Testimony, Michael McAdams
President, Advanced Biofuels Association
House Energy & Commerce Committee, Environment Subcommittee

Friday, June 22, 2018

Executive Summary

The members of the Advanced Biofuels Association strongly support efforts by the House Energy and Commerce Committee to update and reform the RFS program.

Ten years have passed since this program was originally designed and a great deal has been learned about the strengths and weaknesses of the RFS. Since 2007, EPA has been forced to grapple with challenges applying the statute to a wide range of circumstances that could not be considered when the law was first passed. The Committee now has an opportunity to address the shortcomings of the statute, and we urge you to do so.

Today, there are far broader technology options than the first-generation ethanol or biodiesel processes available at the program's inception. This must be kept in mind in order to produce the advanced and cellulosic fuels of the future. On the success front, biodiesel production is three times what was originally anticipated. If a rules-based system is used as the basis for the annual RVO and the small refinery exemptions are used appropriately, biodiesel will continue to be the largest source of high GHG-reduction fuels in the short and medium term. Not to mention that these fuels have created good competition in the marketplace and reduced fuel costs for millions of truck drivers across the country.

ABFA members support top-line provisions including:

1. **A rules-based process for setting the annual RVO mandates** that bases the RVO on actual gallons produced in the previous compliance year. Mid-year and end-of-year adjustments would account for increases or decreases in production.

2. **Clarification on the cellulosic waiver credits** so that those credits can only be used after the cellulosic RINs generated from actual fuels are used. In this case, the credits would only be needed if there was a shortfall of RINs available preventing achievement of the annual RVO. Our proposed RVO fix takes care of this issue.

3. **Guarantee the RINs generated by advanced and cellulosic facilities for a minimum of 20 years** to attract capital and build the next generation of industry.

This testimony identifies a number of specific ambiguities in the existing statute that must be addressed to allow the use of a broader range of technologies and feedstocks. Additionally, we have made a number of suggestions to address issues that need to be resolved immediately, such as the treatment of biointermediate feedstocks and fuels generated from facilities that are not co-located.

Finally, ABFA members ask the Committee to specifically revisit the provisions allowing EPA to grant exemptions to small refineries, as we believe the EPA Administrator has overused this provision. Granting too many of these exemptions undercuts the very essence of the program and, if it is not addressed, renders the entire RVO process meaningless.

WRITTEN TESTIMONY OF MICHAEL MCADAMS
PRESIDENT, ADVANCED BIOFUELS ASSOCIATION

HOUSE COMMITTEE ON ENERGY AND COMMERCE
SUBCOMMITTEE ON ENVIRONMENT

HEARING ON "ADVANCED BIOFUELS UNDER THE RENEWABLE FUEL STANDARD: CURRENT STATUS AND FUTURE PROSPECTS"

FRIDAY, JUNE 22, 2018

Mr. Chairman, Mr. Ranking Member, and Members of the Subcommittee:

My name is Michael McAdams and I am the President of the Advanced Biofuels Association (ABFA). I'd like to thank you for the opportunity to testify this morning on the current status and future prospects of the RFS program. As you all know, the RFS has resulted in both great successes as well as underperformance in the advanced and cellulosic spaces. Today, I will address the good news as well as the shortfalls and discuss potential RFS enhancements as a follow-up to the conversations held by the Committee last year.

The Advanced Biofuels Association represents over 35 companies who produce, distribute and market advanced biofuels approved under the RFS2 program. We represent over four billion gallons of biodiesel and renewable diesel as well as the two largest distributors and marketers of biodiesel and renewable diesel in the United States. Three of our members alone distribute over 20 of the 55 billion gallons of diesel fuel used annually in the United States, operating in all of the lower 48 states. In total, our members' domestic biodiesel production is close to 50% of all the biodiesel produced in the United States, and our international footprint includes the world's largest producers of both biodiesel and renewable diesel. In the cellulosic space, ABFA represents three of the new plants breaking ground this year - Fulcrum, Red Rock, and Ensyn – these plants will produce drop-in diesel fuel, gasoline, and jet fuel.

Before I begin, a reminder that there are two very distinct fuel markets in the United States: diesel and gasoline. As I suggested during the stakeholder meetings last year, these markets are very different and need to be considered independent of each other. Growth in the diesel market will continue to exceed the gasoline market worldwide, and some renewable diesel production facilities will also make "drop-in" gasoline components and jet fuels. Should the Committee choose to move forward on RFS reform, which ABFA supports and believes is critical to the development of the advanced biofuels sector, it's important to bear in mind the distinctions between gasoline, diesel, and jet fuel.

In addition to my written testimony, I have attached a list of suggestions to address issues with the existing statute that ABFA members believe need to be resolved legislatively. We believe these changes will enhance our collective opportunity to deliver the next generation of advanced biofuels. (See Appendix A.)

Let me begin by stating again that ABFA strongly supports your efforts to reform the RFS. We believe that comprehensive reform will actualize the vision for advanced renewable fuels that this Committee and Congress as a whole overwhelmingly supported when it passed the RFS2 in 2007. These fuels will extend our hydrocarbon resources, allowing us to incorporate into our fuel supply renewable resources developed both sustainably and affordably on a standalone economic basis. Proper reform of the RFS will distribute biofuels to all regions of our great country. It will also utilize a far more diverse set of feedstocks and technologies while creating jobs across the entire U.S. It is to that end that we look forward to working with you on your efforts to strengthen the RFS and make the industry even more efficient, economically competitive, and sustainable.

Advanced Biofuels Successes Under the RFS

First, I'll turn to what is without a doubt the overwhelming success story in the advanced biofuels space under the RFS program: biodiesel and renewable diesel. The program originally called for 1 billion gallons of biomass-based diesel; in the last two years, over 2.7 billion gallons has been used annually in the U.S. This year, the market should again approach 3 billion gallons of biomass-based diesel. (See Appendix B for RINs and gallons generated in 2016 and 2017 according to EPA EMTS data.)

For those of you interested in climate change, advanced biofuels deliver the most significant GHG emissions reductions of all the fuels manufactured in the United States. By law, the environmental performance of these gallons deliver reductions of at least 50%, and many of them deliver reductions of 80%. These fuels count toward meeting the biomass-based diesel category, referred to in the program compliance world as the D4 diesel pool, though many of these processes also produce at least 10% renewable gasoline components that qualify for the general advanced category, referred to as the D5 advanced biofuels pool.

This achievement has been accomplished since 2010 in spite of the uncertainty surrounding the biodiesel blenders tax credit. The on-again, off-again implementation of the credit limits the future investment in the market that is a key driver for growth. This year, the diesel market is unfortunately once again forced to operate without knowing whether the credit will be retroactively renewed for 2018.

Suggestions for RFS Reform

I'll turn now to improvements that can be made to the RFS program. The biogas industry has helped deliver the majority of the existing volume in the cellulosic biofuel space, which reached over 250 million gallons last year. However, we still have a long way to go to achieve the targets originally envisioned for the cellulosic sector in the RFS2. As ABFA suggested in last year's stakeholder meetings, the changes needed to make the program function as intended for the advanced and cellulosic sectors fall into three categories. One, simple statutory adjustments to timeframes, definitions, and other items found in our attached list; two, addressing major, debilitating ambiguities in the statute; and three, adjusting EPA's regulatory framework using a common-sense approach. As much as possible, we urge Congress to take politics out of the equation by adjusting the RFS toward being a rules-based system.

A. Statutory adjustments

The Committee should consider starting with adjusting how the annual RVO is set. ABFA commends Congressman Welch for his efforts to address this issue in his recently introduced legislation, H.R. 5212, the GREENER Fuels Act. This proposal would shift the compliance period for the RFS, releasing the annual RVO on March 1 with the mandates for each pool set at previous year's levels according to data from EPA's EMTS system. Mid-year and end-of-year adjustments would then account for increases or decreases in production. This rules-based system would remove the uncertainty and speculation surrounding the RVO and therefore reduce volatility in the program and RIN market.

The second key statutory issue is the cellulosic waiver credit. EPA currently grants as many cellulosic waiver credits as gallons projected for the forthcoming year under the RVO process. This allows obligated parties to purchase waivers in lieu of purchasing cellulosic fuel actually produced. This undermines the potential of the very fuels the RFS2 sought to encourage. EPA should only grant waiver credits to cover any shortfall in actual production relative to the RVO mandates. The RVO process fix I previously outlined would eliminate this issue.

Third, to finance the production of the advanced liquid transportation fuels of the future, investors must have certainty in the value of the RIN well beyond 2022. The Committee must designate a minimum number of years for which these fuels will be able to generate a RIN under the program. To best facilitate investment, we suggest a minimum 20-year timeframe for the life of the advanced biofuel program as that is the general term of debt for most capital loans.

B. Addressing statutory ambiguity

EPA's treatment of one-cell organisms is a prime example of the ambiguity in the statute and its negative impact on advanced biofuels development. Currently, we allow one-cell organism pathways for algae, but not bacteria. Another example: the statute includes "waste" as a permissible feedstock, but it is unclear what is meant by this term. Is tall oil a "waste," given that it is only 2% of the residue from a tree?

I know of a company that hoped to build a plant in Maine, but because of EPA's interpretation of the language in the law, the Agency could not definitively determine that tall oil could count under the definition for use in the capacity it was requested. Ultimately, the company sited this plant in Sweden to use tall oil and make renewable diesel. I also know of a one-cell organism technology which was forced to site its plant in China instead of the U.S. because the law specifically cites fuels produced from algae as acceptable and not fuels produced from bacteria under the definitions for RFS-compliant fuel. Again and again, because of this statutory ambiguity, EPA has been forced to make subjective judgments that have rendered the U.S. market less attractive for advanced renewable fuel producers.

C. Regulatory changes

The RFS's regulatory framework has created barriers to the advanced and cellulosic sector unintended by Congress.

A prime example of this issue is the RFS's treatment of biointermediates which are approved feedstocks that are only partially processed at one facility and then finished into a compliant renewable fuel at another. EPA has taken the stance that plants generating biointermediates and the final fuel must be co-located in order to generate a RFS-compliant fuel. Additionally, a refiner engaging in co-processing and upgrading to processing fuels from a renewable oil must currently use carbon-14 dating to prove its conversion rate for compliance with the RFS. This is unrealistic for most refineries, as carbon-14 dating is prohibitively expensive, especially when renewable oils usually comprise less than 10% of the slipstreams being co-processed at these facilities.

Such regulatory requirements have missed the forest for the trees, driving up the cost of compliance and making renewably-produced fuels uncompetitive compared to incumbent hydrocarbon fuels.

Another example of a devastating regulatory issue with the RFS program is the treatment of wood. I thank Chairman Walden for his leadership in trying to work with EPA to address the challenges in the wood space, as this issue has killed a number of good projects in the U.S.

EPA's regulations currently require producers to segregate wood so as to track whether the wood residues come from approved sources for RFS-compliant fuel. However, the wood products industry has long-established operational processes that make it nearly impossible to know where each and every stick of wood used in biofuel production comes from. This has blocked industry from moving forward with many new technologies that would transform wood into renewable fuels, including jet and diesel fuel. EPA's regulations need revision to allow for an aggregated, mass-balance approach to compliance in lieu of segregation, lowering the cost of production to competitive levels.

Furthermore, as it stands, landowners in many states may cut down a naturally regenerating tree to create pellets that are shipped to Germany, but they cannot use even the thinnings and cuttings from such wood to make an RFS-compliant fuel. This is not just a regulatory issue but a direct result of the legal interpretation of the statutory language. This is simply foolish.

Small Refinery Exemptions

In addition to these longstanding issues, EPA Administrator Pruitt has recently chosen to unilaterally lower the threshold that EPA utilizes to grant RFS compliance exemptions to small refineries. Based on what has been reported in the press, we suspect that EPA has granted up to 30 exemptions for small refineries in compliance years 2016 and 2017 **-** three times what we have seen previously. According to EPA's own May 14 presentation to OMB, this alteration will create over 1.2 billion additional carry-over RINs for use in the 2018 compliance year. EPA documentation also predicts 2.8 carry-over RINs for 2019 – which leads one to believe that the Agency may be intending to follow a similar approach next year for granting exemptions.

The significantly higher number of these small refinery exemptions stand to reduce the demand for renewable fuel by flooding the market with RINs that do not reflect current production and available physical supply of product, despite a growing annual RVO. This process must be halted, as it is undermining the very RVO process in and of itself.

EPA is misusing this provision, stretching the definition of "disproportionate economic hardship" in order to lower RIN prices for the benefit of a small number of merchant refiners that have refused to invest in RFS compliance over the last ten years. As RFS compliance costs were already passed along to consumers through the crack spread, EPA's actions allow a small number of companies to profit off of

American consumers – not to mention endangering renewable fuel blending in 2018 and 2019 because of the new carry-over RINs. (See Appendices C, D, and E).

Congress must make explicit its intent to protect only those small, independent refineries experiencing verifiable, disproportionate, and significant economic hardship, and not to further augment the results of highly profitable refiners.

Conclusion

Again, thank you for the opportunity to testify today and for your work in reviewing the Renewable Fuels Standard. Many of our suggestions today are obvious now as we have had an additional ten years of development in the advanced industry since the RFS2 was passed. When the program was drafted, Congress and the nation understood biodiesel and ethanol. But, newer technologies using new feedstocks have developed, and, in many instances, they utilize two-step processes. The original statute was simply not drafted to allow for this, and the oversight that this Committee has done should point you in new directions compared to what we could understand and achieve in 2007. ABFA looks forward to working with Members of the Subcommittee to continue to build upon the successes of the RFS to further develop the advanced and cellulosic sectors, and I look forward to answering any questions you have today.

Appendix A. RFS Reform Proposals

RVO SETTING

1. Automatically set RVO based on previous year's renewable fuel production volumes with mid-year adjustment for new production facilities or expansion of current facilities.

Move the date that the RVOs are set from November 30th to March 1st. This allows EPA to simply take the renewable fuel production volumes from the previous year, published in the second week of February, and use them to set the next year's RVOs without forecasting. By providing a mid-year adjustment, this practice would reward the market for new production by adding a higher volume mandate at the midyear point. This will have a positive impact on RIN values. It also removes EPA's need to analyze feedstock availability and the "phantom fuels" issue, as the market will do this automatically.

CELLULOSIC FUELS AND CWCS

2. Amend cellulosic RVO fulfillment to require RINs generated in the current year to be purchased ratably, and allow Obligated Parties to purchase waiver credits *only in the event of RVO shortfall* after the close of the compliance year.

The current manner in which EPA issues cellie waiver credits is to issue waiver credits in an amount equal to the cellie RVO. This eliminates any need for Obligated Parties to buy actual cellie RINs generated by fuels production. Additionally, it lowers the RIN value for the pool we want to grow the most, as there are plenty of RINs for purchase. At a minimum, the volume of waiver credits issued should only be that which makes up for the shortfall between actual gallons produced and those mandated.

3. Add extra support for cellulosic fuels by adjusting the current formula for cellie gallons to $4.00 minus the wholesale price of gasoline

This alteration would help offset the cost of capital, allowing cellie fuels to be more competitive head-to-head with first generation ethanol. The RIN should be strengthened for cellulosic fuels, coupled with a revision of the waiver credit to make it clear that the RIN will have value for a minimum of 20 years after the plant becomes operational. This will provide a solid revenue flow and sufficient amount of time to make the cellulosic fuels competitive with first generation fuels.

RINS

4. Provide certainty for new plants' RIN value after 2022 by ensuring a 20-year use of the RINs under the RFS from the time the plant is turned on.

One of the biggest challenges to financing new advanced biofuels plants is when the bank asks, "what happens after 2022?" Most banks refuse to give any value to RINs after 2022 when evaluating the project for financing, which cripples their ability to procure credit and/or private capital. Banks would see that the facility will have a better cash flow and the financing over 20 years, providing more confidence in lending to the sector.

5. Grant extra RIN credits/gallon for exceeding GHG requirements of advanced and cellulosic fuels and for drop-in fuels in order to encourage better renewable fuels.

This is a new concept that would reward fuels exceeding the 50% or 60% GHG reduction requirements under the RFS program. Under this proposal, if a producer choses to use feedstocks that earn higher GHG reductions, such as used cooking oil, and made a D4 renewable diesel with an 80% GHG reduction over baseline diesel fuel, he would receive 1.7 RINs per gallon for the fuel's Btu content plus an extra 0.3 RINs for exceeding the 50% requirement for the pathway. It would reward both more sustainability and higher-quality fuels. Drop-in fuels could also earn extra RINs/gallon.

6. Allow D7 cellulosic diesel RINs to be used in all four RVO categories.

A drop-in cellulosic diesel fuel is one of the most difficult fuels to produce; it is the "holy grail" of renewable fuels. To encourage new technologies in this arena, the D7 RIN should be usable in all four RVO categories. Today, it can only be used in, at most, three RVO categories. This is no different from biogas-derived fuels or biodiesel, despite the higher quality and greater desirability of this fuel. If the D7 RIN was usable in all four RVO categories, it would automatically command a higher price in the marketplace and incentivize additional production.

7. Permit renewable fuels to be used to fuel ocean-going vessels and obtain RINs under the RFS.

If fuel is sold for use in a cruise ship, the seller of the fuel must retire the RIN as this fuel is not considered a "Transportation Fuel" under the RFS. This would expand a target market for the use of environmentally sustainable fuels.

8. Provide a 2X RIN value plus-up for biofuels produced from cover crops

Cover crops are non-commodity crops grown to protect soil in fallow fields during off rotation from commodity crops. Cover crops provide benefits such as erosion prevention, nutrient retention, improved water quality, increased yield, and carbon sequestration. Examples of cover crops are carinata and winter wheat vs. commodity crops which are classified as corn, soybean, canola, and sorghum. Despite the many benefits of cover crops, only a small percentage of farm operations have incorporated cover crops into their rotations. To increase the use of these crops, increase carbon sequestration, provide for further GHG reduction and provide for more biomass for the renewable fuels policy; compliant biofuels produced from cover crops will get a plus up of 2 times the RIN value in the Cellulosic (D3), Advanced (D5), or Biomass based Diesel (D4) pool.

DEFINITIONS

9. Remove the strict limitations on wood-related feedstocks to allow for regenerative species grown on private lands to be utilized.

Loblolly pine is abundant and harvested on private lands, but the tree is not usable to make a renewable fuel. This species alone would provide a tremendous feedstock base of wood for the industry to utilize in making drop-in cellulosic fuels. These and other privately owned/harvested trees should be allowed as renewable fuel feedstock, as the wood is currently used to produce pellets anyway—and a large portion of these pellets are exported out of the U.S. This could also be fixed via EPA's approval of a planted tree pathway.

This fix would enable a number of additional states such as Oregon, Maine and the Southeast to be able to build and manufacture advanced drop-in biofuels.

10. Allow for wood wastes such as sawdust and chips generated from mills to be used to make renewable fuels.

Likewise, true mill wastes such as sawdust and chips should also be allowed to be used to produce fuels; they are also used today to produce pellets or in lesser-value applications.

11. Expand the definition of single-cell biological organisms beyond just algae.

Algae is specifically addressed in the RFS2 statute, but not other single-cell organisms. This has effectively prevented their approval under the RFS program to date. The statute should apply to all single-cell biologic organisms in order to allow a level playing field for varying technology pathways; especially as the market has evolved and multiple technologies are oftentimes combined to produce fuels.

12. Clarify the definition of "waste."

The current definition of "wastes" is an abstraction concerning coproducts such as tall oil from trees, biogenic oils, and other compounds which can be used to produce fuels, but also to make other products such as chemicals, candles, etc. Producers who use these feedstocks to make non-fuel products argue that these materials are not "waste" under the RFS and should be reserved for the other uses—not fuels. This has eliminated some of the highest market-value materials and reduced the number of cheap feedstocks available to produce RFS-compliant fuel.

13. Biogas produced from any type of digester should make cellulosic D3 RINs, regardless of the feedstocks the digester receives, provided that the biogas is still used as a transportation fuel in the form of CNG or LNG.

A digester that takes in fats/oils/greases and produces a biogas generates a D5 RIN. If these wastes are instead dumped into a landfill, the biogas produced from the landfill generates a D3 RIN. We should be encouraging investments in technologically-advanced digesters to alleviate the issues and odors resulting from dumping these wastes into landfills.

14. Address intermediate feedstock definitions to allow derivatives of approved feedstocks to be used to produce renewable fuels eligible for RIN generation.

Currently, if you make an algal oil and then further refine it at a processing facility not co-located with the algae facility, you are denied the ability to generate a RIN for the production of the final renewable fuel. Renewable fuel producers are constantly seeking the lowest-cost feedstocks, and these feedstocks are inherently wastes that cannot be used for anything else due to their toxicity. The worse the feedstock characteristics, the more it needs to be pre-processed to make it usable for producing motor vehicle fuel substitutes. While the EPA currently has a pending rule which would address this issue, the rule has been set aside by the current Administration.

This fix will allow the industry to benefit from the most cost-effective feedstock and cost-effective processing location without having to rebuild—leading to the economic fuel entering the marketplace, while creating jobs. This is a critical issue for the long term viability of the nascent drop-in renewable fuels industry.

15. Amend the existing co-processing definition to allow for generation of D4 RINs while not requiring carbon-14 dating.

Co-processing occurs when renewable feedstocks are run in an existing petroleum refinery along with traditional petroleum feedstocks. This is an advantaged process in terms of fuel quality, as the fuels are identical in quality to traditional petroleum fuels. Currently, these fuels receive a D5 instead of a D4 RIN. They should be granted a D4 RIN, just like what biodiesel producers generate, as they are better fuels and more expensive to make.

16. The Feedstock Energy equations should also be eliminated in favor of simple mass balancing.

EPA’s latest regulatory proposal for co-processing would require a very expensive carbon-14 dating for refineries to prove that renewable oils were used. Since those oils are less than 10% of what is being processed, this is administrative overkill and not likely to be effective according to the National Renewable Energy Labs. We would once again urge simple mass balancing techniques in lieu of carbon dating, and recommend the elimination of the existing feedstock energy equations.

PROCESSING ISSUES

17. Move to a mass-balance system for wood-related feedstocks, removing existing segregation requirements.

Under the current regulatory scheme, all wood must be segregated by type (federal, non- federal and grandfathered/non-grandfathered land) prior to being used to produce a renewable fuel. The wood processing industry does not engage in segregation practices, as it unnecessarily drives up cost. As such, we must find an alternative, streamlined methodology, such as mass balancing, to certify qualified wood which can be used in compliant biofuel production. Mass balancing would be a more efficient process and still provide protection, as the product purchase documents from the tree buyers could provide the percentages of wood from various sources, thus allowing proportional generation of RINs.

18. Allow renewable electricity to be purchased and used by renewable fuel manufacturers.
Currently, renewable fuel producers can purchase off-the-grid biogas and use the biogas in their facility to offset GHG emissions and produce a low GHG reduction fuel. Allowing renewable electricity to also be used by renewable fuel producers levels the playing field.

PATHWAYS AND LABELING

19. Expedite and require all pathway petitions to be reviewed and petitioners notified of the results no later than six months from date of submittal. Submitters of Municipal Solid Waste separation plans must receive feedback in three months.

The EPA has taken, on average, over two years to complete the review for new technologies and feedstocks and fuels to be covered under the RFS2 program. MSW separation plans take more than one year to get approved. This must be more rapid. We suggest a model closer to the U.S. Patent Office, where you get a result in six months. At this point in the program, EPA should be able to accommodate most submissions given the current database.

20. Eliminate pump labeling requirements for drop-in renewable diesel.

We currently produce almost 400 million gallons per year of renewable diesel. It is identical to ultra-low sulfur diesel fuel made from petroleum at a refinery. We should amend the outdated pump labeling requirements for this fuel and fuels like it when dispensed at retail outlets.

ONE POUND WAIVER FOR BIOBUTANOL

21. Address one pound waiver for biobutanol when comingled.

Isobutanol is an energy-dense alcohol that can be blended at B-16 due to its low RVP. It is also not water soluble, and is therefore preferred by boaters and small engine manufactures. Blending E10 and gasoline blended with butanol does not cause the RVP of the resulting gasoline blend to increase, meaning that such commingling has no negative impact on VOC emissions and thus no negative environmental impact. The commingling prohibition was in fact implemented to prevent the blending of E10 with gasoline blended with MTBE (an oxygenate additive no longer used in gasoline in the United States) due at least in part to the increased RVP that resulted from blending two batches of gasoline with these additives. By definition, a fuel with lower RVP is less volatile. The use of lower RVP fuel blends containing butanol will therefore result in lower evaporative emissions at all stages of fuel use, from service station tank loading and vehicle refueling to vehicle in-use evaporative emissions.

The commingling prohibitions as they currently exist were workable because they were put in place to manage market conditions where both ethanol-blended and clear or MTBE-blended gasolines were generally in abundant supply. Gasoline retailers, who commonly receive their supply from multiple terminals, could count on having more than one source of supply for the gasoline blend they had in their tanks. The commercialization of iso-butanol, however, creates a different challenge. By necessity, the first iso-butanol production will be in limited supply available at a very small number of terminals. Without redundant supply points for iso-butanol, the existing commingling rule is a barrier to adoption of iso-butanol with its attendant benefits. The proposed revision to the commingling rule will serve to greatly reduce this barrier without compromise to environmental quality.

Appendix B. EPA Public Data - RINs and gallons for 2016 and 2017

2016

Fuel	Total RINs Generated	Gallons Generated
Cellulosic Biofuel (D3)	192,361,795	192,361,795
Biomass-Based Diesel (D4)	4,003,479,816	2,617,187,047
Advanced Biofuel (D5)	98,103,017	85,201,935
Renewable Fuel (D6)	15,175,717,036	15,003,278,197
Cellulosic Diesel (D7)	534,429	534,429

2017

Fuel	Total RINs Generated	Gallons Generated
Cellulosic Biofuel (D3)	250,624,373	250,624,373
Biomass-Based Diesel (D4)	3,848,850,322	2,505,302,697
Advanced Biofuel (D5)	143,646,572	128,800,020
Renewable Fuel (D6)	15,107,597,002	15,006,721,963
Cellulosic Diesel (D7)	1,743,894	1,743,705

Appendix C. Roger D. Read and Lauren Hendrix, "Independent Refiners: The Crack Ate My RINs – Policy and Profit Implications," Wells Fargo, November 16, 2017.

November 16, 2017 | Equity Research

WELLS FARGO SECURITIES

Independent Refiners: The Crack Ate My RINs--Policy And Profit Implications

Independent Refiners

- **Key Takeaway.** In what may be a surprise to some, most Independent Refiners now enjoy a net benefit from Renewable Identification Numbers (RINs), based on our analysis. This reflects a distinct change from 2013 when RINs negatively impacted refiner's profitability. Today, realized crack spreads and capture rates are weaker versus historical crack spread indices, and the playing field remains uneven. However, bottom line performance appears positive for most of the Independent Refiners across our coverage universe as the vast majority of the cost of RINs is embedded in the crack spread. Consumers now bear the majority of RINs costs – like a tax. Our conclusion is Independent Refiners should focus less on the specific impacts of RINs (though the program could use some tweaks, in our view) and more on establishing a level competitive playing field for biofuels and fossil fuels on taxes and emissions. Investors should not spend much time and effort on the risks to refining margins historically posed by RINs.

- **Things Change.** According to our analysis, oil price changes accounted for 87% of the average change in Gulf Coast gasoline prices when measured against significant changes in 2013 RINs prices. In 2017, oil price changes accounted for less than 30% of the average change in Gulf Coast gasoline prices. In 2013, Gulf Coast gasoline prices and Louisiana Light Sweet (LLS) crude oil prices possessed a correlation of 0.785 with R^2=62%. YTD in 2017, Gulf Coast gasoline and LLS crude prices possess a weaker correlation of 0.649 with R^2=42%. We analyzed significant swings in RINs prices and changes in wholesale Gulf Coast gasoline prices in 2013 and 2017. In 2017, changes in RINs accounted for over 70% of the average change in Gulf Coast gasoline prices. This compares to an immaterial impact in 2013 on average Gulf Coast gasoline prices. We believe it is undeniable that today's crack spread incorporates a majority of the cost of the RINs.

- **Policy Implications.** The Independent Refiners bore the brunt of the first wave of RINs in 2013 but have since turned the tide. With RINs costs now being "passed along" to consumers, the incentive for Independent Refiners to aggressively fight against RINs may wane. There are plenty of other issues within the Renewable Fuel Standard (RFS) program that create opacity and deserve adjustments – a subject for a different note. RINs are now effectively a tax on consumers but do not generate any funds for the U.S. Treasury – probably not the best outcome. In classic political theory, a policy's survival is enhanced if it delivers concentrated benefits while diffusing its costs – and that is where we believe the RINs market is today.

- **Unlevel Playing Fields.** Operational issues associated with RINs and point of obligation (POO) exist. Merchant Independent Refiners remain relatively disadvantaged versus their more integrated peers. These disadvantages will/have narrow(ed) as the financial incentive to "build out" wholesale infrastructure persists. More aggressive product exports also lower compliance costs. Finally, the EPA can/has offer(ed) RINs relief for disadvantaged units, a trend we expect will continue.

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Please see page 7 for rating definitions, important disclosures and required analyst certifications. All estimates/forecasts are as of 11/16/17 unless otherwise stated. 11/16/17 17:00:25 ET

Discussion

RINs and share prices positively correlated in 2017 but not in 2013.

Ever since Q1 2013 when RINs prices increased 10-fold from less than a dime to over 70¢ each in just over two months, most, including ourselves, have considered RINs as detrimental to crack spread realizations and a drag on earnings and cash flows. Certainly in mid-2013, RINs prices leapt above $1.40 and both refining margins and refining equities declined. In a major shift fully evident in 2017, we and others have noticed that movements in RINs prices appear to have less of an impact on investor attitudes towards the sector and share price performance. The following table highlights the differing impacts in 2013 and 2017. Notably, the refining sector's share price performances enjoy a positive correlation with changes in RINs prices. The strongest correlations are generally seen with companies that possess significant wholesale/retail operations, ANDV, MPC and PSX. Refiners with less or lower wholesale/retail operations generally see weaker, but still positive correlations, DK, HFC, PBF and VLO. CLMT, which does not possess significant wholesale/retail ops, is the exception. We believe that CLMT's share price performance has been more tied to a restructuring of the company and less so to specific refining fundamentals.

Independent Refiner Equity and RINs Price Correlations 2013 and 2017 YTD

Ticker	2013	2017
ANDV[1]	0.38	0.77
CLMT	0.51	0.70
DK	0.22	0.43
HFC	(0.12)	0.48
MPC[1]	0.11	0.65
PBF	(0.18)	0.40
PSX[1]	(0.15)	0.66
VLO	(0.30)	0.49
Average	0.06	0.57

[1]Integrated wholesale/retail ops

Source: Bloomberg and Wells Fargo Securities, LLC estimates

RINs mostly embedded within crack spreads in 2017.

The Independent Refiners in our coverage universe continue to consistently and persistently call out RINs as an impediment to realized crack spreads – and they are. However, we and they are less likely to cite actual bottom line impacts and cash losses directly tied to RINs – as RINs costs are being passed along to consumers.

Capture Rates Have Suffered While Consumers Increasingly Bear the Burden

RINs Cost Evolution	2013	2017	2017
% of RIN reflected in crack spread	10%	50%	85%
Refining capture rate including RINs	78%	73%	75%
Refiner % of RINS costs	90%	52%	17%
Consumer % of RINs costs	10%	48%	83%

Source: Bloomberg, EPA, company reports and Wells Fargo Securities, LLC estimates

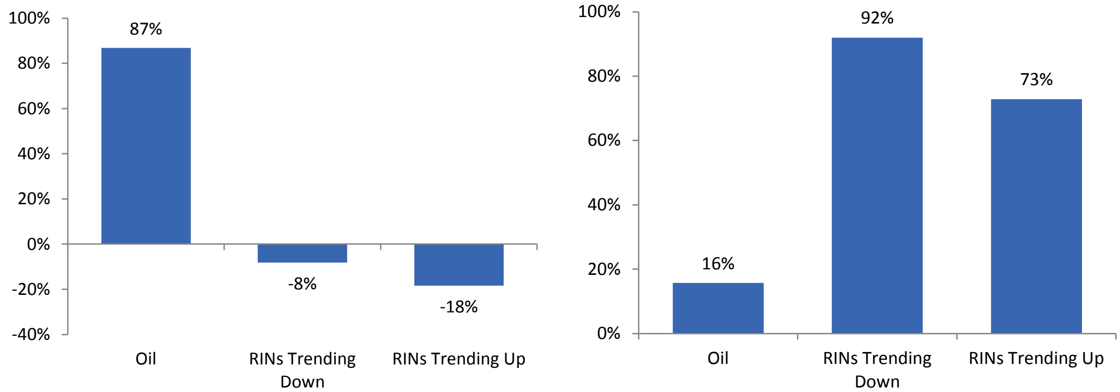
Based on our analysis, the price of a RIN is now embedded in the crack spread. Anecdotally, several Independent Refiners, most notably Marathon Petroleum (MPC), have for some time stated their view that the RINs are in the crack spread and that the focus on changing POO misses the mark and efforts should be focused elsewhere. Other Independent Refiners have been more vocal that RINs were a continuing drag on earnings and cash flows, as they remain in select cases. In all fairness, the 17% of RINs costs we estimate are borne by the Independent Refiners are unevenly distributed. We recognize that several smaller Independent Refiners that we do not cover and specific units of others are more exposed to the RINs obligations given a lack of wholesale and retail blending capacity, local market characteristics and limited trading opportunities. We sympathize with these disadvantaged companies and units, but reiterate this appears to now be the minority position within the sector. We expect the Environmental Protection agency (EPA) to continue issuing small unit exemptions to those plants that are most disadvantaged.

