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Impact of Alternative Biofuels Policies on Agriculture, the Biofuels Industry, Taxpayers and Fuel Consumers

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Introduction

It seems difficult to hold a reasonable discussion about the role that biofuels can and should play in helping us meet our energy current and future needs. Opponents of corn ethanol argue that it should play no role in our energy future because ethanol increases food prices, increases greenhouse gas emissions, relies too heavily on taxpayers subsidies and government mandates, and is too protected from competition from low-cost sugar cane ethanol. Proponents of government support for ethanol and biodiesel argue that biofuels have allowed American farmers to prosper as never before, that biofuels are responsible for hundreds of thousands of jobs that are at risk if subsidies are cut, that gasoline prices would skyrocket without ethanol, and that our nation is safer because of biofuels.

Perhaps it is asking too much for opponents and supporters of biofuels to seek common ground in the search for policies that will enhance the welfare of our country. After all, much more important problems, such as ensuring that the U.S. government does not default on its financial obligations and the future of healthcare in the United States, are treated as political footballs rather than as problems that need solutions. But the future of U.S. biofuels will be heavily influenced by decisions that will have to be made in the coming months. A good understanding of the economic realities of biofuels is crucially needed if we are to create a future for biofuels that meets our needs.

In this paper, I provide estimates of the extent to which the viability of the U.S. biofuels industry depends on taxpayer subsidies, mandates and protection from imports. Separate estimates of the impact of tax credits and mandates are made for the 2012 calendar year. Tax credits for both ethanol and biodiesel are set to expire on December 31, 2011, so these estimates provide insight into how vulnerable the industry is to their elimination. In addition, estimates are provided of the impacts of a variable tax credit for ethanol.

The paper then examines the implications of a proposal by Senators Klobuchar (D-Minnesota) and Thune (R- South Dakota) that would change the ethanol tax credit into a variable tax credit and would invest in fueling infrastructure that would allow for increased consumption of ethanol. The ethanol industry argues that future biofuel targets cannot be met without this infrastructure investment. But, ethanol is not the only biofuel that can be used to meet these targets. Synthetic gasoline and diesel that can be readily blended with petroleum-based gasoline and diesel are viable alternatives. Much more attention needs to be paid to the decision about investing in a fueling infrastructure that would lead to greater reliance on ethanol rather than these synthetic alternatives.

Overview of the Modeling Approach

Tax credits for biodiesel and ethanol expire at the end of 2011. In addition, biofuel mandates are slated to increase by 25 percent for biodiesel, by 4.7 percent for corn ethanol, and by 333 percent for other advanced biofuels. Thus, it makes sense to estimate the impacts alternative policies would have on the biofuels industry, taxpayers, farmers, consumers, and drivers in 2012. Yet, such estimates are not easy to derive because the impacts of tax credits and mandates depend on market-driven demand and on production costs.

The market demand for biofuels depends primarily on crude oil prices because biofuels are a substitute for gasoline and diesel. Thus, when the price of crude oil rises, so too does the demand for biofuels. The cost of producing biofuels is primarily determined by the cost of feedstock.[1] The difficulty in predicting the impact of alternative policies is that we do not know what 2012 crude oil prices or crop prices are going to be. Crop prices depend on crop production both this year and next year and on world demand for crops. Crude oil prices will depend on future OPEC policy, whether there will be a war in the Middle East, and on world growth, among other things.

One way of obtaining insight into the future impacts of alternative biofuels policies is to develop a model that takes into account the inherent uncertainty in crude oil

[1] For example, it takes about 7.6 pounds of soybean oil to produce a gallon of biodiesel. At current prices, 7.6 pounds costs $4.20, whereas a gallon of biodiesel sells for perhaps $5.00 per gallon. It takes about 0.36 bushels of corn to produce a gallon of ethanol. At current prices, corn costs $2.48 and a gallon of ethanol sells for $2.60.

prices and crop yields. Such a model will calculate the impact of alternative policies for a given crude oil price, corn yield, and soybean yield. The model can be solved for many different crude oil prices, corn yields and soybean yields. If the probability distribution of the 2012 crude oil prices and crop yields used to solve the model captures what market traders expect to occur in 2012, as well as their expectations about the amount of volatility that they expect to occur in 2012, then the average result from the model is an estimate of the expected impact of an alternative policy.

The model that was used to generate the results reported here is a modification of the stochastic, partial equilibrium model that was used by Babcock, Barr and Carriquiry (2010). Their model was updated to the 2012 calendar using information about crop supply and demand available in July, 2011. This information includes demand and supply estimates provided by USDA in their July WASDE report. The original model included the markets for ethanol in the U.S. and Brazil and the U.S. market for corn. The current model adds the markets for biodiesel, soybeans, soybean meal, and soybean oil. This addition was done to account for which biofuels will fulfill the advanced biofuels mandate that can be met by imported sugar cane ethanol or biodiesel. The model accounts for both 2011 and 2012 yield variability for U.S. corn and soybeans and 2012 soybean yield variability in Brazil and Argentina. Some of the key modeling assumptions are provided in the Appendix.

Impact of Eliminating Blending Tax Credits for Ethanol and Biodiesel

The first results to be presented show what the impact would be if blending tax credits are not extended to 2012. The current tax credits are 45 cents per gallon for ethanol and $1.00 per gallon for biodiesel. These tax credits increase blenders' willingness to pay for ethanol and biodiesel by the amount of the tax credit. In a supply and demand diagram, the tax credits cause a vertical shift in each fuel's wholesale demand curve by the amount of the tax credit. This shift in demand would normally result in a higher quantity of biofuels purchased and a higher plant-received price. How much biofuels producers benefit from tax credits relative to fuel consumers, farmers, and oil companies is much-debated. Insight into this question can be obtained by looking at some special cases.

The easiest case to analyze is when Renewable Fuel Standard (RFS) mandates bind, which occurs when the cost of increasing biofuels production in excess of mandated levels exceeds the market value of the additional production. In this case, the quantity of production is not determined by the intersection of a supply and demand curve but rather by the mandate. When a tax credit co-exists with a binding mandate, then elimination of the tax credit will not change biofuels production levels or the price received by biofuels producers because the mandate will still bind. Hence, none of the benefits of the tax credit accrues to biofuels producers or farmers. All benefits accrue to blenders and possibly fuel consumers if there is sufficient competition between blenders so that they are forced to pass on some or all of the value of the tax credit through lower fuel prices. In this case, the tax credit subsidizes the cost of meeting the mandate. Hence, its elimination would only hurt blenders and possibly fuel consumers. Taxpayers would benefit. Farmers and biofuels producers would not be hurt.

The next special case is when the biofuels industry is operating above mandated levels and at full operating capacity. In this case, most or all of the benefit of the blenders' tax credit accrues to biofuels producers, so its elimination would be primarily felt by them. Farmers would be hurt by its elimination only if biofuels production levels decreased so that the industry operated below capacity. Because all of the benefit of the tax credit is reflected in the price that blenders paid for biofuels, its elimination would not hurt blenders or fuel consumers.

These two special cases show why it is difficult for people to understand who benefits from the blenders' tax credit. When mandates bind, none of the benefits accrue to biofuels producers. When plants are operating at capacity, biofuels producers capture all of the benefit. When neither of these special cases apply, then the benefits of the blenders' tax credit are shared between blenders (and possibly consumers) and farmers.

If there is excess biofuels capacity, then the price of biofuels reflects both the cost of producing the incremental gallon of biofuels and its incremental value to blenders. Elimination of the tax credit in this situation would lower the blender value of biofuels, so they would demand less. A lower demand would translate into lower biofuels production. Given the importance of the biofuels industry in terms of overall demand for corn and soybean oil, a drop in biofuels production would decrease the market price of

the feedstock. This drop in the price of feedstock would hurt farmers but help biofuel producers. Thus, when there is excess capacity in the industry, the primary beneficiary of the blenders' tax credit is farmers. Therefore, its elimination would primarily hurt farmers, not biofuels producers. This explains why corn farmers have been the biggest advocates of maintaining the tax credits. When there is a lot of flexibility in bringing on and taking off production capacity, the aggregate profits of biofuels producers are largely unaffected by whether the tax credit is extended.

This discussion points out that the impacts of eliminating the tax credit are highly dependent on whether there is excess operating capacity in the industry and whether mandates bind, both of which depend on whether market demand for biofuels is high or low relative to the cost of producing biofuels. Because market demand depends on the price of gasoline and diesel, and production costs depend on feedstock prices, it is important that a study of the impacts of eliminating the tax credit considers a wide range of energy prices and crop yields.

Corn Ethanol Impacts

Table 1 presents the impact of eliminating the tax credit for ethanol averaging across all 500 energy prices and crop yields considered. Each pair of energy prices and set of crop yields generates one model solution, so Table 1 presents the average of 500 model solutions.[2] On average, elimination of the tax credit would decrease U.S. corn ethanol production by 600 million gallons (4.3 percent). [3] Average corn prices would decrease by about 46 cents per bushel (7.5 percent). The wholesale price of ethanol would drop by an average of 13 cents per gallon. This decline is much less than the value of the tax credit. The reason for this relatively modest impact on ethanol prices is that the higher quantity of ethanol produced with the tax credit lowers the market value of ethanol, because at higher volumes, ethanol prices need to be more heavily discounted due to limitations on the amount of ethanol that the U.S. vehicle fleet can use.

[2] The model captures reasonably current market expectations. Average monthly settlement prices in 2012 on June 23, 2011 were $2.70 per gallon for reformulated gasoline, $2.31 per gallon for ethanol, and $6.40 for corn.

[3] The 2012 conventional biofuels mandate is projected to be 13.2 billion gallons. Table 1 average production levels are below this level because the ethanol industry has large quantities of blending credits. (RINs) that they can use to meet 2012 obligations. The model imposes a floor on actual biofuel consumption of 12 billion gallons to reflect the existence of these credits.

Table 1. Average Market Impact in 2012 of Eliminating Ethanol Blenders' Tax Credit

	With Tax Credit	No Tax Credit
U.S. Ethanol Production (billion gal)	13.82	13.16
Corn Price ($/bu)	6.27	5.68
Ethanol Price ($/gal)		
Wholesale	2.43	2.28
Net Price to Blenders	1.98	2.28

These results indicate that the viability of the U.S. corn ethanol industry is not dependent on maintaining tax credits. If production levels are an indicator of help to the corn ethanol industry, then the ethanol industry is hurt by an average of 600 million gallons. But this is a poor measure of help to the industry because production levels do not measure profit.

Table 2 provides some indicators of who would be helped and who would be hurt from elimination of the tax credit. As shown, extending the corn ethanol tax credit would add more than $6 billion to the Federal budget deficit. A crude measure of profit to the industry can be obtained by multiplying the wholesale price of ethanol by the quantity of ethanol and then subtracting the net cost of corn.[4] On average, the drop in the price of corn would not completely offset the drop in the price of ethanol. This indicates that the ethanol industry, in aggregate, would be worse off from elimination of the tax credit by an average of $360 million. This result depends on the particular specification of the demand curve (see Appendix), but clearly a drop in production would reduce feedstock costs, which would partially compensate the biofuels industry for any drop in the ethanol price.[5]

[4] The net cost of corn equals the price of corn minus the value of distillers' grains, which is set at 85 percent of the price of corn. Thus the net cost of corn equals Pcorn*(1 – 0.85(17/56))/2.75, where it is assumed that one bushel of corn produces 2.75 gallons of ethanol.

[5] It is plausible that the ethanol industry could be made better off from a drop in production if the tax credit causes the demand for ethanol to be even more inelastic than assumed here and the tax credit pushes ethanol quantity towards the blend wall.

Table 2. Indicators of Impact from Elimination of the Ethanol Blenders' Tax Credit

	With Tax Credit	No Tax Credit
Cost to Federal Budget ($ billion)	6.21	0.00
Ethanol Industry Profits ($ billion)		
Revenue	33.56	30.00
Net Cost of Corn	23.36	20.17
Returns Over Net Cost of Corn	10.20	9.84
Gasoline Price ($/gal)	2.87	2.87
Fuel Price ($/gal)		
Tax credit passed on to consumers	2.78	2.81
Tax credit kept by blenders	2.83	2.81
Value of Corn Crop ($ billion)	87.50	79.27

With an average gasoline price of $2.87 per gallon, if fuel blenders have been passing on all of the benefits of the blenders' tax credits to their customers, then its elimination would increase blended fuel prices (90 percent gasoline and 10 percent ethanol) by an average of about 4 cents per gallon. If blenders have been keeping all of the benefits of the blenders' tax credits, then fuel prices would decrease by an average of two cents per gallon. The reality is likely somewhere between these two extremes, so that fuel prices might rise a penny or two per gallon, on average, if the blenders' tax credit was eliminated.

The group that loses the most from the drop in demand for ethanol is corn farmers, because the value of the corn crop declines by about $8 billion. But this overstates the loss from tax credit elimination if corn farmers were aware that the credit was going to be eliminated, because they would adjust their acreage somewhat. Furthermore, this loss due to lower corn prices represents a gain to world livestock producers because of lower feed costs. Thus, the overall impact on agriculture would be small.

These single year market impacts and calculations of losses and gains need to be put into perspective. In 2013, the conventional ethanol mandate increases to 13.8 billion gallons, and it rises to 15 billion gallons by 2015. Thus, the Table 1 and Table 2 results overstate the longer-term impacts of elimination of the tax credits because the mandate grows so rapidly after 2012.

