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Growth Energy Policy Brief: California's Dangerous Gamble with Indirect Land Use Change

Introduction

Reducing carbon emissions in transportation fuel, a subject of recent national debate, is in fact an ambitious and admirable goal for the state of California. It is also a goal fraught with danger. Unless sound, proven science is used to determine carbon emissions, the state and nation could suffer the reverse effect: a transportation system that actually emits more pollution.

An issue before California's Air Resources Board (ARB) threatens to cause just that. The theory of Indirect Land Use Change (ILUC) employs no empirical evidence and an unfair notion of justice to single out one industry – ethanol – as the culprit behind poor environmental practices in other countries. The Air Resources Board should reject use of ILUC and prevent bad policy from undermining America's only clean, green alternative to gasoline available today.

In January 2007, Governor Arnold Schwarzenegger signed an Executive Order establishing the first Low Carbon Fuel Standard (LCFS). The goal of the LCFS is to lower the carbon intensity of California's transportation fuels by 10 percent by 2020. Governor Schwarzenegger charged the California Air Resources Board (ARB) with developing the regulations that would govern the LCFS, and the agency is now in the final stages of releasing a draft rule for public comment with the final rule to be voted on by the ARB on April 23 or 24.

One of the most controversial aspects of the ARB's rulemaking has centered on the carbon accounting of biofuels, and more specifically the inclusion of indirect land use change (ILUC) models in calculating the carbon intensity of biofuels. Currently, the carbon intensity of transportation fuels is determined through "lifecycle analysis." So for corn-based ethanol, its carbon intensity is calculated from the time the crop is planted and farmed until it is harvested, turned into ethanol and burned as an additive in gasoline. According to the most recent data from the University of Nebraska-Lincoln[i], the ethanol industry currently is producing a fuel that is 48 to 59 percent lower in lifecycle greenhouse gas emissions than gasoline.

However, the ARB is now proposing a significant shift in these internationally-recognized standards for lifecycle analysis by including indirect emissions theoretically related to production and use of biofuels.

This theory claims that growing crops for biofuel production displaces other crops, which are then grown in other parts of the world, leading to deforestation. Based on this theory, the ARB would assign an indirect land use change "adder" or penalty to ethanol in addition to its direct carbon intensity. According to ARB's preliminary work on this issue, it has calculated the carbon intensity of dry-mill corn-based ethanol to be 67.6 (gCO2/MJ), which is not as good as the University of Nebraska's findings, but is

significantly better than California Gasoline Blendstock's calculation of 96.88 (gCO2/MJ). But, when adding the indirect land use change penalty to ethanol, ethanol's carbon intensity jumps to 97.6 (gCO2/MJ)[ii].

The debate over ILUC has become increasingly polarized, with opponents of ILUC models pointing to the scientific problems with its application and proponents saying any number is better than zero, even if there are many unknowns. Often lost in this debate is whether applying ILUC penalties to biofuels will actually accomplish the original goal – reducing carbon emissions.

In this policy paper, we examine the theory behind ILUC and show that it fails to be realized empirically. Further, we will explain how the adoption of ILUC models could have the opposite intended effect - creating disincentives to decrease a fuel's carbon intensity. The paper will also demonstrate why it could have dangerous repercussions in the broader policymaking effort to reduce carbon emissions. And finally, we will present a series of alternatives to ARB's proposal that would promote incentives for biofuels producers to adopt more sustainable practices that are verifiable and would ultimately contribute greatly to California's efforts to reduce its greenhouse gas emissions.

Indirect Land Use Change – How Did We Get Here

The effort to include ILUC models in lifecycle analysis has been driven by a small group of academics who have relied on a theoretical framework rather than observable data. The first person to promote this theory was Mark Delucchi from the University of California-Davis[iii]. In a paper he released in October 2004, Delucchi claims the calculation of GHG emissions for transportation fuels should include a wide array of factors, including policy action, production and consumption of energy and materials, prices, emissions, and environmental systems. Instead of citing data, Delucchi provides imagined scenarios on how these factors could impact a fuel's carbon footprint.

