Fundamental Inconsistencies Between Federal Biofuels Policy and Their Implications

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Summary

Biofuel policies under the Renewable Fuel Standard (RFS) housed in the CAA and administered by EPA and under the Internal Revenue Code administered by the Internal Revenue Service are reviewed to demonstrate inconsistencies not only between the statutes, but also the regulations developed by each agency. The lack of harmonization creates unintended consequences of some fuels reaping government incentives and others, being used in similar applications and delivering equitable environmental benefits, receiving no government assistance in the form of tax credits or participating in the RFS. Environmental, end-use applications, fuel property requirements, and financial incentive differences are discussed.

Biofuels in the United States have been the subject of much debate within the U.S. Congress stretching back to President Jimmy Carter's Administration; 1978 saw the first tax exemption for mixtures of gasoline and ethanol (gasohol) with the passage of the Energy Tax Act.[1] While the final Congressional Conference Report[2] for that tax exemption does not specifically mention a motivation for implementing this exemption, President Carter remarked during the signing ceremony that this law was part of a national plan to produce domestic energy. It is commonly thought that this law was the U.S. response to the Arab Oil Embargo. Since 1978, Congress revisited the issue of ethanol tax treatment many times and ultimately passed no less than 11 other modifying/expanding laws. Together, these laws resulted in significant changes to the credit amount and implemented a number of other structural changes that affected how the credit can be claimed. The first tax credit for producing a gallon of biodiesel was enacted in 2004 and has been modified far fewer times as a result; the changes have been limited to extensions and issues of retroactive eligibility.

In addition to preferential tax treatment, there are a number of other policies that helped establish the biofuels industry in the United States. One of the most important is the Renewable Fuel Standard (RFS) program, which was signed into law by President George W. Bush with the passage of the Energy Policy Act of 2005.[3] The RFS saw some significant revisions/expansions two years later with the passage of the Energy Independence and Security Act of 2007.[4] While the original program is often referred to as the RFS1, and the revised version is often referred to as the RFS2, we use the general term RFS to refer to the program, as it currently exists. There are many details to this complicated program,[5] but, in short, the RFS is a mandate to use a certain number of gallons of renewable fuel. *Renewable fuel,* within the context of the RFS, is fuel that is produced from *renewable biomass* and is "used to replace or reduce the quantity of fossil fuel present in a transportation fuel, heating oil, or jet fuel."[6]

1. Pub. L. No. 95-618, §221.
2. H.R. Conf. Rep. No. 95-1773, published Oct. 12, 1978.
3. Pub. L. No. 109-59, §1501.
4. Pub. L. No. 110-140, tit. II, Subtitle A.
5. 75 Fed. Reg. 14863.
6. While the definition of renewable fuel clearly includes end uses that are broader than common transportation uses, it should be noted that even the definition of transportation fuel is broader than commonly assumed as it includes fuel for use in motor vehicles, motor vehicle engines, nonroad vehicles, or nonroad engines (except fuel for use in ocean-going vessels). The definition of nonroad engines included in the RFS references the Energy Policy Act of 2005 (see footnote 21 of 75 Fed. Reg. 14720). This definition specifically includes engines used in construction, handling of cargo, agriculture, mining, or energy production (Pub. L. No. 109-58, §792(d)(1)(A)(v)).

As will be discussed throughout this Article, the policy objectives for biofuels tax incentives and the RFS may appear to align on the surface, but there are significant inconsistencies that could affect a company's eligibility to participate in one or both of these programs.[7] These inconsistencies often result in a level of confusion and frustration among biofuel producers and other interested stakeholders. In a worst-case scenario, a fuel producer may operate under the assumption that they qualify for an incentive, but an unexpected determination by policy administrators might suddenly make their business model untenable. Regulators and policymakers have no choice but to pay close attention to critical definitions and referenced standards when creating biofuels policies. The lack of coordination amongst the different rulemaking bodies can easily open the door to significant unintended consequences that undermine explicitly made policy goals.

It is difficult to discern exact congressional intent when discussing biofuel policy as a result of fundamental inconsistencies between policy supports. However, three general themes have appeared across the landscape of tax incentives and the RFS regarding the production of biofuels:

1. Energy security is enhanced through domestic production of biofuel.
2. Biofuels help realize environmental benefits by displacing petroleum products.
3. Increased biofuel production will positively impact rural economic development.

It has already been mentioned that the Energy Tax Act of 1978 was created in the name of energy security; the same justification would also hold for the RFS. In fact, the subtitle that created the revised version of the RFS was called "Energy Security Through Increased Production of Biofuels."[8] Congress was also interested in promoting the biofuels industry in order to obtain their second explicit policy goal, obtaining environmental benefits. The desire to achieve these environmental benefits was made explicit by mandating an increasing number of gallons of biofuels through the RFS. The majority of these new gallons of fuel were to be designated as *advanced biofuels*, which Congress dictated must produce a 50% reduction in life-cycle greenhouse gas (GHG) emissions when compared to a baseline petroleum product.[9] Another category of fuels designated as *cellulosic biofuel* must produce a 60% reduction in life-cycle GHG emissions. *Advanced biofuels*, within the industry, may also be referred to as *second-generation biofuels*, whereas first-generation biofuels are typically limited to corn-based ethanol.[10] Congress recently adopted this moniker at the end of 2012, when the tax code was modified to incentivize an entire class of *second-generation biofuels*[11] through a per-gallon income tax credit; Congress did not include an explicit GHG metric to qualify for this credit.[12]

The complicated system of biofuel policies works to provide a network of market pushes and pulls. The RFS is the major policy tool that helps pull the *advanced biofuel* industry toward commercialization by creating a captive market; favorable tax treatments could be used to reduce the cost of production and are seen as the market push. Favorable tax treatments can also be seen as a way to reduce the marginal cost of compliance for a party that might be obligated to comply with the RFS. However, due to the inconsistent patchwork approach of biofuels tax policies, there is no guarantee that the incentive will actually reduce the cost of compliance. This is because the marginal gallon used for complying with the RFS may be outside the definition of a tax incentive, or the tax incentive may have expired completely. If a coordinated system of biofuels policy were devised, there would be a greater chance of commercial success for any particular biofuel producer.

Remembering the three congressional objectives that were just outlined, the focus of this Article will be on establishing a solid understanding of the existing biofuels policies. As will be seen, there are a number of inconsistencies that exist between the RFS and the system of tax incentives, as well as within the tax incentives themselves, that could undermine one or all of Congress' overarching policy objectives. Other biofuel programs, such as those run by the U.S. Department of Agriculture, play an important role in the development of the biofuels industry, but a full analysis is considered beyond the scope of this Article and is left for later research. This Article begins with a brief description of the chemistry of biofuels and then continues with an introduction to the RFS and its market-based compliance mechanism. Then, building on this foundation, an analysis of key definitions within the RFS and tax code will be presented. This section will also include a discussion of the relevant American Society for Testing and Materials (ASTM) standards that are referenced in the statute.

After presenting the critical definitional differences that are found in biofuels policy, a few historical case studies will be presented to explore the level of inconsistency that exists for certain biofuel products.[13] Through these case studies, the level of specificity that is necessary to maintain when creating biofuels policy will be illuminated. These case studies will also highlight the important role of federal agencies in interpreting congressional intent. The Article concludes with several recommendations that would heighten the coordinating efforts among the tax code and the RFS. As a brief point of clarification, throughout this Article, reference will be made to *sustainable fuels* or fuels that are more *environmentally friendly*. In these instances, the authors are referring to those fuels having a reduced

7. It should be noted that individual states are also free to implement their own policies regarding the use of biofuels, and there are inconsistencies between federal-level and state-level policies. A full analysis of this issue is beyond the scope of this Article though, and is left for further research.
8. Energy Independence and Security Act of 2007 (Pub. L. No. 110-140).
9. 46 U.S.C. §7545(o)(1)(B).
10. Biodiesel is not typically given a label of first- or second-generation.
11. This particular tax credit was previously available only to cellulosic biofuel.
12. 26 U.S.C. §40(b)(6).
13. Congress has since provided clarifying language.

life-cycle GHG emission profile (including emissions from indirect land use changes) when compared to typical petroleum-based fuels, unless otherwise noted.

