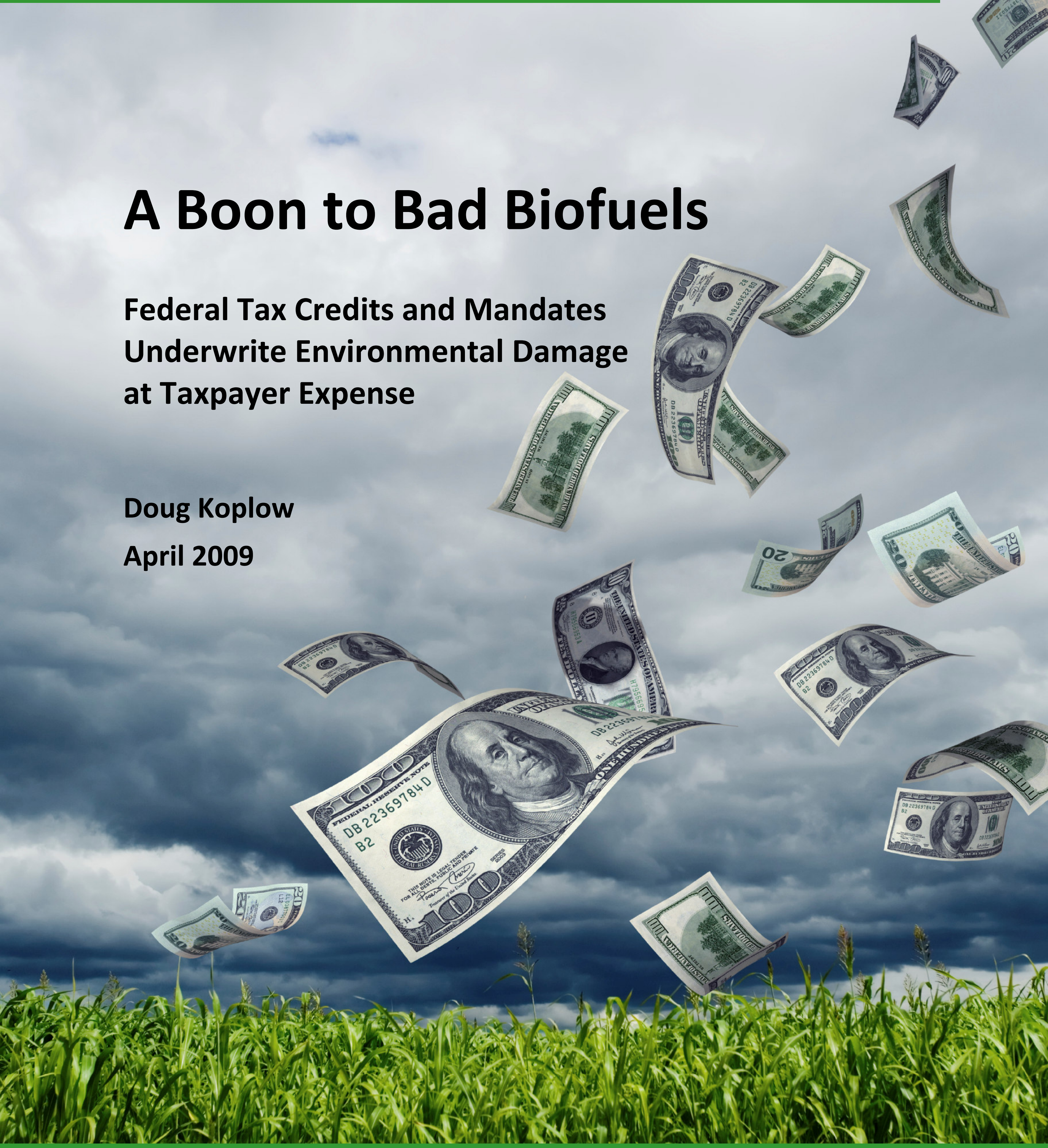


A Boon to Bad Biofuels

Federal Tax Credits and Mandates Underwrite Environmental Damage at Taxpayer Expense

Doug Koplow

April 2009

earth track
www.earthtrack.net
Friends of the Earth

Acknowledgements

This report was written by Doug Koplow, of Earth Track, with contributions by Kate McMahon and Erich Pica of Friends of the Earth. Editorial assistance was provided by Nick Berning and Ben Schreiber, also of Friends of the Earth.

The authors alone bear responsibility for any factual errors. The views expressed in this report are those of the authors and do not necessarily reflect the views of the funders or reviewers.

The report was made possible by the generous support from the Energy Foundation.

Special thanks to the many grassroots activists and leaders who tirelessly advocate for a more healthy and just world.

An electronic copy of this report can be found at http://www.foe.org/energy/biofuels-subsidies

earth track
www.earthtrack.net

2067 Massachusetts Avenue, 4th Floor, Cambridge, MA 02140
tel: 617.661.4700 • fax: 617.354.0463 • email: info@earthtrack.net

and

Friends of the Earth

1717 Massachusetts Ave NW, Suite 600, Washington, DC 20036
tel: 202.783.7400 • fax: 202.783.0444 • email: foe@foe.org

Table of Contents

Summary

Government subsidization of ethanol and biodiesel has spurred rapid growth in productive capacity within the United States, causing a parallel financial hit to taxpayers and consumers. Worth roughly $9.5 billion in 2008 from the top handful of subsidies alone, the programs do little to steer the support away from environmentally-harmful feedstocks and production processes.

Two policy areas are of particular concern. The first is the Renewable Fuels Standard (RFS), which mandates the increased blending of biofuels into the conventional fuel stream. By the year 2022, the RFS will mandate 36 billion gallons of biofuels to be blended, 15 billion gallons of which is expected to come from corn ethanol. Proposals by the incoming administration would boost this target still further: to 60 billion gallons per year by 2030.

Also of concern are lucrative tax credits, such as the Volumetric Ethanol Excise Tax Credit (VEETC), which pays out $.045 for each gallon of corn ethanol. A parallel program for biodiesel is worth $1.00 per gallon; and a production tax credit limited to cellulosic ethanol pays out $1.01 for each gallon produced.

In their current form, these tax credits scale linearly with production, without limit. As a result, their cost quickly becomes astonishing. The $9.5 billion of subsidies in 2008 increases six-fold to $60 billion by 2022, due both to more production and to a shift to more heavily subsidized cellulosic fuels. In total, between 2008 and 2022, taxpayers will have paid out over **$400 billion** to the biofuels industry. Were Obama proposals for 60 billion gallons per year to be realized, subsidies would top $120 billion *per year* by the end of the period, for a cumulative subsidy during the 2008-30 period of more than $1 *trillion*.

For this investment, we accelerate land conversion and exacerbate a wide range of environmental problems. Already, the ecological impact of increased biofuels production is evident, both in the U.S. and abroad, including deforestation, water pollution and increased greenhouse gas emissions. Much smarter policies are needed to protect both environmental and economic interests of taxpayers. These policies need to provide real environmental screening for subsidized fuels, and allocate scarce public resources to the lowest cost substitutes to transport fuels, not merely the most politically savvy.

1. Overview

Aided by a variety of public subsidies, global production of biofuels has more than doubled over the past five years. In the 30 years since "gasohol," a blend of ethyl alcohol and gasoline, first entered the marketplace in the United States, subsidies to support the biofuels industry have grown in both scope and scale. These subsidies are a central factor in the rapid expansion of biofuels production and consumption within the U.S.

Lucrative tax credits are coupled with a blending mandate for a pre-specified volume of biofuels, called the Renewable Fuel Standard (RFS). A five-fold increase from previous levels in the 2007 Energy Independence Security Act (EISA) now requires that 36 billion gallons of biofuels must be blended into U.S. fuel supply by 2022. Despite an effort to promote less damaging fuels, the mandate still allows up to 15 billion gallons to be produced from corn starch,[1] which is known to be one of the more environmentally harmful biofuel feedstocks. **Our analysis found that between the RFS and the tax credits, total subsidies for biofuels between 2008 and 2022 will exceed $400 billion, nearly 40% of which will benefit the corn industry.[2]** These subsidies represent an enormous cost to taxpayers while accelerating a variety of concerning environmental impacts.

Although there are more than 200 subsidies to biofuels nationwide (Koplow, 2006), this analysis focuses on a handful of the largest ones: federal tax credits and mandates. Even this partial view of subsidy policy is sufficient to demonstrate the size of biofuel subsidies under existing federal policies. Additional constraints on these subsidies are needed to keep them from inadvertently underwriting environmental destruction on a large scale.

1.1 Financial Impact

The financial costs are sobering. **Assuming existing laws are extended and mandate levels enforced, <u>the biofuels industry will garner subsidies worth more than $60 billion per year by 2022</u>, a more than six-fold increase from the still impressive $9.5 billion in support the industry received in 2008 from these programs.**[3] Cumulative subsidies between 2008 and

[1] Though the RFS does not have a specific mandate for corn ethanol, there is a residual allowance for conventional renewable fuel after more restrictive submandates have been met. Corn is widely expected to fill most or all of that category.

[2] These are nominal values, not adjusted for present values. Despite the fairly long period analyzed, the impact of this simplification is not expected to be large. While the tax credits are not indexed for inflation and will decline in real value over time, the tax credits interact with the mandates. As the real value of tax credits decline, the market clearing price of renewable fuel blending credits (called Renewable Identification Numbers, or RINS) is expected to rise to enable the more expensive fuels to remain viable. The effect would be to maintain the real value of the total subsidy package.

[3] In addition to the tax credits and the mandate, there are many other ways in which biofuels receive tax payer support. USDA's new Biomass Crop Assistance Program (BCAP) for example could top $1 billion per year (Koplow, 2008). Many states have large excise tax exemptions for higher ethanol blends. Volumes of E85 are expected to grow sharply should the variety of subsidies to promote E85 vehicles and infrastructure begin to take hold.