The Analysis

We selected 2013 and 2017 as our comparison years for the impacts of RINs. We chose 2013 because that is the first year that RINs clearly affected refining margins and investment decisions. We selected 2017 because it is the current year and the one in which the change in market conditions is most clear. For the following analysis, we identified periods within the years where significant changes (both up and down) in the price of RINs occurred within a short timeframe – usually within 10 to 15 days.

Changes in RINs prices nearly fully reflected in gasoline prices in 2017.

Components Affecting Gasoline Prices in 2013 and 2017 Y-T-D



Sources: Bloomberg and Wells Fargo Securities, LLC estimates

In 2013, even when RINs prices experienced significant movements, it was the changes in LLS crude oil prices that accounted for almost all of the changes in the price of Gulf Coast gasoline. RINs were an additional expense borne by the refiners and very disruptive to earnings and cash flows. By 2017, a much different environment had unfolded. Significant changes in RINs prices were directionally matched to a meaningful portion of the changes in Gulf Coast gasoline prices. By contrast, underlying moves in crude oil were resulting in a decreased impact on gasoline prices. Crude oil remains the single most significant cost component of refined products. However, rapid changes in RINs prices are immediately reflected in wholesale gasoline prices. This bolsters our view that the RIN is fully embedded in the gasoline crack spread.

Correlations of RINS and Crude Oil with Gulf Coast Gasoline

LLS/Gasoline	Correlation	R-squared
2013	0.785	62%
2017	0.649	42%

Sources: Bloomberg and Wells Fargo Securities, LLC estimates

Crude oil's correlation with Gulf Coast gasoline has weakened from its relationship in 2013.

The Comparisons

Following from the 2013 and 2017 comparisons that we believe unequivocally demonstrate that the RINs are now embedded in the crack spread. Our next step was to compare how refining profitability has evolved in the world of RINs. We elected to focus only on the gasoline and corn-based, ethanol, D6 RINs for our analysis. We recognize that the RINs market is far from that simple and straightforward – hence one of the biggest problems with RINs. We also did not include changes in ethanol prices, but we believe given the mandate for 10% blending (E10) that ethanol, like crude oil, is a pass-through cost. We believe our analysis, while basic and gasoline/ethanol focused, is fair and representative of the conditions that exist and changes that have occurred in recent years.

Analysis focused on D6 gasoline/ethanol components.

Our analysis is based on a comparison of three types of refiners with varying levels of refining and wholesale/retail integration (full / partial / negligible) represented by 100% / 50% / 0% designations in 2013 and 105% / 55% / 15% in 2017. The increase in integration reflects how the RINs market has incentivized adding blending capacity (i.e., capture the RINs value / minimize RINs costs) since 2013. Funding or dropping-down this capacity expansion via MLP subsidiaries has also improved the bottom line of the Independent Refining sector.

For comparisons sake, we assumed that each refiner in our three scenarios would generate 250,000 barrels per day (bpd) of gasoline. Converted to gallons results in 10.5 million gallons per day (mmgpd). U.S. retail gasoline generally contains 10% ethanol. Thus for every 9 gallons of gasoline 1 gallon of ethanol is required. So the RINs obligation for 1010.5mmgpd of gasoline totals about 1.17 million RINs per day.

We settled on a $12.50/bbl gasoline crack as a level that approximates a mid-cycle Gulf Coast gasoline margin to keep the comparisons equivalent. We converted the per barrel crack to gallons; $0.30/gallon. In 2013, the average RINs price was $0.59. For 2017, we decided to use the most recent RINs price of approximately $0.85.

In 2013, we estimate that the RIN was nominally affecting the crack spread. Our estimate is approximately 10% of the cost of the RIN was reflected in the crack spread – though it may have been closer to zero in H1 2013. For 2017, we made two assumptions about how much of the RIN is reflected in the crack spread; a 50% case and an 85% case. We then embedded the RINs into the crack spreads on a per gallon basis. We believe there is a strong case to be made that the RINs are at least 85% embedded in the crack spread. However, we recognize the opacity of the RINs market, local conditions and the differing opinions within the sector. Thus the 50% scenario remains plausible in some regions and specific locations, in our view.

Believe 85% of the RINs reflected in 2017 crack spread.

Refining Assumptions for RINs Comparisons

Assumptions:	
Gallons Gasoline/day	10,500,000
RINs obligation/day (9:1 ratio)	1,166,667
Base Gas Crack - $/bbls	$12.50
Base Gas Crack - $/gal	$0.30
RINs 2013 average price	$0.59
RINs 2017 average price	$0.85
RINs 2013/gal (9:1 ratio)	$0.066
RINs 2017/gal (9:1 ratio)	$0.094
Adjusted 2013 Crack (10% RIN in crack)	$0.304
Adjusted 2017 Crack (50% RIN in crack)	$0.345
Adjusted 2017 Crack (85% RIN in crack)	$0.378

Source: Bloomberg, EPA, company reports and Wells Fargo Securities, LLC estimates

2013 RINs Comparisons

2013 RINs Case - Assumes 10% of RINs in Crack, $0.59 RINs Price in $/day unless indicated			
Wholesale/retail integration	100%	50%	0%
Gasoline sales (gals/day)	10,500,000	10,500,000	10,500,000
Adjusted crack ($/gal)	0.304	0.304	0.304
Gross margin	3,193,833	3,193,833	3,193,833
RINs expense 100% ($0.59/RIN)	688,333	688,333	688,333
Gross margin, net RINs	2,505,499	2,505,499	2,505,499
Retail/wholesale recapture	688,333	344,167	0
Gross margin, adjusted net	3,193,833	2,849,666	2,505,499
Lost margin, net	0	(344,167)	(688,333)

Source: Bloomberg, EPA, company reports and Wells Fargo Securities, LLC estimates

2017 RINs Comparisons – 50% Embedded

2017 RINs Case - Assumes 50% of RINs in Crack, $0.85 RINs Price in $/day unless indicated			
Wholesale/retail integration	105%	65%	15%
Gasoline sales (gals/day)	10,500,000	10,500,000	10,500,000
Adjusted crack ($/gal)	0.345	0.345	0.345
Gross margin	3,620,833	3,620,833	3,620,833
RINs expense 100% ($0.59/RIN)	991,667	991,667	991,667
Gross margin, net RINs	2,629,166	2,629,166	2,629,166
Retail/wholesale recapture	1,041,250	644,583	148,750
Gross margin, adjusted net	3,670,416	3,273,750	2,777,916
Gross margin expansion vs. 2013	476,584	79,917	(415,916)
RINs borne by retail consumers ($/gal)	0.045	0.008	(0.040)

Source: Bloomberg, EPA, company reports and Wells Fargo Securities, LLC estimates

2017 RINs Comparisons – 85% Embedded

2017 RINS Case - Assumes 85% of RINs in Crack, $0.85 RINs Price			
in $/day unless indicated			
Wholesale/retail integration	105%	65%	15%
Gasoline sales (gals/day)	10,500,000	10,500,000	10,500,000
Adjusted crack ($/gal)	0.378	0.378	0.378
Gross margin	3,967,916	3,967,916	3,967,916
RINs expense 100% ($0.59/RIN)	991,667	991,667	991,667
Gross margin, net RINs	2,976,249	2,976,249	2,976,249
Retail/wholesale recapture	1,041,250	644,583	148,750
Gross margin, adjusted net	4,017,499	3,620,832	3,124,999
Gross margin expansion vs. 2013	823,667	427,000	(68,833)
RINs borne by retail consumers ($/gal)	0.078	0.041	(0.007)

Source: Bloomberg, EPA, company reports and Wells Fargo Securities, LLC estimates

Refining Comp Sheet

Company	Ticker	Rating	Price 11/16/2017	Price Target	Upside Potential	Market Cap ($MM)	EV ($MM)	Capacity Mboed	Avg. Nelson Complexity	2017E Utilization
Andeavor	ANDV	1	$104.79	$127	21.2%	$16,347	$26,985	1,157	10.4	94%
Calumet Specialty Products	CLMT	1	$8.05	$10	24.2%	$618	$2,581	165	NM	81%
Delek US Holdings	DK	1	$28.59	$40	39.9%	$2,329	$3,228	302	9.5	103%
HollyFrontier Corp.	HFC	2	$43.80	$40	-8.7%	$7,765	$9,987	457	12.2	95%
Marathon Petroleum Corp.	MPC	2	$62.01	$60	-3.2%	$30,286	$48,852	1,817	10.7	97%
PBF Energy, Inc.	PBF	1	$32.66	$35	7.2%	$3,594	$6,021	884	12.2	91%
Phillips 66	PSX	2	$92.46	$91	-1.6%	$46,853	$56,943	2,399	11.3	94%
Valero Energy Corp.	VLO	1	$82.12	$87	5.9%	$35,934	$40,097	3,015	12.4	96%
Average					**6.6%**	**$21,127**	**$27,522**	**1,479**	**11.4**	**96%**

Company	Share Price Performance				Consolidated Crack ($/bbl)		Cash Opex ($/bbl)		DD&A ($/bbl)	
	1-wk	1-mo	YTD	QTD	2018E	2019E	2018E	2019E	2018E	2019E
Andeavor	-2.1%	0.9%	19.8%	1.6%	$11.17	$10.98	$5.42	$5.33	$2.78	$2.82
Calumet Specialty Products	-16.6%	3.2%	101.3%	-3.6%	$16.07	$16.02	$11.00	$9.50	$3.51	$3.55
Delek US Holdings	3.1%	8.6%	18.8%	7.0%	$7.49	$8.50	$3.83	$3.90	$1.85	$1.93
HollyFrontier Corp.	3.8%	21.4%	33.7%	21.8%	$10.56	$10.90	$5.90	$5.59	$2.24	$2.77
Marathon Petroleum Corp.	0.6%	11.3%	23.2%	10.6%	$11.26	$11.46	$6.41	$6.49	$4.20	$4.60
PBF Energy, Inc.	5.8%	19.4%	17.1%	18.3%	$8.39	$8.55	$5.42	$5.18	$0.94	$0.97
Phillips 66	-2.1%	1.7%	7.0%	0.9%	$9.08	$9.33	$4.89	$4.89	$1.95	$2.04
Valero Energy Corp.	1.0%	6.1%	20.2%	6.7%	$9.30	$9.80	$3.59	$3.57	$1.84	$1.85
Average	**2.0%**	**11.4%**	**20.0%**	**10.9%**	**$9.35**	**$9.76**	**$5.01**	**$4.94**	**$2.17**	**$2.36**
XOI Index	**-3.5%**	**1.2%**	**-2.5%**	**6.3%**						
SPX Index	**0.0%**	**5.8%**	**-4.2%**	**6.3%**						

Company	EPS		Consensus EPS		P/E		Consensus P/E		EPS vs. Consensus	
	2018E	2019E	2018E	2019E	2018E	2019E	2018E	2019E	2018E	2019E
Andeavor	$7.27	$8.27	$8.34	$9.30	14.4x	12.7x	12.6x	11.3x	-12.8%	-11.1%
Calumet Specialty Products	($0.39)	$0.16	($0.95)	($0.60)	NM	NM	NM	NM	59.0%	NM
Delek US Holdings	$1.16	$1.95	$1.40	$1.69	24.7x	14.6x	NM	16.9x	-17.3%	15.4%
HollyFrontier Corp.	$2.15	$2.72	$2.70	$3.16	20.4x	16.1x	16.2x	13.9x	-20.6%	-13.8%
Marathon Petroleum Corp.	$3.79	$4.86	$4.22	$4.68	16.4x	12.8x	14.7x	13.3x	-10.3%	3.9%
PBF Energy, Inc.	$2.65	$3.55	$2.88	$2.85	12.3x	9.2x	11.3x	11.5x	-7.9%	24.8%
Phillips 66	$5.55	$6.44	$6.30	$6.75	16.7x	14.3x	14.7x	13.7x	-12.0%	-4.6%
Valero Energy Corp.	$5.59	$7.00	$6.29	$6.30	14.7x	11.7x	13.1x	13.0x	-11.1%	11.1%
Average[2]	**$3.48**	**$4.42**	**$3.96**	**$4.24**	**17.1x**	**13.1x**	**13.8x**	**13.4x**	**-13.1%**	**3.7%**

Company	P/CFPS		Gross FCF Yield[1]		EV/EBITDA		Current			
	2018E	2019E	2018E	2019E	2018E	2019E	MC ($/bbl)	EV ($/bbl)	BV/sh	Capex ($/bbl)
Andeavor	6.6x	6.6x	6.4%	7.5%	7.9x	7.6x	$38.71	$63.90	$70.57	$3.58
Calumet Specialty Products	4.9x	3.6x	9.2%	16.8%	8.5x	7.3x	$10.24	$42.78	$2.88	$1.99
Delek US Holdings	7.9x	6.1x	13.0%	7.4%	6.5x	5.5x	$21.13	$29.28	$21.19	$1.54
HollyFrontier Corp.	9.2x	8.1x	7.3%	6.2%	8.5x	7.4x	$46.55	$59.87	$29.41	$1.69
Marathon Petroleum Corp.	6.2x	5.0x	20.4%	11.4%	7.7x	6.9x	$45.67	$73.66	$38.56	$5.33
PBF Energy, Inc.	5.0x	4.4x	8.0%	11.0%	6.5x	5.5x	$11.14	$18.66	$21.04	$2.29
Phillips 66	9.9x	8.8x	6.1%	7.2%	8.0x	7.3x	$53.51	$65.03	$45.77	$2.18
Valero Energy Corp.	8.2x	7.0x	-0.3%	1.4%	6.8x	6.0x	$32.65	$36.44	$46.04	$1.16
Average[2]	**7.7x**	**6.6x**	**9.1%**	**7.4%**	**7.3x**	**6.4x**	**$35.11**	**$47.16**	**$33.67**	**$2.37**

Company	Current						Regular Div.	Div Yield	Short Interest	
	Gross D/C	Net D/C	Debt/EBITDA	Price/Book	ROACE	ROIC	($/sh)	%	Ratio	% of Float
Andeavor	44.4%	29.0%	3.4x	1.5x	7.7%	5.0%	$2.36	2.3%	3.6	2.6%
Calumet Specialty Products	89.9%	88.7%	7.6x	2.8x	2.9%	-5.0%	N/A	N/A	1.7	1.1%
Delek US Holdings	44.5%	18.6%	3.0x	1.3x	1.2%	-0.5%	$0.60	2.1%	7.1	6.9%
HollyFrontier Corp.	29.8%	23.7%	1.9x	1.5x	0.5%	1.5%	$1.32	3.0%	5.5	6.6%
Marathon Petroleum Corp.	39.2%	34.7%	2.1x	1.6x	5.5%	8.1%	$1.60	2.6%	2.2	1.8%
PBF Energy, Inc.	47.7%	43.9%	1.9x	1.6x	0.9%	4.6%	$1.20	3.7%	9.3	14.9%
Phillips 66	29.5%	23.1%	1.7x	2.0x	4.5%	5.6%	$2.80	3.0%	3.1	1.5%
Valero Energy Corp.	28.8%	11.0%	1.5x	1.8x	18.4%	22.3%	$2.80	3.4%	5.0	4.4%
Average[2]	**36.6%**	**25.8%**	**2.0x**	**1.6x**	**5.2%**	**6.9%**	**$1.72**	**3.0%**	**5.4**	**6.0%**

Source: Company reports, Bloomberg, and Wells Fargo Securities, LLC estimates

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SECURITIES: NOT FDIC-INSURED/NOT BANK-GUARANTEED/MAY LOSE VALUE

Appendix D. "Denial of Petitions for Rulemaking to Change RFS Point of Obligation," Environmental Protection Agency, EPA-420-R-17-008, November, 2016, Page 22.

"Less obviously apparent, however, is *the impact of the RFS program on the market price for the petroleum blendstocks that merchant refiners sell.* In addition… all refiners and importers of gasoline and diesel fuel incur costs to comply with RFS obligations. This is true whether the refiners and importers acquire RINs by blending renewable fuels or purchasing separated RINs – meaning no fundamental inequity exists. Moreover, because all refiners and importers have RFS obligations in proportion to the fuels they produce or import, they all have similar costs of compliance related to the RFS program, and they all seek to recover those costs through the pricing of their product. Stated another way: merchant refiners can indeed expend significant funds to purchase RINs needed to demonstrate compliance with the RFS program, but the cost is offset by a corresponding increase in the price of the fuel they sell. That market price reflects the cost of RINs. The same dynamic applies to both merchant and integrated refiners."

Available at: http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100TBGV.TXT

Appendix E. "Small Refinery Exemption Study: An Investigation into Disproportionate Economic Hardship," Department of Energy, Office of Policy and International Affairs, March 2011.

Small Refinery Exemption Study

An Investigation into Disproportionate Economic Hardship

Office of Policy and International Affairs

U.S. Department of Energy

March 2011

For Further Information

This study was prepared by the Office of Policy and International Affairs under the direction of Carmine Difiglio, Deputy Assistant Secretary for Policy Analysis.

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Acronym List

CAA	Clean Air Act Amendments of 1990
DOE	U.S. Department of Energy
EIA	Energy Information Administration
EISA 2007	Energy Independence and Security Act of 2007
EMTS	EPA Moderated Transaction System
EPA	Environmental Protection Agency
EPAct 2005	Energy Policy Act of 2005
GHG	Greenhouse gases
PADD	Petroleum Administration for Defense District
RFS	Renewable Fuel Standard program
RFS1	Renewable Fuel Standard under EPAct 2005
RFS2	Renewable Fuel Standard as amended by EISA
RIN	Renewable Identification Numbers
RVO	Renewable Volume Obligation
SBRFA	Small Business Regulatory Enforcement Fairness Act of 1996

Executive Summary

The Energy Policy Act of 2005 (EPAct 2005) established the Renewable Fuel Standard (RFS) program under Section 211 (o) of the Clean Air Act (CAA) mandating gasoline sold in the United States contain a minimum amount of renewable fuel content determined on an annual production volume basis (original RFS program denoted as RFS1). The Energy Independence and Security Act of 2007 (EISA 2007) amended the original program by increasing the renewable fuels mandate from 7.5 billion gallons to 15.2 billion gallons in 2012, and extending it to 36 billion gallons of renewable fuel to be blended in 2022. The revised program is referred to as RFS2[1].

EPAct 2005 exempted small refineries from compliance with the RFS from 2007 through 2010[2]. EPAct 2005, through its establishment of section 211(o)(9)(A)(ii) of the CAA, required that the U.S. Department of Energy (DOE) conduct a study for the Administrator of the Environmental Protection Agency (EPA) assessing whether the RFS would impose a "disproportionate economic hardship" on small refineries, defined as those facilities with aggregate crude oil throughput that does not exceed 75,000 barrels per calendar day[3]. Small refineries may face challenges complying with the RFS program. For instance small refineries may have less integration with upstream and downstream operations, providing limited access to capital.

On February 24, 2009, DOE transmitted its study with recommendations to EPA. The study concluded that the market for credits (Renewable Identification Numbers, or RINs[4]) was competitive, and found no reason to believe that a competitive market would disproportionately disadvantage participants who purchase credits rather than generating them through blending renewable fuels into their products. Therefore, the study concluded that the exemption for small refineries should not be extended for the RFS2. The analysis did not evaluate the specific circumstances of each small refinery and noted that, should market conditions change, small refineries maintained the right under Section 211(o)(9)(B) of the CAA to individually petition EPA for an extension of their exemption.

In October 2009, Congress directed DOE to revisit the issue of disproportionate economic hardship for small refineries and report its findings. This study reflects the directions of Congress to:

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[1] Many elements from EPAct 2005 remained intact under EISA 2007; RFS refers to those provisions that remained unchanged.

[2] EPA chose to exempt small refiners, defined as refiners producing gasoline from crude oil with fewer than 1,500 employees and less than 155,000 barrels per day crude processing capability, as well as small refineries defined in Section 211(o)(1)(K) as those facilities with aggregate crude oil throughput that does not exceed 75,000 barrels per calendar day. Subsequently, EPA has concluded that it did not have the authority to extend the duration of the exemption period for all of the small refiners as defined under the original RFS rulemaking, but only those statutorily defined in EPAct 2005.

[3] The DOE report only analyses the statutorily defined small refineries.

[4] RINs are marketable credits that obligated parties must register with EPA to demonstrate compliance with the RFS renewable fuel volumetric obligation requirements.

- Seek comment from owners of small refineries on the reasons why they may believe that they would experience disproportionate economic hardship if the small refinery exemption were not extended.
- Assess RFS2 compliance impacts on small refinery utilization rates and profitability.
- Evaluate the financial ability of individual small refineries to meet RFS2 requirements.
- Estimate small refinery impacts by region.
- Reassess whether small refinery compliance costs through the purchase of RINs is similar to the cost of compliance by purchasing and blending renewable fuels.
- Undertake an estimate of the economic impact of RFS2 on small refineries on a regional basis.

Disproportionate economic hardship for small refineries was characterized by increased cost of compliance to the point that the current or future viability of the refinery is impacted. In the current lower refining margin environment, the cost of RFS2 regulations could have a material effect on small refinery profitability

Existing refinery specific survey data collected by Energy Information Administration alone could not provide DOE with the necessary information to make an informed decision regarding which small refineries suffered disproportionate economic hardship and merited an extension of their exemptions. Instead, available public and commercial data sources were consulted and a survey of small refineries was initiated. Before issuing this survey, conference calls were held with operators of several small refineries to ensure that the survey would acquire all of the relevant information with which to evaluate disproportionate economic hardship. The survey was sent on September 22, 2010 to the 59 refineries that qualified for an exemption in the initial RFS2 program. Completed surveys were received for eighteen small refineries that met the statutory requirements for inclusion in the small refinery exemption study. Several of the refineries that were exempt from the initial RFS program under the small refinery provision are part of large integrated oil companies or large geographically diverse refiners. Some of these large refiners notified DOE that they were not going to respond to the survey because they did not believe they faced disproportionate economic hardship.

Small refineries can suffer disproportionate economic hardship from compliance with the RFS program if blending renewable fuel into their transportation fuel or purchasing RINs increases their cost of products relative to competitors to the point that they are not viable, either due to loss of market share or lack of working capital to cover the costs of purchasing RINs. Since certain small refineries may have to rely on RIN purchases instead of blending as a RFS compliance strategy, scenarios where RIN prices might be substantially higher than their historical value or the cost of blending renewable fuels were evaluated. Profiles were developed of the small refineries to categorize profitability and financial health. Regional and local factors that could affect the ability to comply with the RFS were considered in the analysis. Through these factors, metrics were developed to evaluate whether each of the eighteen refineries that responded to the survey and fall within the scope of the study would suffer an economic hardship relative to an industry standard.

Based on the developed metrics and analysis, thirteen of the eighteen refineries analyzed are recommended to receive an extension of their exemption. The refineries recommended are geographically diverse: **[Redacted]**. Of the five small refineries that did not receive the exemption, **[Redacted]**. The refineries recommended for the exemption are:

[Redacted]

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I. Study Objectives

The Energy Policy Act of 2005 (EPAct 2005) established the Renewable Fuel Standard (RFS) program under section 211 (o) of the Clean Air Act (CAA) mandating gasoline sold in the United States contain a minimum amount of renewable fuel content determined on an annual production volume basis. The Energy Independence and Security Act of 2007 (EISA 2007) amended the RFS program by increasing the renewable fuels mandate from 7.5 billion gallons to 15.2 billion gallons in 2012, and extending it to 36 billion gallons of renewable fuel to be blended in 2022[5].

EPAct 2005 exempted certain small refineries from compliance with the RFS from 2007 through 2010[6]. EPAct 2005, through its establishment of section 211(o)(9)(A)(ii) of the CAA, required that the U.S. Department of Energy (DOE) conduct a study for the Administrator of the Environmental Protection Agency (EPA) assessing whether RFS2 would impose a "disproportionate economic hardship" on small refineries, defined as those facilities with aggregate crude oil throughput that does not exceed 75,000 barrels per calendar day[7]. Based on the results of the study, EPA may be obligated to extend the RFS1 exemption to small refineries for at least two additional years beyond its current expiration date of 2010.

On February 24, 2009, DOE transmitted its study with recommendations to EPA. The study concluded that the market for credits (Renewable Identification Numbers, or RINs) was currently competitive, and found no reason to believe that a competitive market would disproportionately disadvantage participants who purchase credits rather than generating them through blending renewable fuels into their products. Therefore, the study concluded that the exemption for small refineries should not be extended beyond 2010. It was noted that, should market conditions change or if individual small refineries were experiencing economic hardship, small refineries maintained the right under Section 211(o)(9)(B) of the CAA EPAct 2005 to individually petition EPA for an extension of their exemption.

Subsequent events required that the study be revisited. First, the economic downturn reduced the profitability of the refining industry, which has disproportionately impacted some small refiners. Second, the expiration of the biodiesel production credit reduced production and has caused the price of biomass-based diesel RINs to increase. Even though the credit was retroactively restored for 2010, these RINs remain relatively expensive. Finally, in order capture the unique factors

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[5] The EPAct 2005 RFS program is abbreviated RFS1 and the EISA 2007 revisions to the RFS1 program is abbreviated RFS2 in the rest of this document. A glossary of relevant terms is provided in Appendix A.

[6] EPA chose to exempt small refiners, defined as refiners producing gasoline from crude oil with fewer than 1,500 employees and less than 155,000 barrels per day crude processing capability, as well as small refineries defined in Section 211(o)(1)(K) as those facilities with aggregate crude oil throughput that does not exceed 75,000 barrels per calendar day Subsequently, EPA has concluded that it did not have the authority to extend the duration of the exemption period for all of the small refiners as defined under the original RFS rulemaking , but only those statutorily defined in EPAct 2005.

[7] As defined in Section 211(o)(1)(K).

contributing to disproportionate economic hardship, additional consultation with individual refiners was necessary.

On a parallel track to the changed market conditions, Congress directed DOE to revisit the issue of disproportionate economic hardship for small refineries and report its findings[8]. This study addresses the concerns of Congress in directing DOE to:

- Seek comments from owners of small refineries on the reasons why they may believe that they would experience disproportionate economic hardship if the small refinery exemption were not extended.
- Assess RFS compliance impacts on small refinery utilization rates and profitability.
- Evaluate the financial ability of individual small refineries to meet RFS requirements.
- Estimate small refinery impacts by region.
- Reassess whether small refinery compliance costs through the purchase of RINs is similar to the cost of compliance by purchasing and blending renewable fuels.
- Estimate the economic impact of RFS on small refineries on a regional basis.

Given this Congressional direction, this study needed to consider the unique factors contributing to disproportionate economic hardship for individual small refineries in the study. Consequently, a survey of small refineries was necessary, something not included in the previous DOE study.

In order to evaluate disproportionate economic hardship caused by the impact of compliance with the RFS on small refineries, these compliance strategies had to be characterized and their varying impact on refineries investigated. There is a direct cost associated with participation in the program. The RFS program is based on a national mandate for renewable fuels, enforced through obligated parties who are responsible to EPA for their pro-rata share of the renewable fuel mandate. However, the program incorporates a market solution to the process of fulfilling the mandates, allowing trading between the obligated parties from those who over-comply to those who find it less advantageous to blend renewable fuels into the transportation fuel mix. Transfer of the obligation is formally accomplished through the market for RINs.

The absolute cost of compliance is one of the key factors in determining disproportionate economic hardship from compliance with RFS2. There are two major pathways that may be followed for compliance. One compliance pathway is blending renewable fuels with gasoline, which may require capital expenditures for equipment. The second pathway is purchasing and maintaining a portfolio of RINs. If certain small refineries must purchase RINs that are far more expensive than those that may be generated through blending, this will lead to disproportionate economic hardship for those effected entities. Economic theory suggests that the price of RINs would reflect the marginal cost of compliance with the RFS, that is, the most expensive cost of

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[8] The Senate Report (Senate Report 111- 45) accompanying the FY2010 Energy and Water Development Appropriations Bill included language directing DOE to re-open the study and revisit the issue in greater detail completing the revised study by June 30, 2010. The Appropriations Bill directed DOE to collect data on small refineries and quantify the economic impact of RFS compliance. In addition, the Appropriations Conference Report (House Report 111-278) included language supporting the Senate Appropriations Report request.

blending renewable fuels. The average cost of compliance may be much lower than the marginal cost. If the economics of blending ethanol are favorable, that is, ethanol is less expensive than the gasoline components it replaces, the compliance cost may be essentially zero for refiners that fulfill their obligation through blending renewable fuels. Such refiners would have blended even without the mandate. While current RIN prices for ethanol are moderate (adding less than 2 cents per gallon of renewable fuel), there are numerous circumstances when RIN prices could rise, increasing the cost of compliance and perhaps increasing the cost of compliance more for refineries that rely on RINs for compliance compared to those that do not. These circumstances include both increases in the costs of renewable fuels and the inability to blend all of the mandated renewable fuel into conventional transportation fuels (the so-called blend wall).

Small refineries could have particular obstacles that would make compliance more costly than those of large integrated companies. Compliance costs and characteristics of small refineries that make them more vulnerable to financial distress may be unique to each small refinery. Since much of the information is not publicly available, the small refineries were surveyed to make a determination of disproportionate economic hardship. This information was supplemented by publicly available data, which also yielded the baseline from which disproportionate economic impact may be discerned. Given the unique nature of each refinery, it is not possible to make a recommendation on any refinery that did not submit a survey.

Disproportionate economic hardship must encompass two broad components: a high cost of compliance relative to the industry average, and an effect sufficient to cause a significant impairment of the refinery operations. The individual metrics for each refinery were grouped into two general categories: eight metrics representing disproportionate impacts on the refinery and three metrics representing the effect of compliance on the viability of the firm.

II. RFS Regulations

The first RFS regulation, referenced as RSF1 in this study, was specified in Section 1501 of EPAct 2005. This section added paragraph 211(o) to the CAA, requiring the EPA to promulgate regulations implementing a renewable fuels program. EPAct 2005 specified that the regulations ensure a specified volume of renewable fuel be blended into gasoline sold in the United States each year, with the total volume increasing over time. The goals of the program included reducing the Nation's dependence on foreign sources of petroleum, increasing domestic sources of energy, and assisting in the transition to alternative fuels from petroleum in the transportation sector.

The final RFS1 program rule was published on May 1, 2007, and the program began on September 1, 2007.[9] RFS1 created a specific annual level for minimum renewable fuel use that increases over time – resulting in a requirement that 7.5 billion gallons of renewable fuel be blended into gasoline (for highway use only) by 2012.

[9] During 2006 an RFS was established using the default compliance criteria as specified by EPAct 2005.

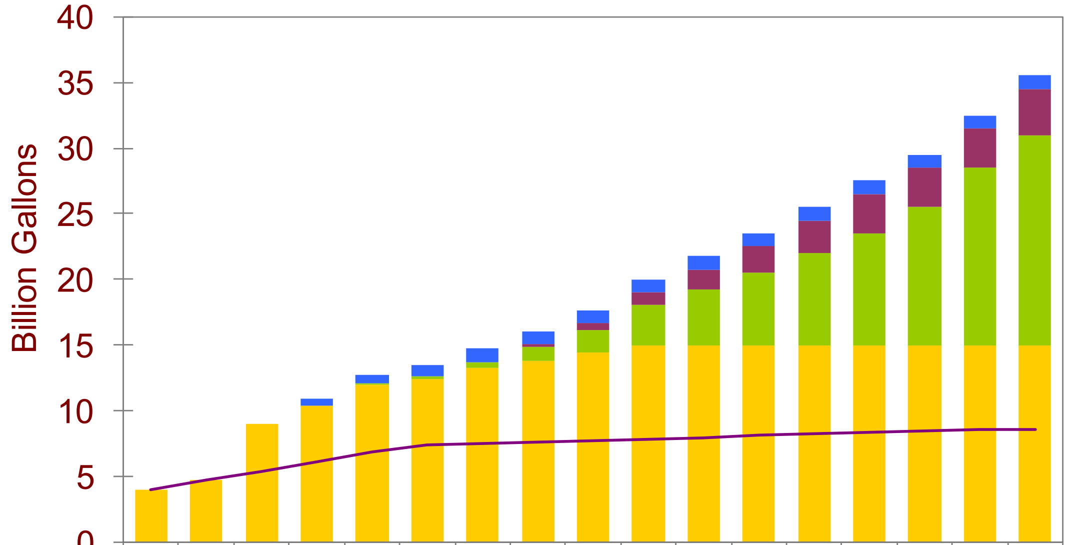
Under the RFS1 program, compliance is based on obligated parties meeting their annual Renewable Volume Obligation (RVO), which is published annually in the *Federal Register* by EPA. Obligated parties include refiners, blenders and importers of gasoline. The RVO is expressed as a percentage of total non-renewable gasoline sold by the obligated party in the specified calendar year. Compliance is demonstrated through the use of transferable credits called RINs, which are assigned to each batch of renewable fuel produced. For obligated parties to show compliance, RINs must be acquired either by blending renewable fuel into gasoline or diesel, or by acquisition of RINs from other parties that have exceeded their RVO.

Provisions of EISA 2007 significantly increased the volume of renewable fuel mandated under the RFS. The required volume of renewable transportation fuel increased from nine billion gallons in 2008 to 36 billion gallons in 2022.[10] RFS2 also established required volumes of cellulosic biofuel, biomass-based diesel fuel, total advanced biofuel, and total renewable fuel to be used each year.[11] As with RFS1, the responsibility for enforcing the annual renewable fuel targets falls to EPA. In addition, the EPA is responsible for assessing domestic supply and setting appropriate percentage standards each year. Figure 1 compares the requirements of RFS1 and RFS2.

[10] http://www.epa.gov/otaq/fuels/renewablefuels/index.htm, accessed 12 20 2010.