I. Chemical Composition of Biofuels

The term biofuel does not have a scientific definition, nor does the term biofuel refer to a compound with a unique chemical formula. A layman's definition of biofuel might simply refer to any fuel that is derived from a biomass feedstock, but again, there is no single definition of the term biomass. This issue will be explored in depth as part of a later section.

There are generally three primary chemical classes that biofuels generally fall under: alcohols; fatty acid esters; and hydrocarbons. Alcohols, by definition, are organic compounds that have a hydroxyl group (OH) bonded to a carbon atom. Common alcohol biofuels are ethanol (C_2H_5OH), methanol (CH_3OH), and butanol (C_4H_9OH). The primary benefit of alcohol-based fuels is as an oxygenate for motor gasoline.[14] Adding oxygen to a liquid fuel mixture can reduce the emission of toxic compounds as well as other ozone-forming chemicals. In fact, the 1990 Amendments to the Clean Air Act (CAA)[15] directed the U.S. Environmental Protection Agency (EPA) to promulgate new regulations that required gasoline sold in certain areas to be reformulated to include a certain amount of oxygen.[16] These requirements played a significant role in ethanol becoming the most widely used alcohol biofuel/oxygenate.[17] Other biomass-based production pathways are focusing on butanol because of its favorable blending characteristics, its higher energy density when compared to ethanol, and its compatibility with existing fuel distribution infrastructure.

Fatty acid esters are fuels that are fat-based (triglyceride). They contain long-chain alkyl (methyl, propyl, or ethyl) esters. Biodiesel fuels are a mixture of many different types of fatty acid methyl esters (FAME). FAME fuels are produced through a process known as transesterification, which involves reacting methanol, a catalyst, and the triglyceride source. A typical biodiesel fatty acid ester profile may contain palmitic acid ($C_{16}H_{32}O_2$), stearic acid ($C_{18}H_{36}O_2$), oleic acid ($C_{18}H_{34}O_2$), linoleic acid ($C_{18}H_{32}O_2$), and linolenic acid ($C_{18}H_{30}O_2$). Biodiesels are typically classified as ultra-low-sulfur fuels (<15 ppm) and as a result, they have air quality benefits over petroleum-based diesels that contain higher levels of sulfur impurities. EPA does regulate the amount of sulfur in diesel fuels pursuant to authority granted by the CAA[18]; however, the sulfur standards vary by vehicle type.

Hydrocarbons describe a class of molecules that contain a number of carbon and hydrogen bonds linked together into longer chains. Gasoline and diesel fuels are examples of hydrocarbon mixtures; neither of these terms refers to a specific type of molecule. Gasoline fuels contain shorter (lighter) hydrocarbon chains (C_5H_{12}–$C_{10}H_{22}$), while diesel fuels contain longer (heavier) hydrocarbon chains ($C_{10}H_{22}$–$C_{18}H_{38}$). Hydrocarbons can be made from both petroleum and biomass sources.

The commonality among all biofuels discussed in the previous paragraph is that they are made, in part or whole, from some sort of biomass feedstock; however, there is little consistency in federal policies as to exactly what is biomass. Companies that are producing a biofuel must carefully assess their technology and judge whether or not the multiple policy definitions match their business model. All of these complexities can affect whether a fuel qualifies for a tax incentive and/or the RFS, and these decisions can ultimately affect the success or failure of a company. These key policy definitions will be discussed in the following section after a brief account of the market mechanisms within the RFS.

II. The RFS

President Bush signed the original RFS into law on August 8, 2005, as part of the Energy Policy Act.[19] This new program mandated that a certain number of gallons of renewable fuel be commercialized in the United States (i.e., introduced into its fuel supply). The regulated entities under the RFS consist of industries that are involved with the production, distribution, and sale of transportation fuels, including gasoline and diesel fuel or renewable fuels such as ethanol and biodiesel. Those entities responsible for demonstrating that biofuels have been purchased or used are called "obligated parties." Obligated parties typically are industries that produce, distribute, or sell gasoline or diesel fuel for use in the United States, including refiners, importers, and blenders (other than oxygenate blenders).[20] In order for an obligated party to comply with their volume of renewable fuel obligations under the RFS, the obligated party must accumulate a sufficient number of compliance certificates. These certificates are referred to as Renewable Identification Numbers or RINs. RINs are a tool created by EPA in order to satisfy Congress' charge to create a market-based compliance credit program, as required under the Act.[21] Every gallon of renewable fuel produced or imported into the United States that

14. Alcohols, particularly ethanol, are also valuable to a refiner as an octane enhancer and a volume extender.
15. 42 U.S.C. §§7401-7671q, ELR Stat. CAA §§101-618.
16. U.S. EPA, *Regulation of Fuels and Fuel Additives: Standards for Reformulated and Conventional Gasoline*, AMS-FRL-4817-8 (1994).
17. Methanol is not widely used in the United States as a transportation fuel in its raw state; however, it was used as a feedstock in the production of methyl tertiary butyl ether (MTBE) for use as an oxygenate. Concerns about groundwater contamination effectively eliminated MTBE from the oxygenate marketplace.
18. 40 C.F.R. pt. 80, subpt. I.
19. Pub. L. No. 109-58, §1501.
20. All gasoline producers in Alaska, Hawaii, or other noncontiguous U.S. territories are exempt from the RFS indefinitely. The state/territory may opt into the program; however, all refiners, importers, and blenders located in that area will then be subject to the RFS requirements. Blenders who only blend renewable fuels downstream from the refinery or importer are not subject to the renewable fuel obligation.
21. 42 U.S.C. §7545(o)(5). The idea is that a tradable compliance credit would help ease the burden of compliance with the RFS.

is a part of the RFS must be assigned a unique RIN.[22] The rules around exported renewable fuels ensure that the RFS can only be complied with by using renewable fuel domestically. Under the first RFS program, the RIN value for a gallon of registered fuel was based primarily on the renewable energy content of a biofuel compared to the energy content of ethanol. There was no GHG reduction requirement as in the RFS2. RINs are self-generated by producers of a renewable fuel and registered in a computer tracking system housed within EPA. RINs can be traded, borrowed, and banked according to rules outlined in the RFS. Ultimately though, every obligated party must demonstrate compliance on an annual basis.

RIN price discovery is complicated by the fact that the value is affected by a number of overlapping policies/other constraints that strongly impact the ultimate supply and demand dynamics. Structural complications within the RFS also serve to obscure the price discovery process in the RIN market. The number and type of RINs generated from a gallon of biofuel depends on a number of factors including the type of fuel produced, the life-cycle GHG emissions associated with that fuel, and the energy content (also known as the energy density) of the produced biofuel. As an example, fuels such as biodiesel or renewable diesel have higher energy density than ethanol and typically have lower associated GHGs, which then translates to more RINs per gallon of these produced biofuels. EPA has stated that a corn-based ethanol has an energy equivalence value (EV) of 1 corresponding to 77,000 British thermal units per gallon (Btu/gallon), whereas biodiesel typically has an energy content of 137,000 Btu/gallon and an EV value of 1.5; thereby, each gallon of biodiesel has 50% more RINs per gallon than does ethanol. Under RFS1, GHG reductions were not included in the statute or the regulations.

The ink had hardly dried on the Energy Policy Act of 2005, and the volumes of renewable fuel specified in the Act were being exceeded by hundreds of millions of gallons. The RFS1 was updated with the passage of the Energy Independence and Security Act (EISA) of 2007.[23] This law modified the CAA and redesigned how the RFS would operate. One of the largest modifications was that fuels would be measured on a life-cycle GHG emission basis as well as having qualifications about what feedstocks can be used. These requirements manifest themselves as four different categories of fuel. The RIN system of compliance was expanded such that five different types of RINs are now available.[24] Each of these different types of RINs can be used to satisfy the different volume mandates; some of the RINs may be used to satisfy more than one category because the mandates are nested. As a consequence of the RFS' nested volume mandate structure, these different RINs will have different market values, creating market pressure to produce certain types of biofuels.

