



February 2014

Biomass-based Diesel Policy Options: Larger RFS Requirements and Tax Credit Extension

FAPRI-MU Report #01-14

Providing objective analysis for more than 25 years
www.fapri.missouri.edu

Published by the Food and Agricultural Policy Research Institute (FAPRI) at the University of Missouri (MU), 101 Park DeVill Drive, Suite E; Columbia, MO 65203. FAPRI–MU is part of the College of Agriculture, Food and Natural Resources (CAFNR).

<http://www.fapri.missouri.edu>

This material is based upon work supported by the U.S. Department of Agriculture, under Agreement No. 58-0111-9-002.

Any opinion, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the view of the U.S. Department of Agriculture nor the University of Missouri.

The authors of this report are Jarrett Whistance (WhistanceJL@missouri.edu), Wyatt Thompson (thompsonw@missouri.edu), and Seth Meyer (SMeyer@oce.usda.gov).

Permission is granted to reproduce this information with appropriate attribution to the author(s) and FAPRI–MU.

The University of Missouri–Columbia does not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation, age, disability or status as a qualified protected veteran. For more information, call Human Resource Services at 573-882-4256 or the US Department of Education, Office of Civil Rights.

Summary

This report estimates the potential impacts of biodiesel mandate expansion and biodiesel tax credit extension on US biofuel and agricultural commodity markets. The results are based on FAPRI-MU economic models of policies and markets using available data in January 2014.

The Environmental Protection Agency (EPA) recently proposed a method to waive mandates from 2014 forward. The renewable fuel use targets set by the Energy Independence and Security Act (EISA) of 2007 climbed to 36 billion gallons of overall use by 2022, of which up to 15 billion gallons could be met by corn starch ethanol and the rest by a combination of biomass-based diesel and other advanced biofuels, including cellulosic biofuels. The EPA implements the mandates, and under some conditions must waive them.

The proposed method is likely to result in a lowering of one or more of the nested mandates in the coming years. The EPA proposes to add anticipated use of biodiesel and other non-ethanol advanced biofuels to come up with the advanced sub-mandate, then add to that volume the anticipated use of ethanol from both low- and high-blend ethanol uses to come up with the overall mandate.

In pursuing this method, the market effects of a biomass-based diesel mandate expansion or tax credit extension depend on the starting point. We use a forward-looking assessment, so our analysis reflects uncertainties about the future. A key question is how binding the mandates will be.

The method proposed by the EPA suggests that decisions made in the near term may have significant influence on mandate levels in subsequent years. Policies, such as blenders credits, which would have changed the cost to motor fuel consumers of meeting legislated mandate quantities, may instead result in volume changes in the waived mandates established by the EPA.

The Renewable Identification Number (RIN) price is a key measure of the degree to which mandates are binding. Our base case starts with the same price for the biodiesel RIN, advanced RIN, and conventional RIN for 2014. From 2015, the biodiesel RIN price is higher than the others in the base case.

Data available as of January 2014 suggest that there is a large stock of biomass-based diesel RINs from 2013 that can help to meet the mandates this year. The EPA proposal intends to be neutral with respect to RIN stocks, so their assessment of feasible biomass-based diesel use may deviate from what is actually used – and the two differ in this analysis because with a large stock of biodiesel (D4) RINs carried into 2014, a draw-down in RIN stocks helps to meet the mandate, particularly in 2014.

We test impacts of a higher biomass-based diesel requirement or biodiesel tax credit extension with alternative starting points, and summarize the results in the tables below.

Results suggest different interactions among mandated biofuels than in the past. The EPA proposes to add up their estimates of feasible use to determine the waived mandate, so more of one type of biofuel might or might not affect others depending on market conditions and the relative positions of these biofuels in the hierarchy of the mandates.

Table 1. Increase of the biomass-based diesel mandate from 1.28 to 1.46 billion gallons, 2014-16 average impacts, Base case with biomass-based diesel mandate easy to meet (not initially binding)

Price or quantity	Change	Reason
Biomass-based diesel RIN price	+\$0.11/RIN	As the higher mandate becomes more difficult to meet, the related RIN price is bid higher.
Biomass-based diesel production	+0.12 billion gallons	A higher biomass-based diesel mandate increases production somewhat, but RINs carried over from the previous year also help meet the mandate, particularly at first.
Conventional (corn starch) RIN price	+\$0.03/RIN	Our base case starts with extra biodiesel used to meet the overall mandate. A higher biodiesel mandate stops this from occurring, so the conventional RIN price is bid higher.
Conventional ethanol production	+0.09 billion gallons	To make up for reallocated biomass-based diesel RINs, more conventional and other biofuels are used.
Soybean oil price	+\$0.91/cwt	More biodiesel required for the mandate means more biodiesel feedstocks are used. Soybean oil, corn oil, and other vegetable oil prices are bid higher.
Soybean price	+\$0.05/bu	Higher soybean oil price leads to a higher soybean price.
Corn price	+\$0.02/bu	The net effect of more competitive soybean prices in land use, somewhat greater use of conventional ethanol, and distillers grain market impacts.