[11] The additional RFS2 biofuel requirements for cellulosic biofuels and biomass-based dieel fuel are "nested" requirements within the category of "advanced biofuels." Likewise, "advanced biofuels" is a nested requirement within the category of "total renewable fuels."

Figure 1. Comparison of RFS1 and RFS2 Volume Requirements



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Bio-mass Based Diesel (Advanced)				0.5	0.65	0.8	1	1	1	1	1	1	1	1	1	1	1
Other Biofuels (Advanced)				0	0	0	0	0.25	0.5	1	1.5	2	2.5	3	3	3	3.5
Cellulosic (Advanced)					0.1	0.25	0.5	1	1.75	3	4.25	5.5	7	8.5	10.5	13.5	16
Conventional Biofuels	4	4.7	9	10.4	12	12.4	13.2	13.8	14.4	15	15	15	15	15	15	15	15
RFS1	4	4.7	5.4	6.1	6.8	7.4	7.5	7.6	7.7	7.8	7.9	8.1	8.2	8.3	8.4	8.5	8.6

Note: Bio-mass based diesel yields 1.5 credits per gallon for the purpose of compliance with the Advanced and Renewable Standards. Aggregate bars represent the RFS2 requirements; line represents RFS1.

Rather than a complete departure from the earlier program, RFS2 represents an evolutionary development that both expands and extends the scope of the renewable fuels agenda, while carrying over to the new standard much of the structure and terminology from RFS1.

- RFS2 expands the fuel requirements to 36 billion gallons by 2022 and also expands the fuel types from on-road gasoline only to gasoline and diesel fuel for both on-road and off-road and to railroad locomotive and domestic marine fuels as well.

- Under RFS1, to ensure compliance, EPA devised a tracking system using RINs to meet a single RVO for renewable fuel. RFS2 retains the concept of the RVO, but expands it to include four distinct RVOs, one for each of the new types of fuels (Cellulosic Biofuels, Biomass-Based Diesel, Other Advanced Biofuels, and Cellulosic Diesel) resulting in four types of RINs.

- EPA established a new system, the EPA-Moderated Transaction System (EMTS), for the generation, trading and tracking of RINs. The effective date for RFS2 is July 1, 2010, and the regulation applies to all renewable fuel produced on or after that date. Because of the mid-year start date and carry-over ability of RINs, both RFS1 and RFS2 versions of RINs will be in force in 2010 and beyond.

- RFS2 changes the definition of qualified renewable fuels to include minimum lifecycle greenhouse gas (GHG) emission reduction thresholds for each of the renewable fuel types as measured against the performance of gasoline or diesel derived from conventional production techniques. The reduction requirements must be at least:
    - 60 percent for Cellulosic Biofuels (including Cellulosic Diesel)
    - 50 percent for Biomass-Based Diesel and Other Advanced Biofuels
    - 20 percent for other Renewable fuels such as corn ethanol from plants built after December 19, 2007.

- The minimum GHG reduction requirements must include consideration of the complete life-cycle of the fuel, including the planting, growing and harvesting of the feedstock and production and distribution of the resulting fuel. In addition, the indirect land use impacts brought about through increased use of biofuels are included. There are also restrictions on the types of feedstocks used to make renewable fuel and the types of land used to grow and harvest feedstock.

- RFS2 also provides for specific types of waivers and a system of credits for cellulosic and biomass-based diesel biofuels.

III. RINs

How RINs Are Used to Ensure Compliance with the Renewable Fuel Standard

For the RFS1 program, the EPA established a very specific method of tracking the production and ownership of the renewable fuels using a 38-character RIN. With the introduction of the EMTS, the concept of the RIN has been retained, but modified, for the RFS2 program. The EMTS is a central automated registry run by EPA that serves as the focal point for recording and tracking the various credits, trades, and the compliance of obligated parties and renewable fuel exporters. The EMTS records the generation and transfer of RINs, the central identifier that enables the obligated parties to demonstrate compliance, as well as track the volumes of renewable fuels. The RIN is generated by the producer or importer of renewable fuel and is assigned to batches of renewable fuel. The RIN is transferred with the physical volume of ethanol, representing the gallons produced through subsequent changes of ownership.

On December 14, 2010, the EPA issued a clarification of its earlier Final Rule implementing the RFS2 program. Although the Final Rule gave an illustration of the 38-digit RIN code, the intention was only to use it as an example. Under RFS2 and the EMTS, RINs are not identified by a 38-digit code, even though most of the information continues to be entered into EMTS. The main difference is that the “SSSSSSSS” and “EEEEEEEE” components for the batch “start” and “end” numbers are eliminated. The 38-digit code proved to be far too error prone to be retained as the mechanism for recording RIN transactions. In addition, because of changes in RFS2, there are also important differences with respect to the RR (Equivalence Value) and D codes (Renewable Fuel Type) in the RIN.

The Equivalence Values (RR in Table 1) are used to determine the number of gallon-RINs generated for a batch of renewable fuel. The intent is to reflect the specific energy content of each fuel relative to ethanol, which is defined to have an equivalence value of 1.0. The use of equivalence values in RFS2 will continue from RFS1 and non-ester renewable diesel will be required to have a minimum lower energy value of at least 123,500 Btu/gal in order to qualify for an equivalence value of 1.7 (see Table 1). In Table 1, if a company produces a 1,000 gallon batch of biodiesel, 1,000 Biomass-Based Diesel RINs would be generated, which could be converted to 1,500 corn ethanol RINs.

Table 1. RR Code Definitions

Renewable Fuel	Equivalence Value	RR Code
Ethanol	1.0	10
Biodiesel	1.5	15
Butanol	1.3	13
Non-ester Renewable Diesel	1.7	17

The D Codes, which identify the Renewable Fuel Category, embody another change in the RIN from RFS1 to RFS2. Under RFS1, there were only two fuel types. With RFS2, there are five codes applicable to four categories of renewable fuels: Cellulosic Biofuel, Cellulosic Diesel, Biomass-Based Diesel, Other Advanced Biofuel, and total renewable fuel (see Table 2). D code 1 from RFS1 has been replaced with D code 3 in RFS2, and D code 2 from RFS1 has been replaced with D code 6 in RFS2. Cellulosic biodiesel is unique in that it may qualify for either the biomass-based diesel mandate or the cellulosic biofuel mandate, but not both. To distinguish it from fuel that may only fulfill the biomass based diesel mandate, it is assigned a separate D code of 7, which may be considered a subset of D code 3.

Table 2. D Code Definitions

RFS1			RFS2	
D Value	Meaning		D Value	Meaning
1	Cellulosic biomass ethanol	=	3	Cellulosic Biofuel
			7	Cellulosic Diesel
			4	Biomass-Based Diesel
			5	Other Advanced Biofuel
2	Renewable fuel not cellulosic biomass ethanol	=	6	Renewable Fuel, corn ethanol

Currently, the marketplace is actively trading four types of RINs: Corn ethanol RINs (D6), cellulosic ethanol RINs (D3), biodiesel RINs (D4) and other advanced biofuels (D5, e.g., cane ethanol). It should be noted that the market also refers to these categories of RINs as Type C (for Cellulosic Biofuel), Type B (for Biomass-Based Diesel), Type A (for Other Advanced Biofuel), and Type R (for Renewable Fuel). This terminology is used interchangeably with their associated D codes, e.g., Types C, B, A, R are interchangeable with D Codes 3, 4, 5, and 6, respectively.

Renewable Fuel Standard Volume Requirements and RIN Values Obligated Parties

Obligated parties required to comply with RFS2 include domestic refiners and blenders dealing with transportation fuels. Importers and foreign producers of transportation fuel used in the United States are also specified as obligated parties. While the scope of obligated parties has been expanded, the RFS2 program continued to provide exemptions for small refineries (and certain small refiners) until the end of 2010. The final RFS2 rule became effective July 1, 2010, and the percentage standards apply to all gasoline and diesel fuel produced or imported for the full year 2010. However, RINs generated under RFS1 (including those in 2010 before the Rule became final) and certain carryover RINs from 2008 and 2009 will be credited toward the 2010 RVO.

For each gallon of renewable fuel produced, a single credit (or multiple credits in the case of an equivalence value greater than one) is generated. These RIN credits are then moved from one party to the next, as they pass through the supply chain, until they eventually find their way to an obligated party. RINs accompany the physical volume of renewable fuel until the renewable fuel is blended with petroleum, at which point it may be separated from the resulting finished transportation fuel. When a RIN is separated from the physical batch of fuel, the first digit of the RIN is changed from a 1 to a 2. An obligated party can obtain RINs either through the purchase and blending of renewable fuel with their petroleum product, or, through acquisition of separated RINs from blenders (those non-obligated parties and those who have exceeded their mandated volumes). Obligated parties must demonstrate compliance with the program at the end of each year by submitting a sufficient number of RIN credits to satisfy their pro-rata share of the overall mandate.

Calculation Issues

The following tables summarize the volume requirements for each main category of renewable fuel by year. The RFS2 regulations require progressively greater blending of renewable fuels each year. Table 3 shows the mandated volume for each of the categories of renewable fuel through 2022.

Table 3. RFS2 Annual Volumetric Requirements (Billion Gallons)

Year	Conventional Biofuels	Advanced Biofuels				Total Conventional & Advanced Renewable Fuel
		Cellulosic Biofuel	Biomass-Based Diesel	Other Advanced Biofuel to Balance	Total Advanced Biofuel	
2009	10.5		0.5	0.1	0.6	11.1
2010	12	0.1	0.65	0.2	0.95	12.95
2010a	12	0.0065	1.15*		0.95**	12.95
2011	12.6	0.006	0.8	0.1	1.35	13.95
2012	13.2	0.5	1	0.0	2	15.2
2013	13.8	1	≥1.0	0.25	2.75	16.55
2014	14.4	1.75	≥1.0	0.5	3.75	18.15
2015	15	3	≥1.0	1.0	5.5	20.5
2016	15	4.25	≥1.0	1.5	7.25	22.25
2017	15	5.5	≥1.0	2.0	9	24
2018	15	7	≥1.0	2.5	11	26
2019	15	8.5	≥1.0	3.0	13	28
2020	15	10.5	≥1.0	3.0	15	30
2021	15	13.5	≥1.0	3.0	18	33
2022	15	16	≥1.0	3.5	21	36

* Combined 2009/2010 Biomass-Based Diesel volumes applied in 2010

** While Biomass-Based Diesel volume was increased to 1.15 billion gallons, Total Advanced Biofuels remained at 0.95 billion gallons for 2010.

Sources: EISA 2007, Public Law 110-140, pages 1522-1523 as amended by EPA 40 CFR Part 80 Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program; Final Rule published March 26, 2010.

Each year, EPA uses these volumes and the U.S. Energy Information Administration (EIA) estimate of transportation fuel demand for the next year to derive the RVO percentage for each biofuel type. These derived values for 2011 are shown in Table 4. The biofuel percentage multiplied by the actual volume of petroleum fuel imported or produced by the obligated party determines the number of RINs of each type that must be surrendered to EPA to meet the RFS2 requirements.

Table 4. Standards for 2011

Fuel Category	% of Fuel Required to be Renewable	Volume of Renewable Fuel (Billion Gallons)
Cellulosic biofuels	0.003%	0.0066
Biomass-based diesel	0.690%	0.80
Total Advanced biofuels	0.780%	1.35
Renewable fuel	8.010%	13.95

Source: Federal Register Vol. 75, No. 236 Thursday, December 9, 2010 pg 76793

One of the possible sources of confusion with RFS2 is the way the RVO percentage requirements are calculated. Under RFS1, the percentage requirements applied only to one biofuel standard.[12] The correct interpretation, due to the "nesting concept," is that the total RVO percentage is 8.010 percent. The other (incorrect) interpretation is that the total RVO percentage is 9.483 percent, derived from the sum of 0.003, 0.69, 0.78 and 8.01 percent.

EPA has the authority to adjust the mandated volume for Cellulosic Biofuel, Biomass-Based Diesel and, if necessary, for Total Advanced Biofuel if it appears there will be a shortfall in supply. As part of the RFS2 final rule, EPA reduced the 2010 Cellulosic Biofuel mandate from 100 million gallons to 6.5 million ethanol-equivalent gallons. Each year during the summer, EPA is required to announce in the *Federal Register* the proposed requirements for the following year. EPA must publish the final rule for the following year volumetric requirements by November 30[13].

The Value of RINs

Until mid-2010, the RIN market was almost exclusively corn ethanol from the RFS1 program. Since then, the RIN market expanded to include three advanced biofuels: cellulosic ethanol, biodiesel and cane ethanol. Today, there are four types of RINs traded: corn ethanol, cellulosic ethanol, biodiesel and advanced (usually sugar cane) ethanol.

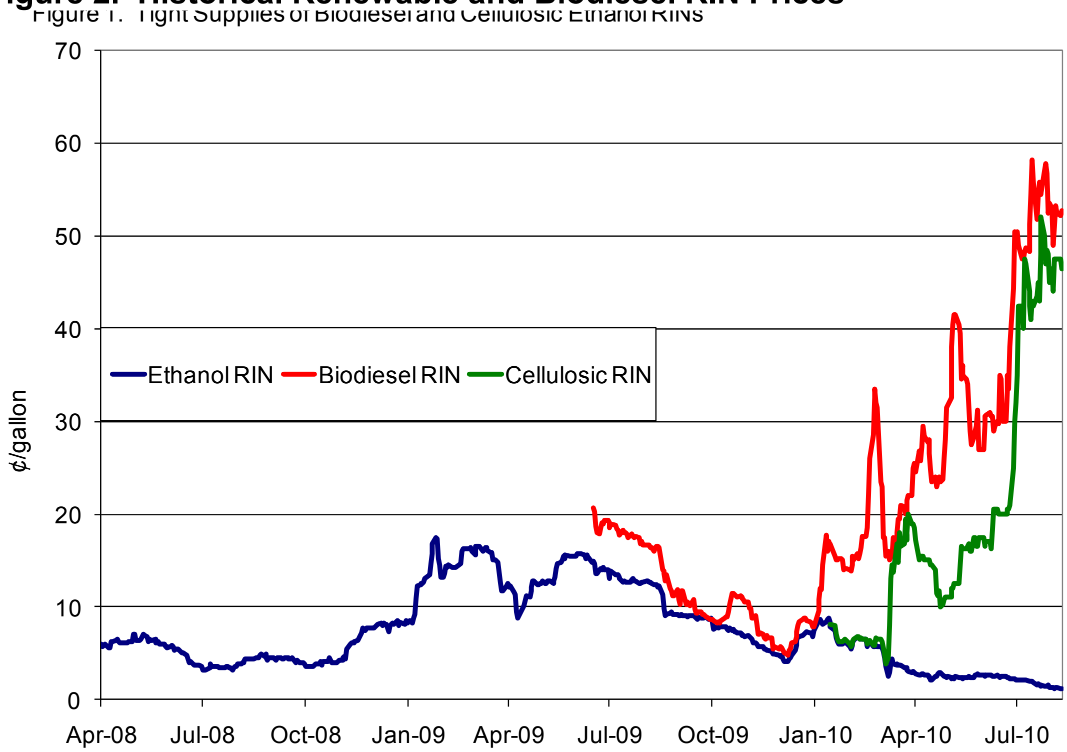
Depending upon the relative price of gasoline and corn ethanol, blending corn ethanol may be economically attractive aside from the mandate. If so, the price of corn ethanol RINs will reflect their transaction costs. As the economics become less favorable for corn ethanol, blending decreases and the amount of corn ethanol consumed is reduced. Once the corn ethanol consumption starts to fall below the mandated level, RIN prices will rise. In equilibrium, RIN prices will rise to increase demand for corn ethanol to the mandated level.

Figure 2 shows the history of RIN prices since program inception and illustrates the significant challenges faced by the biodiesel and cellulosic ethanol segments. Biodiesel and cellulosic RINs have traded at a substantial premium to corn ethanol RINs. This is a result of supply-side pressures associated with the limited production of biodiesel and cellulosic ethanol compared to corn ethanol. Biodiesel RINs have continued their upward trajectory, reaching over $1.10 per RIN in March, 2011. Renewable RINs have remained at historically low levels of $0.02 -$0.03 per RIN through February, 2011

[12] RFS1 specified different compliance values for certain types of biofuels (e.g., a gallon of biodiesel fuel had a higher compliance value than ethanol). These compliance values would be used to calculate an obligated party's compliance volume but that volume would only be measured against one RVO.

[13] More information on RIN market operations and compliance costs may be found in Appendix B.

Figure 2. Historical Renewable and Biodiesel RIN Prices



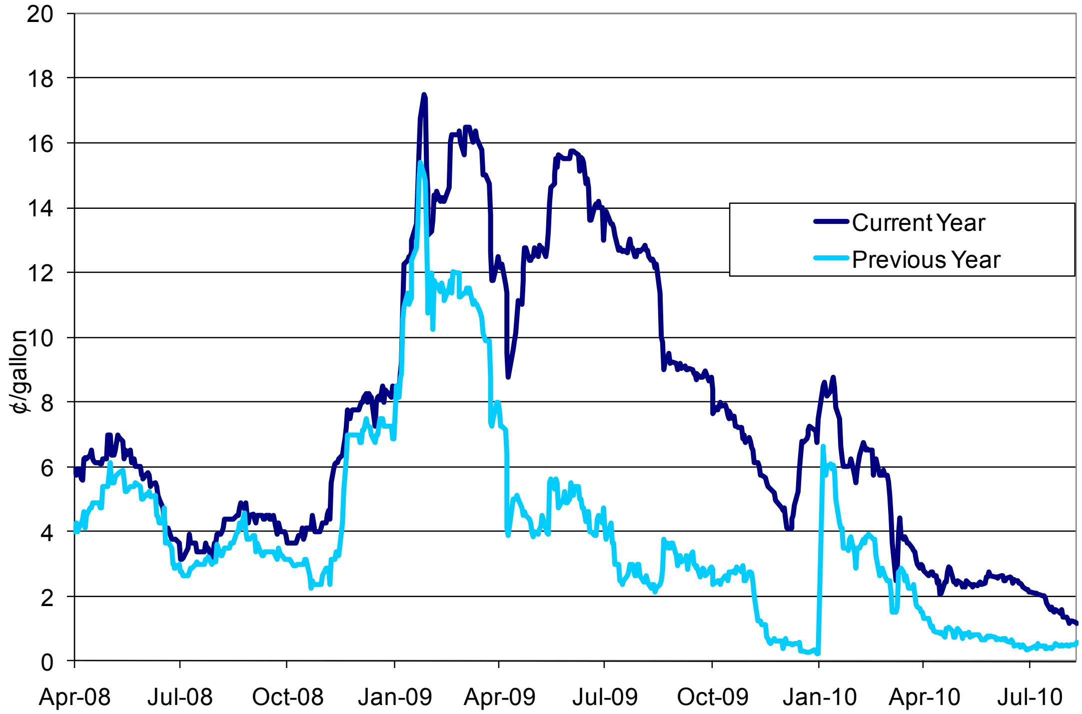
Source: OPIS for 04/02/2008 - 08/09/2010.

Approximately 75 to 80 percent of all U.S. biodiesel production capacity is currently idle due to the high cost of raw materials (soy bean oil, other vegetable oils, fats, and greases) relative to the value of the recipient petroleum diesel. Through December 2009, the biodiesel industry was supported by a federal tax credit of $1.00 per gallon for virgin feedstocks, and to a lesser extent, a European import tax credit that provided a market for biodiesel exports to Europe. While the biodiesel credit was reinstated retroactively at the end of 2010, its impact on supply has not yet been felt.

Cellulosic RINs are expensive because of the lack of Cellulosic Biofuel production. The technology for cellulosic ethanol production is still in the development stage and could be several years from commercial-scale production. If EPA determines that insufficient cellulosic production capacity exists, it may lower the cellulosic mandate and offer cellulosic RINs up to the total revised mandated level at a statutory price. In 2010 and 2011, EPA lowered the mandate for cellulosic ethanol to 6.5 and 6.6 million ethanol-equivalent gallons, respectively. The price was set at $1.56 per RIN for 2010 and $1.13 for 2011.

RINs have a two-year shelf life: the current year (year generated) and the subsequent year. Twenty percent of current-year RINs can be carried over to the subsequent year. For the last several years, there has been a large discount of previous-year RINs versus current-year RINs because of the success in the overall satisfaction of the current-year RVO. Figure 3 illustrates the relative values of current-year and previous-year RINs since inception.

Figure 3. Carry-Over and Current-Year RIN Prices



Source: OPIS for 04/02/2008 - 08/09/2010.

Ethanol serves to displace other blending components of gasoline. When ethanol is expensive, higher RIN prices provide an incentive for blenders to continue to use ethanol up to the statutorily-mandated level. Historically, there has been a close correlation between the value of corn ethanol RINs and the price of corn ethanol relative to gasoline. Figure 4 compares corn ethanol RIN prices with the corn ethanol-versus-RBOB[14] price spread for four major U.S. petroleum product markets; NY Harbor, US Gulf Coast, US West Coast (LA) and Chicago. When corn ethanol prices are high relative to gasoline, corn ethanol RIN prices also tend to be high. When corn ethanol prices are low relative to gasoline, corn ethanol RIN prices tend to be low as well. For most of 2010, corn ethanol traded at prices below the price of gasoline, creating a substantial financial incentive for corn ethanol blending. As a result, as of February, 2011 corn ethanol RIN prices are still at historic lows, hovering around $0.02-$0.03 /gallon.

Obligated parties typically keep close track of their RIN balances, estimating whether they will be long or short at the end of each quarterly reporting period. Manufacturing upsets, shifts in gasoline blending and changes to the supply/demand balance for products can cause unexpected changes to a company's RFS compliance. Generally accepted accounting principles require a company to accrue a liability on its books at the end of a financial quarter when they are in a short position and need to purchase RINs.

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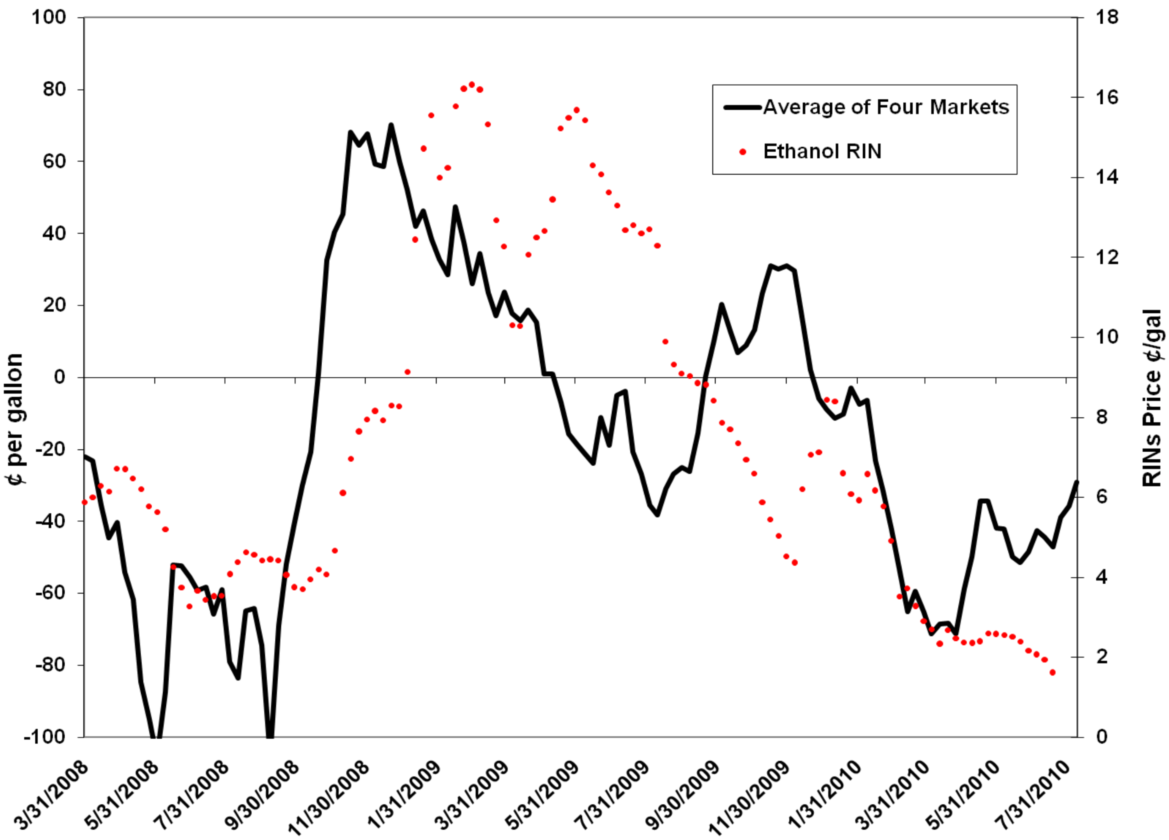
[14] Reformulated blending oxygenated blendstock

Figure 4. RINs Prices Track the Ethanol-RBOB Spread



Source: Derived from OPIS, Refined Spot Prices for 04/02/2008 - 08/09/2010.

As shown in Figure 4, there were occasional end-of-quarter spikes of RINs which were likely caused by the mandated quarterly settlement and reporting process. Firms unable to meet their obligation needed to "pay up," thus causing the apparent lag in RIN prices. The RIN market lag appears to be about two months.

IV. The Blend Wall

There has been considerable discussion among industry and government policy makers about the looming "blend wall" and the impact this blend wall will have on ethanol producers, refiners and blenders, and, in particular, small refiners. There also has been concern about the how the blend wall will impact the industry's ability to comply with RFS2, specifically to meet the renewable fuel volumes mandated by EISA 2007.

A blend wall is the aggregate limit to which a renewable fuel can be blended into its recipient motor fuel. The blend wall reflects both physical limitations and regulatory restrictions on the ability of the vehicle/fuel system to absorb renewable fuels. As a result, a blend wall is specific to a particular renewable fuel and specific to a particular motor fuel. There are two primary blend walls of concern: one encompasses ethanol blending in motor gasoline and another blend wall exists for biodiesel blends in diesel fuel. Since the latter mandate is so much smaller than the former, the ethanol blend wall is of the most concern.

Implementation of ethanol blending requires changes in infrastructure and regulations. At times, the ethanol production capacity has exceeded the market's ability to profitably execute ethanol blending, causing periods when the blend wall actively constrains the market. Continued infrastructure build-out has expanded the fraction of gasoline containing ethanol. However, EIA data has shown that ethanol blending has expanded to almost the entire gasoline pool. At this point, the blend wall cannot be alleviated through increased low-level blends such as E10 alone.

The blend wall is a function of a multitude of contributing factors occurring together or singly. Each of these factors plays a part in determining the maximum amount of ethanol blended into gasoline, and thus, each contributes to the timing of when the blend wall could be reached.

Contributing Factors to Reaching the Blend Wall

The timing of when the blend wall occurs is a function of many contributing factors, including:

1. Motor fuel demand. Ethanol is one of many components of gasoline. With minor exceptions, gasoline is either "neat" (without ethanol) or blended at a fixed proportion to gasoline. Therefore, the overall consumption of ethanol is proportional to demand for gasoline. Since the demand for gasoline is relatively inelastic relative to price, and ethanol has very little impact on the price of gasoline, overall consumption is directly proportional to the demand. Exogenous factors such as unemployment, fuel economy standards and the price of oil play an important role in the ability of the transportation fuel pool to absorb ethanol.

2. Federal, State and Local regulations/mandates/incentives. Not all gasoline contains ethanol. Numerous incentives exist for the production and consumption of ethanol. At the national level, these include the Volumetric Ethanol Excise Tax Credit (VEETC) and the small ethanol producer's credit. Furthermore, numerous states have incentives and mandates for renewable fuels. California has a requirement for 10 percent ethanol in gasoline. Such incentives have encouraged infrastructure changes accelerating blending in almost all available gasoline pools.

   Federal and State regulations have a significant impact on ethanol blending penetration and economics. Under Title I, the CAA puts the regulatory burden of compliance for criteria pollutants on the States, which develop regulations based on their local conditions. Because any change in the proportion of components of gasoline will have a significant impact on vehicle emissions, States must develop such strategies including ethanol blending limits in conjunction with EPA. The limit on blending has increased as more states have incorporated ethanol in their compliance strategies.

   Biodiesel represents an alternative renewable fuel that does not impact the ethanol blend wall. Currently biodiesel receives a $1 per gallon tax incentive. Both Pennsylvania and

Minnesota have mandates for biodiesel consumption. Even with these incentives, biodiesel production costs are so high and acceptance so low that it is unlikely to be consumed in any greater than the minimum volume mandated by EISA 2007.

3. Mid-level blends. If ethanol concentrations greater than 10 percent are allowed, this will increase the total quantity of ethanol consumed in transportation fuel and will raise the effective blend wall. However, there are numerous regulatory and logistical hurdles that must be overcome before the use of mid-level blends becomes widespread. Implications of mid-level blends are discussed in the section "E15 and the Blend Wall" on page 18.

4. E85 infrastructure. E85 is a mixture of approximately 85 percent ethanol and 15 percent gasoline. E85 use requires specialized (flex-fuel) vehicles. E85 does provide another outlet for ethanol. However, given the small number of flex-fuel vehicles currently in use, about 7.3 million according to EPA estimates, the opportunity to increase the blend wall through increased use of E85 is limited. In addition, the E85 delivery system is not well developed. Industry observers have estimated that there are currently only about 2,000 E85 pumps in the US. For the E85 market to absorb significant additional quantities of ethanol, massive demand growth supported by infrastructure improvements would be necessary[15].

   E85 is a complement rather than a replacement for conventional fuels for flex-fuel vehicles. As such it must compete effectively on a per-mile basis. Therefore, ethanol must be sold at its energy content value, which is roughly 2/3 of that of gasoline.

These factors are summarized in Table 5 below.

Table 5: Blend Wall Contributing Factors

Primary Factor	Specific Factors
Motor fuel demand	• Sets limit for maximum ethanol in low level blends
Federal, State and Local regulations/mandates/incentives	• Incentives for expanding blending infrastructure through mandates and ethanol subsidies • Legal restrictions on blending through CAA;State regulations on blending
Limits on increased of mid-level blends	• Vehicle technology and warranties • Allocation of underground storage tanks • Dispenser certifications
E85 market dynamics	• Certification of blender pumps and dual fuel limitations • E85 delivery system • Limit on fraction of fleet using fuel

[15] EPA-420-R-10-006, "Renewable Fuel Standard Program (RFS2) Regulatory Impact Analysis", February 2010

How Close is the Blend Wall

Some ethanol industry trade organizations have stated that the blend wall has already been reached because ethanol production has at times exceeded 10 percent of gasoline consumption. This percentage is often used as a proxy for the total amount of ethanol that can be blended into gasoline because 10 percent is the federally-mandated maximum ethanol content of gasoline consumed in National Ambient Air Quality non-attainment areas as defined in the CAA.[16]

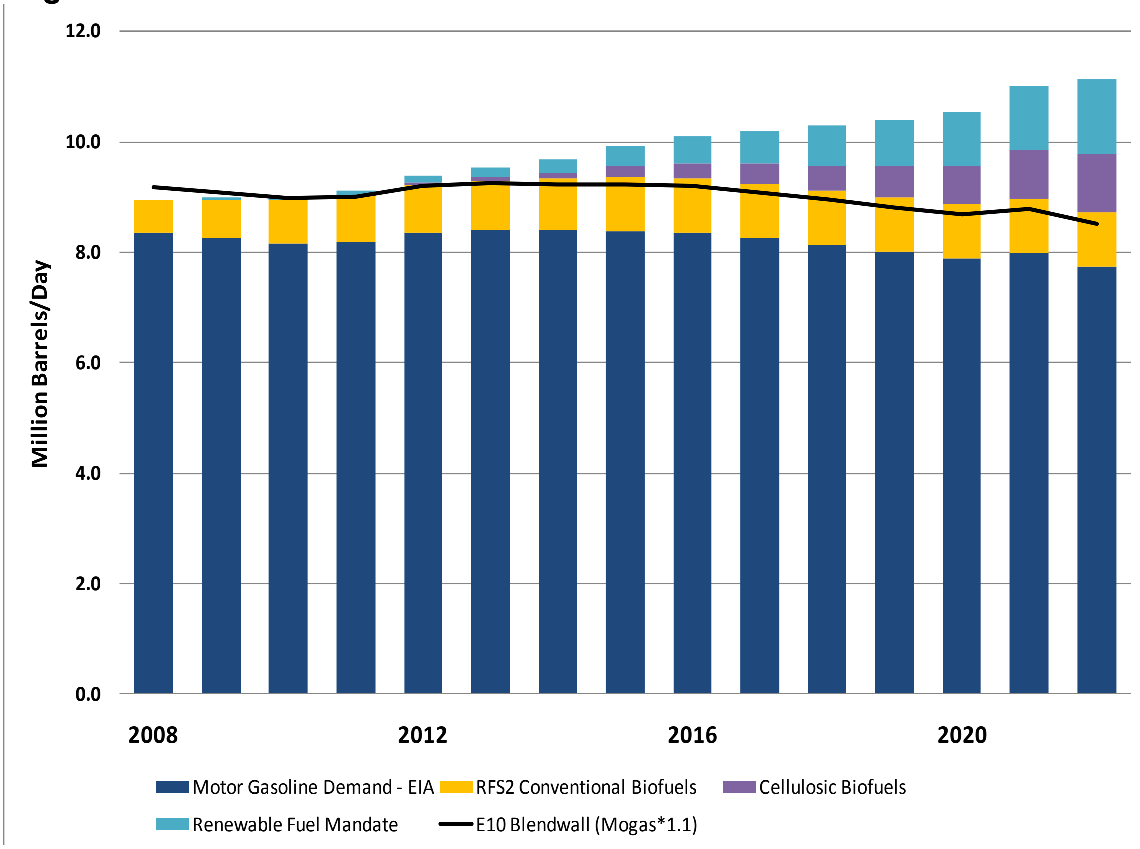
EIA stated in July 2010 that while they were projecting that daily ethanol supply would briefly exceed 10 percent of daily motor gasoline demand in early 2011, they were also projecting that increasing daily demand of gasoline over the balance of the year would absorb the full year ethanol production. EIA's statement makes an important point about the blend wall: the volume associated with the blend wall is more accurately discussed as an annual volume rather than a monthly volume.