In order for a renewable fuel producer to generate an RIN and to participate in the RFS, EPA must verify that the fuel production pathway meets the mandated emission-reduction threshold and feedstock requirements. This process is nontrivial, as EPA must assess emissions from the full fuel life cycle; both direct GHG emissions as well as significant sources of indirect emissions.[25]

III. Policy Inconsistencies

As has already been mentioned, there are a number of definitional inconsistencies between various biofuel policies. These inconsistencies exist among the tax code, the RFS, as well as IRS interpretative actions. To begin to untangle this network, we explicitly state that this Article focuses on the four primary tax incentives: 26 U.S.C. §40 (alcohol, etc., used as fuel); 26 U.S.C. §40A (biodiesel and renewable diesel used as fuel); 26 U.S.C. §6426 (credit for alcohol fuel, biodiesel, and alternative fuel mixtures); and 26 U.S.C. §6427 (fuels not used for taxable purposes). Second-generation biofuel properties are also eligible for an accelerated depreciation allowance[26]; however, many of the critical eligibility definitions are simply included by referencing 26 U.S.C. §40(b)(6)(E). The reader is cautioned that some of these tax credits have expired (see Table 3). While a credit's expiration date may have passed, the full language still remains as part of the *United States Code* and can therefore be cross-referenced in future policymaking activity. As a result, the authors chose to document all biofuels language that existed at the time of writing, independent of the credit expiration date. Definitions are current as of the time of publishing, but historical cases will be discussed and will be identified for the reader as necessary.

The U.S. Tax Code has historically provided incentives for the production and use of both ethanol and biodiesel. The special tax treatment for ethanol was only available to ethanol produced from sources other than petroleum, natural gas, or coal.[27] When this excise tax exemption was created in 1978, the de facto feedstock for ethanol production was corn. When the first biodiesel tax incentive was introduced in 2004,[28] it was limited to biodiesel produced from plant or animal matter; the de facto feedstock for biodiesel was waste soybean oil from the creation of soy meal. As other biofuels and alternative fuels were developed and their uses expanded, new definitions were added to the Tax Code. These piecemeal modifications resulted in a number of inconsistencies. The authors have identified three broad categories of inconsistencies observed when comparing the various tax incentives as well as comparing the Tax Code and the RFS. These include the following:

1. Inconsistencies in environmental requirements (including feedstock sourcing)

22. The RIN number is literally a 38-digit number that is encoded with a number of individual identification numbers (facility ID, batch number, calendar year of production, equivalence values, etc.).
23. Pub. L. No. 110-140.
24. 40 C.F.R. pt. 80.1425.
25. 42 U.S.C. §7545(o)(1)(H).
26. 26 U.S.C. §168(l).
27. Pub. L. No. 95-618, §221.
28. Pub. L. No. 108-357, §302.

2. Inconsistencies in the required end-use applications
3. Inconsistencies in the value of the tax incentive

The first category, referred to here as an environmental inconsistency, stems from differences in key eligibility criteria that would impact the life-cycle GHG emission profile for a biofuel. Environmental inconsistencies also encompass the various feedstock requirements and limitations that are imposed. The second category, termed an end-use inconsistency, results in differences in the required end-use application of the biofuel. An end-use inconsistency impacts the markets that are supported by the policy. The values given to each of these incentives are also inconsistent, and are not necessarily scaled based on any physical attribute of the fuel itself.[29] The development of these inconsistencies, whether intentional or not, creates conflicts in obtaining the stated policy goals outlined by Congress.

A. Inconsistencies in Environmental Requirements

Table 1 catalogs the key terms of art in each of these policies that may result in an environmental inconsistency. In reviewing the terms in the table, it is obvious that the Tax Code and the RFS are not harmonized, with the possible exception of the term *biodiesel*. The number of differences between each of these programs results in a wide range of fuels being supported. The wide range of incentivized fuels can also emit a wide range of life-cycle GHG emissions. A key environmental inconsistency that exists is that the RFS contains GHG reduction requirements while the Tax Code does not include any such metric. This is presumably the case because the initial policy focus was on energy security and energy independence and less so on achieving environmental outcomes. When EISA was passed in 2007, it was the first biofuel policy that included a mandatory GHG reduction. Although the modified RFS was designed to obtain environmental outcomes, the Tax Code was not harmonized at the same time. Policymakers would be faced with significant challenges should an attempt ever be made to include an emissions requirement in the Tax Code. The principle challenge is how to overcome the near certainty of significant administrative burdens being created (as a result of forcing two agencies to collaborate closely on a policy). The government could choose to invest in internal resources that would allow the Treasury Department to determine GHG reductions. However, this would be redundant to the purview of EPA, and raises a number of other important questions about how the science of life-cycle assessment is performed within each of these institutions.

This theme continues when comparing the definitions of biomass. In fact, the RFS uses the term renewable biomass instead of biomass. As can be seen in Table 1, the Tax Code definition of biomass is simply any organic matter other than oil, natural gas, and coal. Clarifying information for the term organic material is not included anywhere in Title 26 of the *U.S. Code*. The Tax Code is also silent on how, where, and when the feedstock is harvested. All of these other considerations drastically impact the sustainability of the finished fuel. Only within the second-generation biofuel producer tax credit is it specified that the feedstock must be available on a recurring basis. Unfortunately, the term recurring basis has not been defined, effectively ignoring the critical time element associated with harvesting and ultimate land use implications associated with the production of biofuel feedstocks.

The RFS definition of renewable biomass is lengthy and does include some details on where feedstocks can be sourced from (i.e., agricultural land, actively managed forests, etc.). The reader is referred directly to 42 U.S.C. §7545(o)(1)(I) for the full definition. Land use changes and harvesting cycles, while not explicitly defined, are wrapped up within the life-cycle GHG emissions threshold determination for a particular fuel production pathway.

Other interesting environmental inconsistencies surround the definition of renewable diesel. The definition of renewable diesel from the Tax Code requires that the fuel meet either ASTM D975 (diesel fuel oils) or ASTM D396 (fuel oils). The RFS definition does not include either of these standards for non-ester renewable diesel because, according to EPA, "there may be renewable fuels or fuel additives that are or will be approved for use in diesel engines, but which nevertheless do not meet all specifications."[30] This results in the possibility that a fuel would not qualify for the tax incentive, but does meet the requirement of the RFS. To take this example one step further, a non-ester renewable diesel could meet the minimum 50% GHG reduction threshold, generate a valuable RIN under the RFS, but despite the higher RIN value, this fuel may still not be economically competitive as a result of being excluded from the tax credit that may be received by a direct competitor. There could also be a situation where an on-specification non-ester renewable diesel (or other fuel type) would not meet the minimum 20% GHG reduction, but may still provide a marginal environmental benefit when compared to other petroleum products. This fuel would not be approved for the RFS, and therefore could not benefit from the generation of an RIN, but could be eligible for a tax incentive. While either scenario could theoretically occur, the market for such fuels is likely to be limited, unless the fuel can aggressively compete on price only.

29. The RFS makes some adjustments to the number of RINs that a fuel can produce based on the energy content of the fuel.