Table 2. Increase of the biomass-based diesel mandate increase from 1.28 to 1.46 billion gallons, 2014-16 average impacts, Biomass-based diesel mandate is already difficult to meet (binding)

Price or quantity	Change	Reason
Biomass-based diesel RIN price	+\$0.17/RIN	As the higher mandate is more difficult to meet, the related RIN price is bid higher.
Biomass-based diesel production	+0.17 billion gallons	Biomass-based diesel use increases by about as much as the mandate does, but a bit less if RIN stocks are drawn down.
Conventional (corn starch) RIN price	+\$0.00/RIN	This case starts with no extra biodiesel used to meet the overall mandate. A higher biodiesel mandate just means more biodiesel. Adding up leads to no displacement of ethanol.
Conventional ethanol production	+0.01 billion gallons	There is no extra biomass-based diesel initially used to help meet the overall mandate, so no biomass-based diesel is diverted from that use. No need to replace it with more conventional ethanol.
Soybean oil price	+\$0.95/cwt	More biodiesel required for the mandate means more biodiesel feedstocks are used. Vegetable oil prices are bid higher.
Soybean price	+\$0.07/bu	Higher soybean oil price leads to a higher soybean price.
Corn price	+\$0.01/bu	The net effect of more competitive soybean prices in land use and distillers grain market impacts.

Table 3. Biodiesel tax credit extension (\$1.00 per gallon), 2014-16 average impacts
Base case with biomass-based diesel mandate easy to meet (not initially binding)

Price or quantity	Change	Reason
Biomass-based diesel RIN price	-\$0.04/RIN	Small effects if extra biodiesel is already sold to meet the other mandates.
Biomass-based diesel production	+0.67 billion gallons	The biodiesel tax credit encourages more production and more use.
Conventional (corn starch) RIN price	-\$0.01/RIN	Minimal effect as the EPA proposal to add up biofuels requires that any additional biodiesel is offset by an equal increase in the broader mandates.
Conventional ethanol production	-0.02 billion gallons	There is no additional biodiesel to displace conventional ethanol. The greater biomass-based diesel use and mandate mostly cancel each other out, so there are limited effects on conventional ethanol.
Soybean oil price	+\$3.99/cwt	More biodiesel production means more biodiesel feedstocks are used. Vegetable oil prices are bid higher.
Soybean price	+\$0.28/bu	Higher soybean oil price leads to a higher soybean price.
Corn price	+\$0.02/bu	The net effect of more competitive soybean prices in land use and distillers grain market impacts.

Table 4. Biodiesel tax credit extension (\$1.00 per gallon), 2014-16 average impacts
Biomass-based diesel mandate is already difficult to meet (binding)

Price or quantity	Change	Reason
Biomass-based diesel RIN price	-\$0.15/RIN	A tax credit makes it easier to meet the mandate. RIN price effects can be larger if the mandate is initially binding.
Biomass-based diesel production	+0.55 billion gallons	The biodiesel tax credit encourages more production and more use.
Conventional (corn starch) RIN price	-\$0.06/RIN	With falling biodiesel RIN stocks in the base case, the proposed stock-neutral approach causes broader mandates to change by less than the change in biomass-based diesel use. The overall mandate is less binding.
Conventional ethanol production	-0.17 billion gallons	The extra biomass-based diesel displaces some other biofuels to help meet the broader mandate.
Soybean oil price	+\$3.26/cwt	More biodiesel production means more biodiesel feedstocks are used. Vegetable oil prices are bid higher.
Soybean price	+\$0.23/bu	Higher soybean oil price leads to a higher soybean price.
Corn price	+\$0.00/bu	The net effect of higher soybean prices, distillers grain market impacts, and slight changes in ethanol price.

Introduction

The Environmental Protection Agency (EPA) is charged with implementing the Renewable Fuel Standard (RFS), or biofuel use mandates. In November 2013, EPA released their proposal for the 2014 and 2015 biomass-based diesel requirements. The proposal would set the requirements at 1.28 billion gallons, which is unchanged from the 2013 requirement for biomass-based diesel. The proposal also sets out a method to determine waived biofuel mandate levels going forward.

Qualified blends of biodiesel were eligible for a \$1.00/gallon tax credit through December 31, 2013, at which point the provision was allowed to expire. Although there have been informal calls to reinstate the tax credit for biodiesel blends, and such proposals have passed and been applied retroactively, there are not currently any legislative proposals to do so.

The analysis starts from a base case, or “Baseline”, that assumes: i) the EPA proposed method is implemented in 2014 and beyond; and ii) the biodiesel blenders tax credit expired on December 31, 2013 and is not reinstated. Using the FAPRI-MU economic models of biofuel and agricultural commodity markets updated with data available as of January 2014, we explore alternative scenarios with a larger biomass-based diesel requirement (from 1.28 billion gallons to 1.46 billion gallons) and an extension of the \$1.00 per gallon biodiesel blenders tax credit.