Biodiesel Impacts

Estimation of the impacts of elimination of the tax credit for biodiesel is much easier than for corn ethanol because the market situation for biodiesel falls into one of the special cases discussed above. Across the 500 model solutions, there were no cases where the biodiesel mandate was not binding with the $1.00 tax credit in place, because the cost of producing biodiesel far exceeds its value as a replacement for diesel, particularly at the billion gallons of biodiesel that are mandated to be consumed. This means that elimination of the tax credit for biodiesel would have no impact on biodiesel producers and no impact on farmers or other feedstock supplies. The only impacted groups would be taxpayers who save $1 billion and biodiesel blenders who would find that it would cost them $1 billion more to use the mandated quantity of biodiesel.

Impacts on Imports

Elimination of the blenders' tax credit for ethanol removes any justification for maintaining the tariff on imported ethanol. Thus, the import tariff was removed along with the tax credit in the model. Its elimination had almost no impact on the model results. It is not really surprising that the U.S. would not see a surge of imported ethanol from Brazil with the elimination of the tariff. Brazil has had trouble meeting its own domestic demand over the last two years because of a lack of new investment in production along with strong growth in its fleet of flex-fuel vehicles. In addition, elimination of the tax credit decreases the incentive for Brazil to export to the US.

The final reason why we would not see a surge in ethanol imports in 2012 is that in almost all model solutions, Brazil is already exporting 494 million gallons of sugar cane ethanol to the U.S. to meet the advanced biofuels mandate in the RFS. In about 80 percent of model solutions, Brazil exports 494 million gallons of sugar cane ethanol to the U.S., while the U.S. exports corn ethanol to Brazil. This two-way flow of ethanol makes some sense if Brazil imports ethanol when its production shuts down in late winter. However, the model that generates this result is an annual model, so the model is predicting that ships will be crossing each other loaded with ethanol. The average export of U.S. corn ethanol to Brazil in these runs is 245 million gallons. It is ironic indeed that

so much bunker fuel will be burned (with associated greenhouse gas emissions) to import Brazilian sugar cane ethanol in order to reduce U.S. greenhouse gas emissions when market forces are trying to get U.S. corn ethanol into Brazil.

Impact of Adopting a Variable Tax Credit

One criticism of the ethanol tax credit is that it stimulates demand even when ethanol demand is already high. Currently, domestic livestock feeders are concerned that they might actually have trouble sourcing corn in late July and August before the new crop is harvested. There is plenty of corn around, but a significant portion of it is being turned into ethanol. A policy of subsidizing ethanol plants' purchases of corn through the blenders' tax credit when corn supplies are so tight is difficult to explain to the livestock industry and to food consumers. Charts 1 and 2 illustrate the problem.

Chart 1: Average Corn Prices Conditional on Gasoline Prices

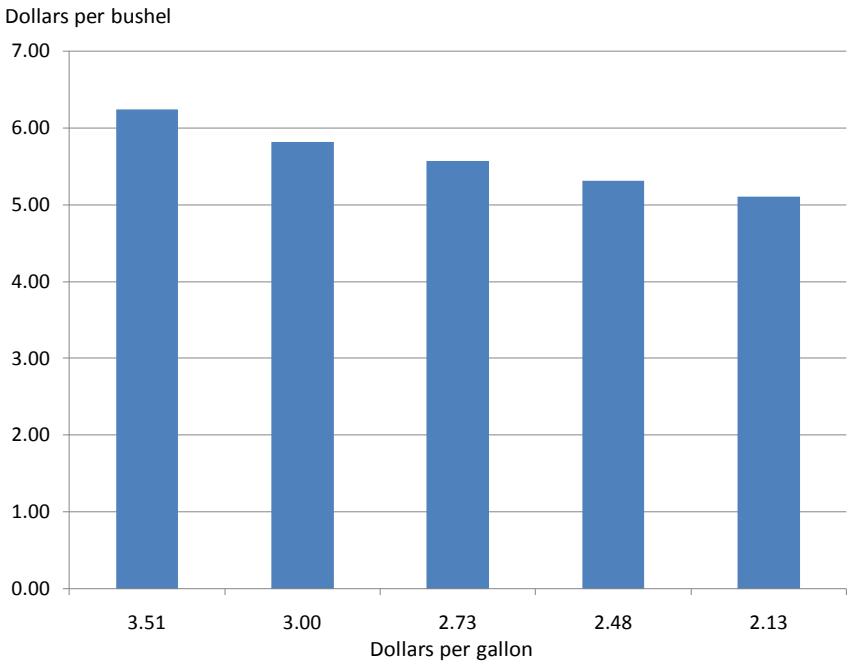
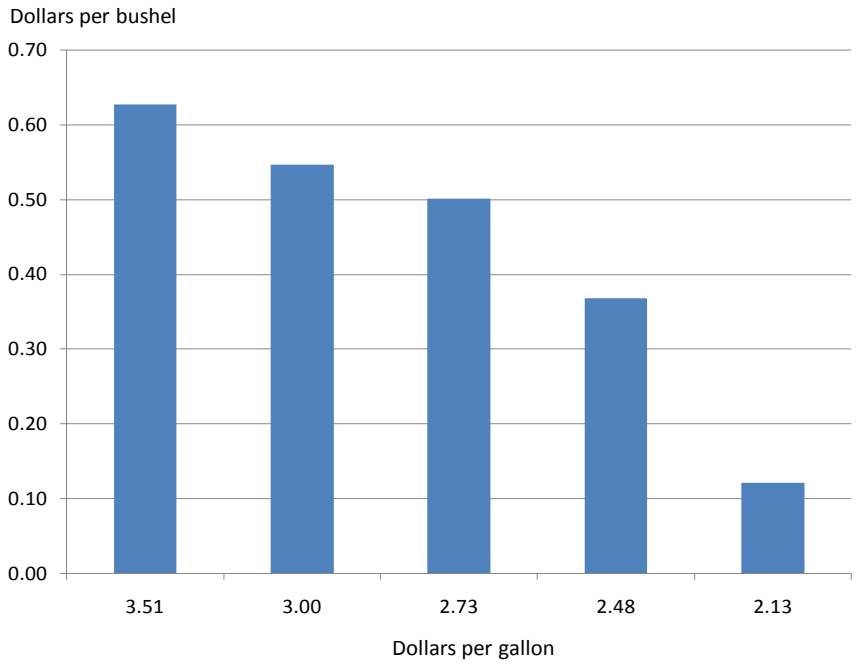


Chart 1 shows the impact of changes in wholesale gasoline prices on the price of corn. The chart's data were calculated by sorting the model results according to gasoline

prices and then averaging the price of gas and the associated price of corn by quintiles. As shown, on average, there is a direct relationship between gasoline prices and corn prices because the demand for ethanol increases as the price of gasoline increases. The amount of the increase in corn prices that is accounted for by the tax credit is shown in Chart 2. These data were calculated by subtracting corn prices from the model solutions without the tax credit from corn prices from the model solutions with the tax credit.[6] As can be readily seen, the impact of the tax credit is highest when the demand for ethanol is highest. This occurs because when gasoline prices are low, the market demand for ethanol is low and the mandate is more likely to be binding. When the mandate is binding, the tax credit has no impact on corn prices. As gasoline prices rise, the probability that the mandate binds decreases, so the tax credit has a larger impact. When gasoline prices are quite high, the mandate never binds and the tax credit has its largest impact. Clearly, a policy that increases the price of corn the most when the price of corn is highest does not work for the livestock industry.

Chart 2: Impact of the Ethanol Blenders' Tax Credit on Average Corn Prices Conditional on Gasoline Prices



[6] The same 500 gasoline prices and crop yields were used across all model runs.

If the mandate were not in place, then the impact of the tax credit would be much more uniform across gasoline prices. But then the ethanol industry would still have to defend a subsidy that pushes corn prices higher even when the market demand for ethanol is high and corn prices are high. In response to this feature of the current ethanol tax credit, a tax credit that varies with the price of crude oil is being floated by Senators Grassley (R-IA), Conrad (D-ND), Klobuchar (D-MN) and Thune (R-SD).

This recent proposal would replace the current fixed tax credit with one that varies with the price of crude oil. When oil prices are above $90 per barrel, the tax credit would fall to zero. For each $10 drop in the price of crude, the tax credit would increase by 7.5 cents per gallon until the tax credit reaches its maximum value at 30 cents per gallon. This particular proposal was analyzed across the 500 crude oil prices and crop yields to determine its impact.

Chart 3: Impact of a Variable Ethanol Blenders' Tax Credit on Average Corn Prices Conditional on Gasoline Prices

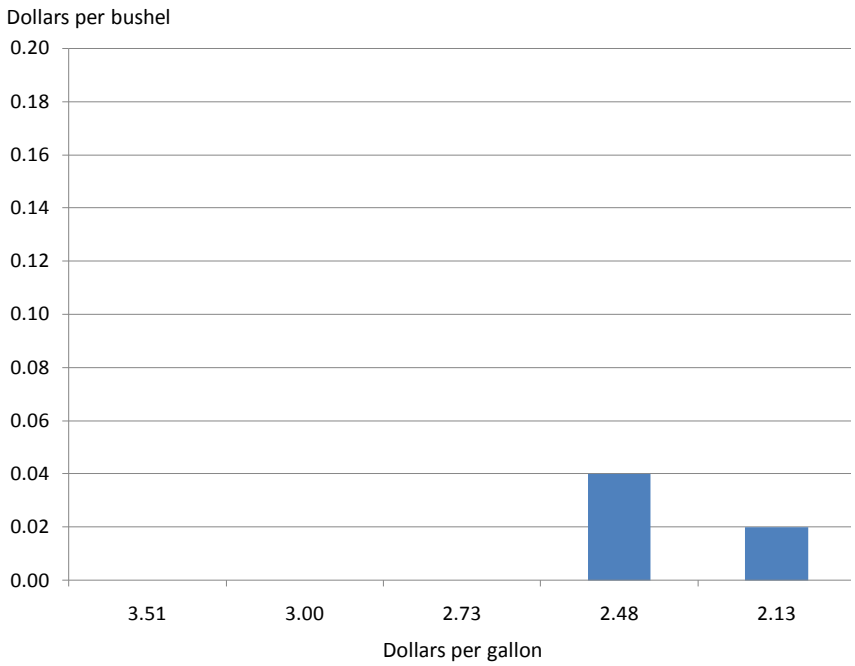


Chart 3 shows that this proposal would have almost no impact on corn prices over the range of gasoline prices that are likely in 2012. The reason is that for wholesale prices above $2.70 per gallon, the variable tax credit is zero. For prices much lower than

this level there is a good chance that the ethanol mandate will be binding, in which case the non-zero tax credit would have no impact on ethanol production levels or on corn prices. This shows that it would be a much cleaner to simply eliminate the tax credit.

Impact of Mandates

The reason why elimination of tax credits has such a modest impact on the biofuels industry is that Renewable Fuel Standard mandates keep demand high when market demand for biofuels drops off. Although tax credits have received much more recent attention than these mandates, this is likely to change in the near future because the cost of meeting these mandates may increase substantially. The cost of meeting mandates is reflected in model runs as the market price for blending credits—Renewable Identification Numbers (RINs)—that must be turned into the Environmental Protection Agency as proof that obligated blending quantities have been met. The price of RINs is the difference between the price that is needed by biofuel producers to cover their production costs and the value the biofuels has in the marketplace as a substitute for gasoline or diesel. If mandates are not binding, then the market value of biofuels equals the price needed to cover production costs, so the price of RINs is zero.

Table 3. Average Price of RINs Across All Model Solutions

	Conventional	Biomass-Based Diesel	Other Advanced
		$/gal	
With tax credits	0.01	1.88	1.26
Without tax credits	0.13	2.77	1.53

Table 3 shows the average RIN price for the three types of biofuels across all 500 model solutions. The low RIN price for conventional biofuels reflects the fact that the conventional mandate is not likely to be binding in 2012. This low probability reflects the existence of a large quantity of RINs from 2011, 2010 and 2009 that can be used to help meet the mandate in 2012. If the ethanol blenders' tax credit is eliminated, the price of RINs will rise modestly. The high RIN price for biodiesel reflects the high price of soybean oil relative to the price of diesel. Even with a $1.00 per gallon subsidy, the price

of RINs average almost $2.00 per gallon in 2012. This rises to almost $3.00 per gallon if the biodiesel tax credit is eliminated. This means that the cost of producing biodiesel from soybean oil is almost $3.00 per gallon higher than the cost of diesel.[7]

There are two advanced biofuels that can meet the advanced mandate: imported ethanol and either imported or domestically produced biodiesel. The model calculates the price of RINs from both and picks the biofuels with the lower RIN price as the one to meet the advanced biofuels mandate. With the tax credits in place, about 60 percent of the model solutions have imported sugar cane ethanol meeting the advanced mandate. Without the tax credit, 99 percent of model solutions meet the advanced mandate with sugar cane ethanol. This difference reflects the fact that the $1.00 per gallon biodiesel tax credit is much higher than the $0.45 per gallon ethanol blenders' tax credit. RIN prices are likely to continue to increase in the future because the mandates continue to grow.

Conventional biofuel mandates grow to 15 billion gallons in 2015. If biodiesel mandates stay at the 1.28 billion gallons that EPA has proposed for 2013, then other advanced biofuels, a category that includes cellulosic biofuels, grows to 3.58 billion ethanol-equivalent gallons. If all of these gallons are ethanol, then total ethanol mandates in 2015 will be 18.58 billion gallons. It is clear that increased scrutiny of these mandates is inevitable.