Delucchi's theory was then promoted by a group of academics at University of California-Berkeley, Alex Farrell, Richard Plevin, Michael O'Hare, and Daniel Kammen. As part of his Masters in Science degree, Richard Plevin submitted a dissertation calling for California policy to measure the carbon intensity of biofuels by using "market-based" lifecycle tools[iv]. It's important to note that while these academics are now firm opponents of corn-based ethanol, they had supported it in a paper they published in *Science* in January 2006[v]. Once Governor Schwarzenegger signed the Low Carbon Fuel Standard in 2007, he appointed Alex Farrell to work with the ARB to develop the regulations for the standard and in August 2007, Farrell and his team submitted a policy analysis on how the ARB should establish the rules[vi]. In the document, they acknowledge "indirect land use changes associated with biofuel production in the LCFS would be difficult to estimate because it is uncertain how increased biofuel production in one location (for instance California or Iowa) would affect the use of land in another location (for instance prairie land in the Great Plains or rain forests in Malaysia or Brazil). Few economists believe that an international computable general equilibrium model could reliably predict such land use changes." Yet they go on to conclude that even though a correct indirect land use change penalty cannot be accurately determined, any number is better than zero. They justify this policy position by writing that it would send a "signal" to biofuels producers.

At that point, it was clear the ARB would move forward in developing a model to calculate an ILUC penalty for biofuels. The theory's proponents scored another victory when ILUC language was inserted in the final version of the Energy Independence & Security Act of 2007, which gave the U.S. Environmental Protection Agency authority to use ILUC models to determine the greenhouse gas emissions of biofuels.

Then, in February 2008, the concept of indirect land use change gained enormous attention when Tim Searchinger, an environmental lawyer with no scientific background, published a study in *Science* claiming that carbon emissions related to ILUC made corn-based ethanol more carbon intensive than gasoline[vii]. According to Searchinger, the land diverted for increased corn production used for ethanol would lead to sharp deceases in American grain exports, which in turn would lead to increased land cultivation elsewhere, releasing the carbon stored in that particular region. This paper will address the many flaws of Searchinger's paper in the next section, but it's important to note that his research was widely disputed by experts in lifecycle analysis, including Dr. Michael Wang of Argonne National Laboratory[viii] and Dr. Bruce Dale of Michigan State University[ix]. Unfortunately, the media did not include these critiques in their stories and treated Searchinger's paper as actual "science."

Meanwhile, the ARB continued work on a model to include ILUC in its calculation of the Low Carbon Fuel Standard. In April 2008, Alex Farrell passed away, and now Michael O'Hare is lead advisor to the ARB. In addition, the ARB hired Lifecycle Associates, a company that includes Richard Plevin as part of its staff to conduct the lifecycle analysis for the various transportation fuels. The ARB's findings have all been posted on its Web site[x].

Theory vs. Reality

While the environmental impacts of land use changes related to international market effects need to be carefully studied for all land use-related activities, the assumptions behind ILUC models are not supported by real world data. Further, policies are already in place that address many of the concerns raised by indirect land use change proponents.

It's easy to understand why the media and opponents of biofuels have come to embrace ILUC theory. It's an uncomplicated concept – corn for ethanol displaces other crops, namely soy, and therefore farmers in Brazil cut down the rainforest to grow soy and fill the demand. However, the facts dispute this simple narrative. First, the theory of ILUC is built on the idea that American grain exports will plummet because of corn used for ethanol. In his paper, Searchinger estimates that corn exports will decrease by 62 percent and that soy exports will decline by 28 percent[xi]. In fact, nothing could be further from the truth. Even with growing ethanol production, corn production has been able to meet the demands for food, fuel, and exports. In 2007, the U.S. produced a record 13 billion bushels of corn and in 2008, American farmers harvested more than 12 billion bushels of corn, the second largest crop ever produced[xii]. Meanwhile, since 1998, corn exports have remained at 1.5-2.5 billion bushels sold abroad each year[xiii]. These exports have been supplemented by the surge in distiller grains, a key co-product in ethanol production used to feed livestock. According to the USDA, exports of distiller grains increased by 91 percent from 2.36 million metric tons (mmt) in 2007 to 4.51 mmt in 2008[xiv]. The story is similar for soybeans. According to the U.S. Soybean Export Council, 2008 was a record year for soy exports, totaling 1.5 billion bushels exported, a 7 percent increase over the previous year[xv]. Indeed, according to the United States Department of Agriculture's Long-Term Projections Report released this month, American exports of corn and soy will grow or remain stable through 2015, showing that Searchinger's dire predictions are baseless[xvi].