Key results of biomass-based diesel RFS requirement increase, 2014 to 2016

A larger biomass-based diesel RFS requirement increases biofuel production relative to the baseline. Average 2014/15-2016/17 soybean prices increase by \$0.05/bu., and corn prices increase by \$0.02/bu.

A larger mandate increases the difficulty of meeting the RFS requirement, and biomass-based diesel RIN prices rise by an average of \$0.11/RIN relative to the baseline.

One implication of EPA’s proposed method to set advanced and overall renewable fuel requirements is that an increase in the biomass-based diesel requirement leads to increases in broader mandates. This reduces the scope for effects on other RIN prices, or on ethanol markets.

If the 1.28 billion gallon biomass-diesel mandate is difficult to meet in the first place, then an increase to 1.46 billion gallons has larger impacts on both the biomass-based diesel RIN price and biodiesel production.

Key results of biodiesel blenders credit extension, 2014 to 2016

The waiver method proposed by EPA changes the way the blenders credit affects biofuel consumption. Before, the biodiesel credit could encourage extra biomass-based diesel to displace ethanol in meeting a fixed volume of overall biofuel requirement. If the tax credit leads to extra biomass-based diesel use under the proposal, then the EPA increases the broader mandates so there might be no displacement of ethanol, depending on the degree to which the biomass-based diesel requirement is binding.

Given the EPA method and nested mandate structure, an increase in the biomass-based diesel mandate leads to an increase in the advanced and total mandates to accommodate the additional biodiesel requirement. If the biomass-based diesel requirement is not binding initially, the increase in broader mandates would be approximately 1:1 and conventional ethanol is less likely to be displaced by extra biomass-based diesel use. If the biomass-based diesel requirement is binding, then the increase in broader mandates could be less than 1:1 and extra biomass-based diesel use could displace conventional ethanol.

An extension of the biodiesel blenders tax credit leads to higher net returns for biodiesel producers despite increased feedstock costs. Biodiesel production increases by an average of 670 million gallons relative to the baseline.

Soybean oil and corn oil prices increase by an average of \$0.04/lb and \$0.06/lb, respectively, due to stronger demand for biomass-based diesel production.

Soybean prices increase by \$0.28/bu., compared to the baseline, and corn prices increase by \$0.02/bu.

The biomass-based diesel RIN price falls by an average of \$0.04/RIN relative to the baseline, given a starting point that the initial biomass-based diesel mandate is easy to meet.

If the biomass-based diesel mandate is more challenging, then the tax credit impacts for the biomass-based diesel RIN price are larger, but the biofuel quantity and crop price effects are smaller.

Key uncertainties

We use the FAPRI-MU deterministic economic model to estimate markets under different RFS waiver scenarios. Data were updated as of January 2014. There are several points of uncertainty about how biofuel markets could evolve in the scenarios explored here.

1. We represent the **blend wall** as a steep discount in the value of ethanol in retail fuels that contain more ethanol, like E85, in order to accelerate sales. The exact discount required and pace of expansion are matters of speculation.
2. California's **Low Carbon Fuel Standard (LCFS)** has the potential to support sugarcane ethanol imports from Brazil, even when the fuel is not needed to satisfy the advanced mandate under the RFS. Here, we assume that the LCFS supports some sugarcane ethanol imports that count towards advanced mandate in the event that no imports would occur for the RFS. We also assume that ability of the LCFS to support ethanol imports depends, in part, on the competitiveness of domestically produced biomass-based diesel.
3. The prospect for larger or more price-sensitive **conventional ethanol exports** is a key uncertainty at this time. Depending on the conventional ethanol price in the US and the prevailing petroleum prices and fuel prices in markets around the world, as well as the price of competing ethanol exporters, US ethanol exports could be greater than expected here. Ethanol exports could also be more responsive to price changes, expanding quickly as domestic price falls or contracting if price rises. Such response could have implications for corn price and other impacts.
4. So far, we have only the **proposed rules**, not the final rule, so the key assumptions of the baseline are uncertain and current market prices for RINs likely reflect this. The EISA outlines a reset of mandates after large or persistent waivers as soon as 2016, but the potential for a mandate reset is not studied here.
5. Results are also sensitive to the timing of decisions. We assume the sequence of events allows EPA to take the tax credit into account when setting mandates in 2014-2016. If the order of decisions is

reversed then the tax credit could cause changes in biofuel use that the EPA does not anticipate and cannot build into its estimates for the adding up process.

Proposed rules compared to legislated values

Fundamental changes in biofuel interactions¹

The EPA proposed method to waive the mandates going forward results in different behavior that is incorporated in numerous revisions to the FAPRI-MU biofuel model used for this analysis, in conjunction with agricultural commodity models.

The Energy Independence and Security Act (EISA) of 2007 set out a hierarchy of four mandates, namely (1) overall, (2) advanced, (3) biomass-based diesel, and (4) cellulosic and agricultural waste based. Previous FAPRI-MU research reflects how the hierarchy leads to potential interactions. For example, extra biodiesel use beyond its own mandate can displace other advanced biofuels, such as sugarcane ethanol, but extra advanced ethanol cannot help to meet the biodiesel mandate.