2022 are expected to be in excess of $400 billion.[4] Impacts on ancillary industries, such as food and livestock production, have not been evaluated in this paper, but could be at least as large as the cost of direct subsidies.

During his presidential campaign, President Barack Obama stated that he would boost the federal Renewable Fuels Standard (RFS) from 36 billion gallons per year by 2022 to 60 billion gallons per year by 2030 (Obama, 2008). Since the cost of the major biofuel subsidy programs scales with consumption, financial problems would worsen. If current laws are not changed, the subsidies from existing programs will top $120 billion per year by 2030; and cumulative transfers from taxpayers and consumers to the biofuels industry between 2008 and 2030 would top $1 *trillion* should Obama's plan become implemented.

The biofuels mandate and tax credits work in tandem to create a massive boon to biofuels producers. Under the RFS mandate, for example, fuel blenders earn credits for each gallon of biofuel they blend. Because the federal government requires markets to use these fuels even if they are more expensive, the credits are expected to have significant value. Under the Obama plan, for example, the market price premiums from the mandate are expected to be the single-largest source of subsidies to the biofuels industry by 2030, with a cumulative value over the 2008-2030 period of more than $500 billion.

Summary of Subsidy to Biofuel Industry through the Tax Credits and RFS (in billions)	
In Year 2008	$10
In Year 2022	$60
Cumulative Between 2008 and 2022	*$420*
Summary of Subsidy to Biofuel Industry through the Tax Credits and RFS under "Obama Plan" (in billions)	
In Year 2030	$125
Cumulative Between 2008 and 2030	*>$1,000*

Subsidies this large move markets and can do so in very significant ways. Consider that the relative economic return from different crops is a major determinant of planting patterns. Subsidized production of biofuel feedstocks, including emerging cellulosic crops, already plays a significant role in cropping patterns because such feedstocks can out-compete the returns from other land uses. For example, corn farmers will not start growing switchgrass if the returns on the latter are much lower. The result is a bizarre policy dynamic: the government will need to boost subsidies to cellulosic crops enough so the return to farmers is higher than that from the

[4] Note that **total** subsidy values to biofuels in 2008, which incorporated a larger array of subsidy programs, were substantially higher: $11 to $13 billion (Koplow, 2007). While the exclusion of a broader array of policies understated support levels by 10-20% in 2008, this share could grow over time with some of the new programs supporting cellulosic fuels come to the fore.

federally subsidized corn they are currently growing. From the taxpayer point of view, it is a farmland equivalent of betting against oneself in a card game.

Production costs, of course, are driven by more than subsidy levels. Raw material inputs also matter. All else being equal, markets would normally favor geographic locations that have fertile soil and sufficient rain. Ideally, markets would stem the expansion of fuel crops into less efficient areas with poor soils and little rain. Unfortunately, key inputs such as irrigation water are often heavily subsidized as well; and topsoil and nutrient losses are poorly regulated and controlled. In short, the layering of water and crop subsidies with huge subsidies for biofuels production itself masks the real economic footprint of the specific fuel delivered, greatly compounding the risks of large expansions.

1.2 Environmental Impact

The major focus of this paper is to evaluate the subsidies that the biofuel industry garners from current policies that promote biofuels production. However, a brief mention of some of the environmental problems associated with biofuels production is warranted, as they are exacerbated by poorly structured subsidy programs. Although the early growth in the industry was bolstered by claims that biofuels bring many environmental benefits, damages have become increasingly visible as production has risen.

Biofuels can be grown and produced in many ways, and wide variation in the environmental performance of different producers is common. Family farmers using sustainable practices can produce biofuels in less harmful ways. Unfortunately, poor production practices have the potential to cause substantial environmental and social harm.

Increased biofuel production can cause a range of environmental problems such as soil degradation, water shortages, pesticide contamination and nitrogen runoff. The runoff is a major contributing factor to marine dead zones, such as those common in the Gulf of Mexico (Donner and Kucharik, 2008). Biodiversity suffers both from these dead zones, and from the growing acreage dedicated to a handful of fuel crops that is displacing mixed ecosystems.

An additional concern involves the growing reliance of the biofuels sector on genetically modified organisms (GMOs), both in the biofuels crops themselves and the enzymes being developed to convert cellulose feedstocks into fuel. Genetic modification and manipulation can have adverse impacts on human health (Netherwood, et al, 2004; and Ewen and Pusztai, 1999) and can contribute to a host of biodiversity issues. Emerging issues involving overuse of antibiotics in ethanol production and residual contamination in cattle feed produced as a byproduct to the fuel are also worrying (Steil, 2009).

Of particular concern are the potential effects of the biofuels expansion on global climate. Early claims by biofuel proponents that the new fuels would reduce greenhouse gas emissions (GHG) did not properly account for land use changes such as deforestation. These shifts are an almost inevitable result of any large scale up of fuel crop production levels, given the baseline sequestration occurring on much of this acreage. A growing number of studies indicate that almost any biofuel produced on natural land, or on agricultural land already in production, results in large net greenhouse gas emissions. Once emissions from direct and indirect land use change are incorporated, many biofuels can release more GHGs than the gasoline or diesel fuels they aim to replace (Searchinger, et al., 2008; Farigone, et al. 2008; Gurel, et al. 2008).

Yet, while billions of taxpayer dollars expand biofuel production and land conversion across the planet, little of this disbursement is restricted to low-impact operations. With few restrictions on access to subsidies, there is little reason for industry to shift to less harmful production systems. Differentiation between producers on the basis of environmental impacts is rarely done. While large-scale biofuels production may be environmentally harmful in any form, the lack of successful differentiation of ecologically harmful biofuels greatly increases the environmental penalty of the biofuels revolution.

Thankfully, efforts to screen fuels for their environmental impacts are starting to emerge. However, they require much improvement to be accurate and effective. At present, federal tax breaks to biofuels do not integrate any environmental screens. The RFS is a little better, with provisions for forest and ecosystem protection and greenhouse gas reductions. However, RFS protections do not address other environmental concerns such as soil degradation, water use, pesticide and fertilizer application, or any other impacts associated with environmental or human health problems.

The federally set targets for greenhouse gas reductions in the RFS are an important environmental safeguard, but they do not go far enough. For example, facilities that were producing ethanol at the time of passage of the RFS are grandfathered and therefore exempt from the GHG screens. Based on corn ethanol capacity in place or in process prior to the end of 2007, it is likely that 13 billion gallons or more will grandfathered out of the GHG standards, even excluding foreign producers. In fact, background conversations with Environmental Protection Agency (EPA) staff suggest that all of the 15 billion gallons from the "renewable fuel" portion of the mandate (expected to be filled with corn) will be waived from meeting the GHG requirement.

The emerging policy issues are quite serious. The details of how the EPA defines the fuel lifecycle on which the GHG reduction targets must be based will drive whether the screens have any environmental benefit at all. The stakes are high, and biofuel producers have orchestrated a well-organized push to ensure that the GHG screens are implemented weakly. There is a concerted effort to convince regulatory agencies to, at least initially, ignore indirect land use changes triggered by surging biofuels production worldwide. (Coleman et al., 23 October 2008). This would ensure that virtually all of their plants meet the GHG reduction criteria of the new mandate. However, under the current statute, if a production facility is deemed in compliance with the GHG cut-offs at any point in time, that facility will remain grandfathered for its entire operating life.[5] This may make even a temporary delay risky.

Since the GHG emissions screens are lifecycle-based, they need to incorporate the impact of cropping patterns as well as production if they are to accurately capture total emissions. If the agricultural acreage is itself grandfathered under RFS, screens will be further weakened. If it is not, EPA models will need to properly integrate GHG scenarios for efficient conversion plants that rely on unsustainably produced feedstocks.

1.3 Methodology

In an effort to better understand the scope of the incentive problem this paper examines three main areas:

- **Tax subsidies to biofuels.** Federal tax credits currently in place include blenders credits for ethanol and methyl ester biodiesel; and production tax credits for small producers, for non-esterification processes to make biodiesel, and for cellulosic ethanol. These credits already cost U.S. Taxpayers billions of dollars per year. This cost will rise sharply as the industry ramps up production to meet the 36 billion gallon per year mandate implemented by EISA; and possibly the proposed 60 billion gallon per year mandate proposed by President Barack Obama during his campaign.

- **Subsidies from biofuel mandates, and interaction of mandates and tax subsidies. The** RFS forces consuming markets to use a pre-set quantity of biofuels, even at significant price premiums over petroleum alternatives. Mandates not only encourage higher production than tax subsidies alone but also provide extremely valuable downside protection for investors against falling oil prices or rising corn prices. This protection comes at a high societal cost, however, as production supply expands more quickly than it should.

- **Options for reform.** Finally, the paper discusses a number of environmental and fiscal constraints that are used to limit the cost of other subsidies and that could be used to mitigate the negative fiscal and environmental costs of a burgeoning biofuels industry.

[5] EISA Section 202(c) covers subsequent adjustments to GHG screens or the analytic methods to calculate the GHG footprint for existing plants. The text on the Applicability of Adjustments reads "If the Administrator adjusts, or revises, a percent level referred to in this paragraph, or makes a change to the analytical methodology used for determining the lifecycle greenhouse gas emissions, such adjustment, revision, or change (or any combination thereof) shall only apply to renewable fuel from new facilities that commence construction after the effective date of such adjustment, revision, or change." (PL 110-140, 19 December 2007).

2. Overview of Biofuel Tax Credits and Purchase Mandates

This section provides an overview of current biofuel tax credits and purchase mandates. The mandates are more commonly called the RFS, and with the tax credits, they provide the largest subsidies to the biofuels sector. There are literally hundreds of other, smaller, subsidies to biofuels across the country, including other federal tax breaks, which are not addressed by this report.[6]

2.1 Biofuel Tax Credits

There are three main types of tax credits targeted at biofuels. Blenders' credits, production tax credits, and small producer tax credits.