To obtain further insight into the impacts of these mandates, Table 1 shows what production levels and prices would be if the mandates were not enforced in 2012. The largest impact of the mandate is on biodiesel. Production would drop significantly from about a billion gallons to less than 200 million gallons. Production and biodiesel prices would drop even more were it not for the demand for biodiesel in Europe. Corn ethanol production would drop to an average of about 11 billion gallons across model solutions. This assumes that fuel blenders would continue to use ethanol in their blends if the price

[7] Current biodiesel RIN prices are around $1.25 per gallon. If the tax credit were not in place, this RIN price would be $2.25 per gallon. The higher RIN price in Table 3 reflects the higher mandate in 2012 (one billion gallons in 2012 versus 800 million gallons in 2011) and continued tight supplies of soybean oil.

were attractive enough relative to gasoline.[8] This result shows that the ethanol industry would be viable even without government support.

Table 4. Comparing Market Outcomes with and without Biofuel Mandates

	No tax credit	No tax credit or mandate
Production		
Ethanol (billion gals)	13.16	12.42
Biodiesel (billion gals)	1.0	0.145
Prices		
Biodiesel ($/gal)	5.49	3.42
Ethanol ($/gal)	2.28	2.16
Corn ($/bu)	5.68	5.28
Soybeans($/bu)	14.04	13.60
Soybean Meal ($/ton)	390	408
Soybean Oil (cents/lb)	60.4	52.1

Corn prices would drop modestly, but would still be high by historical levels. Table 4 results show that soybean prices are not strongly supported by biodiesel mandates. The reason is that soybean prices depend on both soybean meal and soybean oil prices. Increased biodiesel production increases soybean meal production, which lowers its price, whereas soybean oil prices are inflated by biodiesel production. The net effect of lower biodiesel production is slightly lower soybean prices.

Future Directions for Biofuels Policy

The results of this study provide some insight into some problems with current biofuels policies. The first observation and one that has been made repeatedly elsewhere (Just and De Gorter) is that having both a mandate and tax credit is redundant. A tax credit accomplishes little other than as a means of masking the true cost of meeting mandates. Furthermore, if excessive use of petroleum-based gasoline and diesel are the reason for the need to adopt a costly biofuels policy, then it makes sense for fuel users,

[8] The corn ethanol industry would likely characterize as naïve, the assumption that oil companies would continue to use ethanol at something close to current volumes if there were no mandate in place. But the blending infrastructure is largely in place to blend 13 to 14 billion gallons of ethanol so if ethanol is priced attractively, there is no economic reason for oil companies not to use ethanol in their blends.

rather than taxpayers, to bear the cost of biofuel mandates. Thus the current move to eliminate the ethanol blenders' credit and the biodiesel tax credit would be a policy improvement, both from the perspective of removing a redundant policy and having fuel consumers pay for biofuels, but also from a transparency perspective in that the true cost of meeting biofuels consumption targets would be reflected directly in the prices of biofuels relative to gasoline and diesel.

The second observation relates to our ability to consume ethanol. The RFS mandates 36 billion ethanol-equivalent gallons of biofuels use by 2022. The actual volume of biofuels will be significantly lower than 36 billion gallons because a gallon of some biofuels counts as more than a gallon of conventional ethanol. Even so, it will be difficult and costly for these mandated volumes to be met if non-biodiesel volumes are to be met with ethanol.

U.S. flex-fuel vehicles that can use up to 85 percent ethanol blends are dispersed across the country. There are relatively few fueling stations that dispense E85, and they are mainly concentrated in the Midwest. The expense of trying to expand E85 consumption by increasing fueling stations across the whole country seems much too high to be cost effective. Furthermore, automobile manufacturers are reluctant to increase production of flex-fuel vehicles until consumers signal that they want to buy E85. The lack of E85 consumption means that if more than about 14 billion gallons of ethanol are going to be consumed domestically, then a large proportion of the U.S. vehicle fleet will need to run on fuel that contains more than 10 percent ethanol. Simple arithmetic suggests that if 14 billion gallons is the upper limit on how much ethanol we can consume with 10 percent blends, then 28 billion gallons would be the upper limit if all almost all cars ran on 20 percent blends.

The Environmental Protection Agency (EPA) has approved 15 percent ethanol blends for all cars built after 2001. But the cost—both economic and political—of moving the U.S. vehicle fleet to E15 from E10 is looking like it will be high. New pumps need to be installed nationwide; state regulations need to be written to prevent misfueling, consumers need to be convinced that higher blends are good for their cars, and automobile manufacturers will need to extend their warranties to the new higher blends. Is it really feasible for the U.S. to move to high penetration rates of 20 percent

ethanol blends when it looks like it will be years before 15 percent blends are widely used?

An alternative to meeting existing mandates with ethanol is to meet them with so-called drop-in fuels. These fuels can travel through pipelines and be blended with gasoline and diesel at higher percentages than ethanol with less compromise on fuel mileage.

A key policy decision that is being considered by both the House and Senate is whether to adopt the recommendations of the ethanol industry and to authorize large infrastructure investments that would enable much larger volumes of ethanol to be consumed by U.S. consumers. Such a move would signal new fuel producers that they should concentrate their efforts and investments at producing ethanol rather than drop-in fuels. Investments in ethanol infrastructure makes sense if the U.S. chooses to commit to ethanol, as Brazil has done, and backs this commitment with new laws and regulations that allow higher-than-20 percent blends, new blender pumps, and more flex-fuel vehicles. If the U.S. is not ready to choose ethanol as the biofuels that will be used to meet the mandate, then such infrastructure investments would be wasteful because it is likely that they will be stranded as fuel producers find that the supply of ethanol outstrips the demand.

What is needed before a decision is made to invest in new ethanol infrastructure is to have a national discussion about ethanol's future. Are we really ready to follow Brazil's example and match the demand side of biofuels with the supply side? If so, then the decision to invest in more ethanol infrastructure would give a clear signal to investors that they should invest in ethanol. If not, the earlier that policy certainty is created by announcing that our biofuels future will be determined by whichever fuel can best fit into our existing transportation and fuel infrastructure the better it will be for all - investors, taxpayers, and fuel consumers.

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Appendix

Biofuel Policies

The U.S. corn ethanol mandate for 2012 is equal to 13.2 billion gallons. But significant carryover blending credits are available to meet this mandate if blenders choose to use them. Thus the "effective" 2012 mandate for corn ethanol is set at 12 billion gallons. The biomass-based diesel mandate is set at one billion gallons. No carryover credits are available to meet this mandate. The mandate for other advanced biofuels that will be met by imported sugar cane ethanol or biodiesel is 490 million gallons.

The policy alternative that extends the blenders' tax credit extends it at 45 cents per gallon for ethanol and $1.00 per gallon for biodiesel. The 'variable Volumetric Ethanol Excise Tax Credit (VEETC)' policy alternative has a zero blenders' tax credit if crude oil prices exceed $90 per barrel. The tax credit is increased by 7.5 cents per gallon for each $10 drop in crude oil prices up to a maximum of 30 cents per gallon.

Brazilian gasoline is assumed to contain 25 percent ethanol. The cumulative cost of transporting hydrous ethanol from Brazil's interior to the U.S. and converting it to anhydrous ethanol is set at 62 cents per gallon. This does not include an import tariff, because enough U.S. ethanol has been exported to Brazil to allow for a tariff draw back.

Yield Distributions

U.S. expected yields are obtained from simple linear trends from 1990 to 2010 of yield per harvested acre. Yield variability for 2011 is reduced because there is no chance that a disastrous drought hit the Corn Belt in 2011. The correlation between corn and soybean yields equals 0.75. The parameters are as follows:

	Corn		Soybeans	
	2011	2012	2011	2012
Mean	161.7	164	43.3	43.7
Std dev	7	11	2	3
Max	180	182	50	51.5
Min	145	130	39	35
alpha	2.498768	2.65321	2.424614	3.325093
beta	2.738171	1.404641	3.777886	2.82824

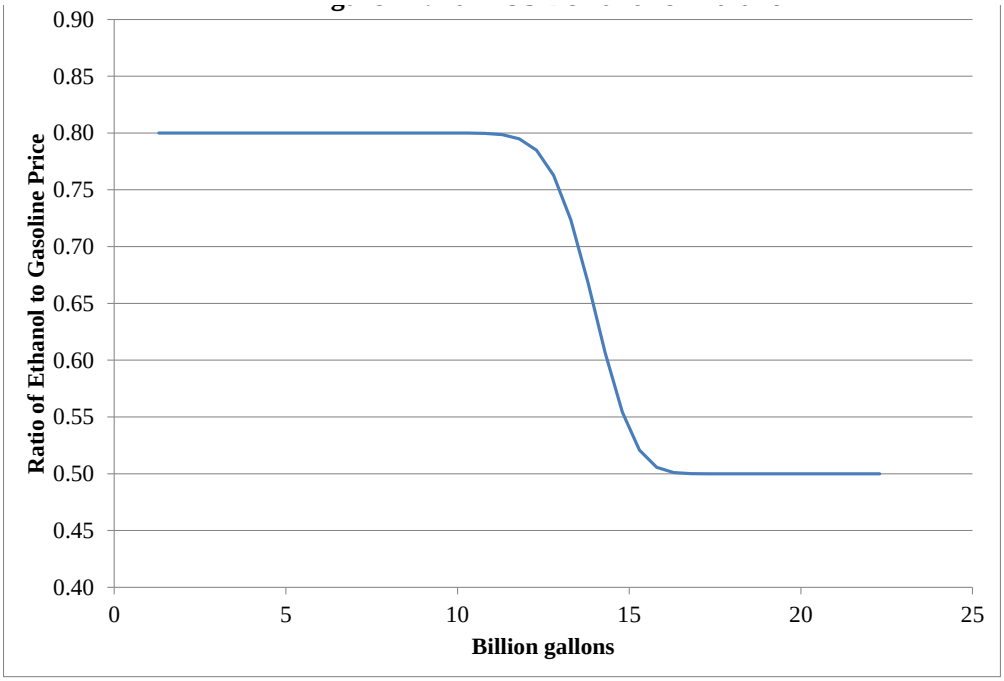
Argentinean and Brazilian soybean yield distributions for 2012 are as follows

	Soybeans	
	Argentina	Brazil
Mean	2.83	3.04
Std dev	.28	.18
Max	3.4	3.5
Min	1.9	2.5
Alpha	3.572117	3.6
beta	2.189362	3.066667

U.S. 2012 Demand Curve for Ethanol

Figure A1 below shows the ethanol demand curve that is used in this analysis. It was calibrated to recent prices and quantities. The demand curve is quite elastic at low volumes and high volumes. At low volumes, demand is assumed nearly perfectly elastic, because fuel blenders find it easy to substitute ethanol for gasoline. The value of 80 percent of the price of gasoline probably understates the willingness to pay for ethanol by blenders at such low volumes. The elastic portion of the demand curve at high volumes assumes that if ethanol is discounted enough then it will find a market in either export markets or in U.S. flex-fuel vehicles. The inelastic portion of the demand curve reflects the inherent limitation of the 10 percent blending limits in U.S. gasoline. Although the U.S. Environmental Protection Agency has approved 15 percent blends, limited market penetration of E15 is expected in 2012.

Figure A1. 2012 U.S. Demand for Ethanol



Impact of Alternative Biofuels Policies on Agriculture, the Biofuels Industry, Taxpayers and Fuel Consumers (Transcript)

Bruce A. Babcock
Iowa State University

Thank you. I really appreciate the opportunity to come to talk with you about renewable energy. I try to tow the direct line down to what I think is happening in the markets and try to understand the impacts of policy changes, but it seems like there is always controversy when you come to such an important topic as renewable energy and the role it plays in the future prosperity of agriculture.

If you are of the camp that attributes all of the current prosperity of crop agriculture to biofuels, and you think biofuels have come about only because of biofuels policy, then clearly a change in biofuels policy is a big risk factor to the prosperity of crop agriculture. If instead you think biofuels have largely been market-driven, then really a change in biofuels policy has a very small risk factor and the risk factors would be more on the market conditions for biofuels.

So what I want to do today is try to sort out a little bit about the market for biofuels and the role that policy plays to get a better understanding of what really are the risk factors facing biofuels. Right now it's clear that Congress is trying to make decisions about the future of biofuels. For example, the tax credit for ethanol is clearly on the table. With less discussion, the tax credit for biodiesel expires on December 31 of this year. Clearly some changes are going to be made. In addition, for the first time, in 2012 the advanced biofuels market is going to take off. There is about a 500 million gallon mandate in 2012 for advanced biofuels.

Is Congress going to allow that to continue? Are they going to allow the Renewable Fuel Standard (RFS) to continue as written? So there is a lot to talk about. I am going to talk primarily about ethanol and biodiesel and the tax credit and the RFS, because that is enough for the time we have.