The EISA hierarchy has implications for how markets can evolve. If ethanol is difficult to use or if biodiesel is easy to use, then obligated parties might at some point switch to biodiesel.

The EPA proposes to exercise its authority and responsibility under the EISA and waive the mandates from 2014. The EPA would continue to estimate the potential volume of cellulosic biofuel use each year. This number would be added to expected use of biodiesel and other non-ethanol advanced biofuels to come up with the advanced mandate. Their estimate of ethanol use, in E10 plus whatever amount is consumed in fuels with more ethanol, would be added to the advanced mandate to come up with the overall mandate.

Implications of adding up mandates

The EPA proposal calculates the advanced and overall mandates as follows:

Advanced RFS requirement is the sum of

Cellulosic biofuels
Biomass-based diesel use (ethanol equivalent)
Other non-ethanol advanced fuels

Overall RFS requirement is the sum of

Advanced RFS requirement
Ethanol use in E10
Ethanol use in high-blend fuels

If biomass-based diesel use, beyond its own mandate, will be higher in one set of circumstances than another, then we expect the advanced and overall mandates to be set at higher levels as well. The adding up method reduces the potential that extra biodiesel would displace other biofuels to help meet the advanced and overall mandates.

¹ A detailed explanation of how these changes are implemented in FAPRI-MU model is available on request.

If ethanol use expands, then the overall mandate is increased to take the larger ethanol market potential into account. Easier E85 use might not make it easier to meet the overall mandate. More ethanol use would lead to a larger mandate, not a less binding mandate.

Readers familiar with the EISA or with FAPRI-MU research should expect different responses to shocks under the EPA proposal than might have occurred under our earlier expectation for how the EISA would be implemented. When analyzing legislated mandate levels, it was RIN prices that adjusted to reflect market pressures. The EPA proposal adjusts mandate levels according to market pressures, suggesting less adjustment in RIN prices.

Biofuel policy scenarios

The baseline scenario uses a “current policy” assumption. In relation to biofuels, this implies: i) the RFS requirements for 2014 and beyond are guided by EPA’s proposed rulemaking; and ii) the biodiesel blenders tax credit expires as scheduled and is not extended.

We explore the impacts of four alternative scenarios for 2014 through 2016.²

- i) A larger mandate scenario that features an increase in the biomass-based diesel requirement from 1.28 billion gallons to 1.46 billion gallons, and with broader mandates also increased as implied by the EPA proposal.
- ii) An extension of the blenders tax credit with the higher biodiesel use also leading to higher broader mandates as implied by the EPA proposal.
- iii) A larger mandate scenario that features an increase in the biomass-based diesel requirement from 1.28 billion gallons to 1.46 billion gallons (**assuming the biodiesel mandate is already binding in 2014**), and with broader mandates also increased as implied by the EPA proposal.
- iv) An extension of the blenders tax credit (**assuming the biodiesel mandate is already binding in 2014**), with the higher biodiesel use also leading to higher broader mandates as implied by the EPA proposal.

Biodiesel market impacts

² The distinction between the scenarios reflects alternative views about which mandate components will be binding in 2014, and how binding they are going forward. In the first and second scenarios, the ethanol-related overall mandate is binding, and extra biomass-based diesel helps to meet it in 2014. The biomass-based diesel mandate is binding on its own in 2015 and 2016, but not much more so than the other mandates in the base case. In the third and fourth scenarios, the biomass-based diesel is binding on its own and quite a bit more difficult to meet than other mandates. In this case, no extra renewable fuel of this type is used to displace ethanol counted towards the total mandate.

In both “Larger mandate” scenarios, the domestic consumption of biomass-based diesel increases relative to the baseline (Table 5). If the requirement is not binding initially, the first-year impact is much smaller as obligated parties choose to draw down available RIN stocks, and divert less toward the broader mandates. Once the biomass-based diesel requirement is binding on its own, consumption of the biofuel must increase by 150-180 million gallons in order to meet the expanded mandate.

The price effects include an increase in the wholesale price of biomass-based diesel. As before, if the mandate is not binding initially, the price effect is small in the first year. Afterwards, the wholesale price of biodiesel increases by up to \$0.16/gallon.

In the “Tax credit extension” scenarios (Table 6), the renewed tax credit bids up wholesale biodiesel prices and leads to greater profitability for biomass-based diesel producers. Greater profitability, in turn, leads to greater production quantities compared to the baseline. Furthermore, biomass-based diesel is more competitive with petroleum-based diesel, so domestic consumption of the renewable fuel also increases. Domestic biomass-based diesel use increases by 640 million gallons, on average, if the biomass-based diesel mandate is not binding initially.

Selected feedstock market impacts

In all four scenarios, there would be an increase in the demand for biomass-based diesel feedstocks such as soybean oil, corn oil, and other fats and oils. All else equal, the prices for these feedstocks rise as biomass-based diesel demand increases. In the “Larger mandate” cases, biomass-based diesel production rises only to the point that the requirement is satisfied. The impact on soybean oil prices holds steady at about \$0.01/lb. In the “Tax credit extension” scenarios, the increased net returns lead to more biodiesel blending and use in excess of the biomass-based diesel requirement. The impact on soybean oil prices is larger and ranges from \$0.03/lb to \$0.04/lb.