Figure 5 shows EIA's projection of the compliance pathway for the RFS2 program through 2022. The line reflects the maximum amount of ethanol that may be blended into gasoline as E10. Any volumes above the line must be a high-level blend such as E85, or a non-ethanol renewable fuel. The difference between the yellow bar and the line represents the level of corn ethanol alone that cannot be absorbed into the transportation fuel pool. The physical limit to ethanol blending could be reached in 2012. However, RFS2 does not explicitly mandate an RVO greater than this physical limit until 2014, when the RVO is over 16 billion gallons of ethanol.

A surplus inventory of RINs could delay the date when the RVO cannot be met if the physical blending limit has been reached. While RINs are generate by blending renewable fuel, surplus RINs from one year may be carried over for use in the compliance in the next. Based on consumption of ethanol over the last few years, it is estimate that approximately 1 – 2 billion RINs may be available. Such carryover RINs may influence the timing of when the blend is reached.

[16] It is important to note, however, that 10 percent of gasoline demand is only a theoretical blend wall value and as a result provides only an estimate of the volume associated with the corn ethanol blend wall. Ten percent is a blend limit only in the absence of ethanol feedstock shortages, changes to federal regulations, imports/exports or a larger market for E15/E85, etc.

Figure 5. RFS2 and U.S. Motor Gasoline Demand



Source: EIA data as of 9/6/10.

Note: These calculations do not reflect the recent EPA decision to grant a partial waiver for E15 use in MY2001-2006 vehicles on January 21, 2011 and MY2007-Current vehicles on October 13, 2010

Consequences of Reaching the Blend Wall

When the blend wall is reached, there could be significant economic consequences for obligated parties such as refiners and ethanol suppliers. There will also likely be downward pressure on ethanol prices given that ethanol production capacity is still increasing while the ability to incorporate ethanol in the transportation fuel system is constrained. This may have a negative impact on ethanol producers.

As the blending opportunities become scarce, more expensive blending opportunities will be pursued. Current options include an increase in biodiesel and an increase in consumption of mid- or high-level ethanol blends. However, biodiesel is limited by limited feedstock supply, high production costs and limited market acceptance. Mid- and high-level ethanol blends, such as E15 and E85, face current physical limits on distribution and vehicles that can use the fuel in additional to other market acceptance factors. These actions provide limited additional blending opportunities in the near term.

RIN prices should rise to reflect the most expensive blending opportunity taken. As the RFS mandate increases, obligated parties will demand more RINs, adding upward price pressure. As the mandate increases, increasing the supply of RINs becomes difficult or nearly impossible. In anticipation of the blend wall, obligated parties may stockpile RINs through discretionary blending in anticipation of a shortage of blending opportunities. Those parties that are short, i.e. cannot generate enough RINs through their own facilities to meet their RVO, will need to purchase RINs and could suffer significant economic hardship.

Declining ethanol prices would probably be favorable to refiners/blenders that predominately blend ethanol rather than purchase RINs for blending. Many small refiners do not retain control over the blending of their products, and must purchase additional RINs. Obligated parties that rely on purchasing RINs would be adversely affected when the blend wall is reached and their RINs inventory has been depleted.

The next section investigates the impact of the approaching blend wall on RIN prices through an econometric relationship developed between discretionary blending, corn ethanol prices and RIN prices.

E15 and the Blend Wall

On October 13, 2010 EPA granted a waiver for fuels containing up to 15 percent ethanol for vehicles of Model Year 2007 and later. On January 21, 2011 this waiver was extended to Model Years 2001 – 2006 vehicles. This waiver covers approximately 2/3 of the light duty vehicle fleet. While it may appear that these E15 waivers substantially increased the amount of ethanol that could be blended into gasoline before the blend wall is approached, there are several reasons why this may not be the case. In particular, there are numerous obstacles to overcome before E15 blends become viable in the marketplace.

- Current pumps are not certified for blends above 10% ethanol. While it is likely that E15 would not harm conventional pumps, liability concerns would no doubt limit the distribution of the new fuel. Replacing pumps would cost anywhere from $750 per pump if only the hanging hardware needs replacing up to approximately $11,000 per pump if interior components also need to be replaced[17].
- Many refueling stations have only two tanks for gasoline, usually one for premium and one for regular gasoline. Mid-grade gasoline is a blend from each tank. Gasoline stations could be unwilling to switch to a fuel that only a portion of their customer base would be able to purchase.
- While EPA has certified the mid-level blends, automobile manufacturers have not followed suit by explicitly modifying their warranties to include E15. It is unclear whether consumers would purchase a fuel that is not covered by their vehicle manufacturer’s warranty.
- Various regulatory requirements would need to be adjusted. For instance, conventional gasoline that is sold as E10 is currently granted a 1-lb waiver on its summer Reid Vapor Pressure (RVP) specification. Either a new rulemaking would be required for E15 or

[17] EPA-420-R-10-006, “Renewable Fuel Standard Program (RFS2) Regulatory Impact Analysis”, February 2010, pg 800.

refiners would have to develop a special low RVP blendstock. Similarly, EPA has developed specifications for Reformulated Gasoline (RFG), a clean-burning fuel required to be used by certain areas under the Clean Air Act. The RFG specification would also need to be changed in order to accommodate ethanol blending over ten percent. Changes for both conventional and reformulated gasoline would require a new EPA rulemaking, which would necessarily take anywhere from months to over a year.

For all of the above reasons, it is unlikely that E15 will play a significant role in the transportation fuel market over the next few years. Therefore, this analysis did not analyze the impact of E15 on the gasoline and ethanol markets.

V. Evaluating the RIN and Ethanol Markets

A simultaneous multi-equation model of the ethanol fuels market was developed to evaluate how precipitation, crude oil prices and the RFS requirements affect corn and ethanol prices, RIN prices and the overall market equilibrium for ethanol. Appendix C describes the model structure, data and parameters, and provides a detailed analysis of the scenarios discussed below.

The model was used to identify conditions conducive to generating high corn ethanol RIN prices, such as drought or flooding, or increased discretionary blending of corn ethanol by obligated parties in order to stockpile RINs against potential shortages due to the blend wall. Scenarios were developed for 2011 and 2012, where the model derived ethanol demand and corn, ethanol, and gasoline prices using assumed values for crude oil, rainfall and the mandated level of ethanol consumption. Under optimal rainfall conditions and crude oil prices of $90-$92 per barrel, corn ethanol production will exceed the mandated levels in 2011 and 2012, and the ethanol is expected to be blended into the motor gasoline pool so that the number of RINs generated will likely exceed the RVO. Therefore, in the case where blending is economic, in a competitive market the price of corn ethanol RINs should reflect no more than their transaction cost. However, it is possible that obligated parties may increase blending relative to the mandated RFS level in anticipation of a shortage of blending opportunities due to the approaching blend wall. If market and meteorological conditions worsen, the combination of higher corn ethanol production costs and increased blending would likely lead to a sharp increase in RIN prices. Several such scenarios are explored below.

The four scenarios described in Table 6 were used to project RIN prices (shown in Table 7) in 2011 and 2012 for varying meteorological conditions, crude oil prices, and obligated party blending levels of corn ethanol.[18] Scenario A represents a “Best Case Scenario” where optimal rainfall creates conditions for low ethanol prices due to a high corn yield. Scenario B dampens the expectations of a high corn yield by introducing poor rainfall conditions, which causes corn prices to increase and corn ethanol production to drop below mandated levels. In contrast, scenario C forces blending up to the RVO, which causes corn ethanol RIN prices to reach $0.38 and $0.64 per gallon of corn ethanol blended in 2011 and 2012, respectively. RIN prices

[18] Full description of the model can be found in Appendix C.

increase to $0.92 and $0.95 in 2011 and 2012 under Scenario D due to over-blending by the obligated parties (under poor rainfall conditions).

Table 6. RIN Scenarios Description

Scenario	Precipitation (Inches/Month)	Blending Level
A	Optimal (2.91)	Unconstrained
B	Poor Rainfall (2.07)	Unconstrained
C	Poor Rainfall (2.07)	Constrained (12.6 in 2011 and 13.2 in 2012)
D	Poor Rainfall (2.07)	Constrained (13.2 in 2011 and 13.6 in 2012)

Table 7. RIN Price Scenario Results for 2011 and 2012 (2009 $)

	Rainfall	VEETC	RIN Price	Ethanol Mandate	Mogas Use[19]	Crude Oil Price	Ethanol Production	Ethanol % in MoGas	Ethanol Price	Corn Price	Wholesale Gasoline Price
	Inches/ Month	$/ Gallon	$/ Gallon	Billion Gallons/ Year	Billion Gallons/ Year	$/Barrel	Billion Gallons/ Year	Percent	$/ Gallon	$/ Bushel	$/Gallon
						2011					
A	2.91	$0.44	$0.00	12.6	139.3	90	13.57	9.7%	$2.94	$4.40	$2.60
B	2.07	$0.44	$0.00	12.6	139.3	90	12.17	8.7%	$3.58	$6.83	$2.73
C	2.07	$0.44	$0.38	12.6	139.3	90	12.60	9.0%	$3.75	$6.95	$2.76
D	2.07	$0.44	$0.92	12.6	139.3	90	13.23	9.5%	$4.02	$7.12	$2.80
						2012					
A	2.91	$0.43	$0.00	13.2	143.0	92	14.02	9.8%	$3.05	$4.42	$2.61
B	2.07	$0.43	$0.00	13.2	143.0	92	12.46	8.7%	$3.69	$6.87	$2.73
C	2.07	$0.43	$0.64	13.2	143.0	92	13.20	9.2%	$4.00	$7.08	$2.78
D	2.07	$0.43	$0.95	13.2	143.3	92	13.59	9.5%	$4.14	$7.18	$2.80

[19] EIA AEO2011

The scenarios considered are indicative of the types of events that could cause a significant increase in RIN prices, but are not designed to be exhaustive. For instance, a continued draw on U.S. corn reserves due to foreign demand would have a similar effect of a domestic reduction in production. The point of these scenarios is to demonstrate that relatively minor changes could dramatically raise the RIN prices from their current level. Such a scenario would have a significant impact on any small refinery that either physically did not blend or was not contractually obligated to receive the RINs generated when the purchaser blended the fuel.

VI. Determining Compliance Cost

Compliance cost information was compiled through interviews with several industry participants, including two refiners, three importers, a fuel marketer, and a corn ethanol marketer. Generally, companies who incur an RFS2 compliance cost are obligated parties who must buy RINs to meet their RVO, instead of blending renewable fuels. Many companies identify blending as a profit opportunity, as historically the price of gasoline of has generally exceeded that of ethanol. These companies reported that the market for RINs has thus far been liquid, implying that RINs are generally available for purchase and no single participant is setting prices. Obligated parties who could do so generally blended corn ethanol beyond their RVO because corn ethanol was inexpensive relative to BOB (Blendstock for Oxygenate Blending) prices up until August 2010. Blending corn ethanol beyond their RVO creates surplus RINs, which in mid-September 2010 sold for around $0.04 per gallon. Biodiesel RINs have thus far been available, although have been an order of magnitude more expensive, at about $0.05 per gallon[20]. RIN sellers also include some blenders who do not have an RVO because they are typically gasoline marketers who buy ethanol and gasoline for blending and final sale.

Obligated parties have a weighted average RIN obligation based on the percentages of the four types of renewable fuels. At current prices, this obligation is about 0.85 cents per gallon for each gallon produced or imported that is not blended with renewable fuel. Table 8 shows a sample calculation where the production volume is 1 million gallons and RINs are priced at mid-September 2010 market values.

Table 8. Sample Obligated Party RINs Costs for 2010

Renewable Fuel Type	Standard	Gasoline & Diesel Production (gallons)	RVO # of RINs	RINS to Acquire	Mid September RIN Price ($/gal)	RIN Cost
Cellulosic Biofuel	0.00004	1,000,000	40	40	$ 0.50	$ 20
Biomass Based Diesel	0.01100	1,000,000	11,000	11,000	$ 0.51	$ 5,610
Advanced Biofuels	0.00610	1,000,000	6,100	-	$ 0.50	$ -
Renewable Fuels	0.08250	1,000,000	82,500	71,460	$ 0.04	$ 2,858
Total				82,500		$ 8,488
Total $/gallon						$ 0.00849

Source: SAIC Analysis, EPA

[20] As of February, biodiesel RINs, have continued to climb in price, currently well over $1 per gallon.

Other observations from the interview process revealed:

- Some of the companies were incorrectly calculating their RVO. Some firms reported calculations that resulted in costs about one-third higher than shown in Table 8.

- Interview participants generally could identify the administrative cost of complying with RFS2 in terms of Full Time Equivalent (FTE) personnel. The highest administrative burden reported was 1.5 FTE. One firm had automated its administrative costs and was unable to break out the compliance costs.

- For the capital costs for compliance, the data was somewhat limited. One refiner reported costs of $200,000 to $1,000,000 to modify its terminals for ethanol blending. The range was a result of whether the terminal had a tank that could be converted to ethanol storage. One marketer reported costs of $3,000,000 to convert its three-lane truck rack to ethanol blending. The other participants either did not blend renewables or used third-party logistics service providers who made the required capital investments. EPA has estimated that adding ethanol blending and truck unloading facilities at a terminal costs approximately $800 thousand.[21]

- In most states, biodiesel blending is limited because biodiesel feedstock is expensive and consumer resistance to the blend exists. Five States have biodiesel mandates: Louisiana, Massachusetts, Minnesota, Oregon, and Pennsylvania, which encourage biodiesel consumption[22]. The vast majority of biodiesel production occurs in the Midwest, where blending creates biodiesel RINs which may be purchased throughout the U.S. Several participants stated that future market conditions were highly uncertain due to the expiration of the biodiesel tax credit. With the renewal of the biodiesel tax credit through 2011[23], this is no longer an issue, though biodiesel RIN prices are still over $1.00 per gallon. For those refineries that intend to blend biodiesel, EPA has estimated adding biodiesel blending capability at approximately $500 thousand per terminal[24]. This includes blending equipment and ancillary piping and other modifications.

- A 50,000 barrel per day refinery that produces about 36,000 barrel per day of gasoline and diesel incurs a one cent per gallon RINs purchase cost which equals approximately a $5.5 million annually. Much of this cost may be seen as a reduction in that refinery's annual pretax profitability. However, since all firms without exemptions must comply with the RFS2 progam, product prices should rise to reflect the additional costs. The

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[21] EPA-420-R-10-006,"Renewable Fuel Standard Program (RFS2) Regulatory Impact Analysis", February 2010, pg 775.

[22] "Alternative Fuels and Advanced Vehicle Data Center", http://www.afdc.energy.gov/afdc/laws/ accessed March 8, 2011.

[23] The Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 (Pub.L. 111-312, H.R. 4853) retroactively extended the biodiesel tax credit through 2011.

[24] Ibid, pg. 797.

degree to which the costs burdening small refineries will be passed through to the market depends on many factors, including the market power and the relative cost level of a small refiner relative to other market participants. Therefore, in the current lower refining margin environment, the cost of the RFS2 regulations could have a material effect on small refinery profitability.

- The response to the RFS2 requirements depends in large measure on the size and scope of the operations of individual companies. Larger refiners have options available on a scale well beyond those available to smaller refiners. Large integrated refiners can more easily obtain financing for blending facilities, generate options, accommodate their needs efficiently and shift emphasis from one sector to another as opportunities indicate. For example, over the past couple of years, compliance strategies for larger companies included engaging in joint ventures with ethanol producers, investing in companies in the renewable sector, or conducting research on renewable fuels. As a result, RFS2 compliance costs for the larger refiner may be a small part of overall operating costs.

- Small companies are more limited in their options. They face a number of challenges and access to capital is generally limited or not available. Even when capital is available, they may have to choose between making substantial investments in blending and investing in other needed facilities to improve operating efficiencies to remain competitive.

- The cost for small refiners to comply with the RFS2 requirements can be substantial. Costs associated with consultants and attorneys to ensure compliance, and joining RINStar or similar services can be burdensome. Their limited product slates coupled with an inability to blend renewable fuels means that many of the small refiners must enter the market to buy RINs. The cost to meet their individual RVO makes this aspect the most significant cost of compliance.

VII. Refinery Classification

The oil industry encompasses a broad spectrum of companies. At one extreme, the multi-national super majors have full vertical integration. Their operations encompass upstream (exploration, development, and production), midstream (transportation and refining), and downstream (refining, marketing, distribution, and sales). Some integrated companies also operate on a world-wide basis but tend to concentrate their refining and marketing operations in the United States. These integrated refiners also enjoy economies of scale from ownership of upstream operations, large refining operations, and interests in the refined product distribution supply chain.

All independent refiners that process crude oil domestically do not directly engage in upstream operations, but some do own pipelines and storage facilities. Although large independent refiners do not extract or produce crude oil, some participate in joint ventures involving integrated refiners and/or crude oil suppliers (for example Motiva,[25] WRB Refining[26]). Consequently, some large independent refiners are indirectly linked to the diversified operations of their owners and can benefit from their vertical integration (exploration, refining, and distribution).

Small refiners operate with limited access to resources under constrained market conditions, and comprise a heterogeneous group of businesses. They may be classified as:

- A subsidiary of a large integrated corporation with both upstream and downstream activities,
- A company owning one or more small refineries with other lines of business contributing significantly to their total operations, or
- A company with a single small refinery which provides the vast majority of the value of the enterprise.

Refiner-Blender Integration

Some larger oil refiners have started integrating ethanol manufacturing with their existing operations. This action has the effect of reducing their feedstock availability risk and of capturing some of the profitability of renewable fuels production. During the recent economic downturn, several ethanol manufacturers went bankrupt and some oil refiners were able to purchase distressed ethanol facilities at low prices. Currently, major oil refiners control about 7 percent of the U.S. ethanol capacity.

Valero has acquired a number of ethanol plants and initiated construction of others, at least one of which is co-located at a refinery. Valero entered into ethanol production in 2008 when they started buying ethanol facilities from VeraSun. They now own ten facilities with a renewable production capacity of 1.1 billion gallons per year. Sunoco and Flint Hills Resources also entered into ethanol manufacturing. Sunoco purchased a bankrupt ethanol plant in Fulton, NY, located near their Northeast refineries. It is reported that the plant will meet about 20 percent of the company's ethanol needs. Flint Hills Resources purchased two facilities from Hawkeye Energy Holdings, in Menlo and Shell Rock, IA. The ethanol facilities are located near a Flint Hills refinery.

VIII. Small Refinery Exemption

In preparation for the RFS1 rulemaking, EPA convened a Small Business Impact (SBRFA) panel to examine the impact of the RFS1 program on small businesses. Subsequent to the discussions of the SBRFA panel, EPA chose to exempt small refiners with fewer than 1,500 employees and less than 155,000 barrels per day crude processing capability from compliance with the RFS1

[25] Motiva is a joint venture of Shell and Saudi Aramco

[26] WRB Refining is a joint venture of Conoco and Cenovus

program. Small refineries, as defined above, were also exempted from the RFS1 mandate through 2010. EPA concluded that it did not have the authority to extend the duration of the exemption period from RFS1 for small refiners.[27]

In addition to the general regulatory flexibility for small business inherent in the Clean Air Act, Congress specifically addressed the potential for an extension of the small refinery exemption in EPAct 2005. Under section 211(o)(9)(A)(ii) of the CAA, the Secretary of DOE is required to conduct a study for the EPA Administrator to determine whether compliance with the RFS2 program would impose a "disproportionate economic hardship" on small refineries, as defined as those facilities with production capacities under 75,000 barrels per calendar day. If the study found that disproportionate economic hardship would occur, EPA is obligated to extend the exemption to the RFS2 program for at least two additional years. In addition, small refiners and small refineries still maintained the right to petition EPA for individual exemption from the program.

As required by EPAct 2005, the final RFS1 regulations exempted gasoline produced by small refineries from the renewable fuels standard through December 31, 2010. Since EISA 2007 did not alter that exemption in any way, EPA retained the small refinery temporary exemption in the RFS2 final rule without change (except for the fact that all transportation fuel produced by small refineries will be exempt, as EISA 2007 also covers diesel and non-road fuels). The RFS1 final rule also offered a temporary exemption to small refiners to allow the few small refiners who owned refineries larger than the statutory limit to also receive the exemption. Similarly, the RFS2 rule continued the small refiner temporary exemption for transportation fuel produced by small refiners through December 31, 2010.[28]

Small refineries and small refiners may also apply for an extension of the temporary exemption, based upon disproportionate economic hardship, on a case-by-case basis. Any small refinery or small refiner may apply at any time. In evaluating applications for this hardship provision, EPA will take into consideration information from this report, annual reports, RIN system progress updates, petitioners and consultations with the DOE.

IX. PI-588 Survey

Existing survey data collected by EIA was insufficient to determine which small refineries merited an extension of their RFS1 exemptions. The data collected by EIA is mostly volumetric information regarding production, inputs, imports, and stocks. Some retail and wholesale price data are gathered, but not for the specific renewable-based transportation fuels. Collection of ethanol is evolving, but there are still some limitations on the coverage. Financial data are gathered annually for major refiners only. Consequently, a new data source was needed if the

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[27] "Final Report of the Small Business Advocacy Review Panel on EPA's Planned Proposed Rule Regulation of Fuels and Fuel Additives: Renewable Fuel Standard Program," September 5, 2008.

[28] EPA Compliance Guide 4-1

Congressional requirements for a revised Small Refiner Exemption Study were to be met. The PI-588 survey was developed over the summer of 2010 to acquire the needed data. After public review in the Federal Register, the survey received clearance from the Office of Management and Budget on September 22, 2010.

This one-time, voluntary survey was distributed electronically on September 27, 2010, to 59 refineries. It contained five parts:

- Respondent Identification
- Submission/Resubmission
- Financial Health of Refinery
- Market Compliance
- Market Issues

Many of the questions sought three years of data (2007, 2008, and 2009). Future-looking questions sought data for three prospective years (2010, 2011, and 2012). The cover letter, survey form, survey instructions, and electronic filing instructions are provided in Appendix D.

The 59 refineries were selected because they currently hold a waiver from EPA under the RFS2 program. These refineries are geographically diverse (see Figure 6) and represent various company sizes and structures. They include:

[Redacted]

Figure 6. Small Refineries Receiving the PI-588 Survey

[Redacted]

[Redacted] of the refineries currently holding waivers belong to **[Redacted]** major refiners Two refiners, **[Redacted]**, responded by declining to participate in the survey; stating that they would be unlikely to be classified as suffering disproportionate economic hardship. Many of the small refineries owned by **[Redacted]** chose not to respond to the PI-588 survey. A total of 22 refineries had responded to the survey when the response period was closed on November 10, 2010. Three additional refineries sent in surveys in February, 2011. Surveys received from five refineries currently holding exemptions were deemed to exceed the small refineries RFS exemption size threshold and two surveys were found to be incomplete for analysis. All responses were validated against annual and monthly EIA surveys. Validated data from 18 surveys that met all criteria were the basis of the analysis of disproportionate economic hardship (see Table 9). More specifics on the classification of the survey responses and their validation are provided in Appendix E (Confidential Business Information), while short summaries of each refinery examined may be found in Appendix F (Confidential Business Information).

Table 9. Refinery Survey Responses by PADD and Ownership [CBI] used in Disproportionate Economic Hardship Analysis

Company Name	Refinery Name	State	PADD	Ownership
[Redacted]				

X. Refinery Viability

Over the last few decades, refining has become an increasingly challenging business due to low refining margins and increasing regulation[29]. Refiner viability refers to the ability of the refiners to remain competitive and profitable. For example, as survey responses were being received, four refineries indicated **[Redacted]**. These are:

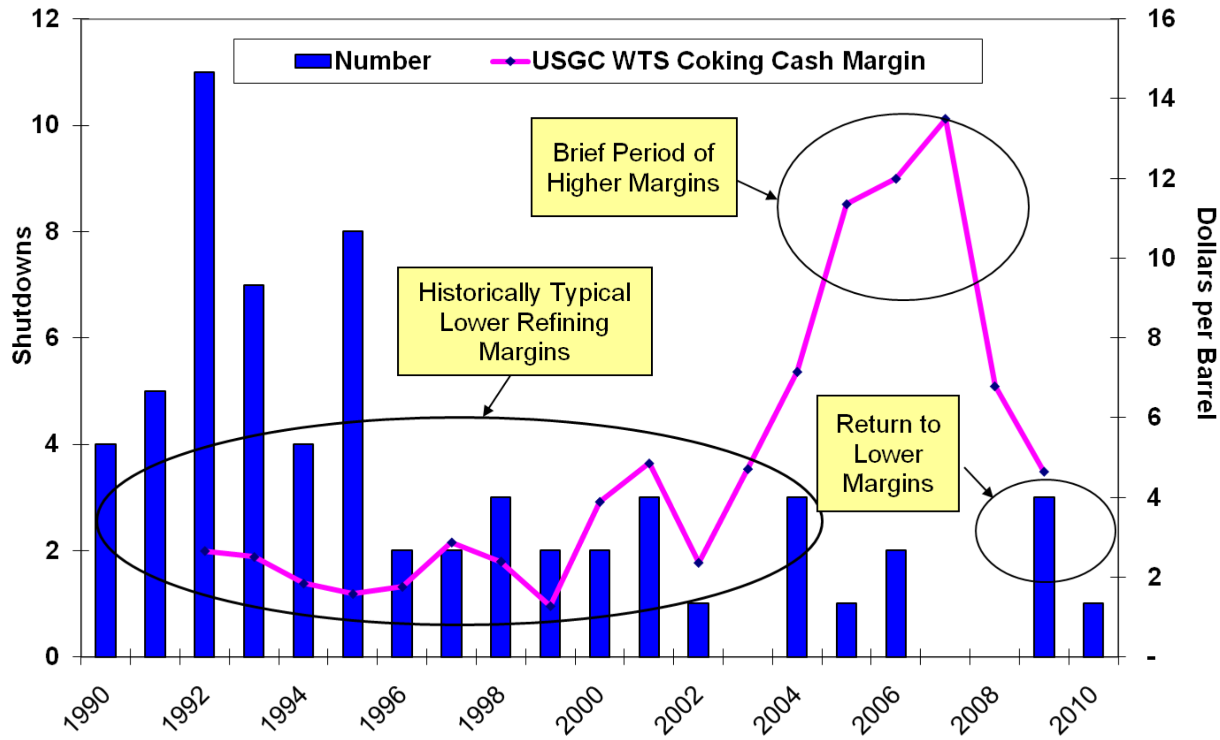
[Redacted]

These refineries did not submit surveys but their economic situations reveal the fragility of refinery viability. To further address the economic hardship faced by these **[Redacted]** refineries and the 22 respondents, a series of small refinery profiles were prepared that incorporated key PI-588 and EIA survey data, corporate press releases and other news. These profiles are provided in Appendix F (Confidential Business Information).

[29] More information on environmental regulations and refinery shutdowns may be found in Appendix G.

To have four refineries idled in one year is unusual in recent years. Historically, the petroleum industry witnessed considerably more shutdowns each year, especially 1990-1995. As presented in Figure 7, over the past two decades, U.S. refiners faced generally low refining margins. The exception was a window of time from 2005 through 2007. An unusual combination of rising global refined product demand, temporarily constrained global refining capacity and hurricane-reduced U.S. Gulf Coast refinery production combined to increase global refining margins for this three year period. Since 2007, conditions have changed and margins have slumped, returning to lower, more typical levels.

Figure 7. U.S. Refining Margins and Shutdowns, 1990-2010

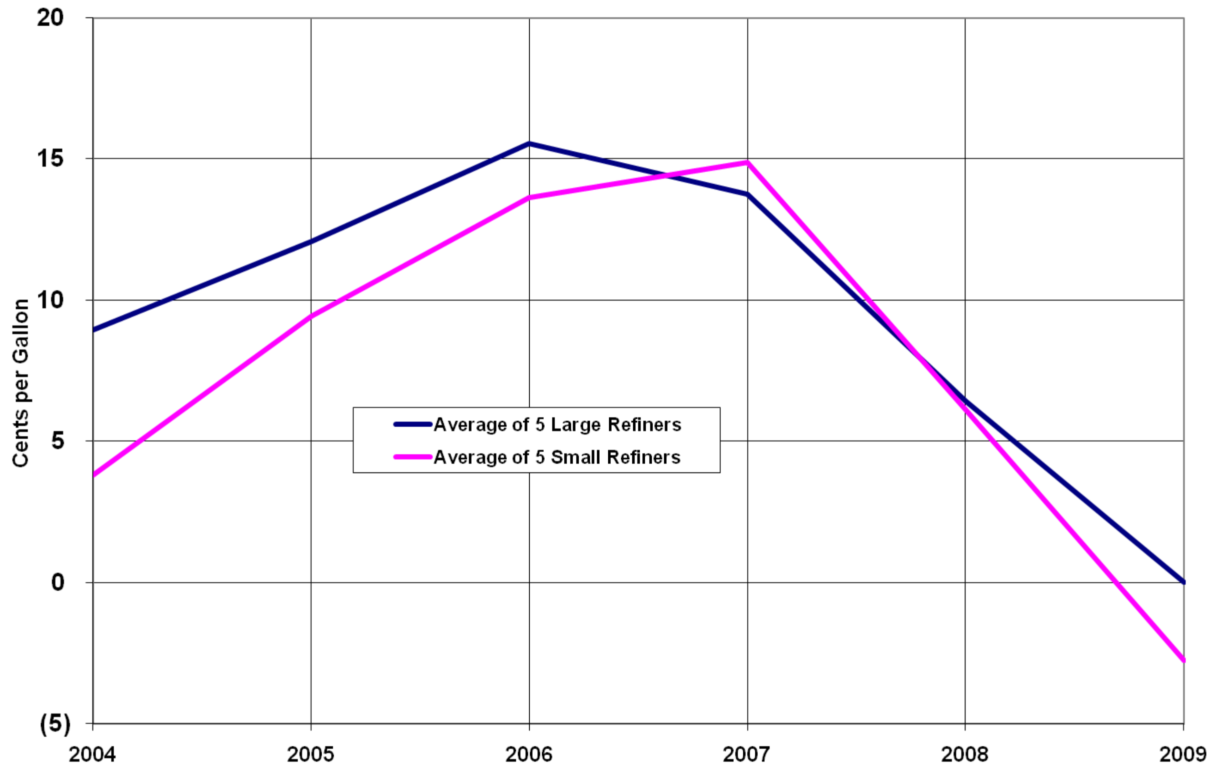


Source: Table 15. Refineries Permanently Shutdown By PAD District Between January 1,1990 and January 1, 2009, EIA, http://www.eia.gov/pub/oil_gas/petroleum/data_publications/refinery_capacity_data/ current/table15.pdf, BP Statistical Review of World Energy – June 2010, USGC WTS Coking Cash Margins, http://www.bp.com/sectiongenericarticle.do?categoryId=9023777&contentId=7044465, Accessed 10/13/10

The refining cash margin is typically used by the oil industry to evaluate the profitability of a given refinery. Frequently expressed in terms of cents per gallon or dollars per barrel throughput, it provides a way to measure the relative performance of one refinery versus another.

Publicly-traded refining companies generally publish their refining economics in their reports to the Securities and Exchange Commission in sufficient detail to arrive at a reasonable estimate of the refining margin of their respective refineries. The 10K reports from 2004 to 2009 for several refining companies were analyzed. Figure 8 presents the results of that analysis.

Figure 8. Sample Refining Margins for Large and Small Refiners 2004 – 2009



Source: Company 10k reports and Stillwater analysis

The data indicates that refining margins for large refining companies (Chevron, ConocoPhillips, ExxonMobil, Tesoro, and Valero) were similar in trend to the refining margins for several smaller refining companies (Calumet, Delek, Frontier, Holly, and Western) during this period.[30] However, the margins for the small refiner group were on average less than the large refiner group. Margins for both groups peaked in 2006 or 2007 and were zero or negative for 2009.

U.S. refiners have complied with a series of environmental regulations over the past two decades (see Figure 9). This series of regulations forced U.S. refiners to invest billions of dollars for process, logistics and other capital upgrades. In addition, compliance with environmental regulations has increased the fixed and variable costs of refinery operations.[31] The cost of compliance contributed to economic stresses that resulted in the shutdown of 66 refineries from 1990 through 2010.

