

## THE FACTS ABOUT ETHANOL AND THE RENEWABLE FUEL STANDARD (RFS)

On April 27, information was circulated in a Dear Colleague letter criticizing ethanol and encouraging Congress to “provide relief” from the “unintended consequence” of the Renewable Fuel Standard (RFS). Attached to the letter was a two-page document that attempted to build a case against the RFS by rehashing long-disproven falsehoods, citing junk science, and mischaracterizing the results of various reports and studies. This fact sheet examines many of the exaggerated claims made in that document and responds to each with fact-based information from reputable sources.

**Claim:** “A National Renewable Energy Laboratory report from 2008 states that studies on ethanol and gasoline prices often fail to account for ethanol’s ‘negative impact on mileage performance’ and ‘the net impact [of ethanol in fuel]...can actually be an increase of the mileage-adjusted cost of gasoline for drivers.’”

**The Truth:** A number of recent analyses have clearly and compellingly shown that ethanol lowers gas prices. In fact, the main conclusion of the same NREL study is that ethanol meaningfully reduces gasoline prices, even when effects on mileage are considered.

- According to NREL, “The study’s major finding is that *ethanol helps to reduce U.S. gasoline prices today*, and could potentially play an even larger role in the future by helping to reduce crude oil prices (emphasis added).” The NREL study found that ethanol blending in the U.S. through 2008 was “keeping U.S. retail gasoline prices about *17 cents per gallon lower* than they would be with no ethanol (emphasis added)...” and the authors clearly pointed out that “...this takes into account the lower mileage impact of ethanol.”<sup>1</sup>
- Further, a 2011 study by economists at the University of Wisconsin and Iowa State University (the Center for Agricultural and Rural Development, or CARD) found that ethanol reduced U.S. wholesale gasoline prices by an *average of 25 cents per gallon from 2000 to 2010*. The authors found that in 2010 alone, ethanol reduced gasoline prices by *89 cents per gallon*.<sup>2</sup> This equates to *\$800 in reduced spending on gasoline* for the typical American household.
- Other economists have examined this issue as well. Experts from DOE and USDA found in 2008 that ethanol reduced gas prices by *20-35 cents per gallon*<sup>3</sup>, while Merrill Lynch analysts determined that gas prices would be *15% higher without ethanol* growth—that amounts to nearly *60 cents per gallon* at today’s prices.<sup>4</sup>
- Contrary to statements in the two-pager, the effects of 10% ethanol blends (E10) on mileage are trivial. More than 99% of the ethanol consumed in the nation today is in the form of E10, while

<sup>1</sup> <http://www.nrel.gov/analysis/pdfs/44517.pdf>

<sup>2</sup> <http://www.card.iastate.edu/publications/synopsis.aspx?id=1160>

<sup>3</sup> [http://www.ethanol.org/pdf/contentmgmt/USDA\\_DOE\\_biofuels\\_letter\\_61208.pdf](http://www.ethanol.org/pdf/contentmgmt/USDA_DOE_biofuels_letter_61208.pdf)

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[http://rcr.ml.com/Archive/10728832.pdf?q=jIPI9II8Z18NAIVu8bwqA&\\_gda\\_=1335894779\\_3f551a39ef46c8c2590e42e25091cd80](http://rcr.ml.com/Archive/10728832.pdf?q=jIPI9II8Z18NAIVu8bwqA&_gda_=1335894779_3f551a39ef46c8c2590e42e25091cd80)

less than 1% of ethanol is consumed as E85. According to EPA, when ethanol is used in E10, “...the theoretically expected decrease in fuel energy as a result of oxygenate use is in the 2% to 3% range when compared to gasoline. This corresponds to 0.5 to 0.8 miles per gallon for a car that averages 27 miles per gallon.”<sup>5</sup> This is less of a mileage reduction than drivers experience from underinflated tires or carrying extra weight in the trunk of their car.<sup>6</sup>

- Two major factors explain ethanol’s ability to reduce gas prices. First, ethanol is cheaper than gasoline; currently, ethanol sells for \$1 per gallon less than gasoline at the wholesale level. Second, and more important, is that ethanol reduces demand for gasoline in the aggregate, which exerts downward pressure on oil and gasoline prices. Indeed, the NREL study found that, “[e]thanol has become the main source of additions to the world fuel supply outside of OPEC, and thus has the potential to moderate crude oil prices by reducing demand for crude oil.”<sup>7</sup>

**Claim:** “Without the mandate, in a competitive marketplace, there would be no national market for corn ethanol as a motor fuel outside of its use as an octane booster. Even today, with gas prices reaching all-time highs, mpg-adjusted E-85 is more expensive than traditional gasoline.”