In the soybean market, the increased demand for soybean oil would require a larger soybean crush, and higher prices for soybeans. Increases in the soybean price remain below \$0.10/bu. The impacts range from \$0.22/bu. to \$0.29/bu. in the tax credit scenarios.

The higher net returns for soybeans would lead to a decrease in corn acres planted and somewhat higher corn prices. The corn price effect remains below \$0.05/bu. in each scenario we investigate. The effect on ethanol production would depend on the offsetting effects of increased revenue from corn oil and the increased input cost from corn. The net effect would determine, to some extent, whether the overall RFS requirement is more or less difficult to meet.

Table 5. Selected market impacts of a 1.46 billion gallon biomass-based diesel mandate, differences from base case with a 1.28 billion gallon mandate

	Not initially binding			Initially binding		
	2014	2015	2016	2014	2015	2016
Applied RFS Standards	(billion gallons)					
Biomass-based diesel	0.18	0.18	0.18	0.18	0.18	0.18
Advanced	0.27	0.27	0.27	0.27	0.27	0.27
Overall	0.27	0.36	0.40	0.27	0.29	0.30
Advanced gap	0.00	0.00	0.00	0.00	0.00	0.00
Conventional gap	0.00	0.09	0.13	0.00	0.02	0.02
Biofuel use						
Biomass-based diesel	0.02	0.15	0.18	0.16	0.18	0.18
Ethanol, conventional	0.05	0.08	0.13	-0.01	-0.02	0.01
Biofuel prices	(\$/gallon)					
Biodiesel, wholesale	0.03	0.13	0.14	0.16	0.14	0.13
Ethanol, wholesale	0.00	0.00	0.01	0.00	0.00	0.00
Crop and feedstock prices						
Corn (\$/bu; Mkt Year)	0.01	0.02	0.02	0.01	0.01	0.01
Soybeans (\$/bu; Mkt Year)	0.04	0.05	0.05	0.07	0.07	0.06
Soybean oil (cts/lb; Mkt Year)	0.88	1.01	0.84	1.14	0.91	0.80
Non-food corn oil (cts/lb; Cal Year)	0.33	1.26	1.38	1.48	1.49	1.36

Note: "Larger mandate" assumes EPA increases the biomass-based diesel requirement to 1,460 million gallons in 2014 and beyond. "Initially binding" assumes all biodiesel is used to meet its own mandate in 2014, so there is no extra to meet the broader mandates.

Table 6. Selected market impacts of an extension of the biodiesel blenders credit, differences from base case without an extension

	Not initially binding			Initially binding		
	2014	2015	2016	2014	2015	2016
Applied RFS Standards	(billion gallons)					
Biomass-based diesel	0.00	0.00	0.00	0.00	0.00	0.00
Advanced	0.93	0.92	1.01	0.40	0.68	0.81
Overall	0.93	0.95	1.06	0.27	0.55	0.62
Advanced gap	0.93	0.92	1.01	0.40	0.68	0.81
Conventional gap	0.00	0.03	0.05	-0.12	-0.13	-0.18
Biofuel use						
Biomass-based diesel	0.64	0.62	0.67	0.58	0.49	0.56
Ethanol, conventional	-0.16	-0.18	-0.12	-0.04	-0.21	-0.25
Biofuel prices	(\$/gallon)					
Biodiesel, wholesale	0.60	0.54	0.51	0.54	0.42	0.43
Ethanol, wholesale	-0.01	-0.02	-0.02	-0.02	-0.03	-0.03
Crop and feedstock prices						
Corn (\$/bu; Mkt Year)	0.02	0.02	0.02	0.00	-0.01	0.00
Soybeans (\$/bu; Mkt Year)	0.29	0.29	0.27	0.22	0.23	0.24
Soybean oil (cts/lb; Mkt Year)	4.49	3.74	3.71	3.42	3.00	3.36
Non-food corn oil (cts/lb; Cal Year)	6.13	6.19	5.84	5.23	4.71	5.11

Note: "Tax credit extension" assumes \$1.00 biodiesel blenders tax credit is reinstated and maintained in 2014 and beyond; "Initially binding" assumes all biodiesel is used to meet its own mandate in 2014, so there is no extra to meet the broader mandates.

RIN market impacts

A larger biomass-based diesel requirement leads to an increase in biomass-based diesel consumption. All else equal, a higher biomass-based diesel requirement is more difficult to meet and the biomass-based diesel RIN price increases relative to the baseline (Figures 1 and 2).