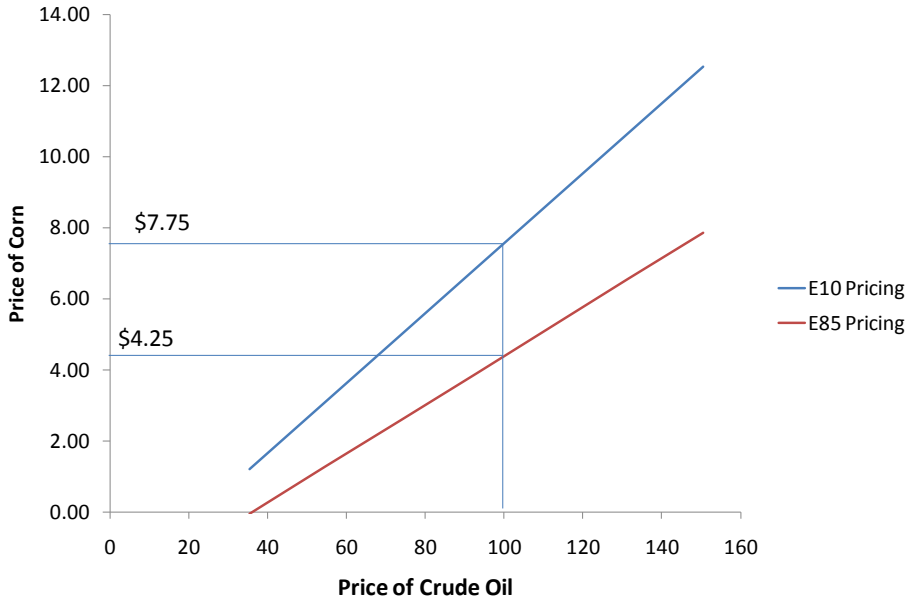
The first thing I want to talk about is the market value of biofuels. What do biofuels bring to the table? How can we generate value from biofuels? There are two values biofuels bring to the table. One is just a market value – how the market generates value or gives value to biofuels. The first source of market value is a source of BTUs. It is a substitute fuel. Ethanol is a source of BTU in an ethanol-gasoline blend. Biodiesel is a source of BTU. So it is a straight substitute as an energy source.

The second sourceof market value and an important one for ethanol is as an octane-enhancer. The refineries are willing to pay money for that attribute of ethanol. So there are two market values.

There are also nonmarket values. You hear those bandied about a lot about why we need a biofuels policy. If it were just left to the market, there is no role for a biofuels policy. So the nonmarket values are that biofuels reduce greenhouse gas emissions; ethanol, in particular, lowers air pollution; and they are a domestic source of fuel. It's hard to put a value on any of these factors – in particular, greenhouse gas emissions – when we don't have a market for carbon. It's also very hard to value the domestic source of a fuel. I am not going to try to place values on those, but those are the things that often drive the political debates. So I am going to put aside for a minute the nonmarket values and just focus in on the market value for biofuels.

I am going to start with ethanol. Because this is an agricultural forum, I am going to say, how does the creation of ethanol from corn affect the price of corn? What I have here is a chart that on the horizontal axis has the price of energy – the price of crude oil [Chart 1]. I have two lines going up there. Those lines translate the price of crude oil into a price of gasoline and a price of ethanol into a price of corn. All of the intermediate steps are gone. All you are doing is taking the price of crude oil and translating it into a price of corn. Given I am from Iowa, that is all that really matters anyway. [laughter]

Chart 1: The Ability to Pay for Corn in E10 and E85 Gasoline



You can see what we have are two lines. One is E-10 pricing and one is E-85 pricing. There isn't any doubt in the world that when you blend ethanol at low (10 percent) blends, you don't have to discount it that much relative to gasoline. How many consumers out there (1) know what E-10 is, (2) know there is slightly lower BTUs in an E-10 blend, and (3) they are probably getting lower fuel mileage from that? And (4), if all of the nation is driving E-10, what are you going to compare fuel mileage to – E-10 versus non-E-10?

I don't think you have to discount E-10 relative to gasoline at all, so it supports a higher price of corn. But, if you start running higher blends, the miles per gallon goes down, consumers will have more choice, and the price E-85 can support in terms of a corn price is going to be far lower, because you are going to have to discount ethanol in order to make up for its lower energy value, which is two-thirds that of gasoline.

Let's do this: We are at about $100 a barrel crude oil. The ability to pay for corn is almost $8 a bushel. You take into account the distillers' grains, the average productivity of an ethanol plant, it takes almost $8 corn at $100 crude oil. Whereas on E-85, it is only $4 a bushel of corn. The first point I want to make is, if the ethanol industry were to get its way and really start making us rely on ethanol for a far larger portion of

our fuel supply, it is going to support far lower feedstock costs, because it will reflect energy value.

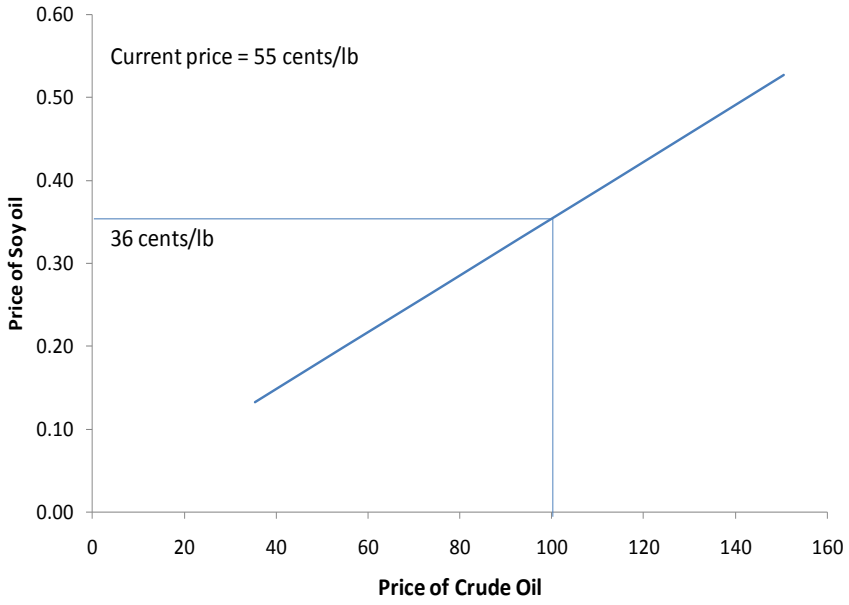
Think of E-85 as the energy value of corn through ethanol and $7.75 as the energy value through the price of gasoline. $100 crude oil supports ethanol corn prices pretty well. If you go to $120 crude, who knows what corn prices are going to be? I don't.

At $120 crude oil, you can see that really supports the price of corn. That is just the energy value of corn. There is no policy there, right? So if we are at $120 crude oil and corn is at $5 a bushel, say, it won't remain at $5 for very long, because the world will demand that corn to be changed into an energy source.

Conversely, if you go down to $60 crude oil, even at E-10, that supports about $3.75 per bushel of corn. Right away, in an E-10 world, you can see the one risk factor clearly is the price of crude oil. If you were relying just on the market, you can see how the price of crude oil is a big risk factor. But, if we are in $100 per barrel crude oil and we have a market response in terms of ethanol and the ability to change corn into ethanol that supports a quite high corn price. That is the first conclusion.

Let's look at soybean oil and biodiesel. Right now, at $100 crude oil, that supports a soybean oil price of about 36 cents a pound [Chart 2]. Do the same translation. Look at what the current price of soybean oil is – 55 cents a pound. How can we have a current price of soybean oil at 55 cents, but the soybean oil-based biodiesel sector is at 36 cents? Clearly, we are producing biodiesel right now from soybean oil. You can see there is a slight disconnect in the biodiesel market and we'll talk about that.

Chart 2: The Ability to Pay for Soybean Oil in Biodiesel



The market value summary is basically that the U.S. ethanol industry is competitive. It's a competitive industry. At $100 crude oil, it doesn't need government support; it's a competitive industry. If you stayed at $100 crude oil, you could probably still be competitive in an E-85 world. But the ethanol industry and corn growers would rather have the rest of the world be E-10, because you don't have to discount it as much as E-85.

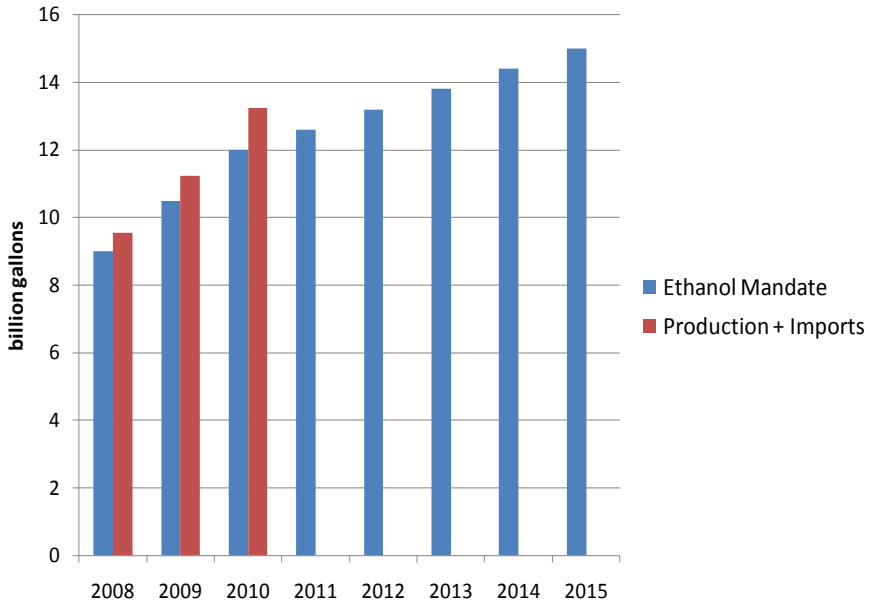
And biodiesel is simply not competitive using vegetable oil. The production cost from using soybean oil in biodiesel is at least $2 greater than the value in terms of the BTUs that biodiesel brings to the table. There is a striking difference of $2 per gallon between corn ethanol and biodiesel. That's my market summary. Again, the U.S. ethanol industry is cost-competitive, even at $6-$6.50 a bushel of corn, because the price of crude oil is so high.

We do have policies, and what are these policies? The two policies we have are tax credits. What those tax credits do is subsidize fuel blenders' ability to pay for biofuels. What it does is it lowers the net cost to these blenders of buying a gallon of biodiesel by $1 and a gallon of ethanol by 45 cents per gallon. That subsidizes their use of these fuels, so it increases their demand for these fuels.

The second big tool we have is mandates. These mandates force the purchase of minimum amounts or inclusion of biofuels into the blends. We'll talk about those now.

Let's look at the ethanol mandate. Here is the ethanol mandate, starting in 2008 [Chart 3]. This is the current Renewable Fuel Standard. This is not the total ethanol mandate. This is just the corn ethanol mandate, or conventional biofuels mandate. The conventional biofuels mandate means corn ethanol.

Chart 3: Ethanol Mandate and Historical Use



You can see we are sitting in 2011 and we're at 12.6 billion gallons of corn ethanol. That ramps up by 600 million gallons a year to 2015 at 15 billion gallons. The first observation you can see is, if you look at the capacity of the corn ethanol industry right now, it is at about 14.5 to 15 billion gallons. That is how much we could produce without building another plant. Largely, we've matched the RFS with the size of the current corn ethanol industry. That isn't a mistake. The investors in investment firms saw the writing on the wall and cut off the flow of investment into ethanol plants at the beginning of 2007. This is the industry we're left with.

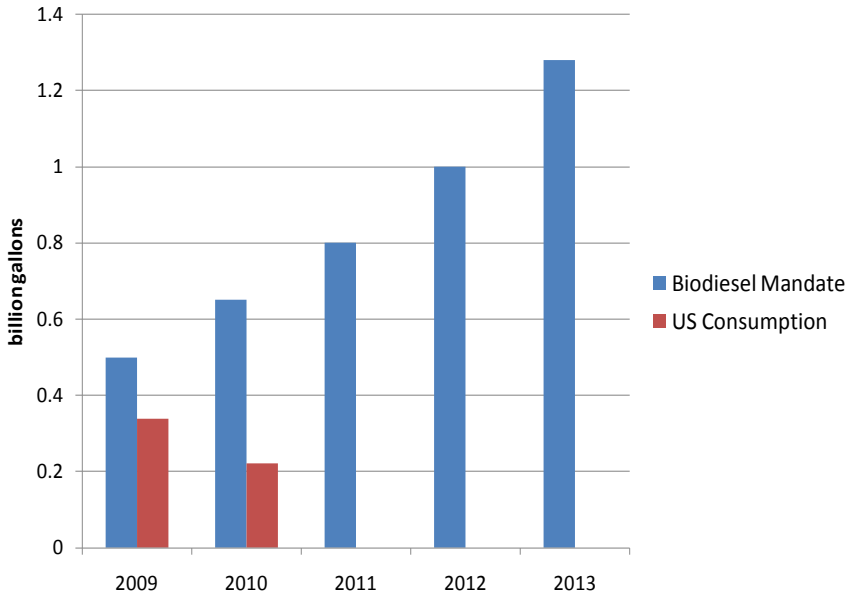
If we compare that mandate to the production and imports, which are our use levels, you can see the mandates haven't been binding. We've consumed more than the

amount the mandates have told us. That is, the economics of blending ethanol have been favorable enough, in part because of the tax credit that we have pushed beyond mandated levels.

If you look at the difference between the red bar and the blue bar, that shows the amount of excess blending that has taken place. That excess blending can be pocketed by blenders as a credit they can use to meet future mandates. We'll keep that in mind also. Basically, this shows you the market for ethanol has been largely unaffected by the mandates.