30. U.S. EPA, *Renewable Fuel Standard Program (RFS2) Summary and Analysis of Comments,* EPA-420-R-10-003, 2010.

Table 1: Key Definitions Shared Between the Tax Code and the Renewable Fuel Standard

Term of Art	Tax Code	*ref*	RFS	*ref*
Biomass	Any organic material other than oil and natural gas (or product thereof), or coal (including lignite) or product thereof.	26 U.S.C. §45K(c)(3)		
Special Fuel	Any fuel, other than gasoline, which can be used in an internal combustion engine.	26 U.S.C. §40(d)(2)		
Agri-biodiesel	Biodiesel derived solely from virgin oils, including esters derived from virgin vegetable oils from corn, soybeans, sunflower seeds, cottonseeds, canola, crambe, rapeseeds, safflowers, flaxseeds, rice bran, mustard seeds, and camelina, and from animal fats.	26 U.S.C. §40A(d)(2)		
Alternative Fuel	Liquid fuel derived from biomass, not including any fuels derived from the production of paper or pulp (see reference for full list).	26 U.S.C. §6426		
Biodiesel (e.g., biodiesel fuel)	Mono-alkyl esters of long chain fatty acids derived from plant or animal matter that meet the registration requirement of the CAA and the requirements of ASTM D6751.	26 U.S.C. §40A(d)(1)	Mono-alkyl ester that meets ASTM D6751.	40 C.F.R. pt. 80.1401
Diesel Fuel (e.g., diesel)	Any liquid (other than gasoline) which is suitable for use as a fuel in a diesel-powered highway vehicle, or a diesel-powered train, transmix, or diesel fuel blend stocks identified by the Secretary.	26 U.S.C. §4083(a)(3)	Diesel fuel or other distillate fuel that meets the definition of motor vehicle (MV) or nonroad, locomotive, or marine (NRLM) diesel fuel and is a transportation fuel (other exceptions apply).	40 C.F.R. pt. 80.2(qqq) & 40 C.F.R. pt. 80.1407(e)
Gasoline	Any gasoline blend, other than methanol, ethanol, or a denatured alcohol.	26 U.S.C. §4083(a)(2)	Reformulated gasoline, conventional gasoline, reformulated gasoline blendstock, conventional gasoline blendstock, other blendstocks, any unfinished gasoline that becomes finished gasoline once oxygentates are added, must be a transportation fuel.	40 C.F.R. pt. 80.1407(c)
	Octane rating of 75 or greater.	IRS Publication 510, July 2012		
	Suitable for use as a motor fuel.	IRS Publication 510, July 2012		
Taxable Fuel	Gasoline, diesel, and kerosene.	26 U.S.C. §4083(a)(1)		
Transmix	A byproduct of refined products pipeline operations created by the mixing of different specification products during pipeline transportation.	26 U.S.C. §4083(a)(3)(B)	Excluded from participation in the RFS.	40 C.F.R. pt. 80.1407(e) & 40 C.F.R. pt. 80.1407(f)

Term of Art	Tax Code	*ref*	RFS	*ref*
Renewable Diesel (e.g., non-ester renewable diesel)	Liquid fuel derived from biomass that meets the registration requirements outlined in the CAA and the requirements of ASTM D975 or ASTM D396. Does not include any liquid fuel derived from co-processing biomass with a feedstock that is not biomass.	26 U.S.C. §40A(f)(3)	A fuel which can be used in an engine designed to operate on conventional diesel fuel, or be heating oil or jet fuel and is not a mono-alkyl ester.	40 C.F.R. pt. 80.1401
Recurring Basis				
Plant or Animal Matter				
Use as a fuel	When consumed in the production of energy.	IRS Notice 2006-92		
Alternative Fuel Mixture	Mixture of alternative fuel and a taxable fuel that contains at least 0.1% (by volume) of taxable fuel.	IRS Notice 2006-92		
Second-Generation Biofuel	Any liquid fuel, which is derived from any lignocellulosic or hemicellulosic matter that is available on a renewable or recurring basis, and any cultivated algae, cyanobacteria, or lemna.	26 U.S.C. §40(b)(6)(E)		
Renewable Biomass			Planted crops and crop residue harvested from agricultural land (see reference for full definition).	42 U.S.C. §7545(o)(1)(I)
Cellulosic Biofuel			Renewable fuel derived from any cellulose, hemicellulose, or lignin that is derived from renewable biomass and that has life-cycle GHG emissions that are at least 60% less than the baseline life-cycle GHG emissions.	42 U.S.C. §7545(o)(1)(E)
Advanced Biofuel			Renewable fuel, other than ethanol derived from corn starch, that has life-cycle GHG emissions that are at least 50% less than baseline life-cycle GHG emissions.	42 U.S.C. §7545(o)(1)(B)
Renewable Fuel			Fuel that is produced from renewable biomass and that is used to replace or reduce the quantity of fossil fuel present in a transportation fuel.	42 U.S.C. §7545(o)(1)(J)

Term of Art	Tax Code	*ref*	RFS	*ref*
Biomass-Based Diesel			Renewable fuel that is biodiesel and that has life-cycle GHG emissions that are at least 50% less than the baseline life-cycle GHG emissions. Renewable fuel derived from co-processing biomass with a petroleum feedstock shall be advanced biofuel if it meets that definition but is not biomass-based diesel.	42 U.S.C. §7545(o)(1)(D)
Transportation Fuel			Fuel for use in motor vehicles, motor vehicle engines, nonroad vehicles, or nonroad engines (except for ocean-going vessels).	42 U.S.C. §7545(o)(1)(L)
Life-cycle GHG Emissions			The aggregate quantity of GHG emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes) related to the full fuel life cycle, including all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery and use of the finished fuel to the ultimate consumer, where the mass values for all GHGs are adjusted to account for their relative global warming potential.	42 U.S.C. §7545(o)(1)(H)
Conventional Biofuel			Renewable fuel that is ethanol derived from corn starch.	42 U.S.C. §7545(o)(1)(F)
Biodiesel Blend				
Hydrocarbon oil				
Heating Oil			Any #1, #2, or non-petroleum diesel blend that is sold for use in furnaces, boilers, and similar applications and which is commonly or commercially known or sold as heating oil, fuel oil, and similar trade names, and that is not jet fuel, kerosene, or MVNRLM diesel fuel or a fuel oil that is used to heat interior spaces of homes or buildings to control ambient climate for human comfort. The fuel oil must be liquid at 60 degrees Fahrenheit and 1 atmosphere of pressure, and contain no more than 2.5% mass solids.	40 C.F.R. pt. 80.2(ccc) and 40 C.F.R. pt. 80.1401

Term of Art	Tax Code	*ref*	RFS	*ref*
Motor Vehicle	Includes all types of vehicles propelled by motor that are designed for carrying or towing loads from one place to another, regardless of the type of load or material carried or towed and whether or not the vehicle is registered or required to be registered for highway use. Included are forklift trucks used to carry loads at railroad stations, industrial plants, warehouses, etc. The term does not include farm tractors, trench diggers, power shovels, bulldozers, road graders or rollers, and similar equipment that does not carry or tow a load; nor does it include any vehicle that moves exclusively on rails.	26 C.F.R. pt. 48.4041-8	Any self-propelled vehicle designed for transporting persons or property on a street or highway.	42 U.S.C. §7550(2)

While there are environmental inconsistences between the Tax Code and the RFS, there are also numerous inconsistences within the Tax Code. There are a total of 14 different credits across both income- and excise-based tax incentives for which biofuels can qualify. The eligibility for most of these credits is not based on any specific fuel standard or performance standard, with the exception of biodiesel and renewable diesel due to references to relevant ASTM specifications. Table 2 breaks down the various credits and details the qualifications placed on the feedstock supply, which result in a number of environmental inconsistences. As can be seen, many of the incentives that are traditionally considered to be biofuel "credits" do not require the feedstock to be made from biomass, made from plant or animal matter, nor be available on a reoccurring basis. Other credits, such as credits available for agri-biodiesel, require that the feedstock be made from a specific list of biomass feedstocks and the oils from those feedstocks must be virgin oils. The requirement that agri-biodiesel be made from virgin oils presents a subtle environmental inconsistency as it speaks to the inherent uncertainty that exists when calculating life-cycle GHG emissions. EPA has determined that the median emissions from a soybean oil biodiesel are 57% lower than the baseline (i.e., petroleum-based diesel produced in 2005), but the 95% confidence limits ranged from an 85% to 22% reduction.[31] In this estimate, EPA did not assign an emissions value to the glycerin, a byproduct of the transesterification process, and has left the range of potential uses open for further research. EPA did comment, however, that if glycerin were to be used as feedstock for the chemical industry, the GHG emissions would likely degrade the current understanding of emissions saved.[32] EPA's estimate of biodiesel produced from waste oil feedstocks is a consistent 86% reduction. EPA justifies this calculation by stating, "in the case of biodiesel made from waste material, there is no land use impact so the agricultural assessment required for crop-based biofuels are unnecessary"[33]; EPA has stated that these are the "best available models."[34] Therefore, the situation exists where agri-biodiesel fuels receive support in the form of a tax credit, but ultimately may release a larger amount of GHGs when compared to biodiesels from waste feedstocks. It should be noted that at the time of writing, not all feedstocks specified as an agri-biodiesel in the Tax Code qualify under the RFS.[35] This inconsistency has the potential to open the door to fuel producers to receive the agri-biodiesel tax credit (which can be more valuable than the biodiesel credit if the producer is considered small) and qualify for the RFS, but their specific plant may not necessarily meet the 50% emissions reduction because of differences in feedstock sourcing practices.