Figure 1. Biomass-based diesel RIN prices under alternative policy options, initially not binding

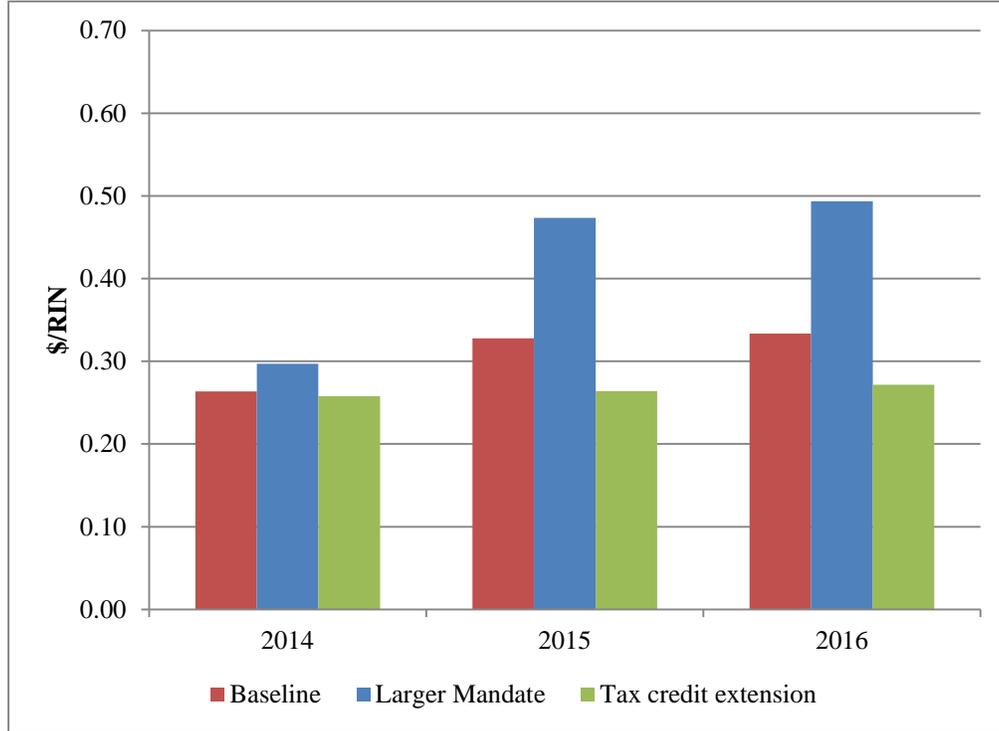
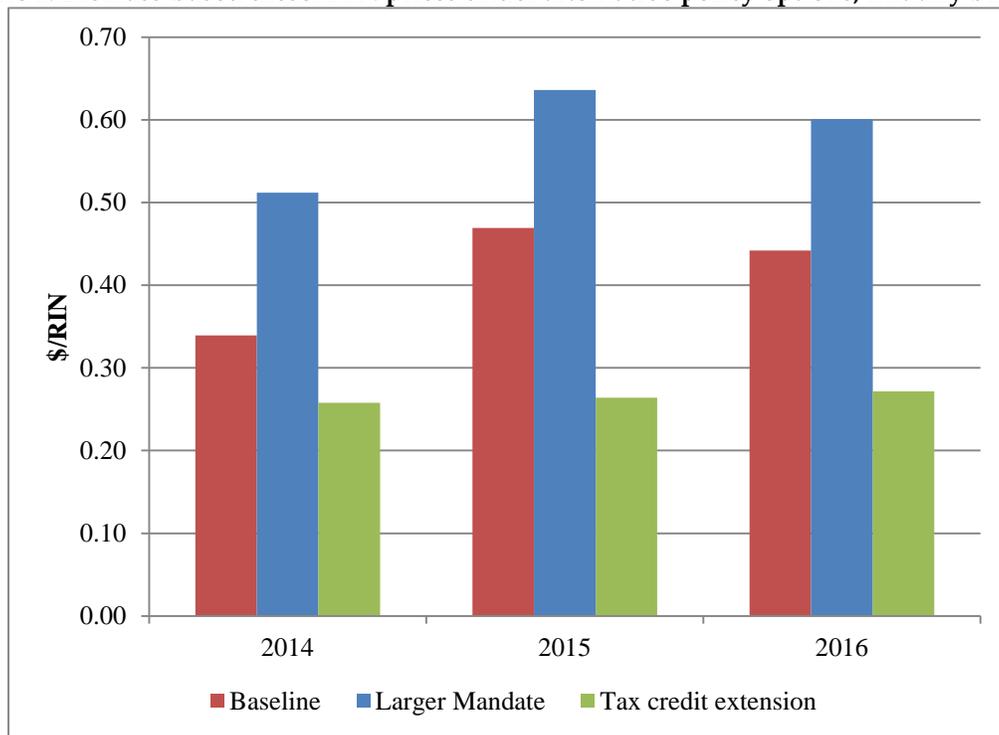


Figure 2. Biomass-based diesel RIN prices under alternative policy options, initially binding



The “summing up” method proposed by the EPA implies that the two broader mandates might not be substantially more or less difficult to meet, despite the higher biodiesel mandate. Approximately the same amount of other renewable fuels apart from biodiesel is necessary in baseline and larger mandate cases. As a result, advanced and conventional RIN prices (relevant to the overall mandate) are not expected to change very much compared to the baseline.

In the “Larger mandate” case, however, RIN carryover behavior may play a somewhat larger role. The results also seem sensitive to the point of comparison, particularly which mandates are binding.