**The Truth:** This is an absurd statement that has no basis in fact. Ethanol production has always exceeded the volumes required by the RFS, proving that there is indeed strong demand beyond what refiners are required to use.

- In 2011 alone, U.S. ethanol production was 11% larger than the RFS required volume. Since the inception of RFS, actual ethanol production volumes have been 14% above RFS requirements on average. This suggests factors other than the RFS (e.g. high oil prices) are primarily driving ethanol production and use, and that the RFS has served mostly as a demand floor and as a signal to investors.
- Further, the fact that ethanol has been priced at a substantial discount to gasoline for much of the past four years has provided significant economic incentive for blenders to maximize their use of ethanol. Currently, ethanol is selling for \$1 per gallon less than gasoline, even after the Volumetric Ethanol Excise Tax Credit (VEETC) expired on Dec. 31, 2011.
- Because ethanol is the lowest cost motor fuel in the world, there is strong international demand as well. Countries that have no biofuel requirement whatsoever are importing U.S. ethanol because it is more economical than gasoline and extends their fuel supplies. In 2011, U.S. ethanol exports set a new record of 1.2 billion gallons, equivalent to roughly 8% of total production.
- Ethanol has significant value as an octane booster. With an octane rating of 113, ethanol is the cheapest and cleanest source of octane available today. As refiners produce more unmarketable sub-octane gasoline, more ethanol is needed to upgrade this gasoline to octane levels that meet requirements for sale into commerce. The oil industry itself has also acknowledged that ethanol’s additive properties (namely its octane value) are driving demand for nearly 60% of

<sup>5</sup> <http://epa.gov/oms/regs/fuels/ostp-3.pdf>

<sup>6</sup> <http://www.fueleconomy.gov/feg/drive.shtml>

<sup>7</sup> <http://www.nrel.gov/analysis/pdfs/44517.pdf>

the ethanol produced today. In testimony before Congress, the president of EPRINC, an oil industry research group, stated that, “ethanol is highly valuable...as an octane booster and as an oxygenate...” and even “[i]f we had no subsidies, we would use a lot of ethanol...”<sup>8</sup>

- Again, it is disingenuous to use AAA’s mileage-adjusted E85 prices to suggest that ethanol is “more expensive” than gasoline when mileage impacts are considered. First, less than 1% of U.S.-produced ethanol is consumed as E85. Second, ethanol is currently selling for two-thirds the price of gasoline at the wholesale level, which means the two fuels are being priced at parity on an energy adjusted basis. However, many retailers selling E85 fail to pass the full wholesale price savings on to consumers. In theory, E85 should produce 27% less mileage than straight gasoline, but practical experience shows the mileage loss when using E85 is typically in the 15-20% range. Finally, AAA’s E85 pricing survey methodology is questionable and appears biased toward those stations that markup E85 prices the most.

**Claim:** “If every kernel of corn grown in the United States in 2011 had been used to make ethanol it would have offset national gasoline consumption by just 16 percent.”

**The Truth:** This statement is yet another popular red herring that adds nothing constructive to the debate over biofuels. No one has ever suggested every kernel of corn should be used for ethanol, and no one has ever suggested corn ethanol alone can fully displace our nation’s thirst for crude oil. However, the facts are clear about ethanol’s significant contribution to the nation’s fuel supply and its meaningful impact on reducing oil imports.