31. U.S. EPA, *Final Regulatory Impact Analysis*, EPA-420-R-10-006, 2010, *available at* http://www.epa.gov/otaq/renewablefuels/420r10006.pdf.
32. 75 Fed. Reg. 14788.
33. 75 Fed. Reg. 14789.
34. U.S. EPA, *Fact Sheet: EPA Lifecycle Analysis of Greenhouse Gas Emissions From Renewable Fuels*, EPA-420-R-10-006 (2010).
35. Agri-biodiesel producers that use feedstocks specified in 26 U.S.C. §40A can petition EPA to approve their fuel production pathway, however this can take a significant amount of time. *See* U.S. EPA, *Freedom of Information Request*, EPA-HQ-2013-00511 (2013), https://foiaonline.regulations.gov/foia/action/public/view/record?objectId=090004d28006d677 (last visited Mar. 24, 2014).

Table 2: Feedstock Requirements for Various Biofuel Tax Credits.

		The feedstock must . . .					
Credit	***ref***	**be biomass**	**be plant or animal matter**	**be first use (i.e., "virgin oils")**	**be available on a reoccurring basis**	**not be petroleum, natural gas, coal, or peat?**	**not be co-processed with feedstocks that are not biomass**
Alcohol Mixture Credit	26 U.S.C. §40(b)(1)					X	
Alcohol Credit	26 U.S.C. §40(b)(2)					X	
Small Ethanol Producer Credit	26 U.S.C. §40(b)(4)					X	
Second-Generation Biofuel Producer Credit	26 U.S.C. §40(b)(6)	X*			X		
Biodiesel Mixture Credit	26 U.S.C. §40A(b)(1)		X				
Biodiesel Credit	26 U.S.C. §40A(b)(2)		X				
Small Agri-Biodiesel Producer Credit	26 U.S.C. §40A(b)(4)	X**		X			
Agri-Biodiesel Mixture Credit	26 U.S.C. §40A(b)(1)	X**		X			
Agri-Biodiesel Credit	26 U.S.C. §40A(b)(2)	X**		X			
Renewable Diesel Credit	26 U.S.C. §40A(f)	X					X
Alcohol Fuel Mixture Credit	26 U.S.C. §6426(b)					X	
Biodiesel Mixture Credit	26 U.S.C. §6426(c)		X				
Alternative Fuel Credit	26 U.S.C. §6426(d)	X***					
Alternative Fuel Mixture Credit	26 U.S.C. §6426(e)	X***					

* any lignocellulosic or hemicellulosic matter or any cultivated algae, cyanobacteria, or lemna

** virgin vegetable oils from corn, soybeans, sunflower seeds, cottonseeds, canola, crambe, rapeseeds, safflowers, flaxseeds, rice bran, mustard seeds, and camelina, and from animal fats

*** certain liquid fuels must be made from biomass, but other eligible fuels are listed in 26 U.S.C. §6426(d)

B. Inconsistencies in the Required End-Use Applications

The second inconsistency pertains to the end-use applications in which the biofuels may be used to qualify for a tax credit and/or qualify under the RFS. All of the biofuel tax credits allow the biofuel to be used as a fuel in a trade or business. The requirement that the biofuel must be used as a fuel is broad and therefore will allow biofuels to be used essentially in any application where a fossil fuel may have been used. The IRS has clarified the phrase "used as a fuel" within the context of the alternative fuel mixture credit to mean, "when it is consumed in the production of energy."[36] The authors assume this clarification can be argued in the context of the other incentives as well. Whether the fuel is used for highway vehicles, farm equipment, a boiler for heating, or an off-road engine, the biofuel producer or blender could still receive a tax credit. The caveat is that fuel must be a separate and identifiable product that can be burned as a fuel.[37] The one exception is the alternative fuel credit, which requires that the fuel be used in a motor vehicle, motorboat, or for aviation, a much narrower definition even when compared to the alternative fuel mixture credit. To highlight this disparity, a fuel qualifying under the alternative fuel credit receives a $0.50/gallon credit and must be of high enough quality to be used in a motor vehicle and would be responsible for the excise tax for on-highway fuel use. An agri-biodiesel fuel could be used in a boiler to generate steam and would receive a $1.10/gallon credit and have no excise tax liability. Given a choice to build a biofuel facility, an entity will install a biodiesel facility, draw on virgin oils if the extra $0.10/gallon justifies the virgin

36. IRS, Notice 2006-92 (2006), *available at* http://www.irs.gov/pub/irs-drop/n-06-92.pdf.

37. IRS, Memorandum 201315018 (2013), *available at* http://www.irs.gov/pub/irs-wd/1315018.pdf.

oil costs, and produce agri-biodiesel to obtain a high tax incentive before developing a more complicated "drop-in fuel" and only receive $0.50/gallon and still have to pay excise tax. One can ascertain that the Tax Code encourages status quo biofuels and does not provide incentives to develop more advanced, environmentally sound biofuels.

Under the RFS, qualifying biofuels may only be used in transportation, home heating and aviation end uses.[38] The definition of "motor vehicle" in the Tax Code includes all types of vehicles propelled by motor that are designed for carrying or towing loads from one place to another, but generally does not include applications for off-road or other construction equipment (see Table 1). Transportation as per the RFS is more broadly defined to include off-road vehicles and off-road engines.[39] The RFS also allows fuel to be used as heating oil under the original RFS2 regulations,[40] only if the biofuel meets a #1 or #2 heating oil[41] neat or if it is biodiesel as per ASTM D6751 and blended at a minimum of 80% biodiesel (i.e., non-petroleum diesel[42]). Recent regulations[43] added a second part to the definition of heating oil previously defined in 40 C.F.R. §80.2(ccc).[44] Producers or importers that meet this expanded definition will be allowed to generate an RIN for use as compliance under the RFS, however, these fuels cannot be used to generate process heat, power, or other functions as it is beyond the scope of the term home heating oil.[45] This means that an RIN cannot be generated for fuels used in these applications. However, biodiesel and the biofuels meeting #1 and #2 heating oil specifications[46] could be used as a fuel in boilers or for process heat or power and would benefit economically by being able to generate an RIN for use as compliance with the RFS. As a result, an off-specification industrial fuel designed for use in heat/power applications would not be eligible for market support through the RFS (by not being able to generate an RIN); it is possible that this fuel still provides an emissions benefit. This end-use inconsistency has the potential to undermine some of the policy goals outlined by Congress. Additionally, in the definition of non-ester renewable diesel, EPA has made it clear that it is not necessary for all fuels that participate in the RFS to meet an industry standard.