- **Blenders' credits** provide tax credits for blending biofuels into gasoline and diesel, providing an incentive to use new and often more expensive blend agents. The Volumetric Ethanol Excise Tax Credit (VEETC) and Volumetric Biodiesel Excise Tax Credit (VBETC) have historically been the largest and most important subsidies to biofuels.

- **Production tax credits** (PTCs) provide financial credits to producers for each gallon of eligible fuel produced. Many states provide production tax credits that can be added to blenders' credits. At the federal level, the ability to take more than one production tax credit at the same time is limited.

- **Small producer tax credits**. Unlike other federal biofuel PTCs, the small producer tax credits can be claimed *in addition* to blenders' credits or other PTCs for conventional ethanol and biodiesel. These subsidies have been limited to relatively low levels of production, and as a result have not been a significant factor in shaping markets.

These policies are dynamic. They have expiration dates, but are renewed regularly. When cut-offs have proven too restrictive (as with an earlier cap on the small producer tax credit to facilities 30 million gallons per year or smaller), Congress has loosened the policy constraints. The subsidies also tend to interact with other programs. For example, a recent reduction in the volumetric ethanol excise tax credit (VEETC) will have virtually no effect on cellulosic producers because a larger cellulosic production tax credit (PTC) will enable the sector to replace declining VEETC with higher uptake from the PTC. Similarly, while eliminating VEETC entirely would save substantial taxpayer funds, total subsidies to biofuel producers would be little changed as the source of funding shifted, taxpayers to consumers as the compliance costs of the mandates rose.

[6] For example, biofuels production facilities receive very generous accelerated depreciation benefits and have been qualified as solid waste facilities to access lower cost tax-exempt debt.

Of critical importance is that eligibility for these tax subsidies is not tied to any performance criteria. While recent changes in biofuels tax credits have shifted support to cellulosic ethanol and small-scale operations, this does not necessarily lead to a better environmental profile. Cellulosic ethanol can cause just as much environmental degradation as conventional biofuels do; in fact, the largest initial source of cellulosic feedstock is expected to be corn stover -- extending the environmental footprint of corn production. Land use impacts on greenhouse gas emissions and biodiversity should have primacy here, though other challenges associated with GMO crops and expansion of cropland in general are also worrisome.

Exhibit 1 provides an overview of the major existing federal tax subsidy programs and how these have evolved over time. Indicative of the power of the biofuels industry, it is useful to note that no federal tax subsidy that has been granted to the biofuels industry over the past 30 years has ever been eliminated.

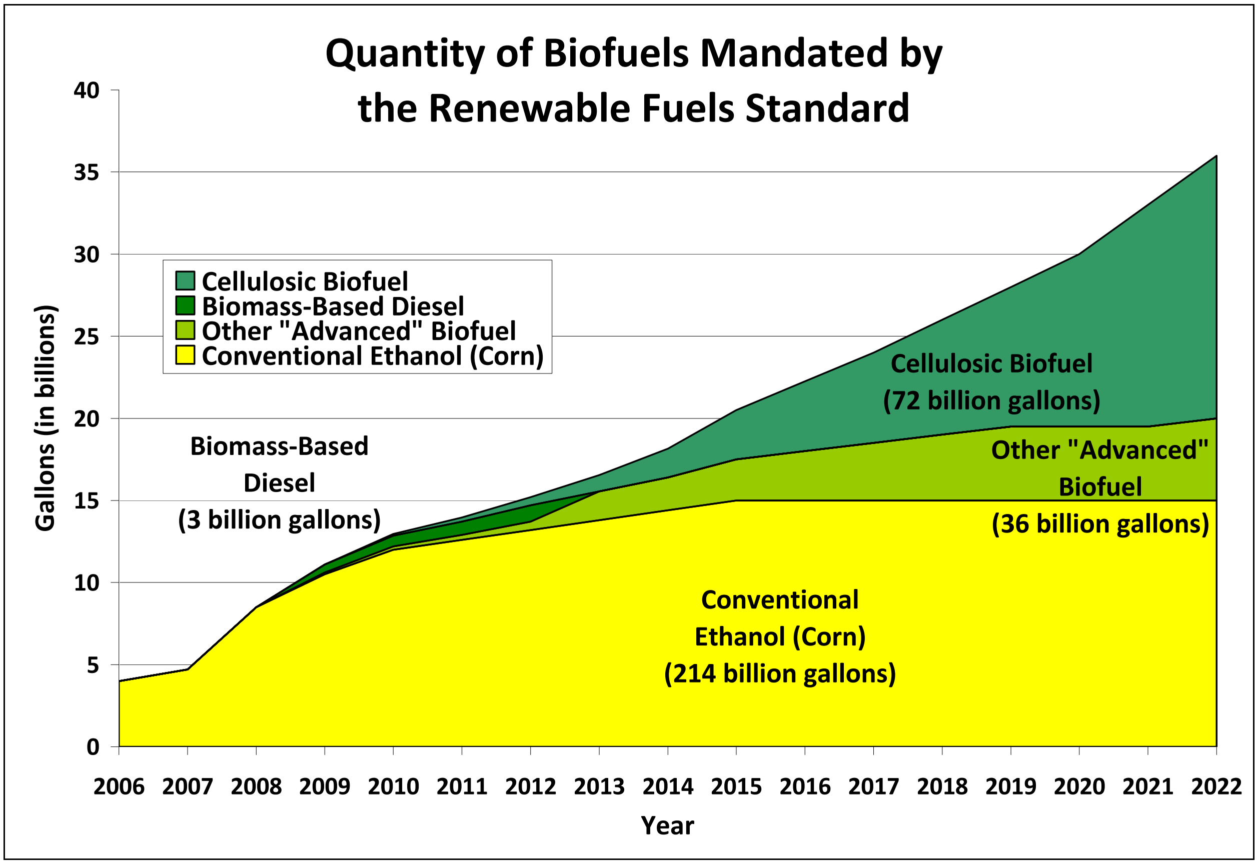
Exhibit 1: Overview of Selected Federal Tax Subsidies to Liquid Biofuels

Policy Description	Eligibility and Limitations	Rate	Notes
Volumetric Ethanol Excise Tax Credit -Enacted in the America JOBS Act (2004). -Replaced partial exemption from motor fuels excise taxes first enacted in the Energy Tax Act of 1978.	-Any ethanol can receive this credit upon blending, including imports. -No restrictions based on facility size, market prices, or environmental or social impact of production method. -Denaturants (non-ethanol portions of the fuel added to make it non-potable) able to claim the credit restricted to 2% of volume in 2007, indicating industry had claimed credit previously on all denaturants (usually 5% of volume).	-$0.51/gallon, dropping to $0.45/gallon once US consumption > 7.5 billion gallons per year (likely in 2009). -Rates on precursor excise tax exemption ranged from $0.40 to $0.60/gallon between 1978 and 2004.	-Anecdotal evidence suggests many recipients do not include their excise tax credits in their taxable gross income, as is required for most production tax credits. This would boost the value of VEETC significantly. -Tax credits are refundable, in that taxpayer is issued a check if their credits exceed other tax liabilities. -The fact that importers could tap into blending subsidies was used to justify introduction of a $0.54/gallon specific tariff on imported ethanol. That tariff is now $0.09/gallon (~20%) higher than the $0.45/gallon VEETC in effect for 2009.
Volumetric Biodiesel Excise Tax Credit -Enacted in the American JOBS Act (2004). -Most recent modifications and extension included in the Emergency Economic Stabilization Act of 2008 (EESA).	-Originally set more favorable rates for animal fats and virgin oils than for recycled oils. -Eligibility has been restricted to exclude biodiesel that is not made or sold in the US; or that co-processed in the US at oil refineries. -Recent modifications have clarified that any process to make biodiesel (not just esterification), other than co-processing with petroleum, can claim the credits.	-Originally $1.00/gallon for virgin oils and animal fats; $0.50/gallon for recycled oils. -At present, $1.00/gallon for all sources other than fuels co-processed at petroleum refineries, which are not eligible.	-As with VEETC, many claimants of the VBETC may take a filing position that does not include excise tax credits into their taxable income, increasing the value of the VBETC to them significantly. -Application of tax credit to "splash and dash" importers (who added 0.1% standard diesel to ship cargos of biodiesel to claim the VBETC on the entire load) has led to trade litigation with Europe. ESA eliminated eligibility of foreign-produced biodiesel to claim blenders credits if it was re-exported. -Biodiesel made in the US and exported; or made abroad and consumed here both remain eligible for the tax credit. US producers have used a "splash-and-dash" approach as well, resulting in countervailing duties on US biodiesel exports to the European Union introduced in March 2009. (CNNMoney, 2009).

Policy Description	Eligibility and Limitations	Rate	Notes
Renewable Biodiesel Tax Credit -Enacted in the American JOBS Creation Act of 2004.	-Originally a parallel tax credit to the VBETC for producers who, for whatever reason, could not claim the excise tax credit. -Applicability extended in an April 2007 IRS notice to include a thermal depolymerization process that didn't meet the standard biodiesel definitions for VBETC eligibility. This ruling increased the usage of the tax break, though appears to have been reversed by EESA.	-Originally, $1.00/gallon for virgin oils and animal fats; $0.50/gallon for recycled oils. -At present, $1.00/gallon for all sources, except for any materials co-processed with petroleum products (e.g., in thermal cracking units at an oil refinery).	-This is a production tax credit rather than a blenders credit, and therefore may be somewhat less valuable to the industry.
Small Producer Tax Credit -Initially authorized by the Omnibus Budget Reconciliation Act of 1990. -Energy Policy Act of 2005 doubled the plant size eligible for the subsidy from 30 to 60 million gallons per year.	-Any form of ethanol or biodiesel.	-$0.10/gallon tax credit on first 15 million gallons per year produced at facilities smaller than 60 million gallons per year. -Cellulosic producers may claim the credit on all 60 million gallons per year. (RFA, 2008a).	-No restrictions based on environmental profile. -Some indication that plants contracting capacity to third parties were able to bypass of the restrictions on earning and using the credit, though this loophole may have been closed in 2008. -Foreign production facilities are not eligible.
Production Tax Credit for Cellulosic Ethanol -Authorized in the 2008 Farm Bill.	-Cellulosic ethanol only.	-$1.01/gallon total support, but VEETC payments must be netted first. -There is some disagreement on whether the Small Producer Tax Credit must also be netted, generating a rough incremental value of $0.46 to $0.56/gallon (values in this paper assume the lower value).	-Attempts in January 2009 by industry to make the PTC refundable (allowing them to receive a payment from the government even if they had no profits) were rebuffed, though will likely resurface (Bailey, 2009).
Sources: Koplow (2006, 2007), Koplow and Steenblik (2008), RFA (2008a), Yacobucci (July 2008).			