- Today *ethanol represents 10% of the nation’s gasoline pool* by volume. In 2011, ethanol displaced the need for an amount of gasoline refined from *477 million barrels of crude oil*—that’s more oil than the U.S. imported from Saudi Arabia.
- Indeed, as a result of the RFS and increased ethanol use, *U.S. oil import dependence has fallen below 50% for the first time since 1997*. In 2005, the year the first RFS was passed by Congress, U.S. oil import dependence peaked at 60.3%. Subsequently, as ethanol production has ramped up, oil import dependence has fallen steadily and hit 45% in 2011, the lowest since 1994.<sup>9</sup> Oil imports from the Persian Gulf have dropped by some 300 million barrels since 2001, while ethanol production has grown by 300 million barrels during that same period.
- Ethanol’s contribution to displacing oil imports will increase in the future, as new feedstocks are used to produce advanced and cellulosic ethanol. The 36 billion gallons of renewable fuels required under the RFS in 2022 would constitute roughly *27% of the nation’s projected gasoline demand* and would *eliminate the need for Persian Gulf imports entirely*.

<sup>8</sup>[http://democrats.energycommerce.house.gov/sites/default/files/image\\_uploads/Trans\\_05.05.11\\_EP\\_AmericanEnergyInitiative.pdf](http://democrats.energycommerce.house.gov/sites/default/files/image_uploads/Trans_05.05.11_EP_AmericanEnergyInitiative.pdf). The EPRINC witness stated that ethanol’s demand as an additive is likely as high as 500,000 barrels per day, which is equivalent to roughly 60% of current production.

<sup>9</sup> [http://205.254.135.7/energy\\_in\\_brief/foreign\\_oil\\_dependence.cfm](http://205.254.135.7/energy_in_brief/foreign_oil_dependence.cfm)

- While an “all-of-the-above” energy strategy will be needed to fully wean the U.S. transportation sector off of imported oil, the RFS and ethanol have already made meaningful contributions and have laid the foundation for ever larger strides toward enhanced energy security.

**Claim:** “From 2005-2009, taxpayers spent a whopping \$17 billion to subsidize ethanol. In return, they got a reduction in overall oil consumption equal to an unimpressive 1.1 mile-per-gallon increase in overall fuel economy.”

**The Truth:** The ethanol industry didn’t fight for an extension of the tax credit and it was allowed to expire at the end of last year.

- The ethanol blender’s credit was a highly successful initiative that accomplished what all energy tax incentives programs should aspire to: help build an industry, get it to stand on its own two feet, and then expire.
- Moreover, by enhancing the value of the agricultural commodities produced by American farmers, the emergence of biofuels has helped to significantly reduce farm program payments over the past decade. Payments to farmers have fallen by nearly 60% since 2005, amounting to some \$11 billion in reduced government spending.<sup>10</sup>

**Claim:** “Today the United States burns over 40% of its corn for fuel, and estimates for the coming year are even higher. More corn goes to the production of ethanol than to either food and seed production or to animal feed.”

**The Truth:** This statement is false and misleading. It ignores the contribution of the animal feed produced by the ethanol industry and misquotes USDA data.

- USDA’s latest estimates project that 37% of the 2011/12 corn supply will be used for “ethanol & **by-products**.”<sup>11</sup> These “by-products” are nutrient-dense animal feed ingredients known as distillers grains, corn gluten feed, and corn gluten meal. Only the starch portion of the corn kernel is used to produce ethanol; the remaining fat, fiber, and protein pass through the process and return to the feed market. In fact, *one-third of every bushel of corn used for ethanol remains available as animal feed*. In 2011 alone, the U.S. ethanol industry produced nearly *39 million metric tons of feed*, which was consumed by beef and dairy cattle, swine, poultry, and fish around the world. When these animal feed co-products are properly accounted for, the *net usage of corn for ethanol is 25%* of the 2011/12 supply.
- When these animal feed co-products are added to the amount of whole corn fed to livestock, *animal feed remains as the top use of U.S. corn* (6.2 billion bushels of corn and ethanol feed co-products will be used for feed use in 2011/12 versus 3.4 billion bushels of net corn use for ethanol).