In response to a larger biomass-based diesel requirement in 2014, obligated parties may choose to draw on existing RIN stocks rather than blend physical gallons of the renewable fuel. In the case where the biomass-based diesel mandate is not binding initially, obligated parties are using extra biodiesel RINs beyond the mandate to help meet broader mandates. They are assumed to reduce the amount of extra biodiesel being used to meet the broader mandates if the biomass-based diesel mandate is increased. The broader mandates become more difficult to meet: these mandates are also increased by the adding up method, but whereas biomass-based diesel mandate can be satisfied in part by decreasing demotion, the broadest binding mandate cannot. The overall RIN price increases slightly in 2014 as it becomes more binding, pushing up the advanced RIN price, as well.

Feedstock interactions in relation to the blend wall also contribute to higher advanced and overall RIN prices in 2014 and beyond. Moreover, because the waived overall mandate is determined by how difficult or easy it is to use ethanol, according to the proposed method, more ethanol use in one year tends to lead to more ethanol in later years. With a slight increase in ethanol use in high blend fuels in 2014, it is easier to use more in 2015 and beyond, leading to a higher overall mandate according to the proposed method of waiving this mandate.³ If the biomass-based diesel mandate is already binding in 2014, there is less scope for obligated parties to draw down biomass-based diesel RIN stocks and no ability to use biomass-based diesel RINs to help meet broader mandates. Any increases in the biomass-based diesel mandate must be met primarily through increased production levels of biomass-based diesel and RIN generation, not by decreasing in stocks or re-allocating extra RINs generated for other mandates.

In the case that the biomass-based diesel mandate is binding in all years even before it is increased, the impacts of the larger biomass-based diesel mandate do not spill over onto other RIN prices. The higher biomass-based diesel mandate still results in corresponding increases in the broader mandates. These increases are offset by the increases in biomass-based diesel RIN generation. Those mandates are no more difficult to meet, so their RIN prices change very little apart from the effects of feedstock interactions.

A tax credit extension makes the biomass-based diesel RFS requirement easier to meet. This translates into lower biomass-based diesel RIN prices relative to the baseline (Figures 1 and 2).

If the biomass-based diesel RIN price falls to the advanced RIN price, then this implies that extra biodiesel use beyond its own mandate can help to fill the advanced mandate. The advanced and overall

³ This result is sensitive to several technical assumptions that we will not know until the proposal is implemented. It is not yet clear how the feasible amount of ethanol will be estimated, for example. We reflect here the implication of the EPA proposal that this amount is actually the greater of expected use or the mandated volume.

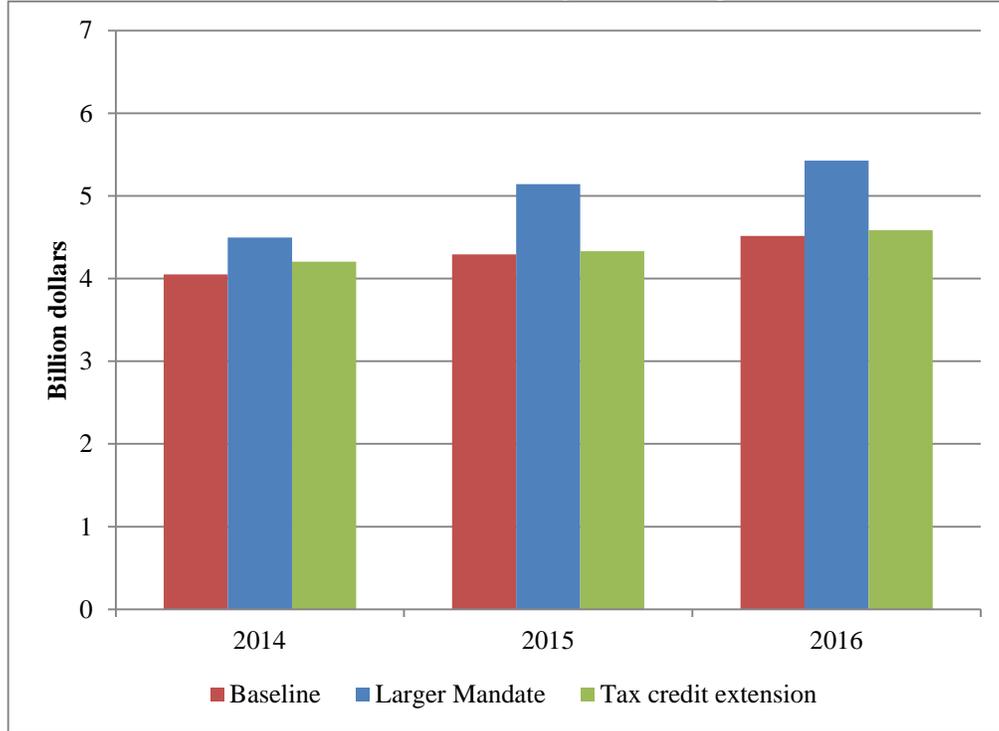
requirements, however, are also larger because of the “summing up” method proposed by the EPA. The increase in the use of biomass-based diesel beyond the 1.28 billion gallon requirement implies more biomass-based diesel RINs might be used to meet the advanced biofuel requirement and the gap between those two RIN prices would narrow, perhaps completely.