2.2 Renewable Fuel Standard as a Biofuels Subsidy

The Renewable Fuel Standard is a legislatively set consumption mandate that stipulates the minimum number of gallons of a particular biofuel that must be purchased in the U.S. market. Fuel producers (often fossil fuel companies) must purchase biofuels to blend with existing fuel products to meet the standard. Under existing federal mandates, the consumption target must be met even if the fuels in question are available only at a substantial price premium to standard gasoline or diesel.



The standard effectively guarantees a market for biofuels. It becomes more valuable in times when biofuel production costs rise, the cost of conventional fuels falls, or both. There is a possibility to delay or waive the mandate in a particular year if it is found to cause "severe economic or environmental harm." However, the standard for demonstrating severe economic harm appears to be high, as is evidenced by the Bush EPA's rejection of the state of Texas' waiver request for 2008.[7] Issues related to the waiver of the cellulosic submandate are more uncertain, as there may be insufficient productive capacity at any price to meet the targets. In this case, the EPA would likely cut the mandate quantities; though it would do so in such as way as not to undermine the viability of the cellulosic facilities that exist at the time.

[7] In its rejection of a waiver request from Texas earlier this year, EPA noted that not only would "severe" harm be an extremely high threshold, but that EPA has "discretion in determining whether to grant or deny a waiver request, even in instances where EPA finds that implementation of the program would severely harm the economy or environment of a State, region, or the United States, or where there is inadequate domestic supply." (US EPA, 13 August 2008: 47172).

In general, the higher the mandated gallons, the more rapid the time frame for compliance, and the more sub-targets exist for specific fuels (e.g., biodiesel, cellulosic ethanol), the more expensive the subsidy per gallon produced will be.

Political pressure to increase the mandates has been strong, and has been successful. The federal RFS, for example, almost quintupled (from 7.5 billion gallons to 36 billion gallons per year) in December 2007 under the Energy Independence and Security Act (EISA). EISA also instituted fuel-specific mandates. Even if one believes biofuels are a part of the strategy to wean the U.S. from reliance on oil, the drivers behind these narrowly defined sub-mandates seem largely political, implemented to protect incumbent producers from down-side market risk. In this goal, the RFS is quite successful. The biodiesel-specific renewable fuel credits under EISA are estimated to trade for $2.22 per gallon by 2017, versus only $0.68/gallon under a RFS with no biodiesel carve out. (Thompson, Meyer, and Westhoff, 2008). Presented another way, on the one billion gallons of biodiesel the RFS mandate requires, the carve-out for biodiesel provides an industry-specific earmark worth $1.5 billion per year.

President Barack Obama introduced a number of legislative proposals during his tenure in the Senate targeting an RFS mandate of 60 billion gallons per year. This figure was also included in his presidential campaign's energy plan, and could be an early action of his administration.

2.2.1 Interaction of RFS with Other Subsidy Policies

The RFS interacts with other subsidy policies -- most prominently federal tax credits and import tariffs. Biofuels produced under the mandate also receive tax credits (through the Volumetric Ethanol Excise Tax Credit, or the newer production tax credit for cellulosic ethanol). Part of the cost to bring the more expensive fuel to market will be paid not by consumers (via higher prices at the pump), but by taxpayers through the tax credit. If the tax credit is high enough to supply the entire mandated quantity, the mandate is classified as "non-binding" in that it is not causing further distortions in production and pricing decisions. A non-binding mandate in a period of high prices may suddenly have enormous financial value should oil price fall -- exactly what has occurred in the fall of 2008.

Even absent falling oil prices, a non-binding mandate is valuable to producers. Investors are perpetually concerned about worsening market conditions. So long as the aggregate production capacity for a specific fuel does not greatly exceed the mandate, the mandates insulate investors against this downside risk by guaranteeing that the production facility will always be able to sell its output at a reasonable price. With lower risks from changing market conditions, capital providers are willing to provide more capital to the sector at more favorable rates than without the mandate. This is likely to result in lower capital costs and increased construction.

The value of mandates to investors can be seen empirically by examining share prices of biofuels firms in December 2007, when the Renewable Fuel Standard became law. Between the first trading day of December 2007 and the day the higher RFS passed (December 19, 2007), the key NASDAQ and S&P 500 benchmarks were both down roughly 2%.[8] Oil-tracking exchange traded funds were up, but only by about 2%.

---

8 Since speculators bid up share prices as the probability of EISA passing grow, it is important to track share price movements over a longer period of time than simply tracking movement on the day the law was signed.

In contrast, biofuels-related firms were up dramatically, in rough proportion to how much protection investors felt that the mandates were likely to provide. For example, the stock value for Verenium, a publicly traded cellulosic ethanol firm well positioned to benefit from the cellulosic mandate, surged 53% during that time frame. The fact that the firm now has a guaranteed buyer no matter the price, should it ever successfully produce at a commercial level, is extremely valuable to investors. Stock prices for firms in the corn ethanol sector also rose sharply: 48% for Pacific Ethanol, Aventine and VeraSun were up more than 20%, and Archer Daniels Midland, which has a more diversified mix of products, was up nearly 12% (Koplow, 2008).

Note that all of these firms have suffered badly since this time during the broader market downturn. Sharply declining prices for oil not surprisingly reduce the market value of ethanol produced for blending and have blunted investor expectations for continued rapid growth in the sector.

2.2.2 Market Price Support

Because of these policy interactions, measuring the *incremental* cost of purchase mandates can be challenging. Incremental cost is estimated using a concept known as *Market Price Support (MPS)*. MPS is a measure of how much extra income U.S. ethanol producers receive as a result of market interventions that artificially raise domestic returns.[9] The most important interventions to consider for biofuel markets are tax credits, import tariffs, and mandates, such as the Renewable Fuels Standard. Some of this extra return may come through higher market prices for their product. However, pump prices for biofuels must be competitive with conventional fuels if consumers are to buy them. Thus, the value to producers of Renewable Fuel Credits (RFCs) turns out to be the more important subsidy conduit. An RFC represents a quantity of renewable fuel that can be counted against the required federal mandates. Blenders (mostly oil companies) earn these credits when they make market-ready fuels containing the targeted biofuels from feedstocks in compliance with RFS mandate levels. The RFCs are traded in the form of Renewable Identification Numbers (RINs) under the current RFS system. Separate RINs are issued to each unique batch of biofuels.

While the EPA has not yet issued rules for the newest mandates under the RFS, it is clear that capacity to meet different submandates will not be available at equal costs. Therefore, the RINs for the more challenging and expensive fuels, most likely cellulosic ethanol, will trade at substantially higher prices than those for corn ethanol. Biodiesel is expected to trade at higher RIN values as well due to the high cost of inputs and lack of market viability without substantial subsidies.

Through the tradable credits, biofuels will be provided to consumers at competitive prices. Behind the scenes, however, the system will require very large tax credits and side payments for the eligible RINs in order for the associated biofuels to be competitive. The sum of the RIN and tax credit amounts provides a good proxy for the total biofuel subsidy cost. While the government policy establishes the rules that give RFCs value, the financial flows are actually from the consumers to the biofuels industry. This makes the policies attractive to politicians, as they appear to be "free" to the government. However, the costs of these fuels are certainly not “free” to taxpayers or consumers.

[9] The approach has long been used by the Organisation for Economic Development and Cooperation. See OECD 2001 for a more detailed discussion.

While the biofuels industry will benefit from the RFS, the benefits to society are far less clear. Environmental and other associated costs aside, by providing politically determined downside protection, the policies mask real risks and volatility in the biofuels sector; shift pricing risk entirely to the consumer and blenders; and disadvantage alternative industries that do not face the same inherent production risks. Plug-in hybrids, for example, face technology risks from alternative drive trains, but would not face nearly the same level of economic risk as do biofuels from fluctuating commodity prices. This means that we could be promoting biofuels at the expense of other more promising and more environmentally friendly technologies.

The risks go well beyond the fuel sector, as noted by former USDA Chief Economist Keith Collins:

> *The once uncertain increase in corn demand due to biofuels, contingent primarily on strong but highly volatile oil prices, is now a certain increase in demand due to the RFS, regardless of oil or corn prices. The mandate makes the demand for corn by ethanol plants highly inelastic with respect to price changes when corn prices are high and crude prices are low. This feature reduces the normal ability of high corn prices to reduce demand and ration short supplies across users.* (Collins, 2008: 17)

Of particular concern is that some of these other "users" of corn happen to be people in the developing world who need the corn for food, but have limited purchasing power relative to developed country fuel markets.

These risks grow as the percentage uptake for particular crops into the biofuels sector rises. Ultimately these pressures can hit multiple crops, and feed back through land rents, reducing the responsiveness of general cropping patterns to broader market conditions.

2.2.3 Subsidy Cost to Meet EISA Mandates

Two academic studies have modeled the impacts of the higher mandates on biofuel and feedstock markets to separate the impacts of the mandates and the tariff from other subsidy policies; and to gain insights on the price impact of sub-mandates. Baker, Hayes and Babcock (2008) estimated the full support level needed to stimulate sufficient production levels of corn ethanol, cellulosic ethanol, and biodiesel to meet the EISA mandates under high- and low-oil price scenarios. The mandate subsidy cost rises as the price of oil falls. The cost estimates presented here conservatively assume the mid-point of the high/low oil price range even though oil is now trading below even the low oil price scenario ($65/barrel) modeled. If only their low-oil price scenario were used, the MPS values for cellulosic, corn ethanol, and biodiesel would increase by 10, 30, and 100 percent, respectively.