<sup>10</sup> [http://www.fsa.usda.gov/Internet/FSA\\_File/pb12\\_tbl35.pdf](http://www.fsa.usda.gov/Internet/FSA_File/pb12_tbl35.pdf)

<sup>11</sup> <http://www.usda.gov/oce/commodity/wasde/latest.pdf>

- The contention that “...estimates [of corn use for ethanol] for the coming year are even higher...” is just plain wrong. USDA’s estimate of 2010/11 corn use for ethanol and animal feed co-products is 5.021 billion bushels, compared to 5.0 billion bushels for 2011/12 and 4.95 billion bushels for 2012/13. USDA projects corn use for ethanol and co-products will actually stay below 5 billion bushels until 2015/16, and from there growth is very modest, averaging just 1% per year through 2022.<sup>12</sup>
- The document also misses the point that U.S. corn production has increased tremendously in recent years, meaning plenty of corn is available for all users. The average annual U.S. corn crop averaged 7.2 billion bushels in the 1980s, 8.6 billion bushels in the 1990s, 10.2 billion bushels in 2000-2005, and 12.3 billion bushels since 2006. Thus, new corn supplies resulting from increased production have been available to the ethanol market without affecting availability of corn for traditional users.

**Claim:** “Greater U.S. demand for corn due to the RFS has contributed to higher corn prices. Since 2005 and the inception of the RFS, the price of a bushel of corn has risen over 300%. The price per bushel of corn rose from a range of \$2.00 in 2005/06 to an average of \$5.18 for the 2010/11 marketing year, and USDA estimates for the coming year are in the \$6.00-\$6.40 per bushel range.”

**The Truth:** It is true that corn prices have risen substantially in recent years, but so have prices for all commodities. World crude oil prices have more than doubled since 2005, and prices for commodities from copper to coffee to gold have increased dramatically. Attributing the entire increase in corn prices, or even a significant portion of it, to the RFS is indefensible and completely contrary to the results of recent analyses examining the impact of ethanol policy on grain and food prices.

- A host of factors, including higher fuel and fertilizer prices, increased financial speculation in commodities markets, extreme weather conditions, rapidly increasing demand in emerging markets, currency valuations, trade policy and export embargoes, and higher labor costs, have all contributed to higher prices for agricultural commodities.
- Recent studies by the International Centre for Trade and Sustainable Development (ICTSD) and CARD at Iowa State University conclude that the RFS has had *no discernible impact* on retail food prices and only modest impacts on grain prices. The ICTSD study, which simulated grain prices and retail prices for chicken, beef, pork, and eggs *with* and *without* U.S. ethanol policies from 2005-2009, found that *the RFS “...had little impact on consumer prices and quite modest impacts on crop prices* (emphasis added).” The study shows corn prices wouldn’t have been even one cent per bushel different in 2009/10 (the last year examined by the study) with or without the RFS in place. Similarly, prices for wheat would have been only 3 cents per bushel lower (0.6%) without the RFS, prices for soybeans would have been just 16 cents per bushel lower (1.8%), and prices for rice would have been just 4 cents per hundredweight lower (0.3%).<sup>13</sup>

<sup>12</sup> Ibid and <http://www.ers.usda.gov/Publications/OCE121/OCE121d.pdf>

<sup>13</sup> <http://ictsd.org/downloads/2011/12/the-impact-of-us-biofuel-policies-on-agricultural-price-levels-and-volatility.pdf>

- Similarly, the CARD study found that “...most of the change in corn prices that we have seen is not due to ethanol expansion but rather is due to other forces at work.” The authors also concluded that “...ethanol subsidies have played a minor role in determining the size of the corn ethanol industry. Thus, ethanol subsidies have *contributed little to corn prices or to food price inflation* (emphasis added).”<sup>14</sup>

**Claim:** “Higher corn prices have led to record low amounts of corn available for feed for animal agriculture. Lower feed availability has meant a 23% meat price increase for consumers due to lower output with significant job losses occurring in the animal agriculture sector because of bankruptcies and downsizing.”

**The Truth:** This statement is not supported by the numbers and ignores the contribution of animal feed co-products manufactured by the ethanol industry, as discussed earlier. Suggesting that the corn available for feed is at a record low amount is simply not true.