Here's the biodiesel mandate [Chart 4]. This is 2009 through 2013. The draft rule the EPA put out in July contains 2012 and 2013. You can see we are out 800 million gallons this year. In 2012, it is 1 billion gallons and, in 2013, it is 1.28 billion gallons. Now that is a lot of biodiesel, particularly if you compare it with what our consumption was. If you look at our consumption of biodiesel, you can see again that biodiesel is quite a different animal than ethanol. It's very costly to produce. The market for most of our biodiesel in the earlier years was exported to Europe, which basically has a very high price for biodiesel because they are trying to meet their own renewable energy standards.

Chart 4: Biodiesel Mandate and Historical Use



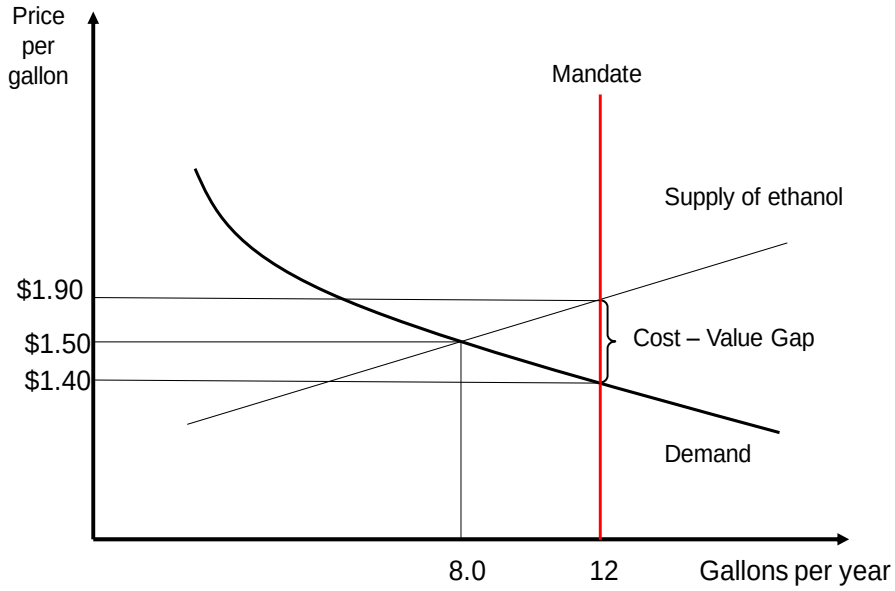
You can see it is going to be tough for us to meet these mandates, both because the production cost of biodiesel is so high, but also because we don't have as good of a blending infrastructure as we do for corn ethanol. These two different fuels have different pathways or viabilities in the market. Again, biodiesel in the 2012 and 2013 numbers are just draft rules.

Let's look at the economics of this mandate. With ethanol, if the market demand is high enough, the mandate has no impact on production, price, or consumption of biofuels. That is, if the price of the biofuel is low enough relative to its substitute or if its market value is high enough, then the mandate will have no impact on production, price, or consumption.

If demand is not high enough – that is, if the value the biofuels brings to the market isn't high enough to induce the private market consumption levels to meet the mandate – then there is going to be a gap. The production cost of biofuels is higher than the market value. That gap, if you are going to meet a mandate, has to be closed.

If you will forgive the economist in me, I can't go through a talk without a little supply and demand diagram to show how this works [Chart 5]. So we have a supply and demand of ethanol (and you can see I prepared this before oil hit $100 – it was at $80 a barrel here) in a hypothetical example. This is a free market for biofuels. We have a $1.50 per gallon price and 8 billion gallons per year consumption. If market forces were left to themselves that is the outcome we would have.

Chart 5: Impact of Mandate



If we suddenly put in a mandate, say, of 12 billion gallons of ethanol, you can see that in order to produce the 12 billion gallons, you have to have a much higher price than $1.50 per gallon. You need $1.90. The plants won't produce 12 billion gallons without a higher price. But the market at12 billion gallons won't suck up the biofuels, it needs to lower the price to $1.40 per gallon. So you can see there is a gap between the cost of production, which is $1.90, and the market value, which is $1.40. You have to make up that gap, which is a cost-minus-value gap. If you don't make up that gap somehow, you won't meet the mandate.

So how do you make up that gap? First of all, why close the gap? Nowhere else in society do we force a certain amount of consumption of a given item. We just don't do it. If the market says we should consume eight at $1.50, usually that's when the government intervenes and says you have to consume 12. We don't usually let that happen. But that is what we are doing potentially with mandates. There must be a reason, right?

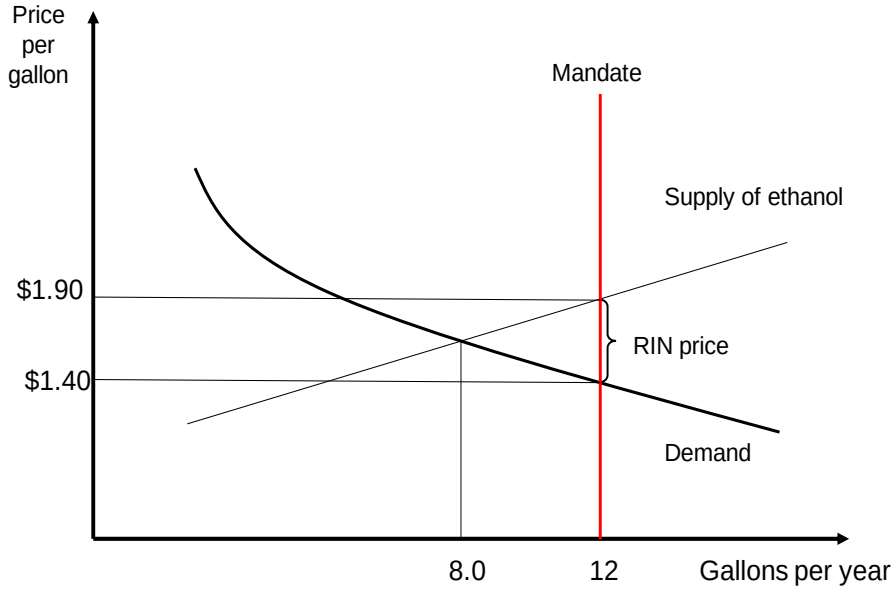
So why close the gap? Why do we do this? The only reason I can come up with is nonmarket values. Politically, are these the reasons? Politically, it is probably because we like high-priced corn. [laughter] But, as an economist, I am not going to say the

reason from society's point of view why we need to close the gap. You need to have some real justification, even if I'm from Iowa.

The nonmarket values are the reasons – reduction in greenhouse gas emissions, lower air pollution, and domestic source of fuel. Keep that in mind as the justification. (We'll come back to that in a bit.)

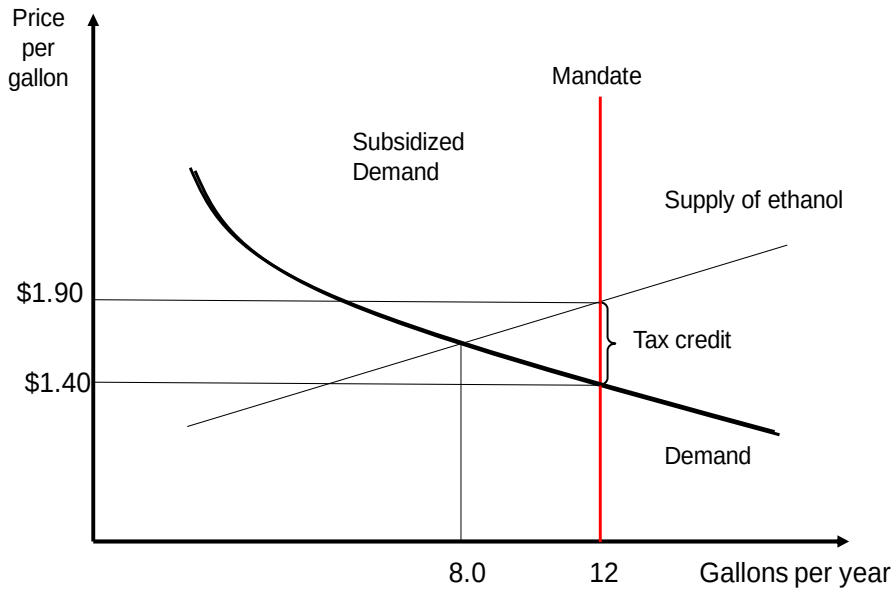
But this is the justification for closing the gap. How do we close the gap? There are two ways you can do it. You can subsidize the demand or you can create a floor in trade, just like a cap-and-trade system, like in the House of Representatives, the Waxman-Markey bill, which was a cap and trade on carbon. This is a floor and trade, where you force the consumption of a product and if you don't you have to buy a permit. You create a market for permits, just like you were creating a market for carbon. That gap is called the Renewable Identification Number (RIN) price [Chart 6]. So we now have a market for RINs. The market price for biodiesel RIN is $1.40. That gap between the market value and the price needed to produce biodiesel is $1.40. That is the first way you can do it. The market value of an ethanol RIN is about zero – 1 cent – because there is no gap. We are beyond mandated levels. This is no gap for ethanol. So that is the first way. Create a market for RINs.

Chart 6: Closing the Gap with RINs



The other way is to close the gap with a subsidy. Suppose, instead of a RIN value, you give a tax credit to the blenders [Chart 7]. What that tax credit does – watch this demand curve – it shifts out the demand, so the market demand intersects the supply curve right at that $1.90. That's the effect of a tax credit. It closes the gap to meet the mandate. Those are the two ways to do it.

Chart 7: Closing the Gap with a Subsidy



In the U.S., we have both of these ways. We have both a tax credit and a mandate. For biodiesel the tax credit covers maybe a bit more than half of the price gap. If the RIN value is $1.40, that means there is a $2.40 price gap, because the biodiesel blender gets a dollar. If you remove the dollar tax credit, that price gap would be $2.40 per gallon. The biodiesel tax credit covers not quite half and the RIN price covers the other half.

The ethanol tax credit, or VEETC, covers all of the gap. Furthermore, it pushes that demand curve that I slid out to the mandate – it actually pushes demand even farther up the supply curve. What that means is we are producing more than the mandated levels because of the tax credit. This gives us our first indication of what would happen if we discontinued the tax credit.

For biodiesel, elimination of the $1 tax credit would do nothing to the market. All that would happen is the RIN value would increase by $1. Production wouldn't change. The price of biodiesel wouldn't change. The price of soybean oil wouldn't change. The price of soybeans wouldn't change. It would do nothing.

All it is doing now is taking $800 million of taxpayer money and giving it to the buyers of biodiesel. That's it. There are no other market impacts. Furthermore, because the mandate is so binding, if you eliminated the mandate, biodiesel production would go down drastically. It really relies on that mandate. Getting rid of the tax credit, but keeping the mandate, nothing happens. If you also eliminate the mandate, then big things happen to the biodiesel market.

What about ethanol? With ethanol, the elimination of the tax credit – because we've pushed beyond mandated levels – would drop production a bit, would drop the price of ethanol, and would drop the price of corn a little bit. If you eliminated both tax credit and mandates, you would cause further adjustment in the market.

The magnitude of that impact is what I want to go to now. Take biodiesel off the table. We know what the impacts are. Corn ethanol is a bigger sector, so I want to go through that. I constructed a model with help from colleagues, and I am looking at the 2012 calendar year – next year. I want to know what that future looks like with and without the tax credit and with and without the mandate, to get an idea of how big of an adjustment the ethanol sector would be and to see how big a risk factor a change of policy would be.

If we look ahead in the key variables, we don't know anything about what the crude oil price is going to be, what the U.S. corn yield is going to be, and what next year's corn yield is going to be. What we do is we run the model over many different corn yields and many different crude oil prices and come up with an average effect to solve the model many times. Regardless of how accurate the [current] projections are, which are based on the NASS [National Agricultural Statistics Service] numbers, which we saw some criticism of and Joe Glauber danced around quite easily about the lack of precision on those things. They are the only numbers we have and the best numbers we have, so I've calibrated this model to the latest [USDA] supply and demand conditions. That's all we have and that's all anyone can do.

Let's look at some of the impacts. If we eliminate the ethanol tax credit, which seems likely, ethanol production adjusts somewhat. Across the 500 model draws, ethanol production goes down about 5 percent, or about 600 million gallons. Corn prices decrease about 9 percent relative to what it would be with extra demand simulation. Essentially when you take 600 million gallons of ethanol off the market, you are dropping the price of corn by about 9 percent.

Is this calamitous? It depends. I am not going to say if it is big or little, but this is what I estimate. The ethanol price decreases about 6 percent, because what you are doing is the "plant price received." Because their price drops, they can't pay as much for corn. The price of corn drops, the production drops, and the net cost to blenders increases 15 percent. So the two parties that are hurt by this are blenders, if they have been pocketing some of that tax credit, which I am sure they have, and corn producers, because the value of their corn crop goes down. Those are the two big affected parties.

Another way of measuring this is by looking at the taxpayer costs. This is a $6 billion tax credit that will be cut. By not renewing the tax credit, we are basically cutting the federal budget deficit by about $6 billion. The ethanol plant returns over corn costs, because their price of producing ethanol drops, their price drops but their costs drop, too. It is a small drop in ethanol plant viability. They are still viable operations.

The value of the corn crop decreases by $8 billion. That sounds like a lot, and it is a lot. But the corn crop is worth $80 billion – a big value. So $8 billion is a lot, but not relative to $80 billion. But I am not going to be judgmental. That's a lot of money. Fuel prices are either going up or down a bit, but consumers aren't going to notice too much change, only a penny or two one way or another. That is the impact of eliminating the tax credit.