The second study, by Thompson, Meyer, and Westhoff (2008), models a wide range of policy scenarios to estimate the value of the renewable fuel credits for each submandate. One limitation of this analysis is their assumption that cellulosic ethanol mandates will be waived entirely. EISA does allow for the cellulosic-specific mandate to be waived as a result of insufficient availability of the fuel. However, while the advent of cellulosic technology is not a certainly, there is still a significant amount of capital being invested in its formation with nearly 300 million gallons of capacity in the planning or construction phases (RFA, 2009). Because the federal government has promoted cellulosic ethanol as a core solution to both energy security and GHG problems, including a wide array of subsidy programs, it does not seem likely that a waiver would be granted in such as way as to undermine the economic viability of cellulosic producers. Future work by these authors may take a more detailed look at the RIN values for cellulosic (Thompson, 2009). In the interim, estimates for the cellulosic MPS presented here rely on the first study only.

3. Biofuel Subsidies Will Rise Sharply As Existing Policies are Implemented

Predicting market conditions decades into the future is always a risky business. The task is made easier, however, because the Renewable Fuel Standard stipulates minimum consumption levels for each year. This creates a consumption floor. Since the major tax credits evaluated (VEETC and VBETC) scale linearly with consumption without limit, one can calculate the likely financial cost going forward. The main assumptions used in the analysis are described in the next section. Subsidy estimates under EISA, and under an Obama proposal, are presented in the subsequent sections.

3.1 Subsidy Cost Estimates: Assumptions and Sensitivities

This paper examines two scenarios: the subsidy costs associated with meeting the existing 36 billion gallon per year mandates under the EISA; and the costs to meet the higher 60 billion gallon per year mandate proposed by President Obama during his presidential campaign. The major assumptions and input sensitivities are discussed below.

Policy extension. The subsidy estimates assume that the federal tax credits and tariffs are extended throughout the term of the analysis (through 2022 or 2030, respectively). Reductions in the VEETC to $0.45 per gallon are assumed to take effect in 2009, with VEETC remaining at that level in subsequent years.

Quantities consumed. For the next couple of years, market projections data from the Food and Agricultural Policy Institute (FAPRI, 2008 and 2009) were used as consumption values. This reflects the fact that some mandates (e.g., biodiesel) don't yet take effect though production clearly exists; and that for others (corn ethanol), historical construction may result in production exceeding the mandates in the short term. FAPRI values were carried forward until such time as the mandated levels exceeded that value, at which time the mandated values were used going forward. In most cases, FAPRI estimate and mandated volumes are fairly close. Cellulosic is a notable exception, and FAPRI assumes much of the mandate will be waived. Since we are estimating the cost of the mandates, we have assumed production growth will meet the required amounts. Obviously, if this does not happen, aggregate subsidies will be lower.

RFS statutory language normally assumes continued growth in mandates past the period stipulated at the same average growth rate as the overall gasoline or diesel market. Where the EISA mandate was projected forward through 2030 (to be more comparable with the Obama mandate), we conservatively assumed no increase in biofuels consumption above the ending EISA values through 2030.

Subsidy Uptake of Tax Expenditures. Exhibit 2 provides a summary of the subsidy per gallon assumptions used in the cost estimates. In some cases, subsidy values assumed are different from the statutory rates. The reasons are explained below.

Exhibit 2
Unit Subsidies Per Gallon of Biofuel Used in Calculations

	VEETC/VBETC (Note 1)		Standard PTC (Note 2)	Small Producer PTC (Note 3)	Market Price Support (Note 4)	Total		Share of Total Subsidies Via Excise Tax Credits (Avg.)
	Low	*High*				*Low*	*High*	
Conventional Ethanol (corn)	$ 0.45	$ 0.64	$ -	$ 0.01	$ 0.14	$ 0.60	$ 0.79	78.0%
Cellulosic Biofuel	$ 0.45	$ 0.64	$ 0.46	$ 0.10	$ 1.25	$ 2.26	$ 2.46	23.0%
Other "Advanced" Biofuel	$ 0.45	$ 0.64	$ -	$ -	$ 0.36	$ 0.81	$ 1.01	59.6%
Biomass-based Diesel	$ 1.00	$ 1.43	$ -	$ 0.03	$ 1.19	$ 2.22	$ 2.65	49.5%

(1) VEETC rate drops from 51 cpg to 45 cpg in 2009; VBETC rates standardized at $1/gallon in the latter part of 2008. Low estimate reflects lost revenue to government; however, the excise tax credits appear not to be includible in taxable corporate income, and therefore generated an incremental value to the industry. This is shown in the high estimate.

(2) Production tax credits for corn ethanol and methyl ester biodiesel are rarely used, as they can't be claimed on top of the excise tax credits, but are less valuable. Some use of the credits in the past for forms of biodiesel not covered by VBETC. However, the expanded eligibility for VBETC is expected to shift claims to that provision. A recent new PTC for cellulosic is worth $1.01/gallon, but must net out the VEETC first. There is disagreement between IRS guidance and industry instructions as to whether the small producer PTC must also be deducted. We have done so, leaving an incremental value of $0.46/gal.

(3) The Small Producer Tax credit is 10 cpg for all facilities less than 60 mgy. However, it can be claimed on only 25% of this capacity for all fuels other than cellulosic. Estimates are for the average gallon, and assume 2.5 cpg for biodiesel, zero for advanced ethanol (since much is imported sugar ethanol and not eligible); and slightly over 1 cpg for corn ethanol since many new plants are too big to be eligible. The full credit of 10 cpg is expected for cellulosic, since all 60 mmgy can claim the credit and plants are smaller than that.

(4) Market price support measures the incremental subsidy provided by mandates above existing tax credits and tariffs. These values are taken from econometric modeling done by Baker, Hayes, and Babcock (2008) and by Thompson, Meyer, and Westhoff (2008). The MPS for corn has been used for all fuels until submandates under EISA take effect (in 2009 or 2010). Values shown in later years are averages, though the magnitude will vary over time based on market conditions and mandate stringency. These issues are discussed in more detail in the text.

- **Outlay equivalent measures for VEETC, VBETC.** Some tax credits provide tax-exempt benefits to the recipient, increasing their value to the industry. In other cases, the credits must be included in taxable gross income, in which case a portion of the benefits are recaptured by the government through taxes paid on this subsidy-related income. The cost estimates shown here assume that excise tax credits *are not* includible in income, and estimate the incremental benefit from this exemption using a 30% combined state and federal marginal rate. Tax-related memos developed by one of the biofuels trade associations assumed a 40% tax rate in their examples, perhaps an indication that the 30% used here may be conservative. (RFA, 2006). There is disagreement as to how excise tax credits must be reported by recipients (see Koplow and Steenblik, 2008 for more discussion). Although not including VEETC or VBETC in taxable income may be a gray area of the tax code, there seems to be a defensible tax position for doing so. The IRS did not respond to a past request from industry to clarify this issue. Given how valuable this filing position is for blenders, it is reasonable to assume most of them take it. The tables in Exhibits 3 and 4 also present aggregate values on a revenue loss basis for comparison purposes.

- **Small producer tax credits**. Although the statutory rate on this subsidy is $0.10 per gallon, it is limited to the first 15 million gallons per year of production (for conventional ethanol and biodiesel) and to the first 60 million gallons per year (for cellulosic). At present, plants larger than 60 million gallons per year cannot claim any credit. Calculations shown in Exhibits 3 and 4 assume that no advanced ethanol facilities will claim this credit since much of this supply is likely to be imported from Brazil as sugarcane ethanol and is therefore ineligible to receive the tax credit. This assumption will undercount the handful of U.S. conventional ethanol facilities relying on non-corn feedstocks such as sorghum, but the impacts on overall estimates are minor. The analysis also assumes that claims by corn and biodiesel producers will not rise over time, either because the new plants are bigger than the cutoff or because new plants will not be built due to worsening economics of biofuel production. Finally, the benefits per eligible gallon are averaged across total gallons produced to generate an average small producer PTC for each fuel type.

- **Cellulosic production tax credits.** The authorizing legislation for the $1.01 per gallon cellulosic production tax credit clearly requires claimants to subtract the VEETC from the incremental PTC. However, there is disagreement as to whether the small producer tax credit must also be deducted.[10] We assume it must be deducted; should industry take a different filing position, we would understate the size of this subsidy.

Compliance schedule. The 24 billion gallon incremental gallons of biofuels required each year under the Obama plan were assumed to occur entirely between 2023 (the year after the EISA mandate hits its target) and 2030 when the Obama mandate requires 60 billion gallons per year. This assumption is supported by proposed compliance schedules in Obama-introduced legislation such as S. 23, the "Biofuels Security Act of 2007," in which mandate targets did not exceed EISA levels until after 2022. To the extent that (a) natural market growth exceeds the mandate; or (b) Obama accelerates the year in which mandate targets must be hit, the subsidy cost would be higher.

[10] The Congressional Research Service (Yacobucci, 29 July 2008) indicated the small producer tax credit does need to be deducted, while guidance from the Renewable Fuel Association (2008a) notes that "This new credit is in addition to, not in place of, the existing 10-cent-per-gallon small producer income tax credit."

Sub-mandate levels. The analysis assumes that existing production will be able to meet GHG screens stipulated for in the current RFS. If this turns out not to be the case (as EPA staff has indicated it may not be), the market price support levels to meet biodiesel and advanced ethanol submandates would likely be higher. The Obama scenarios assume a doubling of the biodiesel submandate, to be met within 4 years of enactment. This follows proposals in earlier Obama-introduced legislation such as S. 3554 (June 21, 2006), the "Alternative Diesel Standard Act of 2006." The rest of the increment is assumed to come from cellulosic ethanol. Non-cellulosic "advanced" ethanol such as sugar could also be promoted, but would likely run into political resistance since the most economic, high volume sugar-based fuels are imported.

