Higher corn yields	Adjustments have been made to account for higher, observed yields resulting in a lower iLUC value. <i>[Like other fuels, future theoretical improvements and credits are more properly accounted for in periodic updates or through data submitted through the Method 2b process].</i>
3. Higher yields for lands that are converted	CARB has agreed and narrowed the potential ranges, resulting in a lower iLUC value.
4. Higher carbon credits for Distiller Dry Grain (DDGS)	CARB is already giving a credit for DDGS and has reviewed the literature. There are significant concerns regarding expanded use of DDGS, including livestock producers' concerns on the nutrient variability; animal performance; handling, storage, and transport; and costs.
5. Model does not represent idle/unmanaged lands	CARB is evaluating the inclusion of idle lands, but these lands will also have carbon emissions associated with their conversion. <i>[Better refinement on carbon-rich public lands in developing countries will tend to work in an opposite direction.]</i>

Continued →

CARB has Addressed and Incorporated the RFA Concerns in a Fair and Reasonable Manner (Continued)

RFA Arguments:

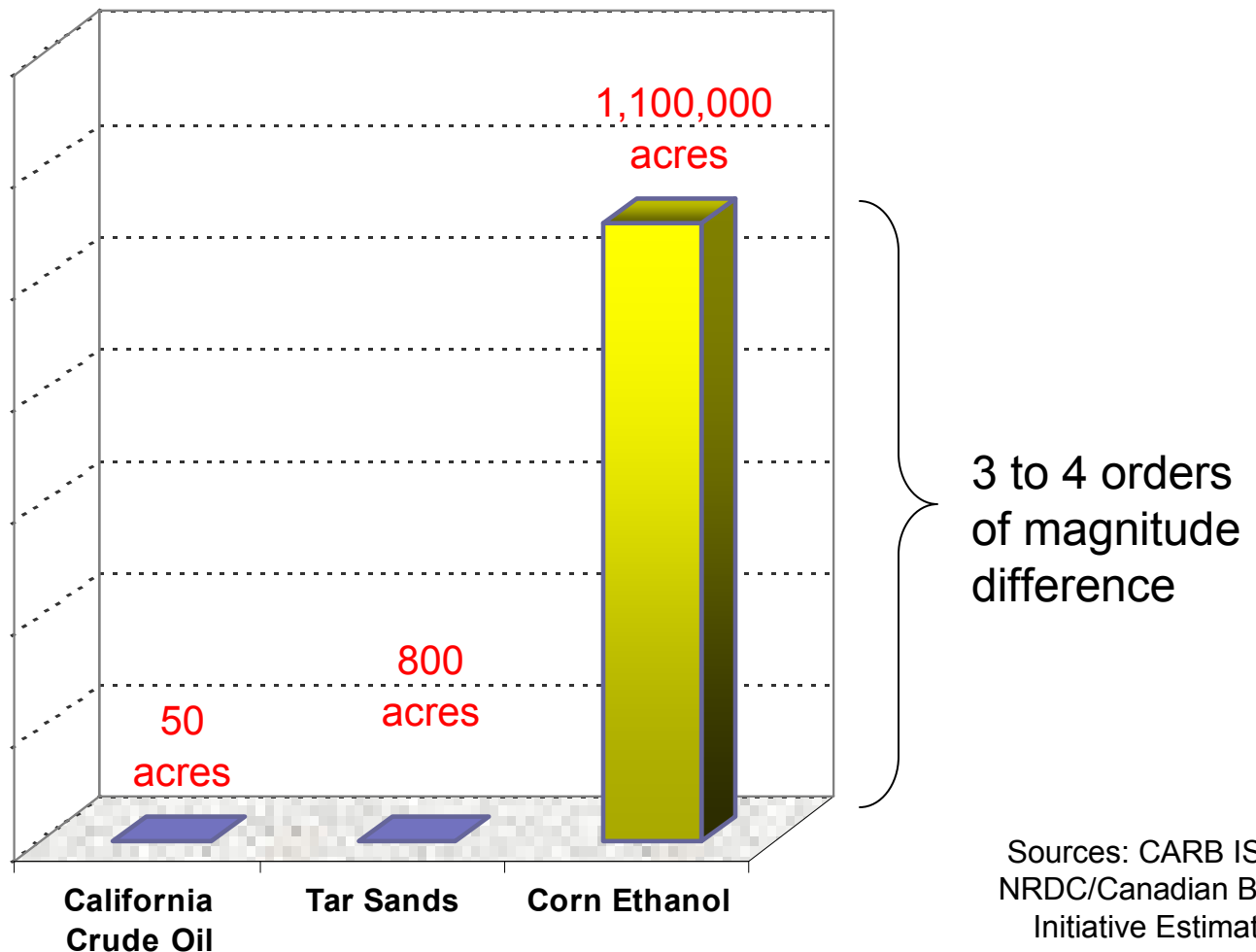
What Has ARB's Response Been?

<p>6. There is no international land use change (Darlington study)</p>	<p>The study appears to presuppose an outcome by assuming that if exports stay constant, then there is no indirect land use change abroad. It fails to ask the right question, which is how do corn exports change due to ethanol.</p>
<p>7. There are indirect effects from other fuels</p>	<p>CARB has evaluated land use change, but these are very small (~1%). No data or analysis has been provided showing these impacts are significant. However, CARB is currently studying potential impacts.</p>
<p>8. Ethanol should get credit for less methane releases from cattle that eat DDGS</p>	<p>CARB will review the data on whether DDGS fed cattle have a shorter time to market and will make adjustments if necessary.</p>
<p>9. Ethanol should get credit for the products produced from the cleared forests</p>	<p>CARB recognizes that carbon may be stored temporarily in wood and paper from the cleared forests. Credit has already been given for a fraction of the carbon contained in the products. CARB will considering other data sources as well and will update as appropriate.</p>

Full table and backgrounder available in NRDC comments, Appendix A and B

Land Use Impacts for Corn Ethanol are Significant

Comparison of land conversion requirements to produce one billion gallons (gasoline-equivalent)



Indirect Effects for Other Fuels

- Does Electricity and Natural Gas Used for the LCFS Indirectly Lead to More Coal?
 - SB 1368 requires that new long-term financial investments in baseload generation resources be from clean energy sources (i.e. GHG emissions at least equal to natural gas)
 - AB32 places a cap on the electricity sector and will reduce GHG emissions (vs. the agricultural sector which is not covered)
 - State RPS will require 33% renewable generation by 2020 (E.O. S-14-08)
- Change in demand due to the LCFS is so small for electricity and natural gas that any price impacts on other sectors is likely to be exceedingly small
 - CARB is evaluating and attempting to quantify significant effects

Other Indirect Market Effects Appear to Be Trivial for Other Fuels