American farmers have been able to meet the demand for corn because technology has allowed them to grow more on the same amount of land. For example, in 1980, the average corn yield per acre was 91 bushels and in 2007, it was 152.8 bushels[xvii]. Similarly, ethanol yield has increased from 2.4 gallons per bushel in 1980 to 2.81 in 2007[xviii]. Had there been no improvements in ethanol and crop yield since 1980, it would have required significantly more land to grow the corn needed for ethanol.

The second major component of the ILUC theory is that corn for ethanol production leads to increased soybean farming worldwide which then encourages deforestation in places like the Amazon rain forest in Brazil. While deforestation continues to be an environmental challenge, there is no verifiable correlation between deforestation in Brazil and ethanol production. According to the National Institute of Space Research, deforestation in the Amazon has declined sharply just as American biofuels production doubled. In 2004, 10,588 square miles of the Amazon was deforested and in 2008, that number dropped to 4,621 square miles[xix].

In addition to government policies that have reduced deforestation in the Amazon, partnerships between the private sector and non-governmental agencies also are helping to keep the rainforests intact. One such project is the Soybean Moratorium. In July 2006, the Brazilian Vegetable Oils Industry Association (ABIOVE), which includes ADM, Cargill, and Bunge, signed an agreement with Conservation International, World Wildlife Fund, and Greenpeace to implement a voluntary ban on the purchase of soybeans grown on deforested land, destroying the market for soybeans grown in the Amazon. ABIOVE and Greenpeace say the moratorium has been effective at reducing new rainforest clearing for explicit soy production. A joint report released in April 2008 found no new soybean plantations in any of the 193 areas that showed deforestation of 100 hectares (250 acres) or more between August 2006 and August 2007[xx]. The moratorium has been extended until 2010.

<u>Violates Tenants of Established International Environmental Law</u>

In addition, the policy of punishing individuals, or in this case, an entire industry, for indirect environmental effects violates the basic "polluter pays" principle that has been one of the bedrocks of international environmental law. According to the polluter pays principle, the party responsible for producing pollution is responsible for paying for the damage done to the environment. This principle has been widely adopted by countries that belong to the Organization for Economic Co-operation and Development (OECD), including the United States, and is part of Principle 16 of the Rio Declaration on Environment and Development.

By applying an ILUC penalty to biofuels, the ARB would punish biofuels producers for actions they are not involved in nor have any control over. Indeed, policy ramifications of adopting ILUC models for the LCFS could be massive. Consider how stakeholders involved in a cap and trade system would react if they were suddenly not only responsible for their own carbon emissions but also indirect carbon emissions from the international market effects related to their product. Indeed, adopting ILUC models as the standard for lifecycle analysis could cause the collapse of the burgeoning carbon market.

Most importantly, applying an ILUC penalty to biofuels will do nothing to reduce carbon emissions. Even if one accepts the ILUC theory, why would a party engaged in deforestation activities change its behavior, since someone else is paying the price for the released carbon?

<u>Endorses Different Standards for Different Types of Energy</u>

It is important to note that land use is only one type of indirect impact that can be accounted for with respect to greenhouse gas emissions. In fact, there are many complex economic, social, and political indirect effects that could lead to energy sources being more carbon intensive. Unfortunately, indirect effect penalties are only applied to biofuels. By singling out biofuels for ILUC penalties, the ARB would be applying different standards to different types of transportation fuels and artificially creating winners and losers in the Low Carbon Fuel Standard.

For example, a study presented by Life Cycle Associates at the last ARB meeting found that there are many direct and indirect carbon emitting effects of oil production that are not captured by the board's current lifecycle analysis[xxi]. Further, it shows that several elements of direct carbon emissions, including oil refining and transport are either not included or not well understood by the current models. And while the ARB has indicated that indirect land use changes may not be applicable to petroleum, there are many indirect effects that are not currently calculated in its lifecycle analysis for gasoline. These include carbon emissions related to refinery co-products, which are often toxic and hazardous waste, macroeconomic effects, the use of military forces and equipment to protect the Middle East oil supply, and the reconstruction of Iraq. Indeed, the increased carbon intensity from the characterization, storage, transport, and disposal of oil production waste products could dwarf what the ARB is considering as a penalty for ILUC related to biofuels.