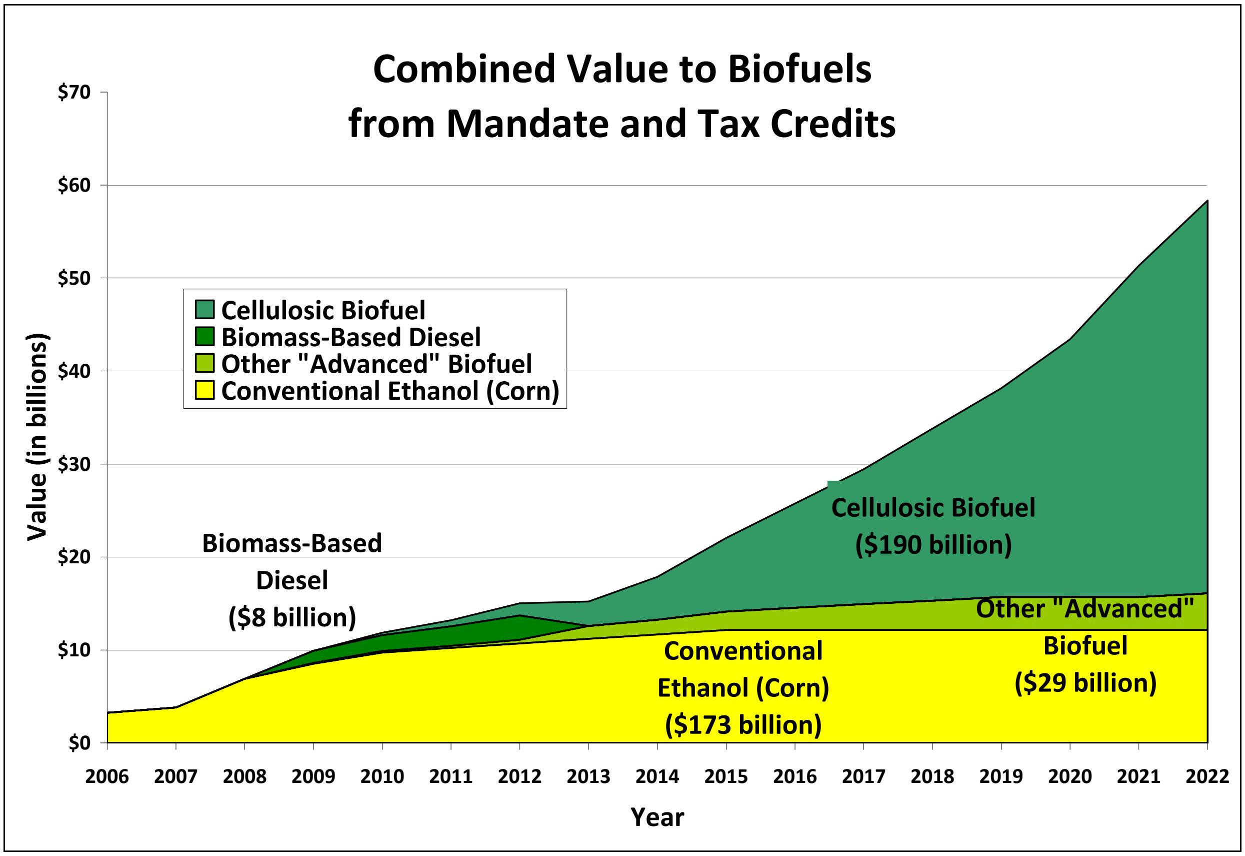
Market price support valuations. The subsidy estimates use single-point values for the market price support provided by tariff and mandate policies, plus the tax credits. While these estimates were produced by well-respected agricultural modeling institutions (the Food and Agricultural Policy Research Center at the University of Missouri and the Center for Agricultural and Rural Development [CARD] at Iowa State University), there are many factors that could result in substantial changes to them over time. Of most immediate relevance is falling oil prices. The CARD estimate, for example, takes the average of a high and low oil price scenario, though current oil prices are below the low price included. As noted above, MPS values will be higher if lower oil prices prevail during much of the period of evaluation.

Similarly, as mandate levels rise, they require diversion of a larger share of existing production. This, in turn, is likely to exacerbate policy-related dislocations elsewhere in the economy. Consider the fact that the Obama mandate requires that domestic consumption of biofuels *grow* by 3 billion gallons *per year* between 2020 and 2030; this would require massive increases in production since current ethanol consumption is only about 9 billion gallons per year (RFA, 2008b).

These factors would also suggest, for example, that the market price support values under a 60 billion gallon per year mandate might be substantially higher than those under a 36 billion gallon per year mandate. So would impacts on ancillary markets such as food and transportation equipment, which would need to adjust to changing fuels much more quickly and perhaps accelerate the write-off of equipment assets. Working in the opposite direction is technical change, where breakthroughs in processing could conceivably sharply reduce the cost structure of the cellulosic industry. It is impossible to predict the scope or timing of such changes considering the lengthy timeline of the mandate; or how easily they could be seen given the hundreds of other subsidy programs affecting biofuel market access and share around the country.

3.2 Federal Subsidies to Meet the EISA Mandate (36 billion gallons per year by 2022)

Exhibit 3 summarizes the subsidies associated with meeting a 36 billion gallon per year mandate by 2022. <u>The cumulative subsidies to the industry are $420 billion, and average $28 billion per year.</u> Both the tax subsidies and market price support rise linearly with biofuel consumption. This results in much higher annual subsidy levels at the end of the period than at the beginning: a six-fold increase from $9.5 billion per year in 2008 to more than $60 billion per year in 2022. This increase is driven both by a larger total quantify of fuel mandated, and by a shift in fuel mix from corn ethanol in 2008 to a higher mandate share of the even more-heavily subsidized cellulosic by 2022. Note that cellulosic captures zero percent of the subsidy in 2008, but 70% of total support by 2022. Unit subsidies for conventional ethanol are flat over the period (declines are mostly the result of a decrease in the VEETC in 2009). Unit subsidies for other fuel types do rise significantly as mandates become more binding. The increasing cost of the fuel mandates, as well as the greater market share for more heavily subsidized cellulosic fuel, results in the average subsidy per gallon of biofuel more than doubling between 2008 and 2022, from $0.70 to nearly $1.50 per gallon. Note that unit subsidies per gallon of cellulosic in 2008 reflect theoretical values were production volume to exist; the annual cellulosic subsidy through MPS and tax credits in 2008 was zero.



As shown in Exhibit 3, the excise tax credits represent roughly half of the cumulative federal support that biofuels receive during 2008-2022. However, if these were eliminated going forward, most or all of the support would shift to the mandates rather than disappear.

The importance of specific subsidy programs varies by type of biofuel. Market price support for corn ethanol is a relatively small share of total subsidization under current policy rules.

This reflects the large installed base and grandfathering of these facilities under the GHG reduction requirements (though the grandfathering itself is a form of market support).

In contrast, market price support forms the largest source of support for cellulosic. This reflects the expectation that cellulosic will be much more expensive than other fuels for many years to come, but that the mandates will nonetheless force the transport sector to buy it. The cellulosic production tax credit is anticipated to provide large subsidies to the biofuels industry, providing roughly $40 billion to cellulosic producers during the mandate period.

Note that projected subsidies per gallon of cellulosic ethanol in 2022 (roughly $2.70 per gallon), now exceed the retail price of regular gasoline, even before discounting the value of cellulosic for its lower energy content.[11] Subsidies per gallon of biodiesel are also extremely high (greater than $2.50 per gallon in 2022). Although corn ethanol is considered a mature technology, it will still capture nearly 40% of total subsidies over the life time of the RFS, worth more than $160 billion cumulatively. This is in addition to the many other direct subsidies to corn production and irrigation throughout the country.

[11] Ethanol contains approximately 2/3rds of the energy content of gasoline. This means that consumers will be paying more money for less energy from each gallon of liquid fuel.

Exhibit 3

Estimated Biofuel Subsidies Under RFS Mandate, Current Rules (36 billion gallons by 2022)

Subsidy Period: 2008-2022, $Billions except as otherwise noted

		Cumulative Subsidy During Period						***Annual Subsidy***		***Unit Subsidy***	
	Mandate by 2022 (bgy)	**VEETC, VBETC**	**PTCs**	**MPS**	**All**	**% by Fuel**	**Average/ Year**	**CY2008**	**CY2022**	**CY2008 ($/gal)**	**CY2022 ($/gal)**
Conventional Ethanol (corn)	15.0	133	3	28	164	39%	10.9	8.0	11.9	0.89	0.79
Cellulosic Biofuel	16.0	46	40	102	189	45%	12.6	0.0	42.0	1.37	2.63
Other "Advanced" Biofuel	4.0	19	0	11	30	7%	2.0	0.4	4.1	0.87	1.02
Biomass-based Diesel	1.0	20	0	17	38	9%	2.5	1.1	2.7	1.59	2.72
Total, Outlay Equivalent	36.0	219	43	159	421	100%	28.1	9.5	60.7	0.93	1.69
% by type		*52%*	*10%*	*38%*	*100%*						
Total, Revenue Loss	36.0	153	43	159	355	na	23.7	7.1	53.6	0.70	1.49

Source: Earth Track calculations

3.3 Federal Subsidies to Meet the Obama Mandate (60 billion gallon per year by 2030)

Under the Obama RFS plan, sharp increases in mandated quantities drive up total subsidy values quickly during the 2023-2030 period. Cumulative subsidies between 2008 and 2030 are expected to approach a stunning $1.2 *trillion.* Even if industry is forced to include blenders credits in taxable income, subsidies (as shown in the total, revenue loss line of Exhibit 4) will still exceed $1 trillion.