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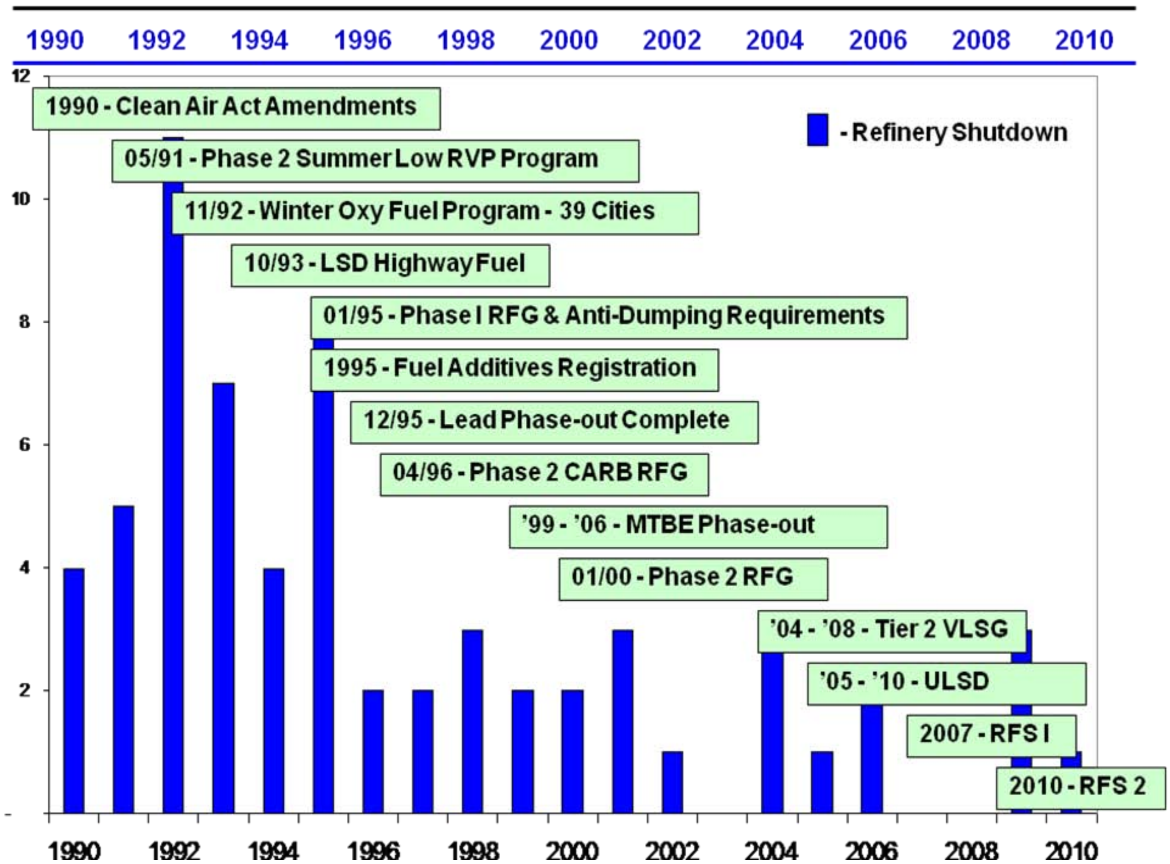
[30] For several refiners, individual refinery or refinery business unit data was available. Tesoro reports data for their four refining business units which contain seven refineries. Delek, CVR, Holly, and Alon report individual refinery data.

[31] EIA examines the costs of compliances in the 1990s in http://www.eia.doe.gov/emeu/finance/usi&to/downstream/ch4.html.

Figure 9. U.S. Refined Product Environmental Regulations 1990-2010



Source: SAIC, 2010, EIA Table 15 - Refineries Permanently Shut Down, 2010.

The reduction in capacity is mostly due to the shutdown of small-to-medium-sized refineries with less than 40,000 barrels per day capacity. This size is approximately half the size of the average operating refinery, which has grown from 80,000 barrels per day in 1990 to 120,000 barrels per day in 2010. The average U.S. refinery has grown in size by 60 percent over the past two decades, as smaller refineries progressively become increasingly rare.

The experience of the refining industry over the past two decades offers insight into the costs of compliance during periods of economic distress.

The majority of the shutdown refineries (46) were privately held:

- Average size (~ 20,000 barrels per day) was half as large as that of publicly-held refineries
- 37 were shut during the 1990s
- 17 were located in PADD 3 and 14 in PADD 5

Twenty idled refineries were publicly-held:

- Closings were distributed throughout the period
- Located primarily in PADDs 1 and 3
- Average capacity was 40,000 barrels per day

XI. Disproportionate Economic Hardship

Based on an analysis of recent public statements by a number of U.S. refiners of varying size, refiners appear to be somewhat optimistic regarding near-term improvements in the U.S. economy. As a consequence of improving economic conditions, they anticipate an increase in demand for gasoline, jet fuel and diesel fuel accompanied by rising refinery utilization and margins.

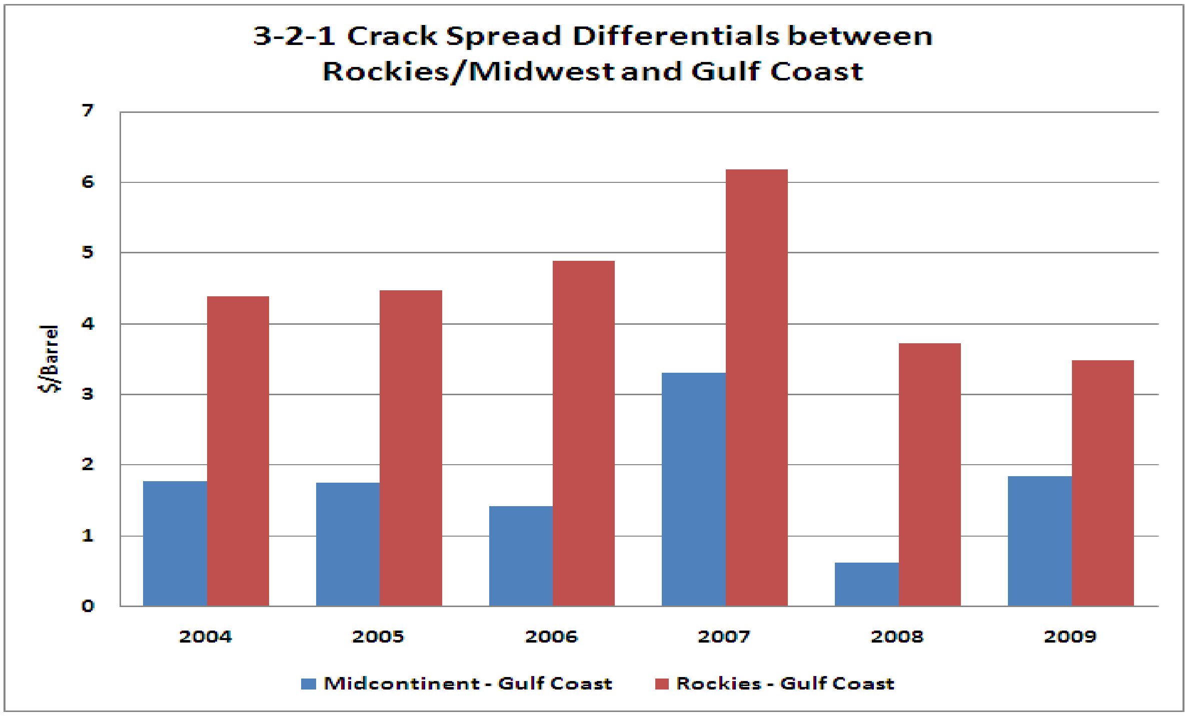
However, despite this somewhat optimistic view, there a number of factors that will work toward minimizing demand growth and may actually reduce domestic demand. First, the RFS2 program acts to progressively reduce demand for refinery produced gasoline and diesel products in the United States as the requirements for renewable products increases. Second, changes in the Corporate Average Fuel Economy (CAFE) and EPA GHG standards for new light-duty vehicles will negatively impact the demand for transportation fuels, renewable and petroleum alike. The projected reduction in demand for refinery-produced petroleum products was discussed in previously in relationship to the blend wall and illustrated in Figure 5 (page 17). As a result, the hoped-for improvement in refinery utilization and margins may be less than those during prior economic recoveries.

Even though the general trend is less favorable for refining industry, local markets do have an impact on refinery outlook. Some U.S. refiners service niche product markets (such as lubricants) and can be less vulnerable to lower profit margins while others service geographically-remote niche markets to buffer themselves from lower overall U.S. refining margins.

At the PADD level, differences in margin are also clear. The 3-2-1 Differential is often used as an approximate indicator of refining gross margins because it can be calculated based on publicly available refined product and crude oil pricing. Figure 10 illustrates that the 3-2-1 Differential for refiners in the Rocky Mountain and Mid-Continent Regions is generally greater than in the U.S. Gulf Coast.[32]

[32] The 3-2-1 Differential is the difference in price between 2/3 barrel of gasoline plus 1/3 barrel of diesel less 1 barrel of crude oil (typically a light sweet crude oil like West Texas Intermediate).

Figure 10. Crack Spread Differentials



Source Data: EIA.

Independent U.S. refiners are highly focused on maintaining sufficient capitalization because they operate in a capital intensive business with continuous expenditures and volatile refining margins. Sufficient capitalization allows them to purchase crude oil and other feedstocks on competitive terms, to remain in regulatory compliance and to survive periodic downturns in their refining business.

Independent refiners typically operate under a variety of debt covenants, including debt to equity ratios and other restrictions. Independents may have limited access to public or private debt depending on the number, size, complexity and location of refineries they own and the degree to which they are integrated in their refined product transportation, storage and retail marketing systems.

Assessing Disproportionate Economic Hardship

A scoring matrix was designed to evaluate the full impact of disproportionate economic hardship on small refiners and used to assess the individual degree of potential impairment. The matrix is comprised of two major sections described individually below: one section combining the scoring for disproportionate structural and economic weightings, and a separate section regarding the impact of compliance with the RFS2 program on the viability of the firm. Each of the eight individual disproportionate structural and economic metrics is weighted equally to derive the disproportionate impact index. The index is then scaled from 0 to 5, with 5 indicating conditions likely to lead to disproportionate economic hardship. Similarly, the three metrics for the viability index are then equally weighted and scaled to the same range. The lines shaded gray have not been used in this analysis, but should be maintained as part of the matrix for use in the future when other renewable fuels become commercially available.

Disproportionate Impacts Index Analysis

Disproportionate impacts consist of Disproportionate Structural and Disproportionate Economic measures, which are described below. Table 10 shows the Disproportionate Structural Impacts metrics.

Table 10. Disproportionate Structural Impact Metrics

1	**Disproportionate Structural Impact Metrics**	
a	Access to capital/credit	0 = Good access (BB- or above credit rating), 5 = Moderate access (rating in B's) 10 = Poor access (C rating or 50% D/E)
b	Other business lines besides refining and marketing	0 = Other Lines, 10 = No Other Lines
c	Local market acceptance of Renewables	0 = Products accepted, 10 = Product not accepted
i	E10	0 = High acceptance, 5 = Low acceptance 10= No acceptance
ii	E85	Not scored because of small E85 volumes
iii	Biodiesel	Not available
d	Percentage of diesel production	0 = D/(G+D) < Industry Avg. 5 = D/(G+D) > Ind. Avg<40%. 10=D/(G+D) > 40%
e	Subject to exceptional state regulations	0 = not subject, 5= Some barriers for compliance 10 = subject to exceptional state regulations
2	**Disproportionate Economic Impact Metrics**	
a	Relative refining margin measure	0 = Above 3 year industry average 5 = positive, and below 3 year industry average 10= Negative, 3 average,
b	Renewable fuel blending (% of production)	
i	Ethanol blending	0 = 75%+, 5 = 25-74%, 10 = <25%
ii	Biodiesel blending (not used)	0 = 1.1% of diesel production, 1 = <1.1%
iii	Other Advanced Biofuel blending (not used)	0 = some blending, 10 = no blending
c	In a niche market	0 = niche 5 = moderate niche impact 10 = no niche
d	RINs net revenue or cost	0 = revenue > cost, 10 = revenue < cost
	Subtotal	

1a. Access to capital/credit. Restrictions on capital may significantly limit the compliance options for firms. If new blending facilities are needed, borrowing would likely be necessary. High borrowing costs would have a disproportionate impact on the ability of less credit-worthy firms to comply with RFS2. In the worst case, loan covenants may prevent firms from taking cost-effective measures for compliance. Even if the firm would be purchasing RINs, additional working capital may be needed to effectively manage the RIN purchases. Access to capital was provided by the survey respondents and publically available data. In the absence of credit ratings, other financial information provided by the respondent (such as debt/equity ratios) were used to determine an individual refinery score. Those companies with poor access to capital were scored a 10 as demonstrated by a credit rating of C or below were scored a 10, below BB- were scored a 5, and those companies above a BB- were scored a 0.

1b. Other business lines besides refining and marketing. Refining margins tend to have considerable volatility. Additional lines of business, in particular upstream operations such as exploration and development that are less correlated with refining, would tend to smooth the firm's cash flows, and improve its ability to borrow money at closer to the investment grade rates. Those refineries without additional lines of business score a 10.

1c. Local market acceptance of Renewable Fuels. Local conditions may inhibit blending as a compliance strategy for meeting RVOs. Blending category can be separated as follows: low ethanol blends (E10), biodiesel and E85. There was no scoring for E85 and biodiesel due to a lack of data.

i. Ethanol blending (E10). Not every state has switched completely to E10. Some locations, due to either logistical obstacles or consumer behavior, still sell clear (unblended) gasoline. Refiners who reside in states with less than 75 percent E10 blending receive a 5; those with less than 25 percent blending receive a 10. Given the current state of ethanol blending, no state which participants in the program would cause a refiner to receive the higher score.

ii. E85. Reserved for later evaluation

iii. Biodiesel. Reserved for later evaluation

1d. Percentage of Diesel Production. While ethanol blending at 10 percent is already common, biodiesel is normally blended at 5 percent or less due to a lack of market acceptance. Therefore, refineries that disproportionately favor diesel production over gasoline inherently have a more difficult compliance pathway, as the percentage of renewable fuel available to blend into diesel is much lower than the 10 percent of ethanol that can be blended into gasoline. Refineries that have greater than the industry average of approximately 32 percent diesel production receive a score of 5; those at 40 percent diesel or above have a score of 10.

1e. Subject to exceptional state regulations. Certain states such as Tennessee and North Carolina require refiners to sell unblended fuel. Refiners are required to purchase RINs to meet their obligations even though they have no blending opportunities with this fuel. Also, under certain unusual circumstances, the interplay between the State regulations (such as the California

Low Carbon Fuel Standard) and the Federal RFS may increase compliance costs. Those refiners subject to exceptional regulations receive a 10.

2a. **Relative refining margin measure**. Refining margins differ from refiner to refiner for many reasons. In order to eliminate market volatility, a three year average was calculated for each small refinery. Refineries with a negative net average margin were scored a 10; those below the industry average were scored a 5.

2b. **Renewable fuel blending (% of production).** The degree to which a small refiner can actively blend refinery production with renewable fuels is a large component of economic impairment. Generally, for ethanol, (and biodiesel and other advanced biofuels) the lower the proportion of renewable fuel blending the greater the impairment.

i. Ethanol. Those refineries with between 25 and 75 percent of their gasoline at E10 were scored a 5; those with less than 25 percent were scored a 10.

ii. Biodiesel. Reserved for later evaluation.

iii. Advanced Biofuels. Reserved for later evaluation.

2c. **In a niche market.** The rationale for utilizing the classification of "niche" refinery is necessary to determine if it has access to specific geographical markets with limited alternative finished product supply or access to distressed crude oil supply, thus creating higher than industry refining margins for the niche refiner. Other refineries classified as "niche" are those that produce a specialty slate of products (lube oils, greases, asphalt, etc.) in addition to gasoline and diesel. The sale of these types of products will also result in higher than industry refining margins. Landlocked refiners whose immediate market does not have access to a refined product pipeline are scored a 0 as are or those whose primary products are not transportation fuels. Landlocked refiners with direct access to single pipeline are scored a 5. Refiners with access to more than one pipeline are scored a 10.

2d. **RINs net revenue or cost**. This criterion was not utilized in the current assessment due to lack of consistency among the survey participants. However, depending upon the business model of the small refiner, complying with their RVO can either be a net cost if they purchase all of their RINs or can generate revenue should they be able to actively trade RINs in the open marketplace. Firms that have a small refiner exemption and generate revenue by blending renewable fuels and selling RINs are not experiencing hardship related to the RFS. The windfall profit may be utilized to offset other margin related impairments. From the DOE small refiner survey, many (but not all) the respondents blended ethanol in 2009. These firms separated RINs and either sold them into the market or held them for future use. Indeed, one publically traded firm reported $4 million of revenue from RINs sales in 2009.[33]

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[33] Frontier Annual Report 2009

Viability Index Analysis

Refiner viability refers to the ability of the refiners to remain competitive and profitable. That requires sufficient profits to make investments in the refinery to remain competitive. In general, small independent refiners generally lack the revenue streams generated by crude oil production and national product marketing to counteract the historic volatility in cash flows from the refining industry. Therefore, under some circumstances, a small refinery may face compliance costs that would significantly impact the operation of the firm, leading eventually to an inability to increase efficiency to remain competitive, eventually resulting in closure. These impacts are evaluated in the viability metric shown in Table 11.

Table 11. Viability Metrics

3	Viability Metrics	
a	Compliance cost eliminates efficiency gains (impairment)	0 = no impact on efficiency, 10 = impact on efficiency
b	Individual special events	0 = no special event, 10 = special event impacting viability
c	Compliance costs likely to lead to shut down	0 = not likely to shut down, 10 = likely to shut down
	Subtotal	

3a. Compliance cost eliminates efficiency gains (impairment). This metric evaluates whether the totality of factors, including both survey results and public information would reduce the profitability of the firm enough to impair future efficiency improvements. While this would not lead to immediate shutdown, given the increasingly competitive refining market, significant constraints on efficiency improvements would eventually leave many small refineries at risk. Refineries that receive a extension of their exemption and do some blending, could sell RINs to improve their ability to position themselves to economically comply with RFS2 (through capital expenditures for blending or increasing capital for a RIN purchase program), thus reducing the impact of their future RFS2 compliance. Thus refineries that currently score high in this category and receive an extension will likely see a reduction in the scoring of this category in the future.

3b. Individual special events. Refinery specific events (such as a shutdown due to an accident, and subsequent loss of revenue) in the recent past that have a temporary negative impact on the ability of the refinery to comply with the RFS.

3c. Compliance costs likely to lead to shutdown. Some refineries have a unique vulnerability such as a weak competitive position and any significant additional burden could cause bankruptcy or closure. This metric covers those refineries indicating that compliance may lead to such an outcome.

Recommendation for Exemption Extension

Utilizing the individual scoring metrics and the previously described index analysis, Figure 11 shows the disproportionate impacts and viability indices for each of the eighteen refineries that submitted sufficient data to be evaluated[34]. A recommendation of disproportionate impact was determined if both indices were greater than 1. This requires a score equivalent to at least four of the eight metrics for disproportionate impact at the moderate level (5), and a positive value for at least one of the three metrics for the viability index. Thirteen of the eighteen refineries scored a 1 or higher in both indices, thus qualifying for a recommendation for extension of their RFS1 exemption.

Figure 11. Refinery Rankings by PADD

[Redacted]

XII. Findings and Conclusion

EPAct 2005, through the establishment of the RFS1 program, mandated a minimum renewable fuel content of gasoline, while exempting certain small refineries from compliance from 2007 through 2010. EPAct 2005 also required DOE to conduct a study for the Administrator of the EPA assessing whether the RFS would impose a "disproportionate economic hardship" on the statutorily defined small refineries. On February 24, 2009, DOE transmitted its study with recommendations to EPA.

In October 2009, Congress directed DOE to seek input from small refineries and revisit the issue of disproportionate economic hardship for small refineries. A survey of local market and financial data from currently exempt small refineries revealed individual differences between refineries that allowed the identification of disproportionate economic hardship among the respondents.

Eighteen refineries responded to the survey and fell within the scope of the study, and it is recommended that thirteen of them should receive an extension of their RFS1 exemption. The refineries recommended were geographically diverse: **[Redacted]**. The refineries recommended for the exemption are:

[Redacted]

[34] The scoring for individual refineries is presented in Appendix H.

Appendix A. Glossary

Barrel: A unit of volume equal to 42 U.S. gallons.

Biodiesel: A fuel typically made from soybean, canola, or other vegetable oils; animal fats; and recycled grease. It can serve as a substitute for petroleum-derived diesel or distillate fuel. For EIA reporting, it is a fuel composed of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100, and meeting the requirements of ASTM (American Society for Testing materials) D 6751.

Biomass: Organic non-fossil material of biological origin constituting a renewable energy source.

Blend Wall: The limit to which a renewable fuel can be blended into its recipient motor fuel. Typically used in reference to limits on ethanol's integration into the U.S. fuel supply.

Blenders' Credit: See Volumetric Ethanol Excise Tax Credit.

Blending Components (Motor Gasoline Blending Components): Naphthas (e.g., straight-run gasoline, alkylate, reformate, benzene, toluene, xylene) used for blending or compounding into finished motor gasoline. These components include reformulated gasoline blendstock for oxygenate blending (RBOB) but exclude oxygenates (alcohols, ethers), butane, and pentanes plus.

Charge capacity: The input (feed) capacity of the refinery processing facilities.

Clean Air Act (CAA): The law that defines the EPA's responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer. Originally signed in 1970, the last major change in the law, the Clean Air Act Amendments of 1990, was enacted by Congress in 1990. Legislation passed since then has made several minor changes.

Code of Federal Regulations: A compilation of the general and permanent rules of the executive departments and agencies of the Federal Government as published in the federal register. The code is divided into 50 titles that represent broad areas subject to Federal regulation. Title 18 contains the FERC regulations.

Crude Oil: A mixture of hydrocarbons that exists in liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities. Depending upon the characteristics of the crude stream, it may also include:

- Small amounts of hydrocarbons that exist in gaseous phase in natural underground reservoirs but are liquid at atmospheric pressure after being recovered from oil well (casing head) gas in lease separators and are subsequently comingled with the crude stream without being separately measured. Lease condensate recovered as a liquid from natural gas wells in lease or field separation facilities and later mixed into the crude stream is also included;

- Small amounts of nonhydrocarbons produced with the oil, such as sulfur and various metals; and
- Drip gases, and liquid hydrocarbons produced from tar sands, oil sands, gilsonite, and oil shale.

E10, E15, E85: A fuel containing a mixture of ethanol and gasoline in a particular ratio. The number is the percentage of the fuel that is ethanol. For example, E85 is 85 percent ethanol and 15 percent gasoline.

Energy Independence and Security Act of 2007 (EISA, or EISA07): EISA, Public Law 110-140, was signed into law in 2007 to establish the Renewable Fuel Standard – 2 (RFS2). Its purpose was to move the U.S. toward greater energy independence and security, increase the production of clean fuels, and promote research on and deploy greenhouse gas capture and storage options.

Energy Policy Act of 2005 (EPAct, or EPAct05): EPAct, Public Law 109-58, was signed in 2005 to establish the Renewable Fuel Standard (RFS1). Its purpose was to "ensure jobs for our future with secure, affordable, and reliable energy."

EPA-Moderated Transaction System (EMTS): Electronic system used for the generation, trading, and tracking of RINs. Established as part of RFS2.

Ethanol: A clear, colorless, flammable alcohol. Ethanol is typically produced biologically from biomass feedstocks such as agricultural crops and cellulosic residues from agricultural crops or wood. Ethanol can also be produced chemically from ethylene.

Form 10-K: A form used by publicly traded companies to disclose information on an annual basis to the U.S. Securities and Exchange Commission. The annual report on Form 10-K provides a comprehensive overview of the company's business and financial condition and includes audited financial statements.

Gasoline (Finished Motor Gasoline): A complex mixture of relatively volatile hydrocarbons with or without small quantities of additives, blended to form a fuel suitable for use in spark-ignition engines. Motor gasoline, as defined in ASTM Specification D 4814 or Federal Specification VV-G-1690C, is characterized as having a boiling range of 122 to 158 degrees Fahrenheit at the 10 percent recovery point to 365 to 374 degrees Fahrenheit at the 90 percent recovery point. Motor Gasoline includes conventional gasoline; all types of oxygenated gasoline, including gasohol; and reformulated gasoline, but excludes aviation gasoline.

Greenhouse Gases (GHGs): Those gases, such as water vapor, carbon dioxide, nitrous oxide, methane, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride, that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface.

Low Sulfur Diesel (LSD) Fuel: diesel fuel containing more than 15 but less than 500 parts per million (ppm) sulfur.

Naphtha: A generic term applied to a petroleum fraction with an approximate boiling range between 122 degrees Fahrenheit and 400 degrees Fahrenheit.

Net Refining Margin: Often expressed in dollars per barrel. The net refining margin is the difference between the gross refining margin and the costs of producing and selling the petroleum products (e.g., refining energy costs and selling costs). The net margin measures before-tax cash earnings from the production and sale of refined products. The net margin excludes peripheral activities such as non-petroleum product sales at convenience stores.

No. 2 Diesel Fuel: A distillate fuel oil that has a distillation temperature of 640 degrees Fahrenheit at the 90-percent recovery point and meets the specifications defined in ASTM Specification D 975. It is used in high-speed diesel engines that are generally operated under uniform speed and load conditions, such as those in railroad locomotives, trucks, and automobiles.

Obligated Party: Refiners, blenders, and importers of gasoline that are subject to the requirements of the RFS program.

Petroleum Administration for Defense District (PADD): A geographic aggregation of the 50 States and the District of Columbia into five Districts, with PADD I further split into three subdistricts. The PADDs include the States listed below:

- PADD I (East Coast):
  - PADD IA (New England): Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.
  - PADD IB (Central Atlantic): Delaware, District of Columbia, Maryland, New Jersey, New York, and Pennsylvania.
  - PADD IC (Lower Atlantic): Florida, Georgia, North Carolina, South Carolina, Virginia, and West Virginia.
- PADD II (Midwest): Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota, Tennessee, and Wisconsin.
- PADD III (Gulf Coast): Alabama, Arkansas, Louisiana, Mississippi, New Mexico, and Texas.
- PADD IV (Rocky Mountain): Colorado, Idaho, Montana, Utah, and Wyoming.
- PADD V (West Coast): Alaska, Arizona, California, Hawaii, Nevada, Oregon, and Washington.

PI-588: A one-time, voluntary survey used by the EIA to collect information about small refineries designed to provide the necessary information to make an informed decision regarding which small refineries merited an extension of their RFS waivers. The PI-588 was developed over the summer of 2010, and received clearance from the OMB on September 22, 2010. It was distributed electronically on September 27, 2010 to 59 refineries. It is an Excel file consisting of five parts: Respondent Identification, Submission/Resubmission, Financial Health of Refinery, Market Compliance, and Market Issues.

Refiner: A firm or the part of a firm that refines products or blends and substantially changes products, or refines liquid hydrocarbons from oil and gas field gases, or recovers liquefied petroleum gases incident to petroleum refining and sells those products to resellers, retailers, reseller/retailers or ultimate consumers. "Refiner" includes any owner of products that contracts to have those products refined and then sells the refined products to resellers, retailers, or ultimate consumers.

Refinery: An installation that manufactures finished petroleum products from crude oil, unfinished oils, natural gas liquids, other hydrocarbons, and oxygenates.

Refining Cash Margin: Represents all product revenues minus the costs of feedstocks (crude oil plus other feedstocks) and minus other operating costs. It is frequently expressed in terms of cents per gallon[1].

Renewable Energy Resources: Energy resources that are naturally replenishing but flow-limited. They are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. Renewable energy resources include biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action.

Renewable Fuel Standard (RFS1, RFS2): RFS1 was established in 2005 (effective 2007) with the passage of EPAct. RFS1 created a specific annual level for minimum renewable fuel use that increases over time. RFS2 was established in 2007 (effective 2010) with the passage of EISA. RFS2 is the revised and expanded version of RFS1.

Renewable Identification Numbers (RINs): RINs are assigned to each batch of renewable fuel produced. RINs demonstrate an obligated party's compliance with its RVO under the RFS program.

Renewable Volume Obligation (RVO): RVO expresses the minimum renewable fuel use that obligated parties must meet under the RFS program. The RVO is expressed as a percentage of total non-renewable gasoline sold by the obligated party in the specified calendar year. Compliance is demonstrated through the use of RINs.

Small Refinery: A refinery for which the average aggregate daily crude oil throughput for a calendar year does not exceed 75,000 barrels. This definition comes from Section 211(o)(9)(A)(ii) of the Clean Air Act.

Super Major: Term used to describe the six largest private-sector oil companies in the world. These six companies are BP, Chevron, ConocoPhillips, ExxonMobil, Royal Dutch Shell, and Total.

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[1] Page 121 (page 127 of the electronic version) http://www.eia.doe.gov/pub/oil_gas/petroleum/analysis_publications/petroleum_issues_trends_1996/ENTIRE.PDF

Ultra-Low Sulfur Diesel (ULSD) Fuel: diesel fuel containing a maximum 15 parts per million (ppm) sulfur.

Volumetric Ethanol Excise Tax Credit (VEETC): Commonly known as a "blenders' credit," VEETC was created as part of the American Jobs Creation Act of 2004. It provides oil companies with an economic incentive to blend ethanol with gasoline.

Appendix B. RFS Market Operations, RINs and the Fuel Supply Chain

Evaluating Industry Obligations

Stillwater Associates conducted informal telephone surveys with oil industry participants in August and September 2010 to gain information around the cost of complying with the Renewable Fuel Standard. Feedback was received from survey participants about how they calculated their Renewable Volume Obligation (RVO). Subsequently, it was discovered that these calculations were incorrect and would lead to potential over-compliance with RVO. With DOE's concurrence, Stillwater then worked with EPA to gain clarity around the regulation. The following sections review the compliance process and address some ambiguities in EPA regulations.

Participation in the RFS may have a significant impact on profitability depending upon RIN pricing. We quantify the impact of variations in pricing through an example.

Background

The Energy Independence and Security Act of 2007 (EISA07), Public Law 110-140 passed by the 110th Congress of the United States, was signed on December 19, 2007 to establish the Renewable Fuel Standard – 2 (RFS2). As a result, on May 26, 2009, the US EPA issued its Notice of Proposed Rule Making and invited the industry to provide comments. The comment period was initially to expire on July 27, 2009, but was extended by 60 days to September 25, 2009, to allow the public additional time to provide comment on the proposed rule.

On February 3, 2010, the US EPA announced it had set the RFS2 factors effective July 1, 2010 and followed its announcement on March 26, 2010 with its 236 page Final Rule 40 CFR Part 80 published in the Federal Register pages 14669-15320.

The first 195 pages of the Final Rule constitute the Preamble where various discussions, explanations and background information occur. Page 14717, attached as Table A, contains the formulas by which the RFS2 percentage factors are calculated, but the Final Rule does not show the values used in the formulas[1].

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[1] Preliminary values for 2011 may be found in the Federal Register Vol. 75, No. 138 pg 42250. Tuesday, July 20, 2010. The final percentages may be found at in the Federal Register at Vol. 75, No. 236 Thursday, December 9, 2010 pg 76804.

The last 41 pages of the Final Rule contain the rules and is entitled "Part 80-Regulation of Fuels and Fuel Additives". It contains Sections 80.1400 through 80.1468, with Sections 1405, 1407, 1415, 1425, 1426 and 1427 being the greatest concentration of rules.

General Approach for Meeting the 2010 RVOs

First, calculate the total volume of on-road and off-road gasoline and diesel that is refined, imported or blended from components and thus is subject to an RVO.

Second, calculate the RVO for D Code 3 Cellulosic and subtract any 2009 rollover RINs subject to the 20% maximum rollover cap. The remainder is the amount of 2010 Cellulosic RINs needed to meet the 2010 Cellulosic RVO.

Third, calculate the RVO for D Code 4 Biomass Based Diesel and subtract the "Used" 2008 and 2009 Biomass Based Diesel RINs available and the "Unused" 2008 and 2009 Biomass Based Diesel RINs available subject to the two rollover cap limits. The remainder is the amount of 2010 Biomass Based Diesel RINs needed to meet the 2010 Biomass Based Diesel RVO.

Fourth, for any Cellulosic Diesel RINs D Code 7 RINs available, decide how many should be applied to the Cellulosic RVO and how many should be applied to the Biomass Based Diesel RVO.

Fifth, calculate the RVO for Total Advanced Biofuels and then subtract the rollover 2009 and 2010 Cellulosic RINs, the 2010 Biomass Based Diesel RINs and the "unused" 2008/2009 Biomass Based Diesel RINs. The remainder is the amount of 2010 D Code 5 Other Advanced Biofuel RINs needed to meet the 2010 Total Advanced Biofuel RV0. As you will note, the "Used" 2008/2009 Biomass Based Diesel RINs can be used to meet the 2010 Biomass Based Diesel RVO but not the 2010 Total Advanced Biofuel RVO.

Sixth, calculate the RVO for Total Renewable Fuels and then subtract the rollover 2009 and 2010 Cellulosic RINs, the 2010 Biomass Based Diesel RINs, the "Unused" 2008/2009 Biomass Based Diesel RINs, the 2010 Other Advanced Biofuel RINs and the rollover 2009 corn ethanol RINs. (The sum of all of the rollover RINs is limited to the rollover cap of 20% of the 2010 Total Renewable Fuel RVO). The remainder is the amount of 2010 corn ethanol RINs needed to meet the 2010 Biomass Based Diesel RVO.

Conference Calls with the US EPA

During the Stillwater industry surveys conducted to assess DEH, it became apparent the industry interpreted the Final Rule in different ways. A series of conference calls were made between David Korotney of the US EPA and David Bulfin of Stillwater Associates LLC during November and December of 2010 to review how an Obligated Party (OP) should use its RINs to meet its RVO. A summary of the rules is as follows:

1. Biomass Based Diesel RINs generated in 2010 can be used to meet the entire 2010 Biomass Based Diesel RVO, and can also be used to meet the 2010 Total Advanced Biofuels and the 2010 Total Renewable Fuel RVOs.