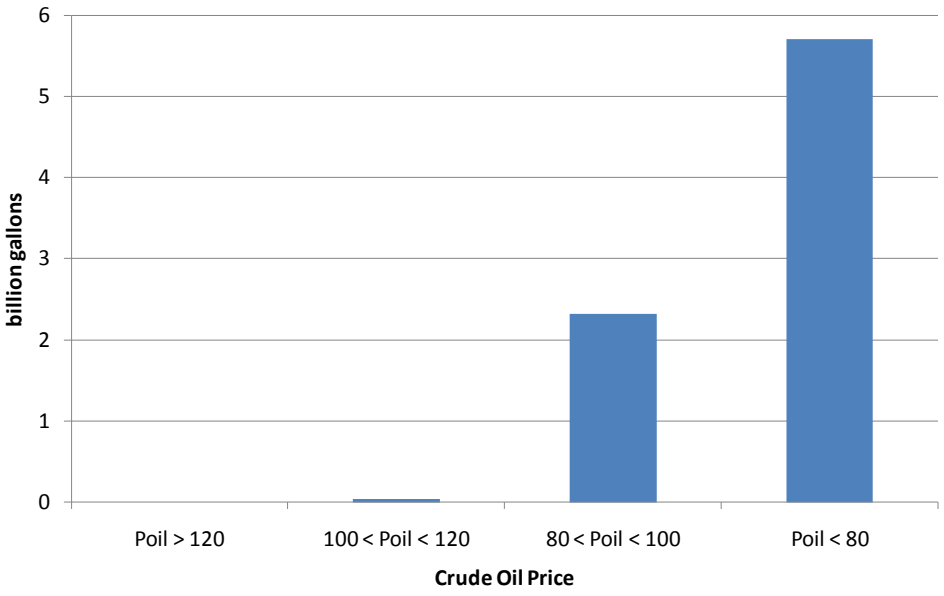
What if we also then eliminated the mandate? I am not advocating eliminating the mandate; I am not advocating anything. I want to understand how important these policy tools are in 2012 for the viability of the ethanol industry.

You can see U.S. ethanol production goes down by quite a bit, to 11 billion gallons. If you were to sit back in 2007 and 2008 and said ethanol production was only going to be 11 billion gallons in 2012 and you didn't know about the RFS, that's a huge market. That's a viable market by my way of thinking. The corn price is about $5.

Again, this is centered around what the futures markets are telling us about crude oil prices and crude oil price volatility.

What I want to show now is just a little bit about what that mandate actually does. If you look at when that mandate does anything, it does it when oil falls below $100 a barrel. If you have $100 crude oil, you don't need a mandate. The market will take care of things. But, if oil were to fall below $80 a barrel – and this is the average across the simulations where I did $80 crude – you can see ethanol production goes down a lot, almost 6 billion gallons [Chart 8]. But, if you keep oil expensive, eliminating the mandate does nothing. So what it does is basically stabilizes the ethanol and corn market for drops in crude oil prices and it does a much better job than any variable VEETC or anything else would do. Keeping the mandate there is what protects the corn and ethanol markets from a drop in crude oil price. You don't need the VEETC to do it.

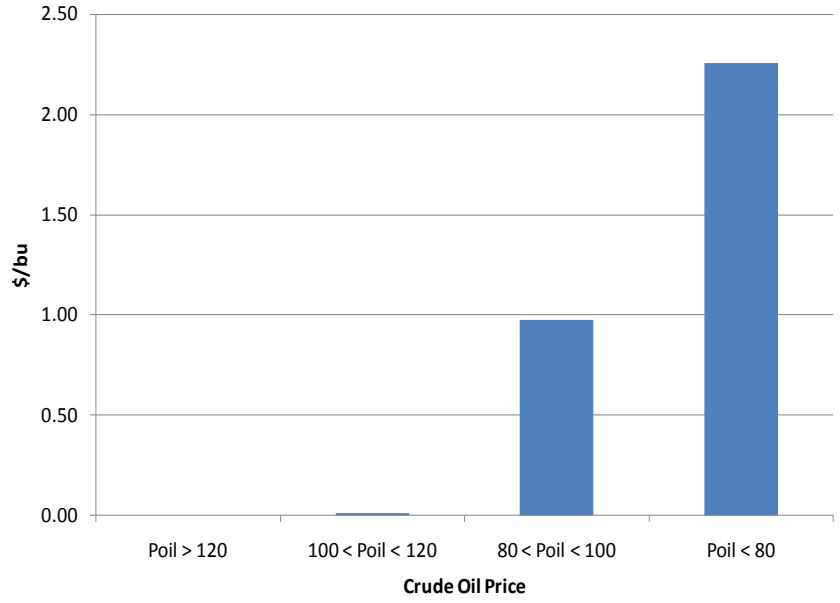
Chart 8: Drop in Ethanol Production from Elimination of Mandate



If you look at the corn price, you see the same effect. It keeps corn prices high. If crude oil falls and you keep the mandate, it only has an impact when crude oil falls below $100 a barrel and its primary impact is when crude oil falls below $80. Essentially, if I were a corn farmer and I was going to buy a risk management tool, I'd put all my

lobbying efforts into keeping the RFS, because it cuts off the tail end of the price shock to corn if the crude oil price falls.

Chart 9: Drop in Corn Price from Elimination of Mandate



I want to conclude by talking about some general policy implications. Before I forget, I am not just analyzing this from the perspective of corn. I am supposed to be here to analyze it from society's point of view. If we are really in the business of using biofuels to obtain nonmarket goods and services, we wouldn't be in the business of using biofuels to do it. They do offer nonmarket values, but there are far less costly ways of lowering greenhouse gas emissions.

The most cost-effective way of lowering greenhouse gas emissions is through a carbon tax. Period. End of story. So, if you want to lower greenhouse gas emissions, be in favor of a carbon tax. I am sure there are not very many advocates of that in this room, but I am letting you know that is the answer. Don't confuse things by saying we are going to lower greenhouse gas emissions, because we really need to do it … and, by the way, we are doing it through biofuel mandates.

If you wanted to reduce consumption of imported oil, you put in place a gasoline tax and mandatory fuel efficiency standards, but a gasoline tax is the most effective way

of doing it. You don't do it through subsidizing a domestic fuel. Also you count Canada as our 51st state and you allow that pipeline from Alberta to be built and come into the U.S., so we can obtain a stable supply of crude oil from a politically stable neighbor. That would do it, too.

If we are talking biofuels to achieve energy security, the lower cost way of doing it is to build that pipeline to Canada. Don't let it go to Vancouver where they are going to export it to China. We have to be clear why we are doing this. Ethanol may be a low-cost way of meeting air-quality standards, but the market will sort that out.

Okay, I am taking off my economist hat. That to me is pure economics about how you efficiently obtain nonmarket values. But when has Congress ever listened to an economist? Half of them seem to think there would be no impact if we default on our debt. This is minor compared with that.

I have some specific policy recommendations. If you are going to use biofuels to meet this, even if there are lower cost ways of doing it, it makes no sense to have taxpayers close the gaps through a subsidy. If these things are the nonmarket values of what you are after, who is causing the problem? It's not taxpayers. It is fuel users, so you should do it only through the mandates. You mandate these biofuels into the fuel supply and make fuel users use them. That is what I would recommend.

I'll leave it up to you. But does it really make sense to mandate a fuel that the substitute value costs $3, but it costs $5.40 to produce? There has to be a limit to how expensive these mandates are. We are going to discover after the tax credit goes away for biodiesel if we have reached that limit with biodiesel. It costs $2.40 more than its market value, so it is almost an 80 percent markup on biodiesel relative to its market value.

The last thing I want to talk about is other policy decisions. The current ethanol mandate is too large. How do I say that? It's too large without the complementary infrastructure investments that will allow us to use more ethanol in our vehicle fleet. Right now, we can only use about 14 billion gallons. Our mandate is going to 15 billion gallons plus 500 million gallons of advanced biofuels plus another 1 or 2 billion. So we are talking 17 or 18 billion gallons in a very short time. We can't use it at E-10, without expanding the ability of the vehicle fleet to use it. The first step was EPA allowing E-15

blends, but no one is going to go to E-15 without blender pumps. It's just not going to happen.

The question that Congress needs to wrestle with before they decide on subsidies for blender pumps is, do we want to hitch our future to more ethanol? If we do, then we should invest in the infrastructure that takes us there. But we should do it with our eyes open.

Is there an alternative to biofuels or ethanol? If we decide we don't want to go down the path of ethanol, that we want the market to decide how to meet the mandates, there are other types of fuels out there that private businesses and big companies are investing in. There is cellulosic ethanol, but that is still ethanol. It still has to come into a 14 billion gallon market. How are you going to do that?

The only way to actually go beyond 14 billion gallons of biofuels – unless it is ethanol – is to do drop-in fuels. Biobutanol might be one source where you could use starch from corn and make biobutanol. That is a drop-in fuel where you don't have the blend wall problem.

There are also synthetic gasolines and diesels that companies like Amyris in California are working on. Companies in Wisconsin are working on fuels that take sugars from either cellulose or from corn starch and have drop-in fuels that don't have that blend wall.

I would end by saying that before Congress starts investing a lot of money in irreversible investments that hitch our wagon to ethanol, we ought to think whether or not that is the molecule we want in biofuels or are we going to allow the market to decide how best to solve that problem. With that I'll end.

Outlook for Biofuels (Remarks)

Bob McNally

The Rapidan Group

Introduction

I am delighted to have been asked to discuss the outlook for U.S. biofuels policy. Before I begin, a quick word about my background and perspective. I approach this subject with 20 years professional experience observing and participating in energy markets and policymaking. The bulk of my career and current role is an observer and analyst of markets and policy, not issue advocate. With the exception of two and a half years' service on the White House staff during George W. Bush's first term, my responsibilities entail mainly helping investors and companies outside the Beltway understand – not influence –policymaking. So while I flew in from partisan Washington today, I am trying to call balls and strikes and have no professional stake in the biofuels, or any other policy discussion.

My outlook for biofuels is, in a word, stark. Hopefully my remarks today will convey three themes:

First, corn ethanol's political power in Washington has peaked and is now in surprisingly rapid decline. Future policy support is blocked, and past policy supports are being scaled back. No one expected such a dramatic turnabout, the speed and extent of which is startling. Corn ethanol will be lucky to hold on to a 15 billion gallon per year (bgy) blending mandate, and other, "advanced" biofuel mandates are likely to be reduced by future Congresses or the Environmental Protection Agency (EPA). This shift in policy support for corn ethanol is not yet fully factored into commodity market analysts' and energy investors' expectations.

Second, following from the first theme, Washington is unlikely to help ethanol surmount the main public policy impediment to greater biofuels blending – i.e. the 10 percent of gasoline "blend wall." Washington's new power constellation and fiscal austerity imperative will limit the future regulatory or fiscal support needed to push ethanol into intermediate blends (e.g. E15) or E85. In the absence of high public support,

future growth in ethanol will require technical breakthroughs that dramatically lower costs and allow for production at the commercial scale.

Finally, when ethanol is blended at levels below the blend wall, prices will depend on ethanol's suitability as a substitute for gasoline, which in turn depends on oil prices. Oil prices are likely to see greater cyclical swings as OPEC is not investing in enough capacity to retain an adequate supply buffer with which to dampen volatility. Greater oil price swings will reduce certainty and bedevil investment in conventional and bio-based energy.

As I elaborate on these three themes, let us briefly take a look back, around, and ahead.

Looking back

Biofuels were very much present at the creation of the modern U.S. transportation sector. Henry Ford supported ethanol and designed his Model T to run on either ethanol or gasoline. But, due to ethanol's relatively lower energy content and the discovery of large new oil supplies in the U.S., gasoline became the transportation fuel of choice.

Ethanol's chief attribute as a liquid transportation fuel was and remains that it is home-grown. Ethanol blending reduces dependence on imported oil and supports domestic farmers and workers. But, that attribute was not high on the priority list as long as we controlled the global oil market and could keep prices low and stable and import dependence small.

That all changed 40 years ago when OPEC supplanted the U.S. as the dominant force in global oil markets, oil prices rose and imports soared, and energy security became a top policy priority. To promote the growth of a domestic transportation fuel supply, Washington exempted ethanol from part of the federal motor-fuel taxes, placed a tariff protection on imports, mandated government fleet purchases, and extended loans and loan guarantees for ethanol plant investment and federal R&D.[9] Later, policymakers added pro-ethanol incentives in federal fuel economy rules and provided a volatility waiver to the formula in the oxygenated and reformulated fuels programs.

[9] Glozer provides a superb summary of the history of ethanol policy support in the United States.

Although President Reagan pared back some support for ethanol, Republican ethanol champions such as Senators Dole, Lugar, and Grassley, as well as longtime Senate Energy Committee Chairman Pete Domenici, protected the blending credit, and the tariff protection survived and was increased. Ethanol has historically enjoyed strong voting blocks in the House and Senate, and the importance of Iowa's role in the presidential nomination process is not lost on aspiring presidential candidates.