Market price support linked to price premiums induced by the higher mandates become ever more important, contributing 45 percent of total subsidies in the 2008-2030 scenario, versus only 38 percent during the EISA mandate period. Cellulosic's dominance of subsidy capture also continues to grow, the result of its larger market share in combination with large VEETC, PTCs, and MPS to this industry-subsector. By 2030, cellulosic will capture more than 80 percent of total support to liquid biofuels. To the extent that the Obama mandate stipulates higher targets for other segments and lower targets for cellulosic, these values would obviously change.

Annual support levels reach a staggering $124 billion *per year* by 2030. Large as this number is, it is roughly in line with a 2007 estimate developed by the US Energy Information Administration. While there is no analysis of a 60 billion gallon mandate, EIA did a similar analysis that displaces 25 percent of U.S. oil consumption, which would equate to 66 billion gallons of biofuels per year in 2030. That analysis evaluated the cost to comply with a 25 percent RFS mandate (based on EIA projections for total motor fuel consumption) by 2025, and estimated the market value of a RFC (assuming no other tax subsidies) at $2.02 in 2030. This credit price, applied to the 66 billion gallons per year, amounts to more than $133 billion per year (EIA, 2007; Koplow, 2007).

While cumulative support to cellulosic producers comprises nearly $800 billion over the 23 year compliance period, again the old technology continues to benefit tremendously from the subsidy regime. Corn-based fuel producers garner more than a quarter trillion dollars of support during the Obama mandate period from these few subsidy programs.

Average subsidies per gallon produced grow from nearly $1.50/gallon at the end of the EISA mandate period to more than $1.80/gallon were the Obama mandate proposal to be implemented. The change in average subsidies per gallon is driven entirely by the larger share of cellulosic in the mix by 2030 versus 2022; subsidies per gallon within each subcategory remain unchanged -- though still quite high. Per gallon subsidies to both cellulosic ethanol and biodiesel are in excess of $2.50/gallon by 2030.

As in the EISA scenario, biodiesel mandates remain too low for the fuel to play a transformational role in the migration of vehicle fleets away from conventional diesel. This leverage is further eroded by mandates forcing expensive biofuel into the heating oil sector as well, such as have been recently passed in Massachusetts. Absent technological breakthroughs to greatly reduce its cost structure, it is unlikely that the biodiesel industry would be viable without its large tax breaks and the RFS mandate carve-out.

Exhibit 4

Estimated Biofuel Subsidies Under Obama Administration Proposal (60 billion gallons by 2030)

Subsidy Period: 2008-2030, $Billions except as otherwise noted

	Mandate by 2030 (bgy)	*Cumulative Subsidy During Period*				% by Fuel	Average/ Year	*Annual Subsidy*			*Unit Subsidy*		
		VEETC, VBETC	PTCs	MPS	All			CY2008	CY2022	CY2030	CY2008 ($/gal)	CY2022 ($/gal)	CY2030 ($/gal)
Conventional Ethanol (corn)	15.0	210	4	45	259	22%	11.2	8.0	11.9	11.9	0.89	0.79	0.79
Cellulosic Biofuel	39.0	194	169	429	792	67%	34.4	0.0	42.0	102.5	1.37	2.63	2.63
Other "Advanced" Biofuel	4.0	40	-	23	63	5%	2.7	0.4	4.1	4.1	0.87	1.02	1.02
Biomass-based Diesel	2.0	40	1	34	75	6%	3.3	1.1	2.7	5.4	1.59	2.72	2.72
Total, Outlay Equivalent	60.0	483	173	532	1,188	100%	51.7	9.5	60.7	123.9	0.93	1.69	2.06
% by type		*41%*	*15%*	*45%*	*100%*								
Total, Revenue Loss	60.0	338	173	532	1,043	na	45.4	7.1	53.6	111.8	0.70	1.49	1.86

4. Conclusion: Biofuel Subsidies are a Growing Cost to Taxpayers and an Important Driver of Environmental Degradation

Subsidy programs attempt to redirect resources to achieve goals such as social welfare and environmental protection. Often overlooked, however, is the fact that creating and accessing government subsidy programs can be complicated, and require political access, sustained funding, and staff. While powerful existing industries often possess these resources, emerging industries often do not. As a result of this dynamic, many subsidies end up bolstering existing firms and industries and impeding emerging ones.

The push for ever more biofuels has focused on the insular goal of boosting production under the false premise that biofuels are environmentally beneficial. Yet, despite new evidence that the benefits of biofuels are far more limited than initially believed, and that they often cause environmental harm, biofuel policies continue to support the production of biofuels, without regard to the ecological, economic and social costs.

Biofuels policies neglect to account for the relatively poor cost-efficiency of the subsidy system in buying improvements in energy security and reductions in GHGs. (Koplow, 2007). The environmental costs of biofuels, from increased GHG emissions to biodiversity loss, outweigh any perceived benefit. Deforestation in the Global South is a primary example of the devastation increased biofuels production causes (for example, Hoojier, et al, 2006). Likewise, overall oil consumption will only be minimally impacted by the biofuels mandate. The massive RFS mandate levels will displace less than 20 percent of overall oil consumption.[12] This figure would be even smaller should mandates be waived due to technological constraints, such as that with cellulosic ethanol Investments in other technologies and truly sustainable energy sources could garner more "bang-for-our-buck."

In the environmental arena, existing biofuels policy is either silent or poorly equipped to evaluate the complex GHG life cycle linkages associated with scaling biofuels production to meet transport needs. While the RFS includes some environmental safeguards for GHG emissions and natural land protection, it is silent on many other biofuels-related ecological impacts such as soil degradation and water pollution. Even still, the RFS' attempt to target subsidies to low-emissions resources is weak and heavily dependent on EPA's modeling parameters.

[12] In 2022, the RFS mandates the production and blending of 36 billion gallons of biofuels. The Department of Energy's Energy Information Administration estimates that we will be consuming roughly 20 million barrels of oil per day in 2022. This means that less than 20 percent of our oil will be displaced by biofuels in 2022, assuming that portions of the mandate, such as those for cellulosic ethanol, are not waived. If they are waived due to technological constraints, the displacement will be much less.

Meanwhile, the biofuel tax credits contain no environmental safeguards at all. While it was perhaps possible to ignore these environmental impacts in the early days of the biofuels industry, this is no longer the case. Rapidly increasing mandates, poorly controlled subsidy programs, and ineffective integration of environmental impacts are contributing to potentially enormous risks to both fiscal health and environmental quality going forward.

Despite this challenging dynamic, there are a number of strategies that have been deployed in other economic sectors to constrain subsidies. These approaches can help to ensure that any public support that is provided more effectively supports emerging, smaller, or cleaner market participants; and does not blindly scale without limit to industries or firms. Although a few of these techniques have been employed in small ways with biofuels tax credits or the RFS, the rising scale of subsidies underscores the importance of implementing much better controls going forward.

- **Subsidies phase out in strong markets.** As the value of a good or service rises, the need for subsidies to keep producing industries viable declines. Taxpayers can reduce their financial exposure with minimal impact on recipient industries if the subsidies phase out automatically during good economic times. It is important that these adjustments be automatic, as they are with some oil and gas supports. Otherwise, the recipient industry can usually lobby successfully to delay or prevent a ratcheting down of existing subsidy programs. None of the tax credits to biofuels phase out in times of high market prices. They should be indexed to oil prices.

  The Renewable Fuel Standard does contain some automatic stabilization, in that the requirements become less onerous as oil prices rise and biofuels become closer to being economic in their own right, resulting in falling prices for renewable fuel credits. The flip side is that the RFS has become a much larger subsidy to biofuels in recent months as oil prices from plummeted from $140 per barrel to under $60 per barrel. As noted earlier, the RFS also reduces the risk of biofuels investments relative to that of potentially superior alternatives to gasoline.

- **Subsidy take is limited by industry or plant.** Production-linked subsidies such as VEETC, where every single gallon of ethanol gets a pre-approved tax credit, grow linearly with production levels. The recent surge in biofuels consumption in the U.S., for example, has driven taxpayer losses under this program billions of dollars higher each year. In other policy areas, subsidy limits are set to cap taxpayer exposure. Caps on eligible capacity are common at the state level, even with subsidies to biofuels. A pre-set amount of total capacity is authorized, and specific projects are allocated portions of the cap. The maximum taxpayer loss can be known in advance.

  Another common approach is to restrict the tax breaks a specific plant receives to a pre-set number of years. Where this restriction is known up-front, investor decisions can incorporate the lifetime value of these subsidies, but the taxpayer exposure is not open-ended.

The Small Producer Tax Credit does restrict the number of gallons per year on which the credit may be claimed. However, this is a fairly small program and none of the other federal biofuel tax credits or the RFS have these types of restrictions.

- **Subsidy eligibility restricted to smaller, less powerful industry players.** Attempts are often made to target government subsidies to smaller industry participants. This type of restriction does exist with the Small Producer Tax Credit, limiting payments to plants controlling less than 60 million gallons per year of productive capacity. This constraint has thus far been binding only in the corn ethanol segment; and was already raised from 30 million gallons per year when average corn ethanol plant sizes grew.

- **Subsidy expiration.** Because subsidy recipients can often lobby successfully to block subsidy repeal, Congress has commonly included expiration (or "sunset") dates for subsidy policies. All of the tax credits to biofuels have expiration dates; the RFS does not. In reality, industry lobbying has frequently undermined the value of sunset provisions, successfully getting the subsidies extended multiple times. Requiring super-majorities to extend the subsidies beyond sunset dates is one solution.

- **Subsidy reduction**. Subsidies can sometimes be reduced or narrowed even if they can't be eliminated. Percentage depletion allowances for oil and gas, for example, were successfully pulled from the oil majors. The VEETC was recently reduced from $0.51 per gallon to $0.45 per gallon. While a positive step, these reductions can sometimes be less successful then they seem at first. Reforms may be undermined by expansions in the subsidy language to more economic sectors, fuels, or more favorable terms. For example:

    - Evidence suggests that excise tax credits, unlike production tax credits, do not need to be included in a firm's taxable gross income. This boosts their value to recipients considerably.