- The amount of corn and ethanol co-products fed to livestock averaged the equivalent of 4.4 billion bushels in the 1980s, 5.3 billion bushels in the 1990s, 6.3 billion bushels from 2000 to 2005, and 6.4 billion bushels since 2006.
- According to USDA, prices for meat, poultry and fish grew *just 1.9% in 2010*, well below historical annual food inflation rates. Egg prices similarly advanced *just 1.5% in 2010*. USDA forecasts prices for meat, poultry and fish will grow 3.5-4.5% and prices for eggs will increase 1-2% in 2012, in line with normal inflation rates.<sup>15</sup>
- The ICTSD study referenced earlier showed that prices for meat and eggs were virtually unaffected by the RFS from 2005/06 to 2009/10. The study found, “The only discernible difference in egg and meat prices from ethanol subsidies is in 2008 *when egg prices would have been two cents per dozen lower than they were*. The reason for such a small price impact is that *feed prices make up a small share of retail prices* and because the feed cost impacts from ethanol subsidies over this period are small (emphasis added).” Similarly, the CARD study concluded that the “...relatively small change in corn prices necessarily implies that the contribution of ethanol subsidies to food inflation is largely imperceptible in the United States.”<sup>16</sup>
- Finally, recent earnings statements from large, corporate meat producers show the industry to be in good financial health. Information from USDA also show livestock receipts at the farm level reaching record levels in 2011. Further, data from the Bureau of Labor Statistics show jobs related to meat processing and rendering being higher in 2011 than 10 years ago in 2002. Similarly, jobs related to dairy product manufacturing are at their highest level since 2003.<sup>17</sup>

<sup>14</sup> [http://www.card.iastate.edu/policy\\_briefs/display.aspx?id=1155](http://www.card.iastate.edu/policy_briefs/display.aspx?id=1155)

<sup>15</sup> <http://www.ers.usda.gov/Briefing/CPIFoodAndExpenditures/Data/cpiforecasts.htm>

<sup>16</sup> See footnotes 14 and 15.

<sup>17</sup> <http://www.bls.gov/data/#employment>

**Claim:** “Riots erupted in 30 countries when 100 million people fell into extreme poverty during the 2008 global food crisis. The World Bank and other experts agree that U.S. and EU biofuel policies created a demand shock to global agriculture systems, pushing prices up.”

**The Truth:** Retrospective analyses by a number of economists, including experts at the World Bank itself, have concluded that the 2008 food crisis was primarily the result of the speculative bubble in the oil market, increased speculation in commodities, and extreme weather. U.S. biofuels policies had little, if anything, to do with the higher food prices experienced worldwide in 2008.

- A 2010 analysis by the World Bank concluded that “...the effect of biofuels on food prices has not been as large as originally thought... the use of commodities by financial investors may have been partly responsible for the 2007-08 spike.”<sup>18</sup> Similarly, the United Kingdom’s Department for Environment, Food and Rural Affairs found in 2010 that, “Available evidence suggests that *biofuels had a relatively small contribution* to the 2008 spike in agricultural commodity prices (emphasis added).”<sup>19</sup>

**Claim:** “Because the U.S. controls 50% of the corn export market, domestic and global corn are operating increasingly in tandem. When our prices go up, so do prices for families in developing countries. The global price of corn rose 84% in 2011. In import-dependent Uganda, where families spend over 60% of their income on food the price of corn in local markets rose between 80-122% in the same time period.”

**The Truth:** U.S. and world corn prices have always been tightly linked, and there is evidence that the linkage has actually weakened in recent years.

- U.S. corn exports have remained steady over the past decade, and if exports of ethanol feed co-products are considered, exports of corn and corn co-products are actually trending upward.
- Further, U.S. corn exports have always fed livestock and poultry in developed nations like Japan and Mexico, not humans in underdeveloped countries like Uganda. Since 2000, just 0.1% of U.S. corn exports have gone to the ten least developed countries.<sup>20</sup> That’s because feed corn is not a staple food source for families in developing countries. As demonstrated by the ICTSD study, prices for staple food grains like rice and wheat have been unaffected by U.S. biofuels policy.

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<sup>18</sup> [http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2010/07/21/000158349\\_20100721110120/Rendered/PDF/WPSS371.pdf](http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2010/07/21/000158349_20100721110120/Rendered/PDF/WPSS371.pdf)

<sup>19</sup> <http://archive.defra.gov.uk/foodfarm/food/pdf/ag-price-annex%205.pdf>

<sup>20</sup> <http://www.fas.usda.gov/gats/default.aspx>



**Claim:** “A recent National Academy of Sciences study found that the RFS is increasing air pollution, increasing greenhouse gas emissions, degrading water sources, and damaging biodiversity.”