Creates Disincentives to Innovate

From an industry perspective, adoption of ILUC models in GHG measurements could slow advancements in second-generation biofuels and discourage corn-based ethanol producers from investing resources to reduce their carbon footprint. ILUC models lead to decreases in innovation because the models inject uncertainty in the marketplace. Already, it is widely understood that the penalties assigned for ILUC cannot be verified. Therefore, even though the penalty is derived from a model, the result is ultimately an arbitrary figure based on theoretical assumptions that have no basis in reality. With that in mind, why would someone invest in second generation biofuels when the feedstock they are using could be deemed to have indirect land use change effects? Why would corn ethanol producers, who have been making their production process increasingly efficient, continue to invest millions of dollars in new technology to be greener when that reduction in GHG emissions could be wiped out by an ILUC penalty?

Alternative Solutions

If California's ultimate goal is to reduce GHG emissions, there are other polices the ARB can pursue that will achieve this objective much more effectively than an ILUC penalty for biofuels. These alternatives are based on empirically researched best practices for biofuels production that can be verified by internationally recognized standards for lifecycle analysis.

For example, California could allow biofuels producers to submit independent carbon intensity studies (beyond the options currently available) based on the source of their feedstock and methods of production and then provide preferred market access to biofuels found to be most efficient. Already, many ethanol producers use methane from landfills and cogeneration or biomass boilers to power their plants, but currently the draft rule only recognizes two types of ethanol production, dry mill and wet mill. By providing flexibility in the calculations, the ARB will provide incentives for ethanol producers to speed up innovative techniques and encourage them to reduce their carbon footprint throughout their supply chain. The ARB can also promote sustainable agricultural practices that mitigate GHG emissions and can even be carbon sinks. In fact, according to research by Dr. Bruce Dale of Michigan State University, even if one believes that indirect land use changes result from biofuels production, using sustainable crop management practices like no-till and no-till plus cover crops can make any carbon from land use impacts negligible[xxii].

Another way the biofuels industry can work with California to reduce carbon emissions is by providing technical expertise and logistical support for nations affected by deforestation. In fact, biofuels producers could be a major asset in the effort Governor Schwarzenegger has spearheaded to find ways that California, Illinois, and Wisconsin can work with states and provinces in Brazil and Indonesia to stop tropical deforestation.

Conclusion

As the world's efforts to reduce greenhouse gas emissions continue, carbon accounting will be an increasingly important factor in identifying the best solutions to our climate challenges. That is why the best available science must be employed, and the standards for such measurements need to be the same across the board. But as we have seen, indirect land use change models fail to accurately account for carbon emissions and are used selectively. As a result, the inclusion of ILUC models to determine the carbon intensity of biofuels should be rejected by California's Air Resources Board.

Not only is the foundation for the theory flawed, its use would violate principles of international environmental law, create different standards for lifecycle analysis, and ultimately damage any innovation that would help decrease GHG emissions further.

Members of the biofuels industry take great pride in the environmental benefits of their product and want to work with states like California and the environmental community to ensure that renewable fuels like ethanol are as clean and green as possible. But that also means policy decisions need to be based on science and facts, not rigid ideology or speculative models.

About Growth Energy

Growth Energy is a group committed to the promise of agriculture and growing America's economy through cleaner, greener energy. Growth Energy members recognize America needs a new ethanol approach. Through smart policy reform and a proactive grassroots campaign, Growth Energy promotes reducing greenhouse gas emissions, expanding the use of ethanol in gasoline, decreasing our dependence on foreign oil, and creating American jobs at home. More information can be found at GrowthEnergy.org

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[iv] http://plevin.berkeley.edu/docs/Plevin-MS-2006.pdf

[v] http://www.sciencemag.org/cgi/content/abstract/311/5760/506

[vi] http://www.arb.ca.gov/fuels/lcfs/lcfs_uc_p2.pdf

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[viii] http://www.bioenergywiki.net/images/0/0a/Michael_Wang-Letter_to_Science_ANLDOE_03_14_08.pdf

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[xiv] http://domesticfuel.com/2009/02/18/record-distillers-grains-exports/

[xv] http://www.ussoyexports.org/news/stories/pr/pr102008.pdf

[xvi] http://www.ers.usda.gov/Publications/OCE091/OCE091c.pdf

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