    - The recently passed cellulosic production tax credit provides $1.01 per gallon in subsidies, but claimants must net out VEETC benefits. As VEETC declines from $0.51 per gallon to $0.45 per gallon, the lost benefits under VEETC are recaptured by the biofuels industry through the higher benefits they can no claim under the cellulosic production tax credit. As a result, only conventional ethanol (corn, sugar, sorghum) will seen an actual decline in benefits. Even for these producers, as tax credits decline, the value of the credits under the RFS may rise, again sheltering to industry from seeing the full impact of subsidy reductions.

- **Do no harm.** Environmental organizations have long argued that if specific industries or individuals are going to receive large subsidies from the taxpayer, they should not at the same time be conducting their environmental affairs poorly and causing widespread environmental damage. In the biofuels arena, the RFS attempts to do this by requiring life cycle greenhouse gas (GHG) reductions of between 20 and 60 percent (reducible to between 10 and 50 percent under certain conditions). There are extensive technical challenges in properly modeling lifecycle emissions (especially with regards to indirect land use and nitrous oxide cycles). Also, somewhat ambiguous grandfathering provisions suggest that many of the theoretical benefits of environmental screens may not be realized in practice. Currently, tax credits may be claimed regardless of the environmental impact of the fuel cycle in question.

- **Policy neutrality with subsidy allocation based on reverse auctions rather than political fiat.** Subsidies are justified on the grounds of achieving a general policy goal, though often targeted to specific favored industries. The two approaches work at counter purposes. Biofuel proponents argue the fuels help reduce oil imports and the GHG emissions from the transport sector. Yet for both areas there are a variety of options for reaching these ends, and it is not likely that earmarking hundreds of billions of dollars in subsidies to liquid biofuels is the most effective venue to achieve them. Holding a reverse auction for subsidy access would force all potential solutions to submit bid proposals for the minimum subsidy they would need per unit transport services delivered. Engaging a full spectrum of transport options in this approach would result in a more dynamic, lower cost, and more environmentally friendly pathways to achieve the desired goals.

A series of changes should immediately be implemented to address the environmental and fiscal concerns with federal biofuels subsidies. First, federal policy should adopt a fuel-neutral approach to low carbon transport fuels, forcing all options to compete against each other for the smallest unit subsidy per oil-vehicle-mile reduced. A key element of this approach would be to end tax breaks to producers or blenders entirely, and to force any support through the single mechanism of support of the fuel mandate. Second, biofuel producers would not be eligible to bid in reverse auctions unless they passed minimum environmental screens along the lines of what the RFS is trying to implement. Third, the available pool of subsidies to biofuels should be capped, and this cap should decrease (a) over time, as technology ostensibly develops; and (b) as oil prices rise, making alternatives inherently more competitive. Finally, any grandfathering that the government offers under any of the screening criteria should be limited to the tax depreciation period of the related capital equipment. Since the purpose of grandfathering is to prevent the premature regulatorily-induced obsolescence of capital investments, matching the protections to the period over which that capital is written off makes sense.

5. References

Baker, Mindy, Demot Hayes, and Bruce Babcock. *Crop-Based Biofuel Production under Acreage Constraints and Uncertainty,* Iowa State University Center for Agricultural and Rural Development, Working Paper 08-WP 460, February 2008.

Bailey, Ronald. "No Biofuels Bailout," *Reason Online*, 13 January 2009.

Capehart, Tom, Randy Schnepf, and Brent Yacobucci. *Biofuels Provisions in the 2007 Energy Bill and the 2008 Farm Bill: A Side-by-Side Comparison*, June 27, 2008. RL34239.

Charter Brokerage, LLC. "Charter Brokerage - Duty Drawback Services," accessed from www.charterbrokerage.net, 3 November 2008.

CNNMoney. "EU imposes duties on biodiesel," 12 March 2009.

Cohn, Peter. "Farm Measure Tightens Imported Ethanol Tariff Loophole," *National Journal*, 28 May 2008.

Cohn, Peter. Reporter, *National Journal*, e-mail communication with Doug Koplow, 5 November 2008.

Coleman, Brooke et al. Letter to Mary Nichols, Chairman, California Air Resources Board opposing inclusion of indirect land use change in the California Low Carbon Fuel Standard, 23 October 2008.

Collins, Keith. "The Role of Biofuels and Other Factors in Increasing Farm and Food Prices," prepared for Kraft Foods Global, Inc., June 19, 2008.

Donner, S.D. and C.J. Kucharik. "Corn-based ethanol production compromises goal of reducing nitrogen export by the Mississippi River." *Proceedings of the National Academy of Sciences of the United States of America,* vol. 105, no. 11, March 18, 2008.

EIA, 2007. US Energy Information Administration, *Energy and Economic Impacts of Implementing Both a 25-Percent Renewable Portfolio Standard and a 25-Percent Renewable Fuel Standard by 2025*, SR/OIA/2007-05, August 2007.

EPA (2008). US Environmental Protection Agency, "Notice of Decision Regarding the State of Texas Request for a Waiver of a Portion of the Renewable Fuel Standard," Federal Register, Vo. 73, No. 157, 13 August 2008, pp. 47168-47184.

Ewen, Stanley WB and Arpad Pusztai. "Effects of diets containing genetically modified potatoes expressing nivalis lectin on rat small intestine." *The Lancet*, Vo. 354, Is. 9187, 16 October 1999, pp. 1353-1354.

FAPRI. Food and Agricultural Policy Research Institute, *Baseline Update for US Agricultural Markets*, University of Missouri, August 2008. FAPRI-MU Report #10-08.

Fargione, Joseph, *et al., "*Land Clearing and the Biofuel Carbon Debt", *Science* (February 29, 2008).

Gurgel, Angelo C, *et. al.,* "Potential Land Use Implications of a Global Biofuels Industry", *MIT Joint Program on the Science of Policy and Global Change* (March 2008).

Harkin, Tom, et. al, S. 23, the "Biofuels Security Act of 2007," 110th Congress, 1st Session, January 4, 2007.

Hooijer, Alijosja, Marcel Silvius, Henk Wosten and Susan Page. "Peat-CO2, Assessment of CO2 emissions from drained peatlands in SE Asia." 2006. Delft Hydraulics report Q3943, *Wetlands International*.

Koplow, Doug. "State and Federal Subsidies to Biofuels: Magnitude and Options for Redirection," forthcoming in the *International Journal of Technology and Globalization.*

Koplow, Doug and Ron Steenblik. "Chapter 4: Subsidies to Ethanol in the United States," in D. Pimentel, editor, *Biofuels, Solar and Wind as Renewable Energy Systems* (Amsterdam: Springer Science and Business Media), 2008.

Koplow, Doug. *Biofuels - At What Cost? Government support for ethanol and biodiesel in the United States: 2007 Update*, (Geneva: Global Subsidies Initiative), October 2007.

Koplow, Doug. *Biofuels - At What Cost? Government support for ethanol and biodiesel in the United States*, (Geneva: Global Subsidies Initiative), October 2006.

Netherwood et al, "Assessing the survival of transgenic planic plant DNA in the human gastrointestinal tract," Nature Biotechnology 22 (2004):2.

Obama, Barack, et. al, S. 3554, the "Alternative Diesel Standard Act of 2006," 109th Congress, 2nd Session, June 21, 2006.

Obama, Barack. S. 1920, the "Renewable Diesel Standard Act of 2005," 109th Congress, 1st Session, October 25, 2005.

Obama, Barak. "Barack Obama: Helping America's Farmers Grow America's Fuels," BarackObama.com, 2008.

OECD, 2001. *Agricultural Policies in OECD Countries: Monitoring and Evaluation 2000*. (Paris: Organisation for Economic Co-Operation and Development.

RFA (2006). Renewable Fuels Association. "Issue Brief: New Cellulosic Biomass Ethanol Depreciation Allowance '50% Depreciation for Cellulosic Biomass Ethanol Property,'" December 2006.

RFA (2008a). Renewable Fuels Association. "Cellulosic Biofuel Producer Tax Credit," 2008. Accessed 27 March 2009 at http://www.ethanolrfa.org/resource/cellulosic/documents/CellulosicBiofuelProducerCreditBrief.pdf

RFA (2008b). Renewable Fuels Association, "2008 Monthly US Fuel Ethanol Production/Demand" accessed from www.ethanolrfa.org on 11 November 2008.

RFA (2009). Renewable Fuels Association, "U.S. Cellulosic Ethanol Projects Under Development and Construction," 8 January 2009.

Schill, Susanne Retka. "Making the Switch," *Ethanol Producer Magazine*, November 2008.

Searchinger, Timothy. *et al.*, "Use of U.S. Cropland for Biofuel Increases Greenhouse Gas Through Emissions from Land Use Change", *Science* (February 8, 2008),

Steil, Mark. "Antiobiotics pose concern for ethanol producers," Minnesota Public Radio, 24 March 2009.

U.S. Government Printing Office, *Energy Independence and Security Act of 2007*, Public Law 110-140, December 19, 2007.

Thompson, Wyatt, Seth Meyer and Pat Westhoff. "Mandate Economics Applied to US Biofuel Policies," paper presented at the Annual Meeting of the International Agricultural Trade Research Consortium, Scottsdale, AZ, December 7-9, 2008.

Thompson, Wyatt (2009). E-mail communication with Doug Koplow, March 2009.

Westhoff, Pat, Wyatt Thompson, and Seth Meyer. *Biofuels: Impact of Selected Farm Bill Provisions and other Biofuel Policy Options*, FAPRI-MU Report #06-08, June 2008.

Yacobucci, Brent. "Waiver Authority Under the Renewable Fuel Standard," US Congressional Research Service, May 5, 2008. RS22870.

Yacobucci, Brent (2008 and 2009). *Biofuels Incentives: A Summary of Federal Programs*, updated July 29, 2008 (RL33572) and January 5, 2009 (R40110). U.S. Congressional Research Service.