38. Although home heating and aviation uses fall under the RFS definition of renewable fuel, there are no explicit mandates in place that require the blending of biofuels with these products. Renewable fuel that does get blended with these products is eligible to generate an RIN for sale to obligated parties.
39. 40 C.F.R. pt. §80.1401.
40. *Id.*, referencing 40 C.F.R. pt. §80.2(ccc).
41. There are several industry standard specifications for fuel oils that could qualify as heating oils. For example, ASTM D396 covers grades of fuel oil intended for use in fuel oil-burning equipment, ASTM D7666 covers two grades of burner fuel consisting of triglycerides and naturally occurring constituents of triglycerides including monoglycerides, diglycerides, and free fatty acids and distinguished by the pour point, and ASTM D7544 covers grades of pyrolysis liquid biofuel produced from biomass intended for use in fuel oil burner equipment.
42. 40 C.F.R. §80.2(sss).
43. 78 Fed. Reg. 62462.
44. New regulations, which take place on December 23, 2013, now include fuel oil that is used to heat interior spaces of homes or buildings to control ambient climate for human comfort. The fuel oil must be liquid at 60 degrees Fahrenheit and 1 atmosphere of pressure, and contain no more than 2.5% mass solids.
45. 78 Fed. Reg. 42463; 45 U.S.C. §7545(o)(1)(A).
46. These fuels would then meet the requirements of the first part of the heating oil definition in 40 C.F.R. pt. 80.2(ccc).

Table 3: Use/Sales Requirements for Different Biofuel Tax Credits

Credit	ref	Expired?/Expires?	Use/Sales Requirements	If the taxpayer uses the biofuel, must they use it as a fuel?	Maximum Value ($/gal)
Alcohol Mixture Credit	26 U.S.C. §40(b)(1)	December 31, 2011	sold by the taxpayer producing an alcohol mixture to any person for use as a fuel, or is used as a fuel by the taxpayer producing an alcohol mixture; sale or use must be in the trade or business of the taxpayer	Y	$0.60
Alcohol Credit	26 U.S.C. §40(b)(2)	December 31, 2011	used by the taxpayer as a fuel in a trade or business, or is sold by the taxpayer at retail to a person and placed in the fuel tank of such person's vehicle	Y	$0.60
Small Ethanol Producer Credit	26 U.S.C. §40(b)(4)	December 31, 2011	sold by such producer to another person— (I) for use by such other person in the production of a qualified mixture in such other person's trade or business, (II) for use by such other person as a fuel in a trade or business, or (III) who sells such ethanol at retail to another person and places such ethanol in the fuel tank of such other person, or is used or sold by such producer for any purpose described above	N	$0.10 (added to the baseline credit for an *alcohol or an alcohol mixture)*
Second-Generation Biofuel Producer Credit	26 U.S.C. §40(b)(6)	December 31, 2013	sold by the taxpayer to another person— (I) for use by such other person in the production of a qualified second-generation biofuel mixture in such other person's trade or business (other than casual off-farm production), (II) for use by such other person as a fuel in a trade or business, or (III) who sells such second-generation biofuel at retail to another person and places such second-generation biofuel in the fuel tank of such other person, or is used or sold by the taxpayer for any purpose described above	N	$1.01
Biodiesel Mixture Credit	26 U.S.C. §40A(b)(1)	December 31, 2013	sold by the taxpayer producing a biodiesel mixture to any person for use as a fuel, or is used as a fuel by the taxpayer producing a biodiesel mixture; the sale or use must be in the trade or business of the taxpayer	Y	$1.00
Biodiesel Credit	26 U.S.C. §40A(b)(2)	December 31, 2013	used by the taxpayer as a fuel in a trade or business, or is sold by the taxpayer at retail to a person and placed in the fuel tank of such person's vehicle	Y	$1.00

Credit	ref	Expired?/Expires?	Use/Sales Requirements	If the taxpayer uses the bio-fuel, must they use it as a fuel?	Maximum Value ($/gal)
Small Agri-Biodiesel Producer Credit	26 U.S.C. §40A(b)(4)	December 31, 2013	sold by such producer to another person— (I) for use by such other person in the production of a qualified biodiesel mixture in such other person's trade or business (other than casual off-farm production), (II) for use by such other person as a fuel in a trade or business, or (III) who sells such agri-biodiesel at retail to another person and places such agri-biodiesel in the fuel tank of such other person, or is used or sold by such producer for any purpose described above	N	$0.10 (added to the baseline credit for an *agri-biodiesel mixture* or *agri-biodiesel)*
Agri-Biodiesel Mixture Credit	26 U.S.C. §40A(b)(1)	December 31, 2013	sold by the taxpayer producing an agri-biodiesel mixture to any person for use as a fuel, or is used as a fuel by the taxpayer producing a agri-biodiesel mixture; the sale or use must be in the trade or business of the taxpayer	Y	$1.00
Agri-Biodiesel Credit	26 U.S.C. §40A(b)(2)	December 31, 2013	used by the taxpayer as a fuel in a trade or business, or is sold by the taxpayer at retail to a person and placed in the fuel tank of such person's vehicle	Y	$1.00
Renewable Diesel Credit	26 U.S.C. §40A(f)	December 31, 2013	used by the taxpayer as a fuel in a trade or business, or is sold by the taxpayer at retail to a person and placed in the fuel tank of such person's vehicle	Y	$1.00
Alcohol Fuel Mixture Credit	26 U.S.C. §6426(b)	December 31, 2011	used by the taxpayer in producing any alcohol fuel mixture for sale or use in a trade or business of the taxpayer	N	$0.60
Biodiesel Mixture Credit	26 U.S.C. §6426(c)	December 31, 2013	sold by the taxpayer to any person for use in producing a biodiesel mixture, or is used by the taxpayer in the production of a biodiesel mixture	N	$1.00
Alternative Fuel Credit	26 U.S.C. §6426(d)	December 31, 2013	sold by the taxpayer for use as a fuel in a motor vehicle or motorboat, sold by the taxpayer for use as a fuel in aviation, or so used by the taxpayer	N	$0.50
Alternative Fuel Mixture Credit	26 U.S.C. §6426(e)	December 31, 2013	used by the taxpayer in producing any alternative fuel mixture for sale or use in a trade or business of the taxpayer, not a refundable credit, only for excise tax reimbursement	N	$0.50

C. *Inconsistencies in the Value of the Tax Incentive*

To clarify Table 3, the maximum value of the tax incentive is given in the last column. The true value of a tax incentive to the company producing a biofuel, of any type, is difficult to determine. While on paper the value of the credit may be $1 per gallon, the ultimate incidence of the subsidy is subject to supply and demand conditions. The value of the tax credit also depends on the unique situation that exists at a particular company; a company's business structure and their tax liability certainly factor into the value of the tax incentive. To give maximum flexibility to the biofuel industry, these credits were coordinated with each other.[47] This means that if a company were in a position to take advantage of both the excise tax credit as well as the income tax credit, the value of the credit would need to be coordinated between the two sections of the Tax Code so as not to go above the maximum value of the credit outlined. For reference, Table 4 shows the excise tax rates for different fuels. The reader is referred to the various code sections for further details.

From Table 3, it is readily apparent that different fuels are given credits that vary in value and these credits do not necessarily scale based on the energy content of the fuel. There are adjustments within the RFS for fuels that are more energy-dense than ethanol. The logic of including this scaling within the RFS is that a consumer could drive further on a gallon of fuel that is more energy-dense than another fuel that may be less energy-dense. While this line of logic makes many assumptions about engine technologies as well as consumer behavior, the directionality of this trend is correct. If the directionality is correct, an argument can be made to distinguish between more energy-dense fuels within a policy construct. There are important questions to be answered about the baseline fuel from which to draw a comparison, but there is established precedence to set ethanol as the energy base within the RFS.[48] Assuming ethanol as a baseline fuel, Table 5 calculates the net tax effect from both the credit as well as the fuel tax rate. The final column in this table calculates the implied energy scaling of the credits. If these credits were to be scaled by the true energy content of the different fuels, these values should be equal to those equivalence values that appear in the RFS. The results show that this is not true, which implies that Congress considered other factors, beside the energy content of the fuel, when creating these credits. The danger here is that the directionality of these other factors may not be as clear as the relationship between miles per gallon and energy content. This could open the door to unnecessary government expenditures or other political influences. Table 6 recasts the results in Table 5 and calculates a tax credit value that is scaled by the energy content of the fuel only.