**The Truth:** The document’s characterization of the NAS study’s findings is misleading. Far from making definitive conclusions about the RFS’ impacts on air quality, water quality and biodiversity, the NAS study qualitatively discussed the potential positive and negative effects of biofuels expansion under various hypothetical scenarios. The NAS study was also criticized for relying on outdated and incomplete information.

- Indeed, the NAS study committee co-chairs state at the outset of the report that “...our clearest conclusion is that there is very high uncertainty in the impacts we were trying to estimate.” They go on to write that, “[t]he bottom line is that it simply was not possible to come up with clear quantitative answers to many of the questions.”
- Further, Dr. Virginia Dale of Oak Ridge National Laboratory, a member of the NAS study committee, stated that “...the report is not based on the most current information.” Dale warned that readers should exercise caution in interpreting the study’s results, stating, “[s]trictly speaking, this report is not a conclusion and should not be read as such but rather a report on work in progress.”<sup>21</sup>
- Data from EPA and independent studies show ethanol reduces emissions of carbon monoxide by as much as 30% and fine particulate matter by as much as 50%. Ethanol also displaces toxic compounds—such as benzene and toluene—from gasoline.<sup>22</sup>
- Numerous studies have demonstrated that ethanol is significantly reducing GHG emissions compared to gasoline. When fairly compared to gasoline (i.e., accounting for direct emissions only), ethanol reduces GHG emissions by 35-50%, according to most studies.<sup>23</sup> *Even when the questionable theory of indirect land use change (ILUC) is applied*, recent research from the Department of Energy’s Argonne National Laboratory and Purdue University shows current corn ethanol reduces GHGs by 24%.<sup>24</sup>
- Analyses from the NREL, Argonne National Laboratory, University of Illinois-Chicago, and Carnegie Mellon University show that the ethanol industry’s water use is improving dramatically with room for further reductions. Recent survey data shows average water use has fallen to 2.7 gallons of gallons per gallon of ethanol, with much of the water being recycled.<sup>25</sup> That’s down 40% from the mid-1990s, and researchers at Carnegie Mellon found water use in ethanol production is likely to fall further to 1.2 gallons of water per gallon of ethanol.<sup>26</sup>

<sup>21</sup> <http://www.forestbusinessnetwork.com/9009/nrc-report-on-rfs-misses-some-real-world-biofuel-industry-developments/>

<sup>22</sup> Gary Z. Whitten, *Air Quality and Ethanol in Gasoline*, Smog Reyes (2004); see also EPA420-D-06-008 (September 2006) at <http://www.epa.gov/otaq/renewablefuels/420d06008.pdf>.

<sup>23</sup> See, for example, Liska et al.: [http://www.ethanolrfa.org/page/-/objects/documents/2110/2009\\_jie\\_improvements\\_in\\_corn\\_ethanol-liska\\_et\\_al.pdf?nocdn=1](http://www.ethanolrfa.org/page/-/objects/documents/2110/2009_jie_improvements_in_corn_ethanol-liska_et_al.pdf?nocdn=1)

<sup>24</sup> <http://www.sciencedirect.com/science/article/pii/S0961953411000298>

<sup>25</sup> <http://www.ethanolrfa.org/page/-/EthanolSurveyReport.pdf?nocdn=1>

<sup>26</sup> [http://egon.cheme.cmu.edu/Papers/Water\\_consumption\\_CornethanolAhmetovicMartinGrossmann.pdf](http://egon.cheme.cmu.edu/Papers/Water_consumption_CornethanolAhmetovicMartinGrossmann.pdf)



- Further, data show that producing a gallon of ethanol requires the same, or less, water than producing a gallon of gasoline.<sup>27</sup> In fact, the Pembina Institute found that tar sands mining requires “...approximately 12 barrels of water to produce each barrel of bitumen in surface mined oil sands operations...”<sup>28</sup>

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<sup>27</sup> <http://www.ethanolrfa.org/page/-/rfa-association-site/studies/waterusagenrel.pdf?nocdn=1>

<sup>28</sup> <http://www.pembina.org/oil-sands/os101/water>