2. Biomass Based Diesel RINs generated in 2008 and 2009 that were previously used for meeting the 2008 or 2009 RFS1 mandate (status “Used”), can be reused to meet the 2010 Biomass Based Diesel RVO with no rollover cap. However, they cannot be used to meet the 2010 Total Advanced Biofuels RVO or the 2010 Total Renewable Fuel RVO. Thus, if an OP uses lots of "Used" 2008 and/or 2009 RINs, the OP could fall short of meeting 2010 Total Advanced Biofuels RVO. As a result, the OP would need D Code 5 cane ethanol RINs to meet the Total Advanced Biofuels RVO.

3. An OP cannot purchase another company’s Used RINs to meet its own RVO.

4. Biomass Based Diesel RINs generated in 2008 and 2009 that were not used for compliance in 2008 or 2009 (status "Unused"), can be used to meet the 2010 Biomass Based Diesel RVO but are limited by the two rollover caps defined in 80.1427(a)(7)(iii). These RINs can be used to meet the 2010 Advanced Total Biofuel RVO and the 2010 Total Renewable Fuel RVOs.

5. "Unused" RINs were unused because they were either excess or they were attached to renewable fuels that were used as, or blended into, non-road fuels (boiler fuel, jet fuel). These RINs were not valid under RFS1, but can be reinstated (reactivated) under RFS2 for 2010 only.

6. An OP can purchase another company’s unused RINs to meet its own RVO.

7. The use on Unused RINs is subject to two rollover caps.

8. The first rollover cap relates to 2008 excess and retired-then-reinstated Biomass Based Diesel RINs and is set at a maximum of 8.7% of the 2010 Biomass Based Diesel RVO. The rationale behind the 8.7% is explained in the middle of the far-right-hand column of page 14719 of the Final Rule. When meeting the 2009 Biomass Based Diesel RVO of 0.5 BG, 2008 RINs were limited to the 20% rollover cap, or 0.1BG. Carrying forward this 2008 RIN limit of 0.1 BG into 2010, it represents 8.7% (0.1/1.15) of the total 2010 Biomass Based Diesel RVO of 1.15 BG.

9. The second rollover cap relates to the total combined 2008 and 2009 excess and retired-then-reinstated Biomass Based Diesel RINs and is set at a maximum of 20% of the 2010 Biomass Based Diesel RVO. The rationale behind the 20% is it is a compromise rate between the refiners wanting 50% and the RFA wanting 0%.

10. If the 20% rollover cap limits the use of available RINs to meet a subcategory RVO, an OP can use the rest of the available subcategory RINs to meet a higher category RVO until its higher volume 20% cap is met. However, the US EPA assumes an OP would sell the more valuable sub-category RINs for cash and then buy the less valuable higher category RINs.

11. Each 20% rollover cap includes the sum of all the RINs being carried over for all the categories.

12. The 1.5 multiplier for Biomass Based Diesel is not applicable if volumes are expressed in terms of paper Gallon-RINs instead of physical gallons.

13. A D Code 7 Cellulosic Diesel RINs can be applied to either the Cellulosic RVO or the Biomass Based Diesel RVO, but not both.

Other comments from the conference calls with the US EPA are as follows:

1. Although there is a provision in the Final Rule to carry over 57% of 2010 Biomass Based Diesel RVO into 2011, the degree of complexity experienced in 2010 is not anticipated to occur in 2011. This is because no more "Used" prior year RINs are allowed and no more "Unused" RINs from 2 years prior are allowed.

2. Based on Table IV.B.3-2 on page 14752 of the Final Rule, from a practical standpoint there will be little or no D Code 7 (Cellulosic Diesel) RINs generated during 2008 and 2009. At the time of this writing, the US EPA does not recognize D Code 7 or D Code 5 RINs under RFS1 which lasted until June 30, 2010. However, Brazilian sugar cane ethanol imports would qualify as an Other Advanced Biofuel with a 50% GHG reduction and a D Code 5 RIN.

Average vs. Marginal Ethanol RINs:

The impact on refiner margins of a rapid rise in RINs prices can be illustrated by discussing the economics of three refiners in different circumstances relative to the RFS. In the illustration, Company A blends all its production with ethanol, so it does not have to purchase ethanol RINs. Company B does not do any blending and must purchase RINs to meet all of its RVO. Company C has excess RINs to sell into the market. Company C could be a blender that does not have an RVO, i.e. a gasoline marketer, or it could be a refiner who blends in excess of its RVO.

Values in Cents per Gallon	Average Values (over 11 months)			Marginal Values (December)		
	Company A Blends to meet RVO	Company B Buys RINs to meet RVO	Company C has RINs to sell	Company A Blends to meet RVO	Company B Buys RINs to meet RVO	Company C has RINs to sell
Gasoline Price	200.00	200.00	200.00	200.00	200.00	200.00
Ethanol Price	190.00	n/a	190.00	190.00	n/a	190.00
Price Difference	10.00	n/a	10.00	10.00	n/a	10.00
Fuel margin/gallon of E10	1.00	n/a	1.00	1.00	n/a	1.00
VEETC (cpg of E10)	4.50	n/a	4.50	4.50	n/a	4.50
RINs Price (cpg of ethanol)	n/a	1.50	1.50	n/a	15.00	15.00
RINs Price (cpg of E10)	n/a	0.15	0.15	n/a	1.50	1.50
Blender Margin (cpg of E10)	5.50	n/a	5.65	5.50	n/a	7.00
Total Cost (cpg of E10)	194.50	200.15	194.35	194.50	201.50	193.00
Advantage vs. B (cpg of E10)	5.65		5.80	7.00		8.50

In the above example, the companies experience an average price for gasoline, ethanol and RINs for eleven months of a year. In the last month, December, RINs prices increase by ten times, from 1.5 cpg to 15 cpg. The average RIN price is 1.5 cpg and the marginal RIN price is 15 cpg.

The companies value their gasoline at 200 cents per gallon and ethanol at 190 cpg. Companies A & C have a fuel margin on a gallon of E10 of 1 cpg, (10 cpg gasoline price – ethanol price times 10%.) They reduce their excise tax obligation with the VEETC by 4.5 cpg of E10.

Company A does not have to buy any ethanol RINs, so its "Blender Margin" is the fuel margin of 1 cpg + the tax credit of 4.5 cpg or 5.5 cpg. This reduces the cost of its product to 194.5 cpg. Company B does not blend and has to buy RINs. Its total cost is 200.15 cpg. Company C blends ethanol, reduces its taxes and sells a RIN. This reduces its cost to 193.00 cpg.

On average, Company A has a cost advantage over Company B of 5.65 cpg and Company C has an advantage over Company B of 5.8 cpg.

In the final month, when RINs prices go to 15 cpg, Company A's advantage vs. Company B grows to 7.00 cpg and Company C's advantage grows to 8.50 cpg. Assuming a net refining margin of 5 cpg, high RIN prices could significantly impair the profitability of non-blending small refineries.

Table A. Calculation of RVO Percentages

$$Std_{CB,i} = 100\% \times \frac{RFV_{CB,i}}{(G_i - RG_i) + (GS_i - RGS_i) - GE_i + (D_i - RD_i) + (DS_i - RDS_i) - DE_i}$$

$$Std_{BBD,i} = 100\% \times \frac{RFV_{BBD,i} \times 1.5}{(G_i - RG_i) + (GS_i - RGS_i) - GE_i + (D_i - RD_i) + (DS_i - RDS_i) - DE_i}$$

$$Std_{AB,i} = 100\% \times \frac{RFV_{AB,i}}{(G_i - RG_i) + (GS_i - RGS_i) - GE_i + (D_i - RD_i) + (DS_i - RDS_i) - DE_i}$$

$$Std_{RF,i} = 100\% \times \frac{RFV_{RF,i}}{(G_i - RG_i) + (GS_i - RGS_i) - GE_i + (D_i - RD_i) + (DS_i - RDS_i) - DE_i}$$

Where

$Std_{CB,i}$ = The cellulosic biofuel standard for year i, in percent

$Std_{BBD,i}$ = The biomass-based diesel standard (ethanol-equivalent basis) for year i, in percent

$Std_{AB,i}$ = The advanced biofuel standard for year i, in percent

$Std_{RF,i}$ = The renewable fuel standard for year i, in percent

$RFV_{CB,i}$ = Annual volume of cellulosic biofuel required by section 211(o)(2)(B) of the Clean Air Act for year i, in gallons

$RFV_{BBD,i}$ = Annual volume of biomass-based diesel required by section 211(o)(2)(B) of the Clean Air Act for year i, in gallons

$RFV_{AB,i}$ = Annual volume of advanced biofuel required by section 211(o)(2)(B) of the Clean Air Act for year i, in gallons

$RFV_{RF,i}$ = Annual volume of renewable fuel required by section 211(o)(2)(B) of the Clean Air Act for year i, in gallons

G_i = Amount of gasoline projected to be used in the 48 contiguous states and Hawaii, in year i, in gallons*

D_i = Amount of diesel projected to be used in the 48 contiguous states and Hawaii, in year i, in gallons

RG_i = Amount of renewable fuel blended into gasoline that is projected to be consumed in the 48 contiguous states and Hawaii, in year i, in gallons

RD_i = Amount of renewable fuel blended into diesel that is projected to be consumed in the 48 contiguous states and Hawaii, in year i, in gallons

GS_i = Amount of gasoline projected to be used in Alaska or a U.S. territory in year i if the state or territory opts-in, in gallons*

RGS_i = Amount of renewable fuel blended into gasoline that is projected to be consumed in Alaska or a U.S. territory in year i if the state or territory opts-in, in gallons

DS_i = Amount of diesel projected to be used in Alaska or a U.S. territory in year i if the state or territory opts-in, in gallons *

RDS_i = Amount of renewable fuel blended into diesel that is projected to be consumed in Alaska or a U.S. territory in year i if the state or territory opts-in, in gallons

GE_i = The amount of gasoline projected to be produced by exempt small refineries and small refiners in year i, in gallons, in any year they are exempt per §§ 80.1441 and 80.1442, respectively. Equivalent to $0.119^*(G_i - RG_i)$.

DE_i = The amount of diesel projected to be produced by exempt small refineries and small refiners in year i, in gallons, in any year they are exempt per §§ 80.1441 and 80.1442, respectively. Equivalent to $0.152^*(D_i - RD_i)$.

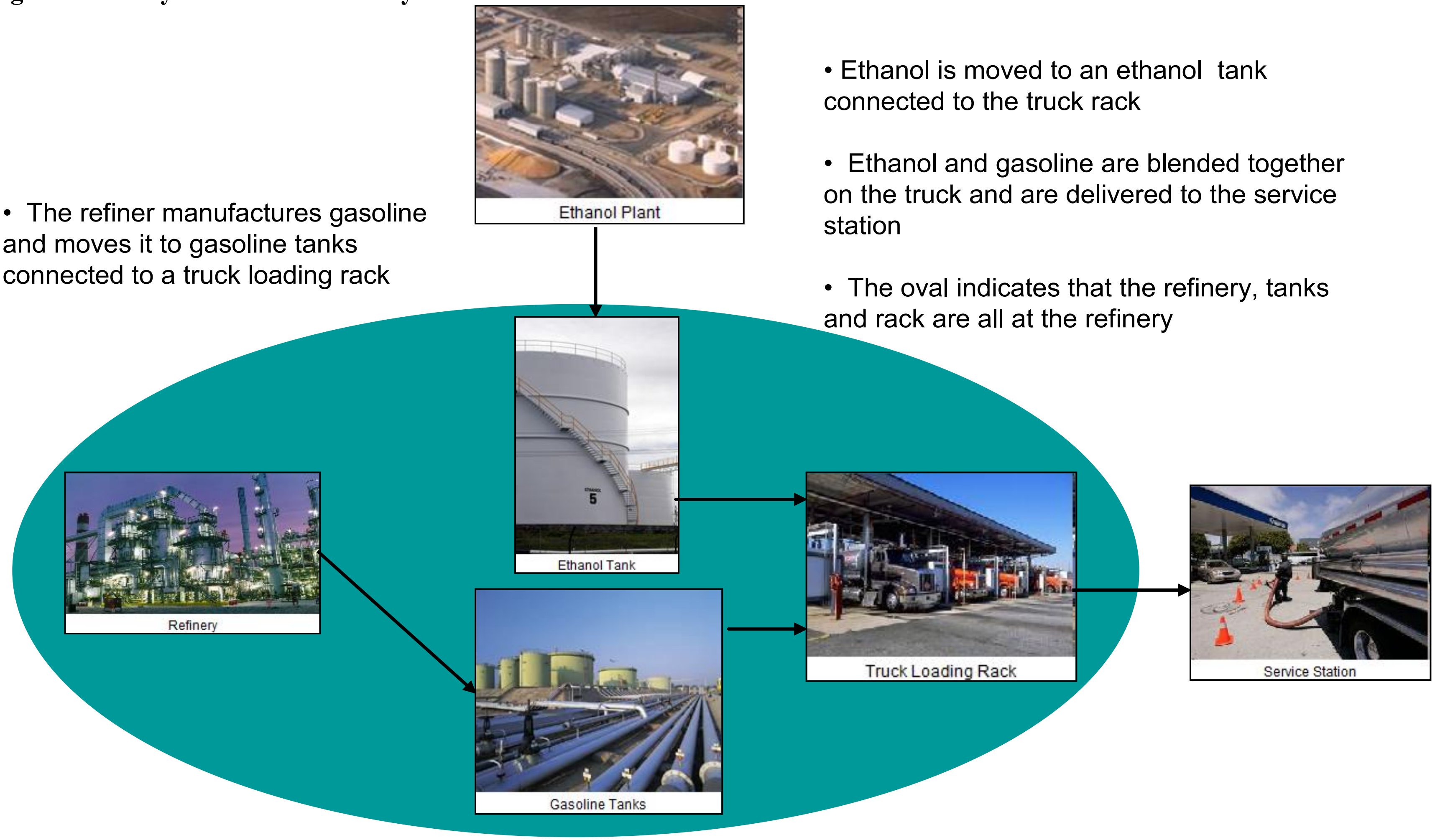
* Note that these terms for projected volumes of gasoline and diesel use include gasoline and diesel that has been blended with renewable fuel.

Source: Vol. 75, No. 58 / Friday, March 26, 2010 pgs 14717- 14718.

A Comparison of the Physical Flow of Product with the Flow of RINs

Figures B-1 and B-2 illustrate the physical flow of gasoline and ethanol in the distribution system. In Figure B-3, the flow of RINs is overlaid on the illustration of the physical flow.

Figure B-1. Physical Flow – Refinery Truck Rack



- The refiner manufactures gasoline and moves it to gasoline tanks connected to a truck loading rack

- Ethanol is moved to an ethanol tank connected to the truck rack

- Ethanol and gasoline are blended together on the truck and are delivered to the service station

- The oval indicates that the refinery, tanks and rack are all at the refinery

- Truck racks at refineries only supply a minor amount of fuel. Most production is pipelined away from the refinery to more distant truck rack terminals

Figure B-2. Physical Flow – Off-Refinery Truck Rack

- Ethanol is moved to an ethanol tank connected to the truck rack
- Ethanol and gasoline are blended together on the truck and are delivered to the service station
- The oval indicates that the tanks and rack are not located at the refinery

- The refiner manufactures gasoline and moves it to gasoline tanks connected to a truck rack

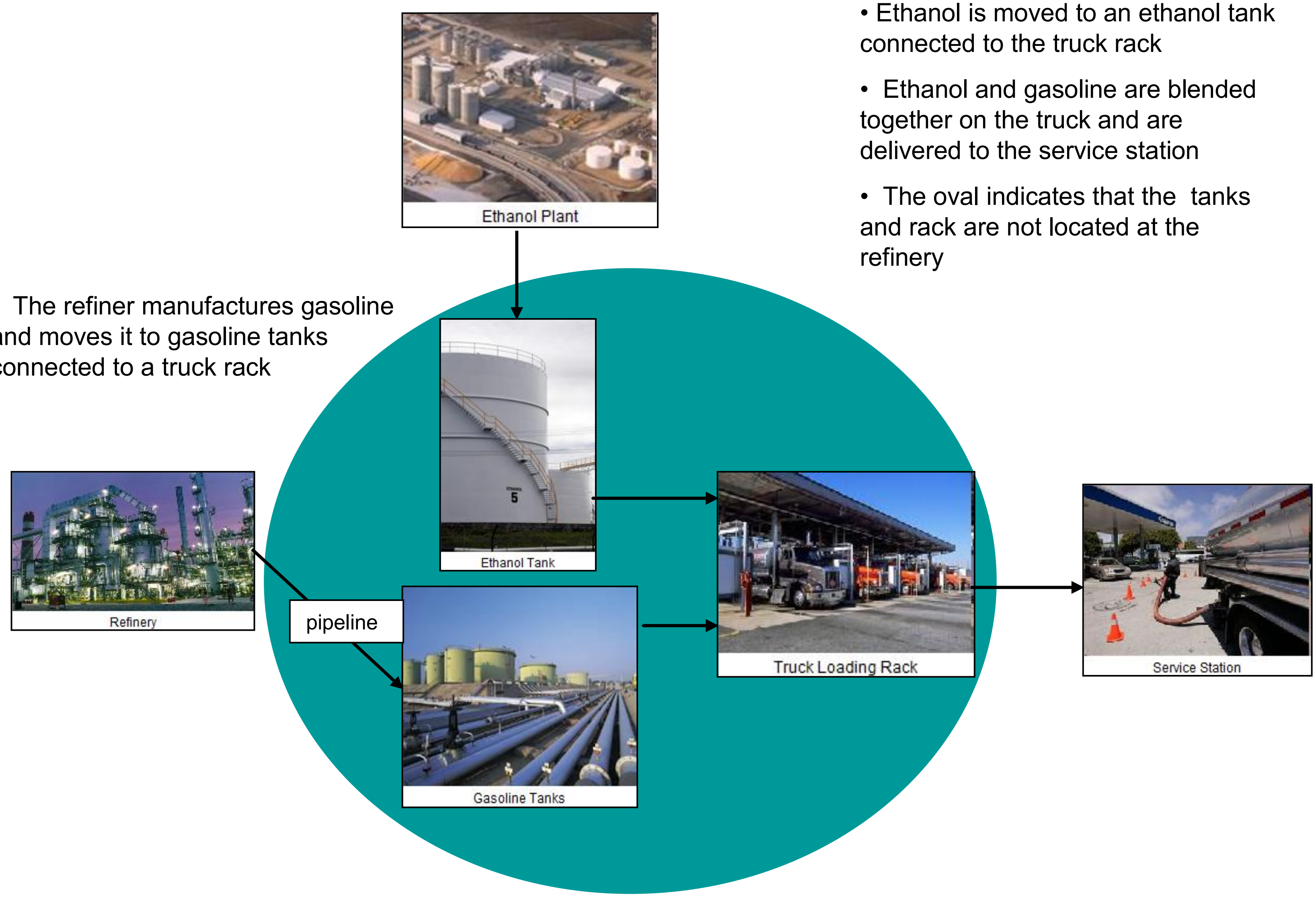
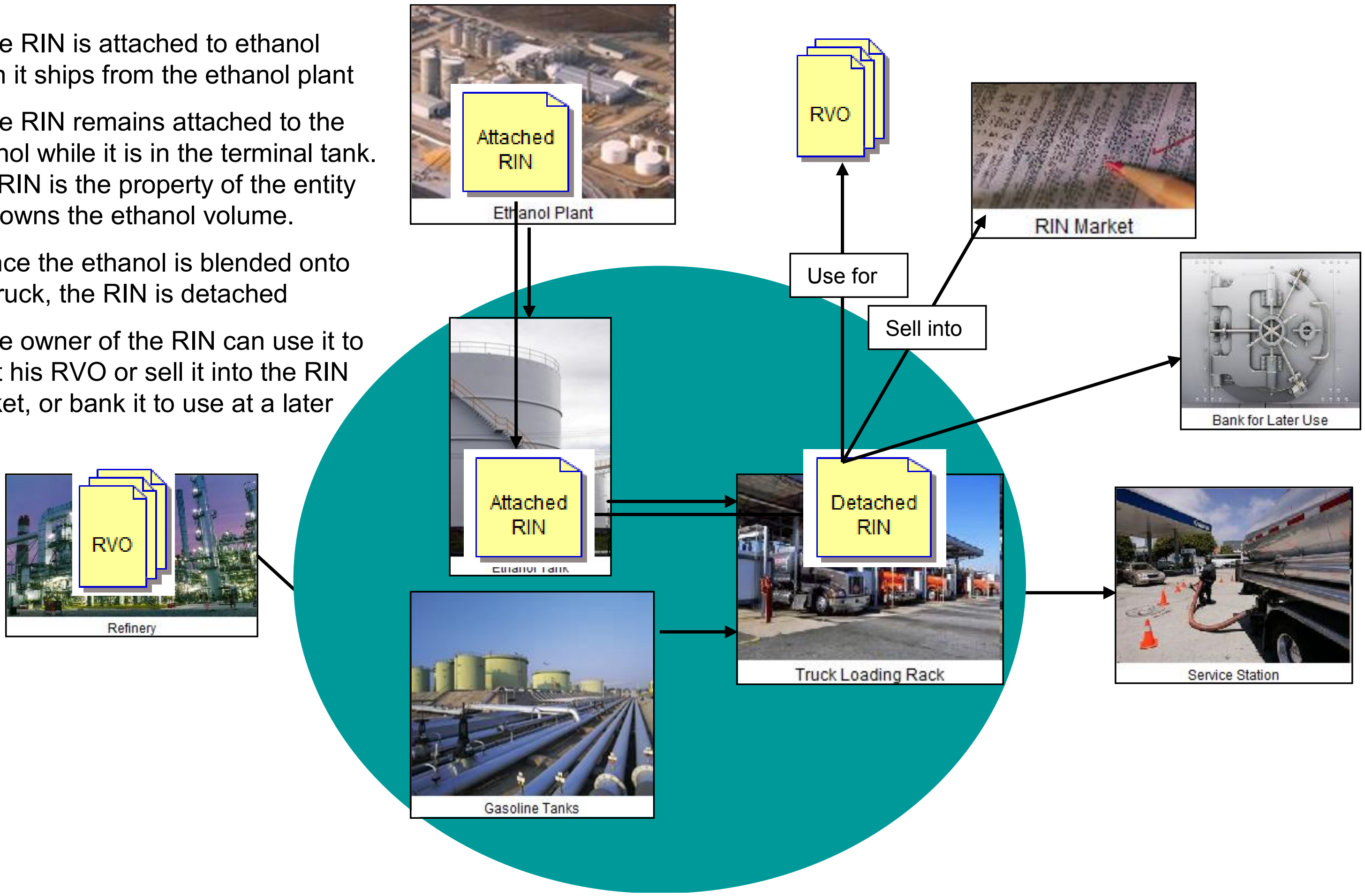


Figure B-3. RIN Flow

- The RIN is attached to ethanol when it ships from the ethanol plant
- The RIN remains attached to the ethanol while it is in the terminal tank. The RIN is the property of the entity who owns the ethanol volume.
- Once the ethanol is blended onto the truck, the RIN is detached
- The owner of the RIN can use it to meet his RVO or sell it into the RIN market, or bank it to use at a later time



- Since the owner of the ethanol at the time of blending controls the RIN, refiners who do not blend all of their production with owned ethanol will have to buy RINs to meet their RVO

Appendix C. DOE Ethanol Model Description

Through the use of an econometric model we investigate the impact of the combination of precipitation, crude oil prices, and discretionary blending on the ethanol supply and demand market in the next two years, as well as the variables upon which ethanol depends: corn and ethanol prices. This appendix provides a five equation model determining ethanol supply and demand quantities and prices, price of corn, and the retail price of gasoline. The equations are estimated using two stage least squares with standard errors robust to heteroskedasticity and autocorrelation using yearly data from 1986 to 2009. The parameter estimates are intended to be used as a basis for examining policy questions regarding the ethanol market, RFS, and waivers within a stochastic framework.

The model equations are presented below.

Ethanol Supply (Equation 1)

$$\ln ETHPROD_t = \alpha_0 + \alpha_1 PETHANOL2005_t + \alpha_2 \ln PCORN2005_t + \alpha_3 \ln ETHPLANTS_t$$

Ethanol Demand (Equation 2)

$$\ln ETHPROD_t = \beta_0 + \beta_1 PETHANOL2005D_t + \beta_2 \ln PGASOLINE2005_t + \beta_3 MANDATE_t + \beta_4 TREND\_PROD_t$$

Retail Gasoline Price Excluding Taxes (Equation 3)

$$\ln PGASOLINE2005_t = \gamma_0 + \gamma_1 \ln REFINE\_UTIL_t + \gamma_2 \ln RAC2005_t$$

Corn Price (Equation 4)

$$\ln PCORN2005_t = \delta_0 + \delta_1 \ln ETHPROD_t + \delta_2 \ln CORNYIELD_t$$

Corn Yield (Equation 5)

$$\ln CORNYIELD_t = \lambda_0 + \lambda_1 \ln PRECIP_t + \lambda_2 (\ln PRECIP)_t^2 + \lambda_3 TREND\_CY$$

All $\alpha_i, \beta_i, \gamma_i, \delta_i, \lambda_i$ coefficients are calculated from regression analysis of the explanatory variables provided in each equation. Equations 3, 4, and 5 can be substituted into equations 1 and 2, equated, and then solved for the PETHANOL2005D (price of ethanol in 2005 constant dollars).

Table C-1 summarizes the variables within the model, their units, and their dependencies. For example, historical precipitation data was used to create the regression model, and assumptions are made about the possible rainfall in 2011 and 2012. On the other hand, production of ethanol in billion gallons per year (Ethanol Supply and Demand) is calculated by the regression model, and therefore an output of the model and directly and indirectly dependent on all model variables[1].

Table C-1. Model Variables

Variable	Units	Function of:	Historical Data	Assumption (Input)	Regression (Output)
Precipitation	Inches/Month	---	Yes	Yes	---
Ethanol Supply and Demand	Billion Gallons/Year	Ethanol Price, Gasoline Price, Corn Price, Ethanol Mandate, Number of Ethanol Plants	Yes	---	Yes
Refiner Acquisition Cost (RAC)	$/Barrel	---	Yes	Yes	---
Gasoline Price	$/Gallon	Refinery Utilization, Refiner Acquisition Cost (RAC) Ethanol Price[2]	Yes	---	Yes
Ethanol Mandate	Billion gallons/Year	---	Yes	Yes	---
Corn Price	$/Bushel	Ethanol Production, Corn yield	Yes	---	Yes
Volumetric Ethanol Excise Credit (VEETC)	$/Gallon	---	Yes	Yes	---
Ethanol Price	$/Gallon	Corn price, Refiner Acquisition Cost	Yes	---	Yes

Nominal monthly ethanol prices are average rack prices in Nebraska obtained from Nebraska's Energy Statistics website and averaged to produce yearly prices. Ethanol production and the number of ethanol plants were obtained online from the Renewable Fuels Association. Nominal monthly corn prices are average prices received by farmers in the U.S. from USDA's Economic Research Service (USDA/ERS) and converted to yearly prices. Corn yields were also collected

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[1] Ethanol supply and demand are determined through equation one and two, but some variables of equations one and two are outputs of equation 3, 4 and 5.

[2] Elasticity of ethanol price (as related to gasoline price) is determined to be 0.19 through regression analysis, for every 1% increase in ethanol demand price, all else constant, an increase of 0.19% is observed in the gasoline price. This elasticity is applied in model run post-processing.

from USDA/ERS. The nominal retail price of gasoline (exclusive of taxes) is the U.S. city average retail price for regular unleaded gasoline taken from EIA's Monthly Energy Review and averaged to produce a yearly price. The nominal refiner acquisition cost is the U.S. crude oil composite acquisition cost by refiner and was collected from EIA. Refinery utilization rate is the annual refinery utilization rate provided by EIA. Precipitation figures for the U.S. corn-belt were gathered from the National Climatic Data Center website. All nominal dollar values were converted to constant 2009 dollars using the GDP deflator from the 2010 *Economic Report of the President*.

Historical values for all variables are presented from 1999-2010 and independent variables are projected into the future (2011 and 2012) in Figures C-1 through C-6, and dependent variables calculated by the regression model are presented in Figures C-7 through C-10.

Figure C-1 details historical annual rainfall within the U.S. corn-belt for the last decade. As expected, rainfall varies each year. Rainfall data from 1986-2009 is used within the regression analysis, and over that time period the average annual rainfall is found to be 2.91 inches/month. Corn yield is intimately tied to the precipitation in any given year (equation 5) and maximum corn yield is attained at the average annual rainfall, thus allowing for modeling of drought and flood conditions. Any deviation from the average will yield a less than optimal corn yield, and Figure C-2 illustrates the affect on expected corn yield for 2011.

Figure C-3 outlines the historical and projected Volumetric Ethanol Excise Credit (VEETC). Congress has recently passed legislation for continued VEETC of $0.45 per gallon, and this value is assumed for 2011 and 2012. The VEETC has decreased over the last decade in real and constant dollars, and is projected to be $0.45 (real dollars) in the near future. The VEETC is $0.44 and $0.43 in 2009 constant dollars for 2011 and 2012, respectively.

Refiner Acquisition Cost (RAC) is used as a regression variable to account for the influence of crude oil on ethanol production and consumption within the U.S. Typical RAC is a few dollars more than the WTI crude oil price. RAC is projected to be $82 for 2011 and $84 for 2012[3] in the base case ($90 and $92.2 in 2009 constant dollars for 2011 and 2012, respectively). Figure C-4 provides the RAC historical and projected values in constant 2009 dollars.

Figure C-5 provides the historical and projected number of ethanol plants within the U.S. Number of ethanol plants is used as a proxy for ethanol production capacity within the United States. As the U.S. production capacity gets close to the maximum mandate of corn ethanol (15 billion gallons per year) new construction should slow and total number of plants should reach a maximum value[4]; thereafter, number of plants should decrease due to increased plant efficiency and economies of scale.

Figure C-6 shows the historical and regression values for corn yield (bushels/acre). Corn yield has increased over the past decade and is expected to grow in the future. Corn yield is primarily

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[3] The RAC price represents the crude oil price as of December 2010.
[4] The model uses a constant value of 170 plants in 2011 and 2012.

a function of rainfall and increasing efficiency of corn growers. Change in corn yield due to variability in rainfall has been demonstrated in Figure C-2.

Figure C-7 provides historical and regression values for corn prices. Within Equation 4 corn price is a largely a function of corn yield and the volume of ethanol produced. However, Equations 1,2,3, and 4 have interdependent variables, thus corn yield is effectively a function of all model variables. Corn price varies with market and meteorological conditions, although general trend over the last decade indicates an increase in price. Under optimal rainfall conditions, and a crude oil price of approximately $90-$92.2 dollars, regression analysis projects a corn price of $4.40-$4.42 per bushel over the next two years.