Table 4: Federal Excise Tax Rates for Different Fuels

Fuel	*ref*	Tax Rate (¢/gallon)
Gasoline other than aviation gasoline	26 U.S.C. §4081(a)(2)	18.4*
Aviation gasoline	26 U.S.C. §4081(a)(2)	19.4*
Diesel fuel or kerosene	26 U.S.C. §4081(a)(2)	24.4*
Kerosene which is removed from any refinery or terminal directly into the fuel tank of an aircraft for use in aviation	26 U.S.C. §4081(a)(2)(C)	4.3 (if used in commercial aviation) 21.8 (if used in noncommercial application)
Diesel-water fuel emulsion at least 14% of which is water	26 U.S.C. §4081(a)(2)(D)	19.8*
Alternative fuels**		18.4*
85% ethanol/methanol fuels (made from natural gas)	26 U.S.C. §4041(m)	9.15 (if fuel does not contain ethanol, before Oct 1, 2016) 11.3 (in any other case, before Oct 1, 2016)
85% ethanol/methanol (made from coal or peat)	26 U.S.C. §4041(b)(2)	12.4*

* Includes LUST tax as specified in 26 U.S.C. §4081(a)(2)(B)
** Any liquid other than gas oil, fuel oil, or any product taxable under 26 U.S.C. §4081

47. 26 U.S.C. §40(c), 26 U.S.C. §40A(c), 26 U.S.C. §6426(g).

48. Embedded within the alternative fuel credit, an adjustment is made for non-liquid fuels into gasoline gallon equivalents (26 U.S.C. §6426(d)(3)), but all other liquid fuels are measured on a pure volume basis.

Table 5: Implied Energy Scaling of Tax Credits for Different Fuels

(Net tax credit is defined as the maximum tax credit from Table 3 net the applicable excise tax rate from Table 4. Note that mixtures of gasoline and alcohols are assumed taxed at the gasoline rate and mixtures of diesel and biodiesel are assumed taxed at the diesel rate.)

Fuel	Maximum Current Credit Value ($/gal)		Excise Tax Rate ($/gal)		Net Tax Credit ($/gal)	Implied Energy Scaling (Net Tax Credit/Net Ethanol Tax Credit)	RFS Equivalence Value
Ethanol	$0.60	-	0.184	=	$0.416	*1*	1
Butanol	$0.60	-	0.184	=	$0.416	*1*	1.3
Biodiesel	$1.00	-	0.244	=	$0.756	*1.82*	1.5
Renewable Diesel	$1.00	-	0.244	=	$0.756	*1.82*	1.7
Second-Generation Biofuel (ethanol)	$1.01	-	0.184	=	$0.826	*1.99*	1
Second-Generation Biofuel (gasoline)	$1.01	-	0.184	=	$0.826	*1.99*	1.5
Second-Generation Biofuel (diesel)	$1.01	-	0.244	=	$0.766	*1.84*	1.7

Table 6: Hypothetical Tax Credit Values if They Were Scaled by the True Energy Content of the Fuel

(This table assumes the ethanol is the baseline for comparison. To maintain this scaling, it is implied that the fuel tax rate would need to be uniform across all fuels.)

Fuel	RFS Equivalence Value		Ethanol Credit Baseline ($/gal)		Energy Scaled Credit Value ($/gal)
Ethanol	1	x	$0.60	=	$0.60
Butanol	1.3	x	$0.60	=	$0.78
Biodiesel	1.5	x	$0.60	=	$0.90
Renewable Diesel	1.7	x	$0.60	=	$1.02
Second-Generation Biofuel (ethanol)	1	x	$0.60	=	$0.60
Second-Generation Biofuel (gasoline)	1.5	x	$0.60	=	$0.90
Second-Generation Biofuel (diesel)	1.7	x	$0.60	=	$1.02

IV. Case Study: Renewable Diesel

As illustrated in the previous sections, the incentives surrounding biofuels are complicated due to a large number of fundamental inconsistencies, but up until now, discussion has been fairly general. The case of Limerick Energy, a renewable diesel producer, will be presented as it highlights the importance of regulatory and legislative harmonization.

In the Emergency Economic Stabilization Act of 2008 (Division B, §202), Congress amended the definition of renewable diesel in Code §40A to remove a requirement that renewable diesel fuel be made using a thermal depolymerization process, and to permit the Secretary of the Treasury to identify standards equivalent to ASTM D975 and ASTM D396 for renewable diesel. These changes were made specifically because Congress wanted the §40A tax credit to be "technology neutral." As the Ways and Means Committee noted in Report No. 110-658, pp. 74-75:

> [w]hile the Committee is unaware of an appropriate standard in addition to ASTM D975 and ASTM D396 for renewable diesel, the Committee recognizes that as technology evolves other appropriate standards may arise for such fuel and therefore, the provision permits the Secretary to identify other equivalent or improved standards for renewable diesel.

In the case of Limerick Energy, they were producing a renewable diesel product that when tested by an independent fuels laboratory met the ASTM D396 standards. The fuel was used in a heating application, and was therefore being "used as a fuel in a trade or business." The ASTM D396 standard uses the term *homogeneous hydrocarbon oils* in order to describe the base of the fuel oil that fell under this specification. A specific definition of homogeneous hydrocarbon was not given in this ASTM standard at the time, but it required that the oils be ". . . free from inorganic acid, and free from excessive amounts of solid

or fibrous foreign matter." Despite the broader language in the specification, the IRS decided to interpret the term liquid hydrocarbon as a true homogenous hydrocarbon in the strictest sense: literally, a fuel made up of only carbon and hydrogen.[49] This level of scrutiny is impossible for any fuel to meet as there will always be a de minimis amount of impurities present; even petroleum products will never be a perfect "homogeneous hydrocarbon." As a result, Limerick's renewable diesel heating oil was declined the credit, even though their fuel met the specifications of the ASTM standard.[50] The IRS made this issue a priority under their 2006-2007 Priority Guidance Plan, released August 13, 2007, and later followed up with the publication of Notice 2007-49 on December 3, 2007, when the Senate Finance Committee also approved a technical change of the phrase liquid hydrocarbon to liquid fuel.[51] The first appearance of this technical correction appeared on November 17, 2007, with the introduction of S. 2374. The Senate's change was ultimately signed into law in the Technical Corrections Act of 2007.[52]

V. Case Study: Black Liquor

Perhaps the most discussed and widely criticized biofuels tax issue also surrounded the alternative fuel mixture credit. The pulp and paper industry discovered that a waste stream known as black liquor met the broad definition of biomass in the Tax Code, and when mixed with a taxable fuel, the finished mixture was eligible for the refundable excise tax credit. The IRS has determined that a mixture only needed to be 0.1% by volume taxable fuel. This level of mixing is typically referred to as splash blending; this threshold applies to both alternative fuel mixtures as well as biodiesel mixtures and alcohol mixtures.[53] If the pulping plant decided not to splash blend, their waste stream still qualified for the $1 per gallon cellulosic biofuel producer credit (now called the second-generation biofuel producer credit).[54] A pulp and paper mill had the flexibility to choose which credit was most valuable to their particular business situation. Expenditures as a result of this behavior have been well-documented by the Joint Committee on Taxation as part of their estimated expenditures, but at its core, this behavior is not fundamentally an inconsistency.

