

## **Outlook for US Biofuels**

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### **Introduction**

I am delighted to have been asked to discuss the outlook for US 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 entailed 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 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% 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 US 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 US, 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 United States 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.<sup>1</sup> 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.

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. And as ethanol's chief competitor in the oxygenate market – MTBE – was phased out due to concerns over water contamination, ethanol benefited further. In the last decade, both 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 US blend 15 bgy of ethanol into gasoline by 2015, which translates into a conversion of some 40% of the US corn crop into 10% of the gasoline pool. And 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 have come to believe ethanol is a winner in Washington. As Senator Feinstein 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 RFS. Of course, other factors were also at work in the commodity price boom. But there had been no prior official analysis by EIA or anyone else of the impact of the RFS on grain prices. Unusually 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. But in Washington perception matters as much as reality, and the perception was and is that

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<sup>1</sup> Glozer provides a superb summary of the history of ethanol policy support in the United States.

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, Greens held their noses and allied with ethanol. Greens 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 CO2 equivalent reduction.<sup>2</sup>) 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" 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 \$6bn per year blending 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 [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 us 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 blending 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 of 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,

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<sup>2</sup> CBO

despite higher projected oil prices,<sup>3</sup> due to higher corn prices and greater uncertainty around mandates.<sup>4</sup> IEA sees global biofuels rising from 1.8 mb/d to 2.3 mb/d by 2016, displacing some 5.3% of gasoline and 1.5% of diesel by 2016 on an energy content basis.<sup>5</sup> IEA does not expect cellulosic biofuels to achieve widespread cost competitiveness with conventional gasoline until 2030, despite aggressive mandates.<sup>6</sup> IEA projects advanced biofuels will rise from 20 kb/d now to 100-130 kb/d in 2016. Even DOE's forecasting arm, the Energy Information Administration, projects the US will fail to meet advanced biofuels targets by 2022.

## Looking Ahead

With the blending 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% 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.<sup>7</sup>) But on the other hand, the RFS has mandated 15 bgy of corn ethanol by 2015, requiring blending above the 10% 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% of gasoline but the RFS mandated more, RINs prices would rise as obligated parties sought to fulfill both mandates. But those higher RINs 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.<sup>8</sup>

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%, such as 15% ethanol or E15. Ethanol forces are trying to secure federal funding and indemnification for intermediate blend infrastructure and consumer acceptance. While EPA (grudgingly, I suspect) granted partial approval for E15 blends, they did so in 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.<sup>9</sup> 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-

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<sup>3</sup> IEA, p. 90

<sup>4</sup> IEA projects global biofuels rising from 1.8 mb/d to 2.3 mb/d by 2016, displacing some 5.3% of gasoline and 1.5% of diesel by 2016 on an energy content basis.<sup>4</sup> As for cellulosic biofuels, IEA<sup>4</sup> 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.

<sup>5</sup> IEA, p. 20

<sup>6</sup> EIA, March 24, 2011. <http://www.eia.gov/pressroom/presentations.cfm>, slide 4.

<sup>7</sup> Tyner, Dooley, Hurt, and Quear

<sup>8</sup> 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

<sup>9</sup> GAO

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 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.<sup>10</sup>

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 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 US grain markets will rise by about 25%. And volatility of US coarse grain prices in response to supply side shocks in energy markets will rise by almost one-half.<sup>11</sup>

### **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 US 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 a 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 RINs price.<sup>12</sup> This makes most analysts cautious about the outlook for biodiesel growth. IEA projects biofuel-based distillate will account for only 4% of diesel demand growth in the next five years, compared with having taken 9% over the last five.<sup>13</sup> EIA expects US biodiesel use to rise from 0.1% of total liquids supply or 0.6% of diesel fuel consumption in 2010 to 0.6% of total supply and 3.0% of diesel demand by 2035.<sup>14</sup>

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

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<sup>10</sup> Tyner

<sup>11</sup> Hertel and Beckman

<sup>12</sup> Babcock

<sup>13</sup> IEA, p. 20

<sup>14</sup> Annual Energy Outlook, EIA, 2011

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 3 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 payfor, but now a payfor 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.

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. But 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/kwh 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 United States. 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 US oil sector is now invested in corn ethanol. However other RFS mandates should be placed on downgrade watch. The US will have opportunities to export biofuels, as it is currently doing to Brazil and increasingly to Canada (which just introduced a 5% 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.<sup>15</sup>

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 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

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<sup>15</sup> Tyner

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 the Space Mountain 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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