Figure C-1. U.S. Average Annual Precipitation – Corn Belt

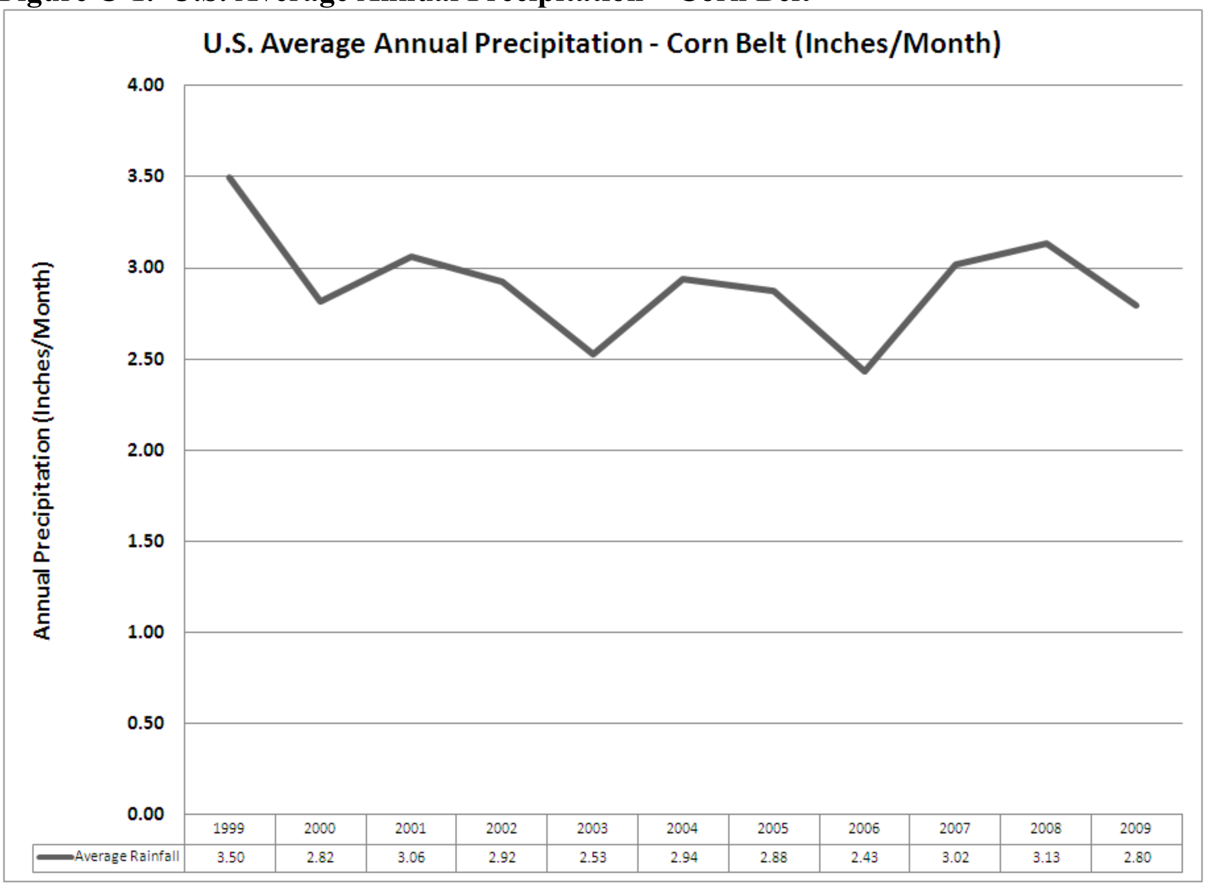


Figure C-2. Projected Corn Yield vs. Rainfall (2010)

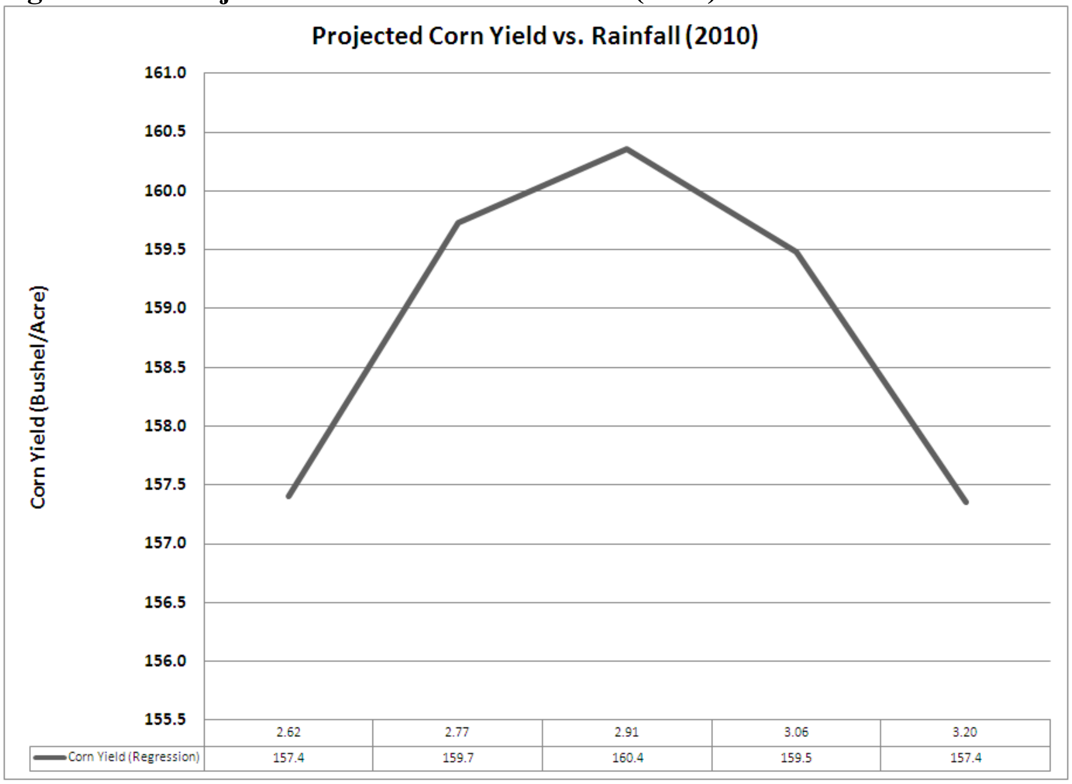


Figure C-3. U.S. Volumetric Ethanol Excise Tax Credit (VEETC)

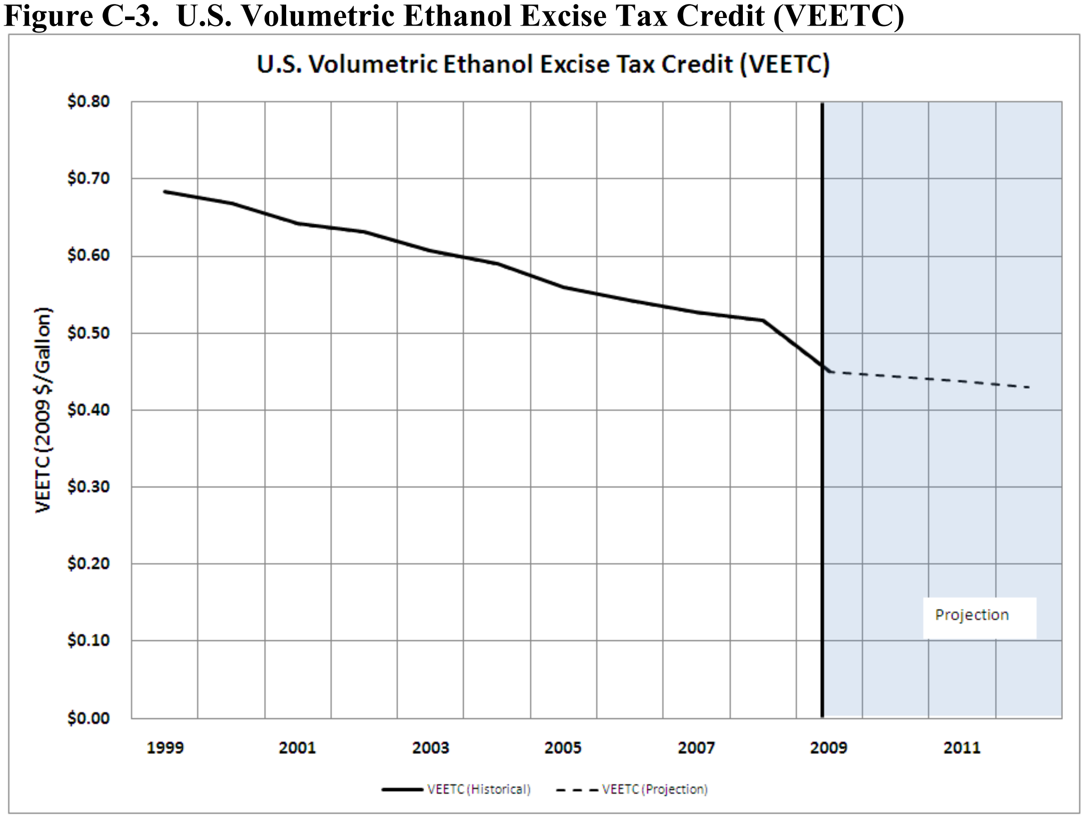


Figure C-4. Refiner Average Crude (RAC) Oil Acquisition Cost

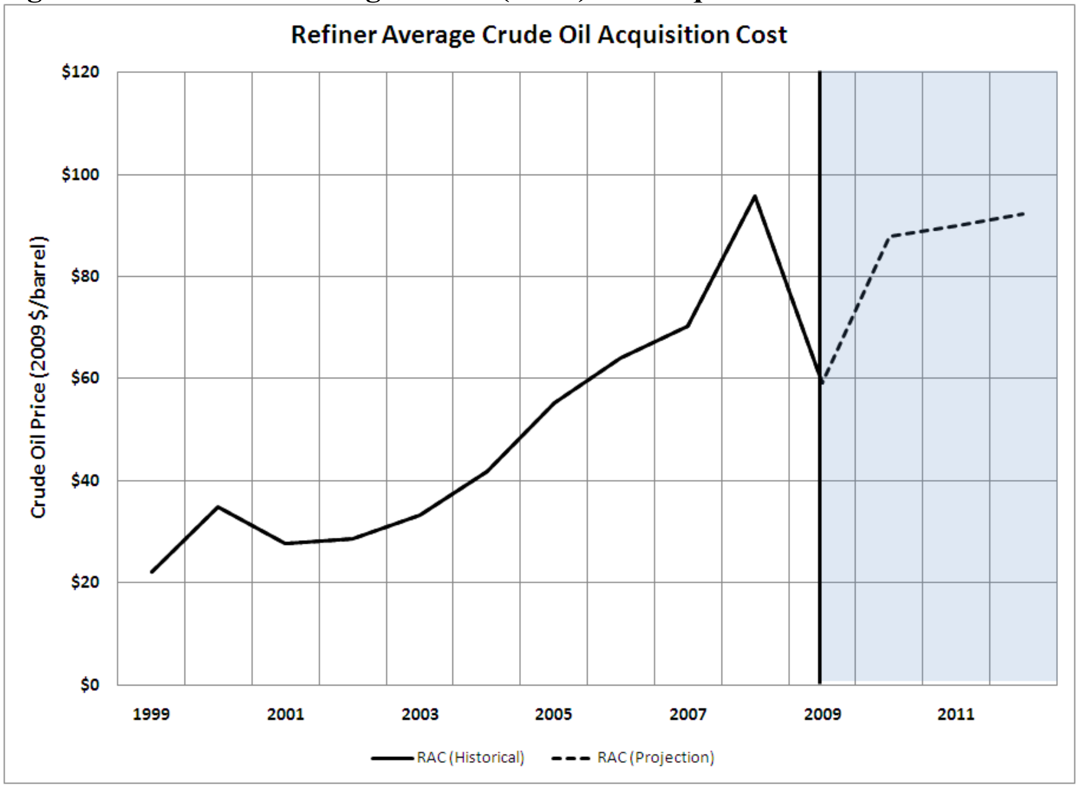


Figure C-5. Number of Ethanol Plants in the U.S.

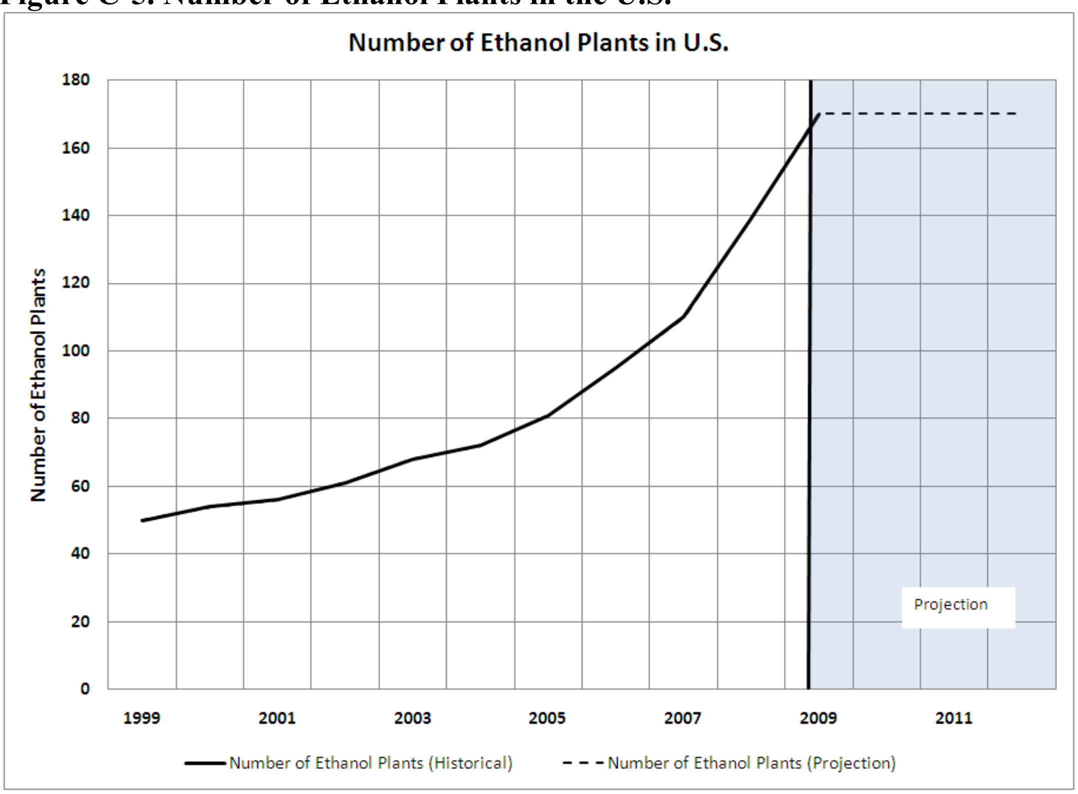


Figure C-6. U.S. Corn Yield

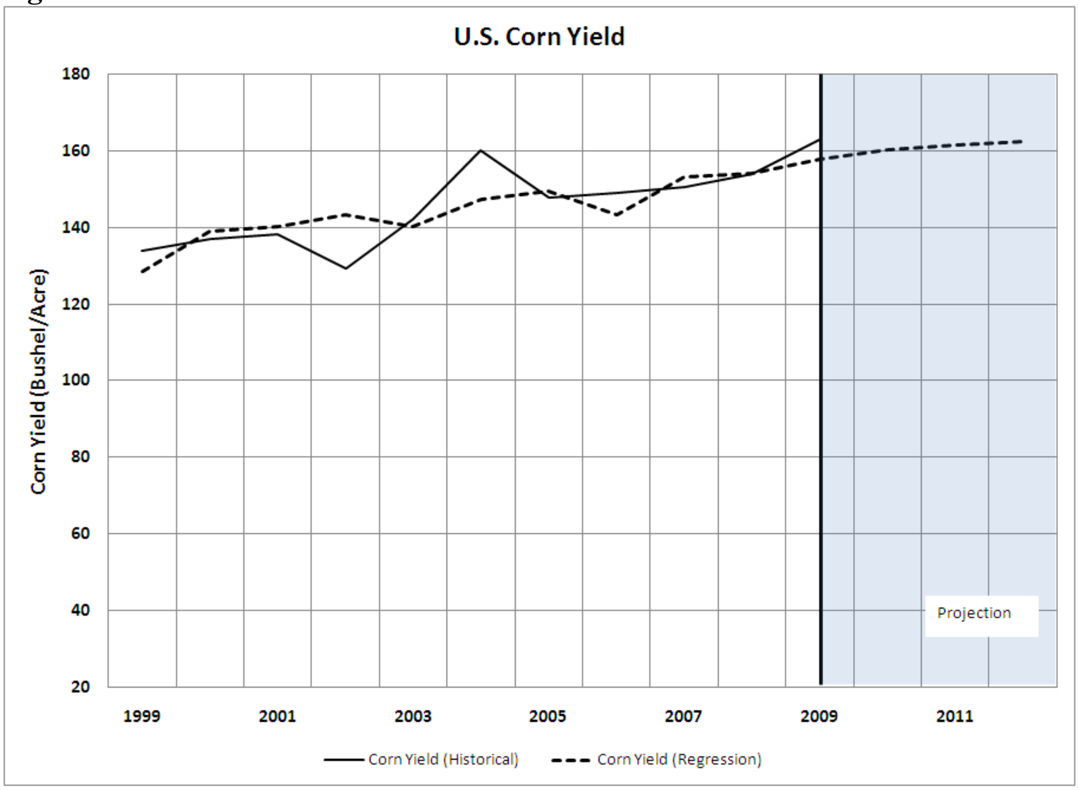


Figure C-7. U.S. Corn Prices

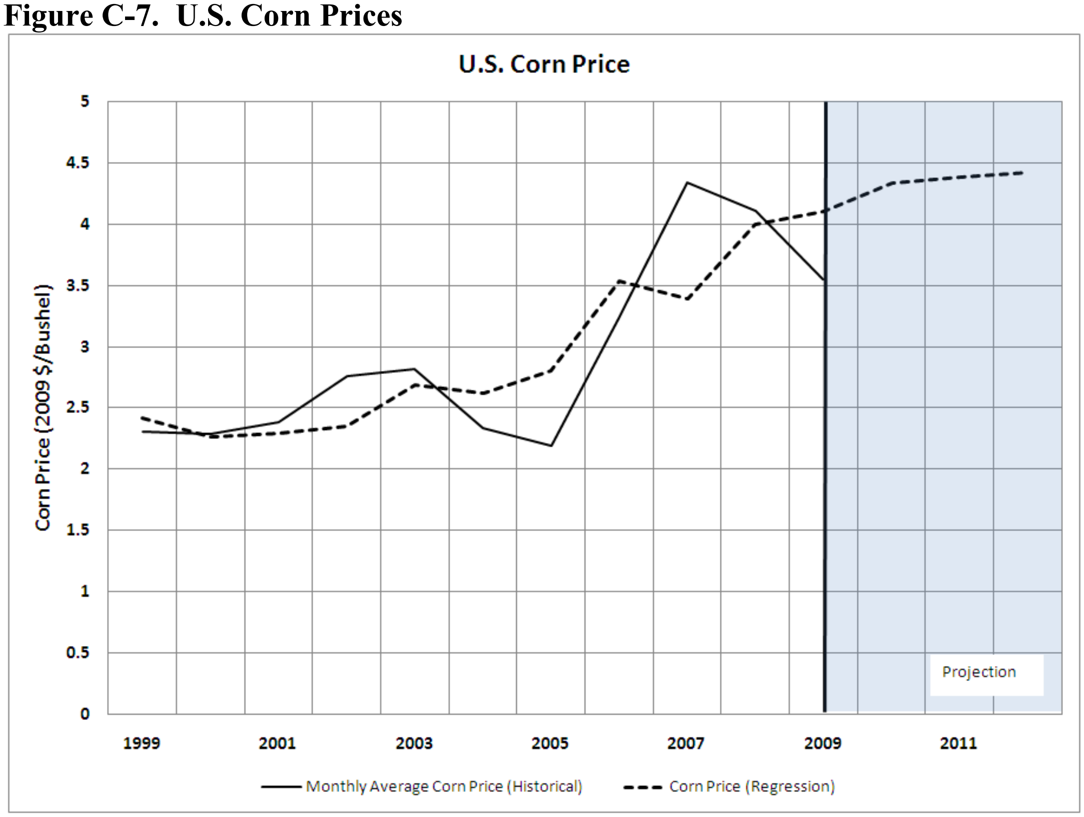


Figure C-8. U.S. Yearly Ethanol Production

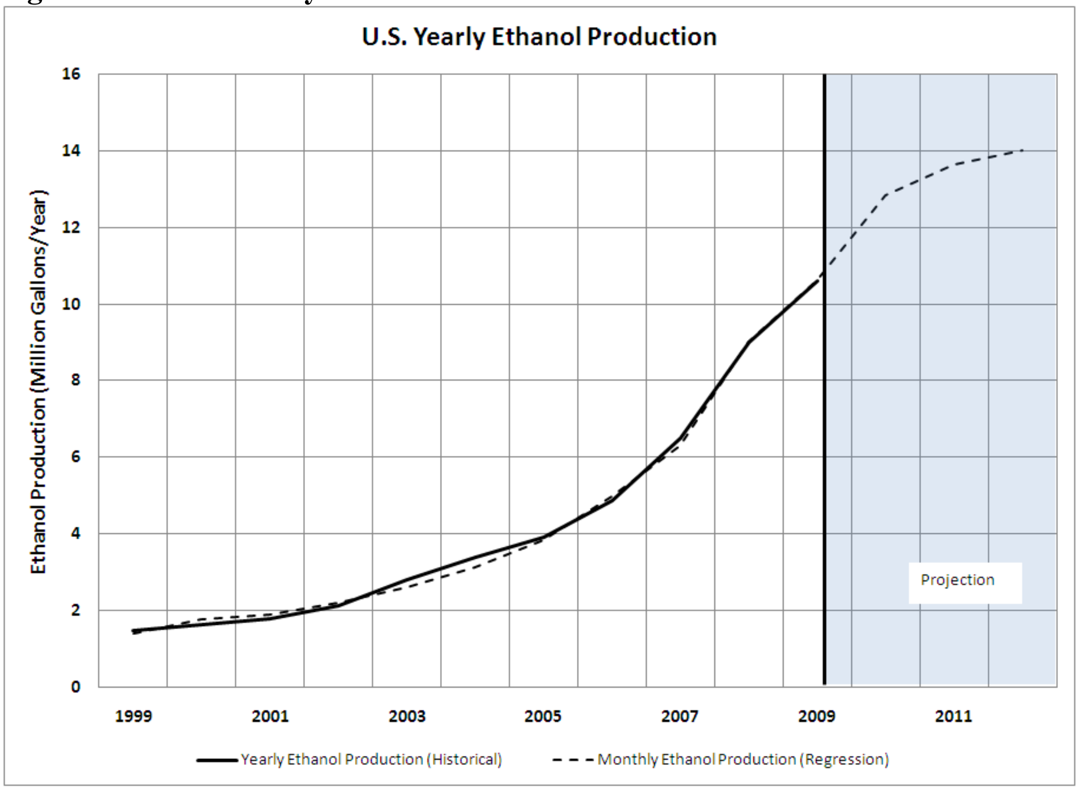


Figure C-9. U.S. Retail Gasoline Price

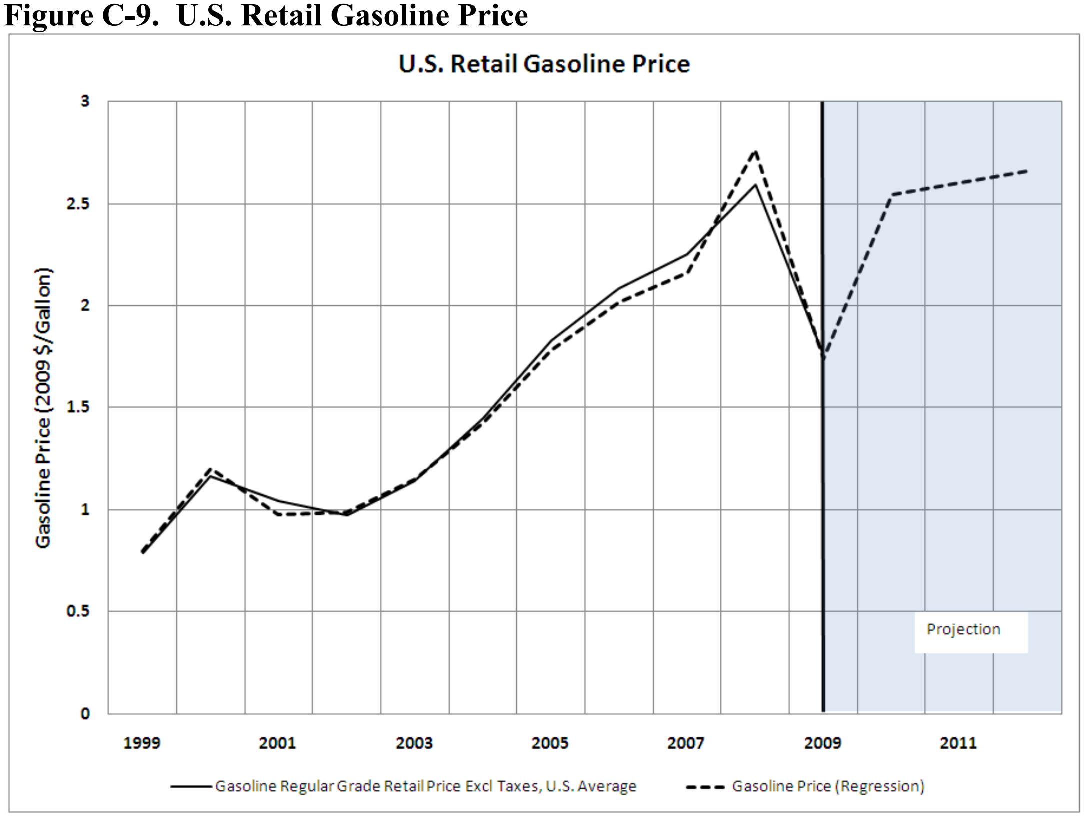


Figure C-10. U.S. Ethanol Supply Price

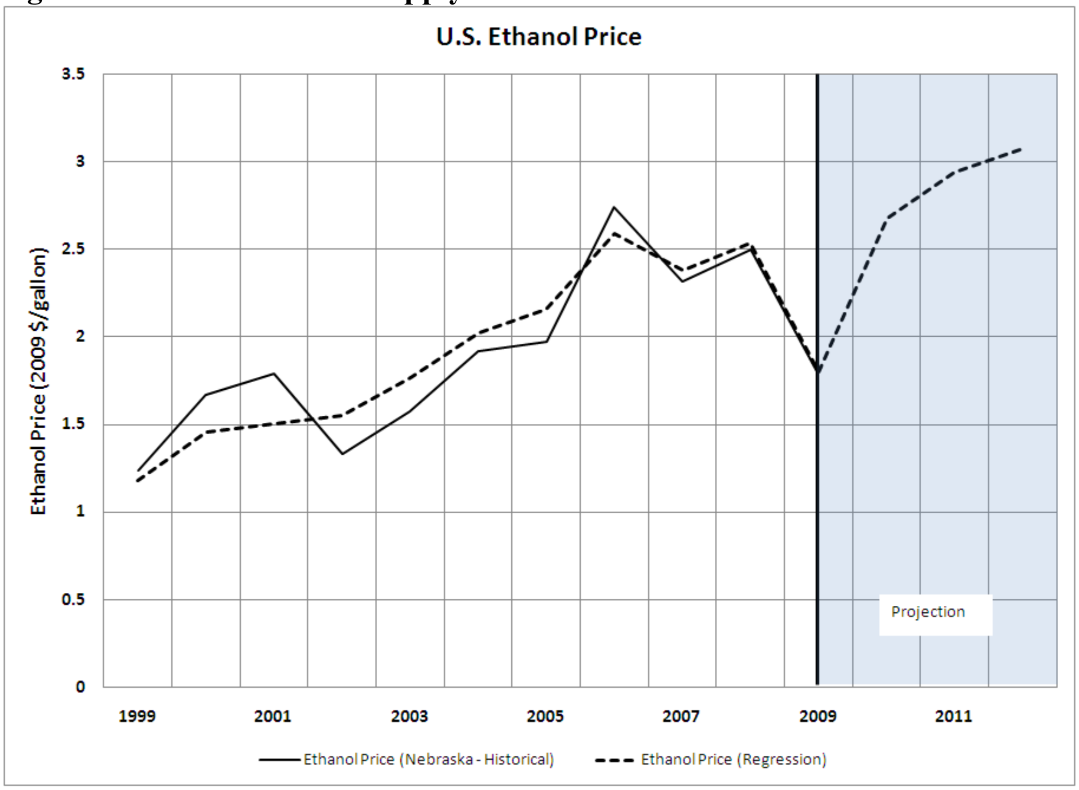


Figure C-8 details the historical ethanol production over the last decade and the regression results of ethanol production for 2011 and 2012 under optimal rainfall and approximately $90-$92.2 dollars crude oil price. Under optimal conditions ethanol production is expected to rise steadily to meet and exceed the corn ethanol mandate of 12.6 and 13.2 billion gallons per year.

Historical price of gasoline over the last decade and regression results for 2011 and 2012 are provided in Figure C-9. Retail gasoline price is a function of ethanol and crude oil price and under $90-$92.2 dollar crude oil price retail gasoline price is expected to be $2.68-$2.78 per gallon.

Figure C-10 provides historical price of ethanol over the last decade and the regression results for 2011 and 2012. Ethanol price is a function of all of the model variables, and under $82-$84 dollar crude oil price and optimal rainfall conditions ethanol price is expected to be 2.37-2.39 without the VEETC subsidy.

The DOE model describes the ethanol supply and demand market in the next two years, as well as corn, ethanol, and gasoline prices. Under optimal rainfall conditions and crude oil price of $82-$84 per barrel, the model predicts ethanol production above the mandated levels in 2011 and 2012, within the motor gasoline pool and therefore the quantity of Renewable Identification Number (RINs) generated should exceed the Renewable Volume Obligation (RVO) comfortably and RINs traded between parties should cost no more than the transaction cost. However, if market and meteorological conditions are worse, then it is possible for reduced levels of ethanol production and blending which will lead to an increase in RIN prices.

In the following analysis the DOE model is used to identify conditions that may be conducive to generating high RIN prices within the marketplace. Parametric analysis reveals that High RIN prices can be expected due to a period of drought or flooding, or over-blending of ethanol by obligated parties among other factors.

The four cases in Table C-2 represent four states of the world that may exist in 2011 and 2012, and the assumptions for the cases. Scenario A represents a "Best Case Scenario" where optimal rainfall creates conditions for low ethanol price due to a high corn yield, crude oil price is maintained at December 2010 levels ($82-$84 per barrel), and ethanol production is unconstrained. Scenario B dampens the expectations of a high corn yield by introducing poor rainfall, leaving all other conditions the same as Scenario A. Poor rainfall is defined by reducing the average annual rainfall (in inches per month) from the optimal (2.91 inches/month) to rainfall amount two standard deviations below the normal (2.07 inches/month)[5]. Scenario C requires blending to increase to RVO, while under the poor rainfall condition described in Scenario B. Scenario D considers a situation where obligated parties blend above the RVO under poor rainfall conditions, in anticipation of future RIN shortages.

Table C-2. RIN Scenarios Description

Scenario	Precipitation (Inches/Month)	Crude Oil Price ($/Barrel)	Blending Level
A	Optimal (2.91)	($82-$84)	Unconstrained
B	Poor Rainfall (2.07)	($82-$84)	Unconstrained
C	Poor Rainfall (2.07)	($82-$84)	Constrained (RVO- 9.0% in 2011, 9.2% in 2012)
D	Poor Rainfall (2.07)	($82-$84)	Constrained (9.5%)

Under Scenario A optimal rainfall and $82-84 crude oil prices ample existing ethanol production capacity within the U.S. allows for ample ethanol production in 2011 and 2012. 13.57 billion gallons of ethanol produced under optimal rainfall condition represents 9.7% blending of ethanol by volume in motor gasoline (139.3 billion gallons[6]) expected to be consumed within the U.S. in 2011. Ethanol production is expected to increase to 14.02 billion gallons (10.1% blending of ethanol) in 2012 due to increases in overall ethanol production capacity under optimal rainfall conditions. **Under Scenario A, the level of blending is above the required mandate of 12.6 and 13.2 billion gallons in 2011 and 2012, respectively; therefore, over-compliance should lead to a surplus of RINs in the marketplace and RIN price can be expected to be negligible in 2011 and 2012.**

[5] The definition of a drought is beyond the scope of this paper. In order to approximate a drought condition, rainfall was set to two standard deviations below the mean, covering approximately 95% of all outcomes.
[6] EIA AEO2011

Under Scenario B, annual rainfall is expected to be two standard deviations lower than the optimal case (Scenario A). As expected, poor rainfall leads to a lower corn yield which puts upwards pressure on corn prices. Higher corn prices lead to reduced ethanol production and higher ethanol and gasoline prices. If ethanol blending is allowed to occur without regards to the RVO in 2011 and 2012 (no ethanol mandate), the model predicts reduction of 1.40 billion gallons of ethanol production an increase in corn price of $2.21 per bushel and an increase in ethanol price of $0.62 per gallon in 2011 when compared to Scenario A. **Since the projected amount of ethanol produced in Scenario B is below the ethanol mandate (12.6 and 13.2 billion gallons in 2011 and 2012) and obligated parties are required to blend to the RVO, Scenario B would require addition consumption of ethanol.**

Scenario C forces obligated parties to blend to the RVO under poor rainfall conditions in order to comply with the RFS program, thus boosting ethanol production to 12.6 and 13.2 billion gallons in 2011 and 2012, respectively, as compared to Scenario B. A RIN cost of $0.35 per ethanol gallon blended is introduced within the model to increase ethanol production to 12.6 billion gallons in 2011 and from $.58 from 12.91 to 13.2 billion gallons in 2012. The other key prices and market metrics may be found in Table C-3 below. **RIN prices of $0.32 and $0.58 may exist in 2011 and 2012 in order to increase ethanol production to meet the mandate due to poor rainfall conditions outlined in Scenario C.**

Scenario D investigates the possibility of over-blending under poor rainfall conditions. If obligated parties over-blend in order to accumulate RINs for future compliance, the increased production (and consumption) of ethanol may lead to higher RIN prices. **Scenario D predicts a RIN price of $0.81 and $0.87 per ethanol gallon blended in 2011 and 2012, if the obligated parties blend ethanol at 9.5% (by volume) within the motor gasoline pool.** Corresponding corn, ethanol and gasoline prices may be found in Table C-3.

All prices reported in Table C-3 are in constant 2009 dollars.

Table C-3. RIN Price Scenarios for 2011 and 2012

	Rainfall	VEETC	RIN Price	Ethanol Mandate	MoGas Use[7]	Crude Oil Price	Ethanol Production	Ethanol % in MoGas	Ethanol Price	Corn Price	Wholesale Gasoline Price
	Inches/ Month	$/ Gallon	$/ Gallon	Billion Gallons/ Year	Billion Gallons/ Year	$/Barrel	Billion Gallons/ Year	Percent	$/ Gallon	$/ Bushel	$/Gallon
2011											
A	2.91	$0.44	$0.00	12.6	139.3	90	13.57	9.7%	$2.94	$4.40	$2.60
B	2.07	$0.44	$0.00	12.6	139.3	90	12.17	8.7%	$3.58	$6.83	$2.73
C	2.07	$0.44	$0.38	12.6	139.3	90	12.60	9.0%	$3.75	$6.95	$2.76
D	2.07	$0.44	$0.92	12.6	139.3	90	13.23	9.5%	$4.02	$7.12	$2.80
2012											
A	2.91	$0.43	$0.00	13.2	143.0	92.2	14.02	9.8%	$3.05	$4.42	$2.61
B	2.07	$0.43	$0.00	13.2	143.0	92.2	12.46	8.7%	$3.69	$6.87	$2.73
C	2.07	$0.43	$0.64	13.2	143.0	92.2	13.20	9.2%	$4.00	$7.08	$2.78
D	2.07	$0.43	$0.95	13.2	143.3	92.2	13.59	9.5%	$4.14	$7.18	$2.80

[7] EIA AEO2011

Appendix D. PI-588 Survey Form

Introduction

The 2010 Small Refineries Exemption Study was developed to determine if small refiners suffer "disproportionate economic hardship" through compliance with the Renewable Fuel Standard (RFS). In an effort to collect input from small refineries for use in the study, the Department of Energy's Office of Policy and International Affairs (PI) developed an original survey instrument to gather data on specific characteristics of individual small refineries. The optional survey allowed respondents to submit data that provided technical support for a determination of disproportionate economic hardship.