Lisa De Simone and Matthew Dalton raised a more subtle issue of tax avoidance that speaks to inconsistencies within the Tax Code.[55] The issue at hand is if the income generated from refundable excise tax credits should be treated as taxable income. If this income is not taxed, companies that benefitted from this credit stand to gain millions of dollars. De Simone studied the Securities and Exchange Commission (SEC) filings for 19 different pulp and paper companies and found that IRS filings were not consistent on this issue. Some companies reported 100% of the refunded money as taxable income, while other companies did not report any of this income as taxable. A full legal analysis is included in De Simone, but little was done in order to provide clarity, even though congressional staff were aware of this inconsistency since 2006. Congress eliminated the refundability component[56] for the alternative fuel mixture (the alternative fuel credit is still refundable) series of credits in the American Taxpayer Relief Act.[57]

VI. Performance Standards and Conclusions

As has been highlighted throughout this Article, there is very little recognition of specific, harmonized goals between tax incentives and the RFS. There is also very little harmonization of policy priorities within the tax system. To summarize some of the major points:

- There are major environmental inconsistencies between the RFS and the Tax Code as a result of GHG emissions thresholds in the RFS not being captured within the Tax Code.
- There are major environment inconsistencies within the Tax Code as not all credits require that the biofuels are produced from biomass, nor are there requirements on how the biomass is sourced.
- There are major end-use inconsistencies within the Tax Code as most of the credits require the biofuel to be used as a fuel, while other credits require the fuel to specifically be used in motor vehicles, motor boats, or for aviation.
- There are end-use inconsistencies in the definition of transportation between the Tax Code and the RFS, whereby the EPA definition is broader hence promoting additional GHG reductions.
- There are major end-use inconsistencies within the Tax Code as some credits do not require that the biofuel to be sold for any particular purpose;

49. IRS, Notice 2007-49 (2007), *available at* http://www.irs.gov/pub/irs-drop/n-07-97.pdf.
50. H. Dent, Legal Counsel to Limerick Energy, phone conversation followed by e-mail confirmation, June 2013.
51. Joint Committee on Taxation, Legislative Background of Expiriing Federal Tax Provisions 2011-2022 (2012), https://http://www.jct.gov/publications.html?func=startdown&id=4388 (last visited Mar. 24, 2014); IRS, Priority Guidance Plan 2006-2007 (2007), *available at* http://www.irs.gov/pub/irs-utl/2007-2008_pgp_initial.pdf.
52. Pub. L. No. 110-172.
53. IRS, Notice 2006-92 (2006), *available at* http://www.irs.gov/pub/irs-drop/n-06-92.pdf; IRS, Notice 2005-4 (2005), http://www.irs.gov/irb/2005-02_IRB/ar14.html (last visited Mar. 24, 2014); IRS, Notice 2005-62 (2005), http://www.irs.gov/irb/2005-35_IRB/ar18.html (last visited Mar. 24, 2014).
54. IRS, Memorandium 200941011 (2009), *available at* http://www.irs.gov/pub/irs-wd/0941011.pdf.
55. Lisa De Simone et al., *Distilling the Reserve for Uncertain Tax Positions: The Revealing Case of Black Liquor*, American Accounting Association Annual Meeting (2011), http://dx.doi.org/10.2139/ssrn.1905209 (last visited Mar. 24, 2014). Matthew Dalton, *Black Liquor Highlights Unresolved Excise Tax Questions*, Tax Notes (Apr. 9, 2012).
56. 26 U.S.C. §6427.
57. Pub. L. No. 112-240.

some credits do not require that the fuel be sold to another person.

- There is no harmonization of end-uses between the RFS and the Tax Code as the RFS specifically targets the replacement of transportation fuel (interpreted as gasoline and diesel fuels); the Tax Code is much broader.
- Many of the tax credits do not go directly to the producer of the biofuel; instead, a taxpayer that produces a mixture is eligible (i.e., blenders).
- Credits are not scaled to the energy content of the fuel. Embedded within the alternative fuel credit, an adjustment is made for non-liquid fuels into gasoline gallon equivalents,[58] but all other liquid fuels are measured on a volume basis. There are adjustments within the RFS for fuels that are more energy-dense than ethanol.

These inconsistencies undermine the primary policy objectives of biofuels by creating a complicated crediting system within the biofuels market. These complications have also opened many of these policies to abuse and unintended consequences, which has resulted in unnecessary government expenditures as well as loss of market confidence.[59] In addition to these codified inconsistencies, there is another complicating factor that many of the tax credits are on a year-by-year extension cycle. The biodiesel credit has been allowed to expire every other year, but then reinstated retroactively.[60] All of the current biofuel tax credits expired on December 31, 2013, and there is significant political uncertainty surrounding the extension of these credits. In March 2014, the Senate Finance and House Ways and Means Committees, the committees with jurisdiction on tax policy, were contemplating tax extensions for a number of credits, including existing biofuel tax credits. Other substantive revisions were proposed just before the expiration, but it is unclear if any additional efforts to debate these changes will take place.[61]

There is an important question that remains to be answered regarding biofuels policy: should the industry benefit from both a system of tax incentives as well as a mandate to use the product that they produce? With the market-based support system (RINs) within the RFS, are tax incentives even useful? These authors would argue that it depends on your policy objective, and to date, Congress has not been specific enough with their objectives to offer a clear answer to this question. An alternative objective to the ones outlined previously might be to use policy to draw investors to invest in biofuels technology that is more sustainable. For example, at the early stages of commercialization, a stable tax credit might be more helpful than a volatile revenue stream that comes from producing/selling RINs. It is not uncommon for a project financier to discount, sometimes heavily, the value of an RIN, making that revenue stream ineffective at drawing additional debt/equity financing that could be used for capacity-expansion projects. This is certainly not the only objective that Congress may need to consider, so in light of the additional complications resulting from multi-objective policymaking, the authors recommend that specific and deliberate steps be taken to harmonize the biofuel policy objectives. Harmonization should include careful consideration across critical governmental programs and incentives.

To be clear, Congress would need to lead any effort to harmonize the system of biofuel policies; agencies such as IRS and EPA do not have proper authority to modify many of the key legal terms outlined in Table 1. To begin, if Congress decided to address end-use inconsistencies specifically, the authors would recommend that they carefully consider which markets can be effectively targeted with policy. However, it is noted that the primary difficulty in targeting a specific market, say transportation fuel, is that many liquid fuels are fungible commodities and can be used in widely disparate applications. It is possible that a fuel, not previously used in transportation applications, would be used for transportation when there is an active supporting policy (particularly if the policy made that fuel economically competitive). The authors emphasize that Congress should place priority on creating policies for liquid fuel markets that can be separated from others, effectively. This would help minimize the opportunities for spillover effects/unintended consequences. Defining these markets is a nontrivial task, and the authors recognize that it may not be appropriate to specify exactly which markets to direct policy support to due to the relative ease at which fuels can be substituted for each other.[62] Instead, a performance-based policy may be better suited to achieving the overarching national biofuels policy goals. For example, if the primary national objective is to reduce petroleum use, Congress should direct policy toward the use of biofuels in all markets (heating, transportation, etc.). With this type of framework, the users of the fuel will best decide how to achieve the stated goal.

Addressing the issue of environmental inconsistencies could be as simple as harmonizing the key definitions found within the RFS and the Tax Code. However, implementation and enforcement would require a level of collaboration between IRS and EPA that currently does not exist. Therefore, if any collaboration were to form, it would need to be specifically required by Congress. As discussed before, there is the potential for significant administrative burden when joint rulemaking processes are undertaken, although the successful joint process between National

58. 26 U.S.C. §6426(d)(3).
59. U.S. EPA, Renewable Identification Number (RIN) Quality Assurance Program, 78 Fed. Reg. 12158 (Feb. 21, 2013).
60. Pub. L. No. 111-312, §701, Pub. L. No. 112-240, §405.
61. Tax reform staff discussion drafts, *available at* http://www.finance.senate.gov/newsroom/chairman/release/?id=4f681789-343a-401c-a752-516028838040.
62. The issue of fuel substitution is made even easier when one considers that many engines can burn complex mixtures of different fuels without encountering major technical barriers.

Highway Traffic Safety Administration and EPA when writing fuel economy standards could serve as a model.[63]

As has been mentioned throughout this Article, there are many significant challenges when creating biofuels policies. Despite these challenges, there are steps that can be taken to create a more uniform incentive system that will ultimately push the use of more sustainable liquid fuels within the United States.

63. 77 Fed. Reg. 62624.