In the 1990s, another rationale for ethanol blending emerged: environmental protection. The 1990 Clean Air Act Amendments (CAAA) mandated oxygenates in gasoline to reduce carbon monoxide emissions resulting from gasoline combustion. As ethanol's chief competitor in the oxygenate market – methyl tertiary butyl ether (MTBE) – was phased out due to concerns over water contamination, ethanol benefited further. In the last decade, energy, security and environmental rationales for ethanol blending combined to create a third, and by far the biggest, political wave of support for ethanol. Terrorist attacks and oil price gyrations renewed national alarm about energy security, and the reduction of greenhouse gas emissions became the holy grail of the environmental movement. By offering benefits and political support to both causes, ethanol supporters succeeded, via the 2005 and 2007 energy policy acts, in achieving a new and powerful policy support for ethanol – a large and direct blending mandate. Specifically, in 2007 Congress ordered that the U.S. blend 15 bgy of ethanol into gasoline by 2015, which translates into a conversion of some 40 percent of the U.S. corn crop into 10 percent of the gasoline pool. The nation must consume another 21 bgy of advanced (cellulosic, not corn starch-based) ethanol by 2022. From an energy policy and political perspective, the ethanol mandate is probably the single most impactful energy policy Washington has implemented in the last 11 years.

From a financial market perspective, it is no secret that neither Wall Street nor the oil industry is terribly fond of ethanol on its merits. But market participants came to believe ethanol was a winner in Washington. As Senator Feinstein (CA) observed: "Ethanol is the only industry that benefits from a triple crown of government intervention: its use is mandated by law, it is protected by tariffs, and companies are paid by the federal government to use it." Investment in ethanol production and actual blending soared. Commodity analysts and traders began to assume a greater part of

future liquid fuel demand would be met by biofuels. And oil companies began to acquire ethanol facilities and started to view corn fields as upstream energy assets.

Looking around

As we turn to the near past and present, it is striking to watch how ethanol's fortunes have fallen so hard and so fast in Washington. The change was completely unexpected and is still underway, and market participants have been slow to realize it. I must admit, as one who has been noting the turnaround in ethanol's fortunes over the recent years, the collapse in recent weeks has been breathtaking.

With the benefit of hindsight, signs of the trend shift emerged in 2008, when agricultural commodity prices soared as ethanol was ramping up in response to the 2007 Renewable Fuel Standard (RFS). Of course, other factors were also at work in the commodity price boom. But, there had been no prior official analysis by the Energy Information Administration (EIA) or anyone else of the impact of the RFS on grain prices. Unusual for such a major energy policy initiative, Washington mandated first but analyzed and debated later. Now well underway, the food versus fuel debate will rage for years. Yet in Washington, perception matters as much as reality, and the perception was and is that biofuels mandates contributed to rising food prices.

The second shift came in 2009, when the always-tenuous alliance between the environmental community and the ethanol community began to sour. While green groups appreciated corn ethanol's utility in reducing carbon monoxide, they were irked by exemptions from tough rules limiting vapor pressure. Nor did they like the fossil fuel consumption, land-use impacts, and life-cycle carbon emissions associated with higher ethanol blending. But as long as cap-and-trade was on the table in the late-Bush and early-Obama administrations, green groups held their noses and allied with ethanol. Green groups did lay some traps in the path of potential corn ethanol growth by insisting in the 2007 RFS that biofuels blending above 15 bgy come from more efficient, less carbon emitting sources than corn, such as cellulosic ethanol. But in the last two years, the Great Recession and Republican gains in the 2010 election have taken cap-and-trade off the table, and as a result, the falling out has gathered steam. Now that the chief rationale for the ethanol-green alliance has fallen away, tensions are laid bare and the

gloves are coming off. Green groups are stepping up opposition to ethanol on grounds that it emits high amounts of carbon on a life-cycle basis and that blending credits are an expensive way to cut carbon emissions. (The Congressional Budget Office estimated blending credits cost about $750/ton of CO_2 equivalent reduction.[10]) Environmental groups joined with their usual foes on letters to Congress opposing E15.

The third, and I would argue most important, challenge corn ethanol faced was the emergence of fiscal austerity and the need to tighten fiscal policy, which is now the primary focus of the Republican-controlled House and also the top priority of the Senate and White House. And given the size of our fiscal imbalances and the election outlooks of most observers, it is fair to assume Washington's budget cutting imperative won't be going away soon. Even those without a strong anti-ethanol bias found it hard to justify continuing a blending credit for a product whose demand is mandated.

Long envied, courted, and respected, ethanol now finds itself vulnerable, low-hanging fruit and facing an "unholy coalition" of environmentalists, fiscal conservatives, the oil and food industries, and small engine manufacturers able and willing to block its growth and take back its prior gains.

The first tangible signs that corn ethanol was in trouble in Washington came during the E15 debate in 2010, when Congress and the White House failed to direct EPA to grant ethanol the sweeping waiver for E15 it desired. Then the Tea Party and Republican House came to town. Turning first to E15, the House voted twice to deny federal funding for E15 blending pumps and storage tanks, by 262-158 and 283-128, and by 285-136 to block E15 waiver implementation.

Then the $6 billon per year blenders' tax credit moved to the center of the bulls-eye. In June, the Senate voted 73-27 for a Coburn/Feinstein proposal to end the blending credit immediately rather than wait for end-year expiration. A strong reversal from the 1990s, when it was the anti-ethanol forces that typically lost Senate votes with counts in the 20s.

The most recent indication of how far corn ethanol's star has fallen came during President Obama's recent news conference – actually the first Twitter town hall. He raised eyebrows calling corn ethanol producers "probably the least efficient producers

[10] CBO

[compared with cellulosic]" and saying "it's important for even those folks in farm states who traditionally have been strong supporters of ethanol to examine are we, in fact, going after the cutting-edge biodiesel and ethanol approaches that allow, for example, Brazil to run about a third of its transportation system on biofuels. Now, they get it from sugar cane and it's a more efficient conversion process than corn-based ethanol. And so doing more basic research in finding better ways to do the same concept, I think is the right way to go." The President reportedly has put the blenders' tax credit on the table to help offset a continuation of the payroll tax cut.

Adding further support to the negative outlook for ethanol, official energy analysts making long term projections on fuel mix are becoming more cautious about biofuels growth. Whereas International Energy Agency (IEA) projections had ethanol accounting for almost half of gasoline demand growth in the last five years, IEA now projects the fuel will account for less than a quarter of demand growth in the next five years, despite higher projected oil prices,[11] due to higher corn prices and greater uncertainty around mandates.[12] IEA sees global biofuels rising from 1.8 million barrels/day to 2.3 million barrels/day by 2016, displacing some 5.3 percent of gasoline and 1.5 percent of diesel by 2016 on an energy content basis.[13] IEA does not expect cellulosic biofuels to achieve widespread cost competitiveness with conventional gasoline until 2030, despite aggressive mandates.[14] IEA projects advanced biofuels will rise from 20 thousand barrels/day now to 100-130 thousand barrels/day in 2016. Even the Department of Energy's (DOE) forecasting arm, the Energy Information Administration, projects the U.S. will fail to meet advanced biofuels targets by 2022.

[11] IEA, p. 90
[12] IEA projects global biofuels rising from 1.8 mb/d to 2.3 mb/d by 2016, displacing some 5.3 percent of gasoline and 1.5 percent of diesel by 2016 on an energy content basis.[12] As for cellulosic biofuels, IEA[12] does not expect cellulosic biofuels to achieve widespread cost competitiveness with conventional gasoline until 2030, despite aggressive mandates. IEA projects advanced biofuels will rise from 20 kb/d now to 100-130 kb/d in 2016.
[13] IEA, p. 20
[14] EIA, March 24, 2011. http://www.eia.gov/pressroom/presentations.cfm, slide 4.

Looking Ahead

With the blenders' tax credit all but dead and buried, the most important public policy issue now confronting the ethanol sector is the so-called "blend wall," where Washington appears to have mandated a major contradiction.

On the one hand, EPA limits ethanol blending to 10 percent of conventional gasoline, the sales of which are about 140 bgy – so the limit is 14 bgy. (Some think the practical ethanol limit is closer to 12 bgy because of inadequate distribution infrastructure and summer blending constraints in southern states due to high evaporative emissions associated with ethanol blends.[15]). On the other hand, the RFS has mandated 15 bgy of corn ethanol by 2015, requiring blending above the 10 percent level. Technically there is no explicit contradiction, because the RFS is designed like a cap-and-trade program where producers can fulfill their obligation by either blending the required amount of ethanol or purchasing blending credits, called RINs. Theoretically, if actual ethanol blending is limited to 10 percent of gasoline, but the RFS mandated more, RIN prices would rise as obligated parties sought to fulfill both mandates. But those higher RIN prices would be passed along to the pump, which would likely attract conservative opposition since it would amount to a tax penalty for refusing to blend an amount of ethanol Washington has simultaneously mandated and prohibited.[16]

Discussion about weakening the RFS has already started in Washington. Senator Inhofe (R-OK) and Representative Issa (R-CA) have introduced the Fuel Feedstock Freedom Act, which would allow states to withdraw from the RFS. However, state opt-outs are likely to be logistically difficult if not unworkable. Eventually, either Congress or EPA will probably reduce the mandate to prevent it from colliding with the blend wall and raising gasoline prices.

The ethanol lobby saw the blend wall danger and first tried to surmount it by getting EPA approval for "intermediate" blends above 10 percent, such as 15 percent ethanol or E15. Ethanol forces are trying to secure federal funding and indemnification for intermediate blend infrastructure and consumer acceptance. While EPA (grudgingly,

[15] Tyner, Dooley, Hurt, and Quear

[16] For a version of this argument pertaining to cellulosic RINs and involving economic scarcity instead of regulatory prohibition, see *Cellulosic Ethanol and Unicorns: The EPA punishes oil refiners for not buying a product no one makes*, Wall Street Journal editorial, July 15, 2011

I suspect) granted partial approval for E15 blends, they did so with the full knowledge that very little is likely to be sold due to large remaining infrastructure compatibility, cost and liability concerns, as spelled out in a recent GAO report.[17] Even ethanol-laden companies like Marathon and Valero said they would not offer E15. While ethanol forces took heart when Senator McCain's bill against ethanol pump funding failed 40-59, it is far from certain that Congress will be in the mood to grant ethanol additional funds or legal protection to enable E15 growth.

Some investors surveying the scene have concluded the future of the biofuels industry belongs to Brazil. Setting aside a recent surge in ethanol *exports* to Brazil, optimism stems from the fact that Brazilian sugar-cane ethanol will dominate the 5 bgy non-cellulosic slice of the 16 bgy "advanced" biofuels market that starts to come into effect in 2013. Companies like Shell appear to agree with President Obama that Brazilian ethanol is the future and is making plans to invest in new facilities that would export to the US.

As far as Washington policy support goes, optimism that Brazil will be the big winner following the recent decline in ethanol support is misplaced. Congress did not establish aggressive mandates to make the world safe for Brazilian ethanol. Talk has already begun in Washington about reducing "advanced" biofuels targets if EPA does not administratively scale them back.

Grains and oil converge

From a commodity market perspective, it is noteworthy that grain and fuel prices are becoming more correlated and volatility is going up. Wallace Tyner, of Purdue University, noted the rapid explosion in ethanol's market share has established a high and positive correlation between crude oil and corn that has not previously existed. Below the blend wall, the price of crude will drive ethanol prices. Above the blend wall, the price of corn will drive ethanol prices.[18]

There are also important linkages between the RFS and higher grain price volatility. As the RFS mandate rises, it will introduce a price-insensitive source of demand for corn. That in turn will impart greater price volatility back onto agricultural

[17] GAO
[18] Tyner

markets. Two academics recently estimated that at times when the RFS is driving ethanol demand instead of high oil prices relative to corn, inherent volatility in U.S. grain markets will rise by about 25 percent. In addition, volatility of U.S. coarse grain prices in response to supply side shocks in energy markets will rise by almost one-half.[19]

A word about biodiesel and wind energy

Biodiesel history has mirrored that of corn ethanol. The inventor of the diesel engine, Rudolph Diesel, actively considered agricultural feedstocks as a fuel. But petroleum distillate established a dominant position, though oil price hikes of the 1970s renewed interest in homegrown alternatives. Commercial production of biodiesel began in the 1990s, but only increased sharply since 2004 when a $1 blending/production credit was implemented. In 2005, supplemental credits for the "renewable diesel tax credit" ("renewable" diesel does not use alcohol in conversion) and "small agri-biodiesel production credit" also went into effect. Biodiesel production was around 30 million gallons before 2005, but by 2008 was over 700 million gallons per year, with a large portion exported (though the EU has since imposed an import tariff that has hurt U.S. exports).

Biodiesel remains expensive compared with petroleum distillate. Biodiesel economics feature a high correlation between soybean oil and conventional diesel prices, since it takes a gallon of soybean oil to produce a gallon of soy-based biodiesel. In addition, soy-based biodiesel has slightly lower energy content than conventional diesel. Bruce Babcock, of Iowa State University, has noted biodiesel marginal costs are $2 per gallon higher than diesel, requiring a $1.00 credit and $1.00 RIN price.[20] This makes most analysts cautious about the outlook for biodiesel growth. IEA projects biofuel-based distillate will account for only 4 percent of diesel demand growth in the next five years, compared with having taken 9 percent over the last five.[21] EIA expects U.S. biodiesel use to rise from 0.1 percent of total liquids supply or 0.6 percent of diesel fuel

[19] Hertel and Beckman
[20] Babcock
[21] IEA, p. 20

consumption in 2010 to 0.6 percent of total supply and 3.0 percent of diesel demand by 2035.[22]

The $1 per gallon biodiesel blending credit does not attract as much support or opposition as the ethanol blending credit. Because biodiesel blending, and therefore subsidy costs, have been lower, it has avoided the attention of the budget cutters, so far. But being small has its downsides too – Washington has frequently let the biodiesel credit expire with barely a whimper. When the credit last expired in 2010, the industry estimated production fell 42 percent and nearly 9,000 jobs were lost. Production fell despite a retroactive and rising RFS mandate, and exports were hurt by an EU import tariff.