If the biomass-based diesel requirement is binding initially and biomass-based diesel RIN stocks are already falling in 2014, then the increase in the advanced requirement might be less than the full increase in the biomass-based diesel requirement under the EPA’s stock-neutral approach. In that case, the advanced requirement would be somewhat easier to meet and advanced RIN prices would fall slightly.

Moreover, the biodiesel tax credit could make the overall requirement easier to meet under the proposed rule. The reason is the same as for the advanced mandate: the proposed stock-neutral approach ignores the effect of RIN stock drawdown in the base case. The proposed method would increase the overall mandate by less than the increase in the biomass-based diesel use, if part of the biomass-based diesel requirement is met by drawing down RIN stocks. In addition the tax credit extension increases biomass-based diesel use to the point that it displaces conventional ethanol use and further limits the increase in the overall mandate. The combination of a smaller increase in the overall mandate and the additional biomass-based diesel available to meet overall requirement leads to a decrease in the conventional RIN price.

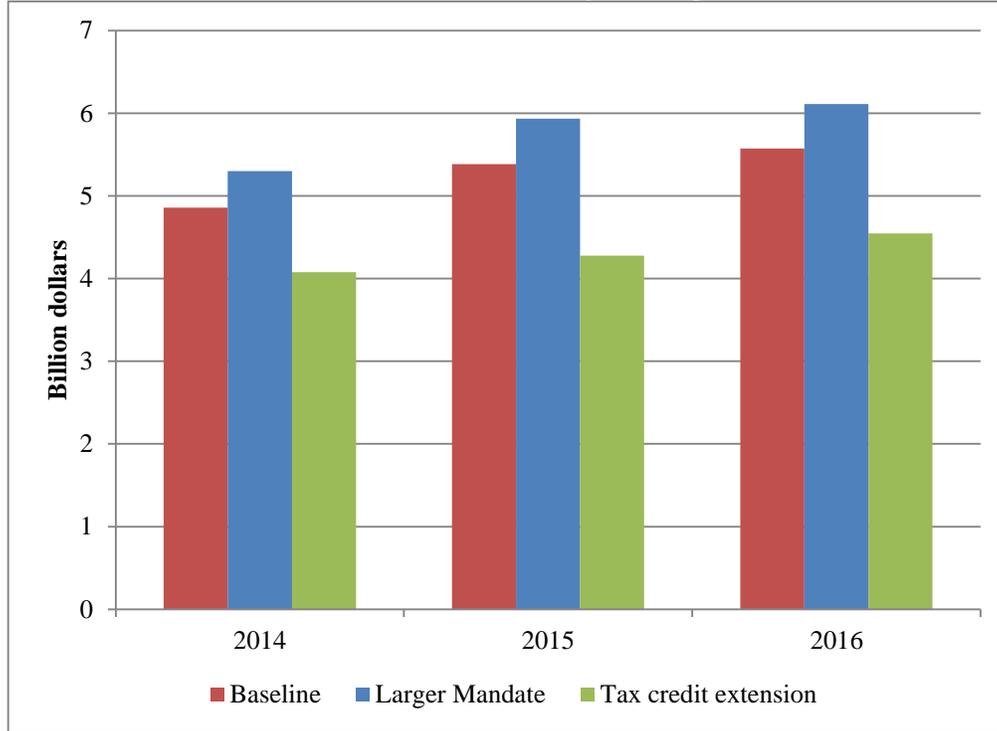
The estimated cost of complying with the RFS depends on both RIN prices and the amount of RINs used to demonstrate compliance. Although RIN prices are lower in the “Tax credit extension” scenarios, the increase in the volume of RINs necessary for compliance is large enough to result in a slight increase in the compliance cost relative to the baseline (Figures 3 and 4). In both “Larger mandate” cases, larger RFS requirements and higher RIN prices combine to form even larger increases in compliance costs.

Figure 3. Compliance cost under alternative biomass-based diesel policy options, biomass-based diesel mandate initially not binding



Note: (1) RFS compliance cost is calculated as the sum of: a) conventional RINs used for compliance multiplied by the conventional RIN price; b) other advanced RINs used for compliance multiplied by the advanced RIN price; c) cellulosic RINs used for compliance multiplied by the cellulosic RIN price; d) biomass-based diesel RINs used for compliance multiplied by the biomass-based diesel RIN price.

Figure 4. Compliance cost under alternative biomass-based diesel policy options, biomass-based diesel mandate initially binding



Note: (1) RFS compliance cost is calculated as the sum of: a) conventional RINs used for compliance multiplied by the conventional RIN price; b) other advanced RINs used for compliance multiplied by the advanced RIN price; c) cellulosic RINs used for compliance multiplied by the cellulosic RIN price; d) biomass-based diesel RINs used for compliance multiplied by the biomass-based diesel RIN price.