Last month, biodiesel supporters in the House and Senate introduced a bill that would extend the credit for three years, until 2014. The bill would reform the biodiesel tax incentive from a blenders' excise tax credit to a production excise tax credit, which supporters say will benefit biodiesel producers and improve the functioning and credibility of the subsidy program. Views are mixed as to whether it will be extended this year. In past Congresses, extensions usually passed without a pay-for, but now a pay-for is required and any funding supplies are low and likely to be depleted during the debt limit and continuing resolution agreements to come. Biodiesel is not part of Feinstein-Thune-Klobuchar discussions.

In biodiesel's favor, it enjoys a "carve-out to the carve-out" under the RFS, which not only mandates a broad quantity of "advanced" biofuels, for which biodiesel qualifies, but also a specific bio-based diesel mandate. Whereas EPA slashed the RFS mandate for cellulosic biodiesel from 500 million gallons in 2012 to less than 20 million gallons due to a lack of large-scale commercial production, the agency sees plenty of idled biodiesel capacity and has ordered the mandate increased from 1.0 bgy in 2012 and proposed a 1.3 bgy target in 2013. It is possible that steadily rising regulatory demand for biodiesel will require shifting production from corn to soy, which will create a new set of antagonisms and tensions that will play out in Washington between ethanol and biodiesel, splitting the biofuels sector.

[22] Annual Energy Outlook, EIA, 2011

As for wind, challenges to large-scale commercialization are fairly well understood. They include intermittency, austerity, distance from load centers, political opposition, and low natural gas prices. However, I am skeptical that $4 per MMBtu natural gas will endure for too long, given questions about the economics and politics of shale gas production, as well as strong political opposition to new nuclear and coal build-out. Ultimately, wind cannot scale unless large cost and technological barriers are broken (not the least of which are storage and transmission) and public opposition on footprint grounds is overcome.

It is likely that, like ethanol, wind will have to get by with lower subsidies in the future. Wind enjoys a 2.2 cent/kilowatt hour incentive, though Congress has often let it expire and usually extends it by only 1-2 years. The renewable energy production tax credit expires at the end of 2012 and will face an uphill battle to be extended.

Reaching for a happy note

Corn ethanol is mature and has probably reached the end of its growth phase for the foreseeable future in the U.S. Congress is no longer in the mood to subsidize or mandate ethanol blending beyond current levels, much less to help ethanol over the formidable "blend wall." Ethanol will retain value as an oxygenate and octane enhancer, and when economical, as a volume extender. And political support to retain a 14-15 bgy blending mandate will probably remain in place. A good part of the U.S. oil sector is now invested in corn ethanol. However other RFS mandates should be placed on downgrade watch. The U.S. will have opportunities to export biofuels, as it is currently doing to Brazil and increasingly to Canada (which just introduced a 5 percent biofuels target).

Perhaps the greatest hope of jumping the blend wall is the commercially scalable development of thermochemical processing technologies that can turn cellulosic feedstocks into bio-based gasoline and diesel. Tyner estimates the crude oil break-even price for thermochemical processing to be $108 per barrel.[23]

Such crude prices are well within the range we have seen and, in my view, are likely to see going forward. Income-driven, price insensitive developing country oil

[23] Tyner

demand is strong, and the supply curve is steep. As a result, crude prices are likely to remain in the range of recent years' for the foreseeable future. Notably, that oil price *range* has been very wide – from $147 to $34 in recent years, in fact in one year. Such wild gyrations in price are also likely to endure, since OPEC is not investing enough to maintain sufficient spare capacity to stabilize prices. Short-run oil price elasticity of demand and supply remain very low, implying large price swings will be needed to balance net supply growth and consumption when they are unbalanced. Oil prices are likely to resemble a roller coaster ride for some time to come, which will retard investment in biofuels and conventional energy supply alike.

As Lucille Ball said, "Whether we're prepared or not, life has a habit of thrusting situations upon us." Market participants and officials are still coming to terms with a new and volatile energy situation, of which biofuels is now an important part. We must contend with declining public policy support for biofuels, daunting technological obstacles, roiling feedstock prices, and uncertain investment economics. To cope, we will have to learn to live with greater price volatility, devise more rational public policies, and accelerate research and development for alternative energy break-throughs.

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General Discussion

Transcript

Moderator: Mark Snead
Vice President and Denver Branch Executive
Federal Reserve Bank of Kansas City

Mr. Mark Snead: We have a few minutes for questions. I will just start out with, exactly how large a carbon tax were you recommending? [laughter]

Mr. Jim Andrew, Andrew Farms, Inc.: Dr. Babcock, I'm Jim Andrew, an Iowa farmer. I just returned from Washington lobbying for these very mandates and subsidies last week. There is one more nonmarket value of biofuels and that is jobs. That seemed to be the resonating point with every member of the Iowa Congressional delegation. If you talk about it, first, the high-paying jobs that were created and, secondly, the farmer investments that are made in ethanol and biodiesel plants are a consideration that should be in your chart.

Mr. Bruce Babcock: Jobs aren't a nonmarket value. They follow from the market price of the fuels. That's an economics lesson, and you are teaching me a political lesson. That has more political resonance than anything. I agree with that. You get to the point about these policies following the investments. I agree with you that you have these farmer investments in these plants without a mandate covering them and they could be a stranded investment. That's why I think it is important for the Congress to have a discussion about, do we want more stranded investments by investing in blender pumps and investing in pipelines and other flex-fuel vehicles?

Do we want to make that investment? Because as soon as you make that investment, then there will be people going to Congress saying we have to protect that investment by adopting policies that subsidize the use of these fuels, so our investments weren't wasted. I agree with you that the stranded farmer investments are one reason why politically you need the mandate. But, I would say, before we go on and make more investments that would create its own lobby to have it also protected, let's have that conversation about, do we want to do that with ethanol or other biofuels?

Mr. Andrew: Can I just add to this? What else would be required for a fully market-driven market for biodiesel?

Mr. Babcock: A big tax on diesel – but I guess that is not market-driven, is it? It's tough to find out how vegetable oil can be used economically in biodiesel. You saw that 4.4 percent growth in soybean consumption over time. The world wants vegetable oil and soybean meal or protein meal. The world wants it. You are working against that world demand. So maybe a tremendous oversupply of soybeans would help. If productivity grew by 5 percent for soybeans, that would lower the cost of soybean oil and that would allow it to kick in.

Mr. Kenneth McCauley, Past President, National Corn Growers Association: Dr. Babcock, my former friend.

Mr. Babcock: I didn't know I had any friends left on the _____

Mr. McCauley: I am not sure you do. [laughter] One thing I think is really important – your points are good – but, on the road getting to this point, we have to go back to remember why we did these things. We did a really good job of putting these things in place, because we had corn selling for way below the cost of production. We were farming for the government program. Really, corn got cheaper than grass and it affected a lot of things. We've built this industry.

Now your points are good, but the other part is that some of your presentation looked confusing to me, because we had biodiesel versus ethanol. Ethanol is standing on its own today. If things stay the way they are, we are probably in good shape. Talking about new fuels at this point doesn't look like the agriculture-friendly issue we want to talk about – in my opinion anyway. We've elevated agriculture to a place now where we are profitable across the board and one of the few good points about the whole U.S. economy.

I told my friend from Iowa to take his Valium, because he's not really happy with you either. But I think you have to recognize those things.

Mr. Babcock: Let me address the first point. When you say we've taken the industry higher, presumably that means we've put in place the policy tools that took corn higher. I disagree. High crude oil prices – MTBE plus the certainty of the policy – took corn higher.

Ethanol plants had margins of $1.30 a gallon that lasted 18 months. You can pay off a 100-million-gallon ethanol plant in about 11 months of those margins. Those margins are what drove the ethanol industry higher. It wasn't the government policy. So you cannot attribute the growth in ethanol and the high corn prices to ethanol policy. It was the higher crude oil and cheap corn combining to make big margins, which created a gold-rush fever into the ethanol market.

The paper I did just a bit ago would suggest we would have $5 a bushel corn today. Corn would be at $5 if we never had an ethanol policy in an E-10 world.

My last point is I hope I'm making the differentiation between ethanol, which largely can stand on its own. At $100 crude oil, even at $80 crude, it will be a viable industry, with or without government subsidies and policies. The mandate serves as an insurance policy against that from lower crude oil prices. Biodiesel is a different animal. The production costs are too high. So I hope I differentiated between the two sufficiently.

Mr. Snead: At the risk of broadening your final comments, could you talk a little bit more about unconventional -- both crude oil and natural gas – in the broader equation?

Mr. McNally: On the oil side, clearly there are real grounds for optimism. Mainly due to improvements in hydraulic fracturing and multistage hydraulic fracturing and so forth, we are able to not only unlock and make commercial resources of oil and gas we knew were there but not producible economically, we can do that now. So all that is real. If anything we're still underestimating in our consensus estimates of what the shale and the oil gas potential really is. It is a sector the U.S. is able and willing and we have seen _____take the lead in. We have the right kind of small, independent risk-taking companies. We have the technology. We have the profit incentives and so forth. So it's no surprise we'll lead the world in this. It is a very promising story. However, both for oil and for gas, in my view, there is enormous regulatory risk.

The U.S. public cares very little about global warming. They care very little about reducing carbon. But they care an awful lot about water, whether it is in the water-starved parts of the country or the water-rich parts, they just don't like people drilling through the water aquifers, not saying what they are putting in the fluids, causing little earthquakes, and taking out really gunky water. It makes them very, very nervous.

While I believe there is no real significant risk to water from hydraulic fracturing in my view, that almost doesn't matter because with water there is very low public tolerance for risk. So I think the industry and all of us have to come to terms that, while the resource is there, we have the technology to produce it, we may have to have a little higher gas prices to do so, we are going to have a real humdinger of a policy discussion and debate over how we balance protecting water against producing this energy.

Mr. Thomas Hoenig, Federal Reserve Bank of Kansas City: Bob, one of the issues that always comes up in this context – I don't know the answer to this and maybe it's zero – is what are the dimensions of the subsidy floor for carbon energy that goes on in this country, because we talk a lot about biofuels and ethanol, but what about this other energy source we compete for? Do you have any sense of that?

Mr. McNally: Off the top of my head, I have no firm numbers. Generally the industry response to that is the industry takes advantage of tax breaks, which are widely available to other sectors. Whether it's an investment tax credit or other kind of income tax breaks, they will say, "This isn't a specific tax break for the oil industry, we just happen to be the largest payer of this category of tax, because we pay the most taxes because we are so big."

In terms of specific directed subsidies, they would say it's quite small. Matter of fact, I have heard some of the large companies say, if I'm not mistaken even Exxon say, "Take away. Just take it away for everybody."

So they call out those folks on that ground. They say, "It's not just us who is getting it, it's everybody. If you want to take it away for everybody, that's fine and, if you want to take every little one we have, that's fine too."

I believe that's how they respond to that present headache.

[Audience Question]: I have a question on your prediction of a lower RFS. How much lower? What is your probability that happens? And when do you think that will happen?

Mr. McNally: You sound like you are one of my clients. [laughter]

Within the next year or two, I think the probability of touching the ethanol orifice, the 15 million gallons a year is low – so 15-20 percent. There is discussion of having a broad ethanol compromise discussion in the House where we finally work out although

we can't get blending credits done, but we work out some incentives for E-15, we take down the advanced biofuel targets, and maybe we tweak and adjust the 15 billion RFS. But that won't happen until it becomes visibly painful in a political way. That will happen only when you start to see what we haven't yet – and that is where the RFS is binding, where you are forcing that tax gap to be closed by RIN prices going up. Going with the price of gasoline and the *Wall Street Journal* saying, "Americans are paying a useless tax." We're sending taxpayer dollars to blenders – consumers of ethanol for no good reason because they are refusing to consume a product that cannot be produced by law. That's ridiculous!

If that discussion starts and comes into full bloom, that is when we will tweak it. The chances of that happening in the next year or two are pretty low, so I'd be low on that.

In terms of the RFS for the advanced biofuels, I think that could come within next year or two. Maybe we would have to wait through an election. By 2013, I'd be surprised if either EPA, using its authority under the Clean Air Act, or Congress hasn't drastically taken down some of those advanced biofuel targets.

Mr. Snead: May I add one more element to the discussion? Many are arguing the game changer is carbon constraints. Can you think out loud a little bit what the potential for biofuels will be if and when we see that first real carbon constraint?

Mr. Robert McNally: Depending on how the policy would be implemented, it could be significant, as Bruce said. They peg carbon tax on fuels and it will help certainly cellulosic. The problem is there is a debate - and again, as the Greens and the ag community fall out and start arguing more and more - what is the real carbon impact of biofuel subsidies and mandates?

Some would argue on a lifecycle basis, it's a loser. So it's chief for corn ethanol. It's very unlikely we'll put a carbon constraint on. It's more likely we will go to an energy tax of some sort in an eventual fiscal workout. Nevertheless, if we were to put a carbon constraint on, it would rekindle this debate about whether corn ethanol is really helpful in that way. What you do is steer more interest in investment and consensus to help the cellulosic and biodiesel and other forms of unquestionably less carbon-emitting biofuels.