The survey elements, in conjunction with previously collected and other public data were used to characterize the firm's cost of compliance and its financial resilience in the face of estimated compliance costs associated with the RFS2 regulation. Data elements from the survey, including capital costs, operating costs, ability to generate Renewable Identification Numbers (RINs) and projected RIN costs were used to estimate the cost of compliance in cents per gallon of product.

The survey was submitted to the Office of Management and Budget (OMB) for review and clearance on July 8, 2010. A Federal Register Notice[1] and 30 day public comment period were opened on July 15, 2010.

The survey received clearance from the Office of Management and Budget on September 22, 2010 and was distributed electronically via email to 59 small refineries on September 27, 2010. The survey was to be completed and returned electronically using a designated PI website by October 25, 2010.

The survey consisted of five parts:

- Respondent Identification
- Submission/Resubmission
- Financial Health of Refinery
- Market Compliance
- Market Issues

Time series questions sought three years of data (2007, 2008, 2009 for historical series and 2010, 2011, 2012 for future looking series). The cover letter, survey form, survey instructions, and electronic filing instructions are provided in this appendix.

[1] Federal Register: July 15, 2010 (Volume 75, Number 135). http://edocket.access.gpo.gov/2010/2010-17288.htm

Figure D-1. Survey Cover Letter

Dear PI-588 Respondent,

The Department of Energy (DOE) has determined that the following refinery(s) under your authority meet the qualifications for possible extension of the exemption from compliance with the Renewable Fuel Standard program: Refinery Name(s). As a result, your company has been selected to participate in the DOE "Small Refinery Exemption," survey PI-588. Section 211(o)(9)(A)(ii) of the Clean Air Act, as amended by the Energy Policy Act of 2005 (EPACT 2005), requires that the DOE conduct a study for the Administrator of the Environmental Protection Agency assessing whether compliance with the Renewable Fuel Standard would impose a "disproportionate economic hardship" on small refineries.

Your cooperation in completing this optional, one-time, survey will be greatly appreciated. It will help us to produce a more complete and accurate assessment of "disproportionate economic hardship." Since qualification for exemption will be determined on a case by case basis for each refinery, please complete and submit a separate survey form for each refinery listed. Please rename your survey form file (PI-588-survey-form.xls) by adding the name of the city where the refinery is located when submitting to avoid confusion. Please return the PI-588 survey by **October 25, 2010 in** order for it to be considered in the Small Refinery Exemption study.

Please read the attached instructional document, PI-588-survey-instructions.pdf, carefully as it contains important information regarding each data field including units of measure. Note that some of the fields ask for data in a different unit of measure than you may be accustomed to reporting on the EIA-810 or other surveys. Also, please refer to the PI-588 survey instructions for a description of the authority of the DOE to collect information and a statement describing confidentiality of the information collected.

The Small Refinery Exemption survey must be submitted electronically. Please follow the attached instructional document, PI-588 posting instructions.pdf, which explains the process for secure, electronic posting of the survey. Your initial **username** is the email address to which the survey was delivered; the initial password is **!#password**. As noted in the posting instructions, please change your password after your initial log-in.

If you have any questions or concerns, please contact **Pete Whitman, 202-586-1010,** Peter.Whitman@hq.doe.gov (especially for technical questions) or me (carmen.difiglio@hq.doe.gov, 202-586-8436). Please keep a copy of your completed survey for your files.

Thank you for your cooperation in this important endeavor.

Sincerely,

Carmine Difiglio
Deputy Assistant Secretary for Policy Analysis
Office of Policy and International Affairs

Figure D-2. PI-588 Survey Form

This form may be submitted to DOE by fax, e-mail, or secure file transfer. Should you choose to submit your data via e-mail, we must advise you that e-mail is an insecure means of transmission because the data are not encrypted, and there is some possibility that your data could be compromised. You can also send your Excel files to DOE using a secure method of transmission: HTTPS. This is an industry standard method to send information over the web using secure, encrypted processes. (It is the same method that commercial companies communicate with customers when transacting business on the web.) To use this service, we recommend the use of Microsoft Internet Explorer 5.5 or later or Netscape 4.77 or later. Send your surveys using this secure method at: https://signon.eia.doe.gov/upload/noticeoog.jsp

U.S. DEPARTMENT OF ENERGY

OMB No. XXXX-XXXX

Expiration Date: 12/30/2010

Version NO. 2010.01

FORM PI-588

RFS2 SMALL REFINERY SURVEY 2010

Section 211(o)(9)(A)(ii) of the Clean Air Act, as amended by the Energy Policy Act of 2005 (EPACT 2005), requires that the Department of Energy (DOE) conduct a study for the Administrator of the Environmental Protection Agency (EPA) assessing whether the renewable fuel standard (RFS) would impose a "disproportionate economic hardship" on small refineries, This optional survey allows respondents to submit data that will provide technical support for a determination of disproportionate economic hardship. **Title 18 USC 1001 makes it a criminal offense for any person knowingly and willingly makes to any Agency or Department of the United States any false, fictitious, or fraudulent statements as to any matter within its jurisdiction.**

Part 1. RESPONDENT IDENTIFICATION DATA

ID NUMBER: ____________

Company Name: ____________

Doing Business as: ____________

Site name: ____________

Terminal Control Number: ____________

Physical Address of Contact (e.g. Street Address, Building Number, Floor, Suite): ____________

City: _______________ **State:** _______________ **Zip:**______ - ________

Mailing Address of Contact (e.g., PO Box, RR): If the physical and mailing address are the same, only complete the physical address.

City: _______________ **State:** _______________ **Zip:**______ - ________

Contact Name: ____________

Phone No.: ____________

Fax No.: ____________

Email address: ____________

Part 2. SUBMISSION/RESUBMISSION INFORMATION

If this is a resubmission, enter an "X" in the box: [ ]

A completed form must be received by July 17th, 2010.

Forms may be submitted using one of the following methods:

Email: SBR@hq.doe.gov
Fax: (202) 586-1076

Secure File Transfer:

https://signon.eia.doe.gov/upload/noticeoog.jsp

Questions? **Call: 202 586 1393** **Tom White**
202 586 1010 **Pete Whitman**

Part 3. Financial Health of the Refinery

Balance Sheet

		2007	2008	2009
3.01	What month did your fiscal year start in 2007,2008 and 2009?			
3.1	How much cash and marketable securities did you have at the end of the fiscal year 2007, 2008 and 2009?			
3.2	How much were your Current Liabilities at the end of fiscal year 2007,2008 and 2009?			
3.3	How much did you owe in long term debt at the end of fiscal year 2007, 2008 and 2009?			

Statement of Income

		2007	2008	2009
3.4	What were your yearly Capital Expenditures in 2007, 2008 and 2009?			
3.5	What were your yearly Operational Expenditures in the fiscal year 2007, 2008 and 2009?			
3.6	What was your Gross Refining Margin in dollars per barrel for the fiscal year 2007, 2008 and 2009?			
3.7	What was your Net Refining Margin in dollars per barrel in fiscal year 2007, 2008 and 2009?			

3.8 Are there any items on your Balance Sheet that you judge to be noteworthy with regards to claiming disproportionate economic hardship? Please provide comments below.

3.9 Are there any items on your Statement of Income that you judge to be noteworthy with regards to claiming disproportionate economic hardship? Please provide comments below.

	Cost of Capital	
3.10	What is your current Debt/Equity Ratio?	
3.11	What is your current Weighted Average Cost of Capital?	
3.12	What is your Internal Rate of Return (IRR) on projects?	
	If financing is required for future projects related to purchasing or holding RINs, estimate the cost (interest rate) of:	
3.13	Capital Expenditures	
3.14	Operational Expenditures	
3.15	Do you have a credit rating with a rating agency? YES or NO	
	If YES, provide:	
3.16	Name of rating agency	
3.17	Current credit rating	

If financing is required for future projects related to purchasing or holding RINs, are there any debt loan covenents that may pose restrictions on borrowing? Please specify below.

3.18

Do you anticipate any cash flow or credit issues related to purchasing, separating, or holding RINs? Please specify below.

3.19

	Previous Projects			
	What percent of Capital Expenditures over the last three years have been for:	2007	2008	2009
3.20	Environmentally required projects?			
3.21	Required safety projects?			
3.22	What percent of these projects were financed through internally generated cash flow?			

	Future Projects			
	Estimate the dollar value of capital expenditures on environmentally required projects do you plan to spend Capital Expenditures on over the next three years:	2011	2012	2013
3.23	Ultra Low sulfur diesel			
3.24	Low sulfur gasoline			
3.25	Control of Hazardous Air Pollutants From Mobile Sources (MSAT2)			
3.26	Consent Decree			
3.27	Other			
3.28	What percent of these projects will be financed through internally generated cash flow?			

Part 4. Cost of RFS2 Compliance

4.1	Do you currently own a facility capable of blending renewable fuels? YES or NO. If YES, answer the following questions:		
	Type of facility	Refinery Rack	Terminal
4.2	If you answered YES, state the average annual net input of gasoline blendstock (thousands of barrels per day).		
4.3	If you answered YES, state the average annual net input of diesel (thousands of barrels per day) .		
4.4	If you answered YES, please state the in-service date.		
4.5	If you answered YES, please estimate the cost of building the facility, in thousands of dollars.		
4.6	If you answered YES, please estimate the length of time it took to construct the faciilty. Use Comment section in 4.17 for additional space.		
	Estimate the dollar value of capital expenditures needed to change refinery operations to produce blendstock required for RFS2 compliance in 2011?		
4.7	Cost of modifying refinery operations.		
4.8	Cost of modifying terminal or rack blending operation.		
4.9	Cost to maintain RIN records, and/or purchase RINS. The RIN transaction cost (not the cost of RINS).		
4.10	Please estimate the length of time it will take to construct the facilities. Use Comment section in 4.17 for additional space.		
4.11	How many RINS did you separate through blending in 2009?		
	How much blendstock required for RFS2 compliance will you produce in 2011?		Volume (thousand barrels per day)
4.12	Gasoline		
4.13	Diesel		
	How does the introduction of renewable fuels into the transportation fuel mix change your competitive position?		
4.14	If the introduction of renewable fuels changes your competitive position, place X in box. Please provide reasons and comments below.		
4.15			
	Please list any state or local regulations that may impede your ability to sell renewable fuels. Provide comments in text box below.		
4.16			
	Additional comment section for questions (4.1-4.10)		
4.17			

Part 5. Market Share

		2007	2008	2009
	How much of the transportation fuel blendstock produced at your refinery could accept renewable fuels (i.e. ethanol, biomass diesel) and then be sold as a finished product in 2007, 2008, and 2009? Please indicate the quantity of:	2007	2008	2009
5.1	Gasoline			
5.2	Diesel			
	What is your share of supply in your primary market for retail gasoline sales? Please indicate your primary market, and your market share for the years 2007, 2008, and 2009. Provide a description in the comment section below (5.4).	2007	2008	2009
5.3	Market Share			
5.4				
	What is your share of supply in your primary market for retail diesel sales? Please indicate your primary market, and your market share for the years 2007, 2008, and 2009. Provide a description in the comment section below (5.6).	2007	2008	2009
5.5	Market Share			
5.6				

	Provide the RINS generated through sale of products via contractual agreements and the share of your gasoline and diesel blendstock sold through contractual agreements in 2009.	RINS	Share
5.7	Gasoline		
5.8	Diesel		

		2007	2008	2009
	What is your share of the market for sales to resellers? Please provide the share of volume sold in 2007, 2008, and 2009.	2007	2008	2009
5.9	Gasoline			
5.10	Diesel			
	What share of your product is sold into common carrier product pipelines? Please provide the share of volume sold in 2007, 2008, and 2009.	2007	2008	2009
5.11	Gasoline			
5.12	Diesel			
	What share of your product is sold through company owned retail outlets (include lessee-dealers) ? Please provide the share of volume sold in 2007, 2008, and 2009.	2007	2008	2009
5.13	Gasoline			
5.14	Diesel			

	If you own or control facilities listed below, please provide the following information for 2009:	Volume of Ethanol Blended **(thousand gallons per day)**	Volume of Petroleum Gasoline Blendstock shipments **(thousand barrels per day)**	Volume of Biomass Based Diesel Blended **(thousand gallons per day)**	Volume of Diesel shipments **(thousand barrels per day)**
5.15	Rack				
5.16	Terminal				

For additional comments use the following comment section.

5.17

Figure D-3. PI-588 Survey Instructions

U.S. DEPARTMENT OF ENERGY
Policy and International Affairs
Washington, D.C. 20585

OMB No. xxx
Expiration Date: xxx
(Initial version 05/2010)

PI-588

RFS2 Small Refinery Survey 2010

INSTRUCTIONS

QUESTIONS

If you have any questions about the Small Refinery Exemption Survey after reading the instructions, please contact the Policy and International Affairs (PI) Survey Manager at (202) 586-1393 or at (202) 586-1010.

PURPOSE

The purpose of this survey is to collect information to assist in determining a small refinery's eligibility for exemption from the requirements of the RFS2 (CAA § 211(o))

WHO MUST SUBMIT

This survey is optional. Small refineries may submit data to provide technical support for a determination of disproportionate economic hardship. Each refinery should fill out a separate survey.

WHEN TO SUBMIT

This is a one-time data collection.

HOW TO SUBMIT

Instructions on how to report via facsimile, secure file transfer, or e-mail are printed on PART 2 of the survey form.

- Secure File Transfer: This form may be submitted to PI by facsimile, e-mail, or secure file transfer. Should you choose to submit your data via e-mail or facsimile, we must advise you that e-mail and facsimile are insecure means of transmission because the data are not encrypted, and there is some possibility that your data could be compromised. You can also send your Excel files to PI using a secure method of transmission: HTTPS. This is an industry standard method to send information over the web using secure, encrypted processes. (It is the same method that commercial companies use to communicate with customers when transacting business on the web.) To use this service, we recommend the use of Microsoft Internet Explorer 5.5 or later or Netscape 4.77 or later. Send your surveys using this secure method to: https://signon.eia.doe.gov/upload/noticeoog.jsp

COPIES OF SURVEY FORMS, INSTRUCTIONS AND DEFINITIONS

Copies in portable document format (PDF) and spreadsheet format (XLS) are available on the Office of Policy and International Affairs (PI's) website. You may access the materials by following the steps:

- Go to PI's website at www.pi.energy.gov

Files must be saved to your personal computer. Data cannot be entered interactively on the website.

GENERAL INSTRUCTIONS

All definitions are to be construed as consistent with the Energy Information Administration's Form EI-810, "Monthly Refinery Report," EIA-815, "Monthly Bulk Terminal and Blender Report," and EI-28, "Financial Reporting System," and other forms as appropriate.

Renewable Identification Numbers (RINs) are construed as defined by EPA here. Other definitions of petroleum products and terms are available on the EIA website www.eia.doe.gov . A Glossary of terms used in the EI-28 is also available, with additional terms here. Please refer to these definitions before completing the survey form.

PART 1. RESPONDENT IDENTIFICATION DATA

- Enter the 3 digit number you received with the survey form. If you do not have a number, submit your report leaving this field blank. PI will advise you of the number.
- Enter the name of the reporting company.
- Enter the Doing Business As "DBA" name if appropriate.
- Enter the refinery site name.
- Enter the Terminal Control Number (TCN) used for identification of terminals and other facilities in the IRS ExSTARS system.
- Enter the physical address of the reporting company.
- Enter the mailing address of the Contact. (Note: If the physical address and mailing address are the same, provide the information only for the physical address.)
- Enter the name, telephone number, facsimile number, and e-mail address of the person to contact concerning information shown on the report. The person listed should be the person most knowledgeable of the specific data reported.

PART 2. SUBMISSION/RESUBMISSION INFORMATION

Submission

Refer to "How to Submit" section for more details or methods for submitting data.

Resubmission

A resubmission is required whenever an error greater than

5 percent of the true value is discovered by a respondent or if requested by PI.

Enter "X" in the resubmission box if you are correcting information previously reported.

Identify only those data cells and lines which are affected by the changes. You are not required to file a complete form when you resubmit, but be sure to complete the ID number and contact information.

SPECIFIC INSTRUCTIONS

PART 3. FINANCIAL HEALTH OF THE REFINERY

Do not report the data elements in this Part if you are a public company and the data are publicly available. Note where to locate the data items you did not report in the comments.

Balance Sheet Items

All values in thousands of dollars unless otherwise stated.

Start of Fiscal Year (3.01). Report the month the fiscal year started in 2007, 2008, 2009.

Cash and marketable securities. (3.1) Report available cash and marketable securities at the end of the fiscal year 2007, 2008 and 2009.

Current liabilities (3.2) Report current liabilities, defined as debt or obligations (including long term debt interest) due within one year at the end of the fiscal year 2007, 2008 and 2009.

Long Term Debt (3.3) Report long term debt is defined as debt due over a horizon longer than one year at the end of the fiscal year 2007, 2008 and 2009.

Statement of Income

Report for fiscal year 2007, 2008 and 2009 unless otherwise stated.

All values in thousands of dollars unless otherwise stated.

Capital Expenditures (3.4). Report capital expenditures for the fiscal years 2007, 2008 and 2009.

Yearly operating expenditures (3.5). Report annual operational expenditures for the fiscal years 2007, 2008 and 2009.

Gross Refining Margin (dollars per barrel) (3.6) Report the difference between the revenue from the sale of petroleum products (e.g., motor gasoline) and the refinery acquisition cost of the raw materials (e.g., crude oil) used to produce the products.

Net Refinery Margin (dollars per barrel) (3.7) Report the difference between the gross refining margin and the costs of producing and selling the petroleum products (e.g., refining energy costs and selling costs). The net margin measures before-tax cash earnings from the production and sale of refined products. The net margin excludes peripheral activities such as non-petroleum product sales at convenience stores.

Comments on Balance Sheet (3.8). Report any items on your Balance Sheet that you judge to be noteworthy with regards to claiming disproportionate economic hardship.

Comments on Statement of Income (3.9). Report any items on your Balance Sheet that you judge to be noteworthy with regards to claiming disproportionate economic hardship.

Cost of Capital

All values in thousands of dollars unless otherwise stated

Current Debt/equity ratio (3.10): Report the current debt/equity ratio (fraction).

Current weighted average cost of capital (3.11). Report your weighted average cost of capital for capital expenditures (percent).

Internal Rate of Return (IRR): (3.12) Report the current required rate of return.

Anticipated cost of incremental capital (3.13). Report based on current market conditions, your weighted average cost of capital for anticipated capital expenditures (percent).

Anticipated cost of financing incremental operational expenditures. (3.14). Report based on current market conditions**,** your interest rate for anticipated incremental working capital (percent).

Credit rating (3.15). Report yes if the company has a credit rating by a NRSRO (e.g. Moody's).

Name of Credit Rating Company (3.16). Report the name of the credit rating company, if available.

Credit Rating (3.17). Report the rating, if available.

Debt restriction or covenants (3.18). If financing is required for future projects related to purchasing or holding RINS, **report** any debt loan covenants that may pose restrictions on borrowing.

Anticipated cash flow or credit issues (3.19): Report any anticipated cash flow or credit issues (such as loan covenants) that may present problems for compliance with the Renewable Fuel Standard (RFS) program

Historical Capital Improvements: Report percent of capital expenditures over last three years for

(3. 20) Required environmental projects

(3.21) Required Safety projects

Use of internal funds (3.22) for historical capital improvements. Report the percent of historical capital improvements in (3.20 – 3.21) funded through internal funds.

Future environmental projects: Report anticipated capital expenditures over next three years for:

(3.23) Low (and ultra-low) sulfur diesel

(3.24) Low sulfur gasoline

(3.25) MSAT2

(3.26) Consent decrees

(3.27) Other

Use of internal funds (3.28) for future capital improvements. Report the percent of anticipated capital improvements in (3.23 – 3.27) to be funded through internal funds.

Part 4. Market Compliance

All values in thousands of dollars unless otherwise stated.

Owned or controlled facilities (4.1). Report annual net inputs in thousands of barrels of fuel per day of owned facilities capable of blending renewable fuels. If there are multiple facilities, list names in the comment section (4.17)

(4.2) Total average daily gasoline blendstock (including GTAB, RBOB, and CBOB) net inputs in 2009 (thousands of barrels per day). (Note: I think you want net inputs – look at Table 3 of the Petroleum Supply Monthly)

(4.3) Total daily average diesel transportation fuels net inputs in 2009 (thousands of barrels per day). The term 'transportation fuel' means fuel for use in motor vehicles, motor vehicle engines, nonroad vehicles, or nonroad engines (except for ocean-going vessels).

(4.4) In-service dates.

(4.5) Total cost for all facilities.

(4.6) Report number of months needed to construct facility(s) to allow blending by project.

Capital expenditures required to develop blending capability. Report dollar value of facilities necessary to develop sufficient blending capability to meet the 2011 Renewable Volume Obligation listed below.

(4. 7) Modify refining operations

(4. 8) Modify terminal or blending operations

(4.9) Modify reporting and accounting operations to include RINS

(4.10) Estimate number of months needed to construct facility(s) to allow blending by project.

RINS generated through blending (4.11). Report number of RINS (in thousands) separated through blending renewable fuels in 2009.

Gasoline Blendstock produced. (4.12) Report total gasoline blendstock **(**thousands of barrels per day) anticipated to be produced in 2011.

Diesel Blendstock produced. (4.13) Report total diesel blendstock **(**thousands of barrels per day) anticipated to be produced in 2011

Competitive pricing (4.14) Report Yes if you believe that if your refinery blended renewable fuels, it would you be able to price the renewable fuels competitively with other conventional fuels in the market.

Comment on competitive price (4.15). Comment on ability for competitive pricing of renewable fuels (4.14) describe above.

State and local restrictions (4.16). Report any state or local restrictions that would impede either blending renewable fuels or maintaining ownership of the generated RINS.

Comment on multiple constructed facilities (4.17). **Report** any additional data on cost and construction time of facilities listed in (4.1 – 4.10).

Part 5. Market Issues

Gasoline Blendstock produced. (5.1) Report total gasoline blendstock **(**thousands of barrels per day) produced at your refinery that could accept renewable fuels (i.e. ethanol) in 2007, 2008, and 2009.

Diesel Blendstock produced. (5.2) Report total diesel blendstock **(**thousands of barrels per day) produced at your refinery that could accept renewable fuels in 2007, 2008, and 2009.

Share of supply for gasoline (5.3) Report your market share (in percent) of gasoline supplied in your primary market in 2007, 2008, and 2009**.**

Description of gasoline market (5.4) Define your primary market consistent with (5.3). Examples are a city, metropolitan area, or a maximum distance from the supply point.

Share of supply for diesel (5.5) Report your market share (in percent) of transportation diesel fuels supplied in your primary market in 2007, 2008, and 2009**.** The term 'transportation fuel' means fuel for use in motor vehicles, motor vehicle engines, nonroad vehicles, or nonroad engines (except for ocean-going vessels).

Description of diesel market (5.6) Define your primary market for diesel consistent with (5.5). Examples are a city, metropolitan area, or a maximum distance from the supply point.

Contractual arrangements (5.7) Report the number (in thousands of RINS) and share (percent) of (5.1) of any contracts in which you sell gasoline blendstock and retained the RINS separated 2009.

Contractual arrangements (5.8) Report the number (in thousands of RINS) and share (percent) of (5.2) of any contracts in which you sell diesel blendstock and retained the RINS separated in 2009

Sales for resale of gasoline (5.9) Report the share (percent of (5.1)) of sales to resellers in 2007, 2008, and 2009.

Sales for resale of transportation diesel (5.10) Report the share (percent of (5.2)) of sales to resellers of transportation diesel in 2007, 2008, and 2009. The term 'transportation fuel' means fuel for use in motor vehicles, motor vehicle engines, nonroad vehicles, or nonroad engines (except for ocean-going vessels).

Pipeline sales of gasoline (5.11) Report the volume (in thousands of barrels per day) and share (percent of (5.1)) of pipeline sales (sales where custody changes at the refinery gate or pipeline) through common carrier pipelines in 2007, 2008, and 2009.

Pipeline sales of diesel (5.12) Report the volume (in thousands of barrels per day) and share (percent of (5.1)) of pipeline sales (sales where custody changes at the refinery gate or pipeline) through common carrier pipelines in 2007, 2008, and 2009.

Retail sales of gasoline (5.13) Report the share (percent of (5.1)) of retail sales through your company-owned (including lessee-dealers) or operated retail outlets in 2007, 2008, and 2009.

Retail sales of diesel (5.14) Report the share (percent of (5.1)) of retail sales through your company-owned (including lessee-dealers) or operated retail outlets in 2007, 2008, and 2009.

For (5.15) and (5.16) ethanol and biodiesel are measured in thousands of gallons per day and gasoline blendstock and diesel are measured in thousands of barrels per day for 2009. Biomass-based diesel includes both biodiesel and renewable diesel

Owned or controlled facilities (refinery rack) (5.15) Report the volume of shipments from owned rack for ethanol, gasoline blendstock, biodiesel and total diesel for 2009. Note: For ethanol and biomass diesel, the form asks for volume blended. For Gasoline blendstock and diesel, the form asks for throughput)

Owned or controlled facilities (terminal) (5.16) Report the volume (in thousands of barrels) of shipments from owned rack for ethanol gasoline blendstock, biodiesel and total diesel for 2009.

Comments (5.17): Report any additional information for Part 5.

PROVISIONS REGARDING CONFIDENTIALITY OF INFORMATION

The information reported on this form will be protected and not disclosed to the public to the extent that it satisfies the criteria for exemption under the Freedom of Information Act (FOIA), 5 U.S.C. §552, the DOE regulations, 10 C.F.R. §1004.11, implementing the FOIA, and the Trade Secrets Act, 18 U.S.C. §1905.

The Federal Energy Administration Act requires the DOE to provide company-specific data to other Federal agencies when requested for official use. The information reported on this form may also be made available, upon request, to another component of the Department of Energy (DOE); to any Committee of Congress, the Government Accountability Office, or other Federal agencies authorized by law to receive such information. A court of competent jurisdiction may obtain this information in response to an order. The information may be used for any nonstatistical purposes such as administrative, regulatory, law enforcement, or adjudicatory purposes.

Disclosure limitation procedures are not applied to the statistical data published from this survey's information. Thus, there may be some statistics that are based on data from fewer than three respondents, or that are dominated by data from one or two large respondents. In these cases, it may be possible for a knowledgeable person to estimate the information reported by a specific respondent.

Company specific data are also provided to other DOE offices for the purpose of examining specific petroleum operations in the context of determining compliance costs with the RFS2 program.

The data collected on Form PI-588, "RFS2 Small Refinery Survey 2010" are used to report aggregate statistics on and conduct analyses of the operation of U.S. petroleum refineries.

FILING FORMS WITH THE FEDERAL GOVERNMENT AND ESTIMATED REPORTING BURDEN

Respondents are not required to file or reply to any Federal collection of information unless it has a valid OMB control number. This is a one time survey. Public reporting burden for this collection of information is estimated to average 15 hours per response. This includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information including suggestions for reducing this burden to: Policy and International and Affairs, PI-42, 1000 Independence Avenue, S.W., Washington, D.C. 20585; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503.

Figure D-4. Survey Submit Instructions

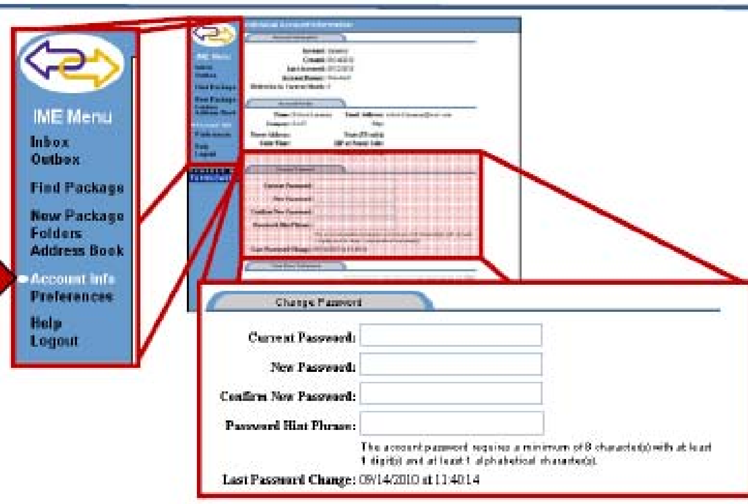
IME Secure Server Form Submission
Quick Start Guide

Log In

A username and default password will be assigned to you by the administrator. After the initial log-in you will need to change your password.

Change Password

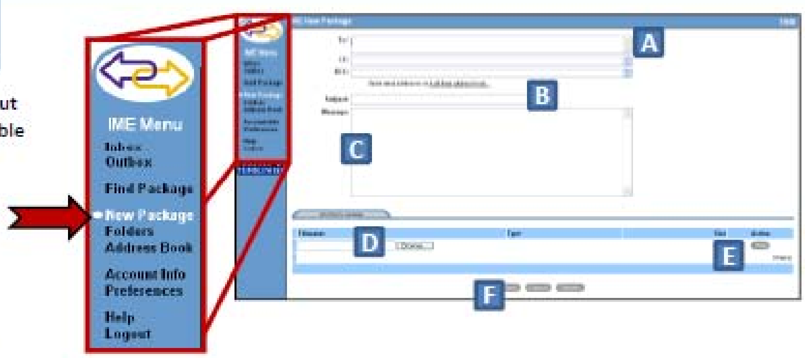
After logging in, navigate to the Account Info Screen by clicking on the Left Navigation Menu. There you will be able to change your password and set a Password Hint.



Submit Package

Similar to writing an email fill out the New Package page, accessible via the left navigation menu.

A. Enter the recipient of the package.
B. Add a Subject Line
C. Add a message if desired
D. Attach form by clicking Browse and selecting the location of the file
E. Click the Add Button to attach the completed form.
F. Click Send to send the form to the Department of Energy.



Appendix E. PI-588 Survey Response

Survey Responses

The EPA list of refineries holding RFS exemptions served as the basis of identifying potential respondents to the PI-588 survey. Of the 59 refineries that met the qualifications for possible extension of exemption, **[Redacted]** submitted a Form PI-588. **[Redacted]** and **[Redacted]** responded by declining to participate in the survey. One company, **[Redacted]**, responded that **[Redacted]** they were not able to respond to the survey. Three companies advised DOE that their four refineries were either not producing transportation fuels or no long in operation due to financial hardship:

[Redacted]

DOE permitted these four to forego submitting the survey. An additional **[Redacted]** refineries did not respond to the survey or communicate with DOE. Reminder emails were sent but no calls were made to non-respondents.

DOE received surveys from **[Redacted]** refineries. During validation efforts, five refineries were found to exceed the "small" threshold established for compliance with RFS2 guidelines:

[Redacted]

In addition, **[Redacted]** submitted incomplete surveys for its two refineries in **[Redacted]** and **[Redacted]**. These surveys could not be used in the analysis.

As a result, 18 surveys were considered valid and used in the disproportionate economic hardship analysis (see Table E-1). The refineries are distributed across all five PADDs, with five located in PADD 3 and four located in PADD 4. Nine of the refineries are privately held and eight belong to public companies (see Table E-2).

Table E-1. Valid Refinery Responses by PADD and Ownership

[Redacted]

Table E-2. Summary Responses by PADD and Ownership

[Redacted]

Validation of Form PI-588

To ensure the integrity of the data submitted on the Form PI-588,"RFS2 Small Refinery Survey 2010," responses to the survey were validated against information from other sources including survey data from the Energy Information Administration (EIA), corporate financial data submitted to the Security Exchange Commission (SEC), and information from previous studies. Edits that checked for possible inconsistencies or errors within the submitted forms were also developed and performed. In addition, analysts with extensive knowledge of the refinery industry reviewed the data for inconsistencies or possible errors.

The validation of the Form PI-588 included:

- Part 3, Financial Health of the Refinery

  For publicly traded companies, responses to "Part 3, Financial Health of the Refinery" were compared to data reported to the SEC on Form 10-K. Edits were also developed and applied to all responses to insure the reasonableness of the data (e.g. the reported Gross Refining Margin is greater than the reported Net Refining Margin, the reported Rate of Return on capital projects greater than the reported Average Cost on capital projects,)

- Part 4. Cost of RFS2 Compliance – Refinery Level

  EIA data were used to validate responses to parts 4 and 5 of the PI-588 survey. The Office of Policy and International Affairs (PI) of DOE signed a Memorandum of Understanding with EIA that allowed PI to have access to petroleum data submitted to EIA from 2002 to the most current data available on appropriate weekly, monthly, and annual petroleum survey forms. The EIA data provided analysts with detailed respondent level data for analysis and background information, for use in portions of the report, and for validation of data provided by the respondents to the PI-588 survey.

  EIA refinery and terminal level receipts, inputs, and production data for motor gasoline blending components (MGBC), low and mid sulfur distillates, fuel ethanol, and bio-diesel submitted on Form EIA-810, "Monthly Refinery Report" and Form EIA-815, "Monthly Bulk Terminal and Blender Report" were used to validate refinery and terminal level input and blending cost of compliance data in Part 4 of Form PI-588.

- Part 5. Market Share – Refinery Level

EIA refinery level operable capacity, crude inputs, and throughput data from Form EIA-810 were used to validate how much of the transportation fuel produced at the refinery could accept renewable fuels and then be sold as gasoline, gasoline blendstock, or diesel fuel.

EIA refiner level data on Form EIA-782C, "Monthly Report of Prime Supplier Sales of Petroleum Products Sold for Local Consumption" were used to validate the responses to the market share questions for sales of gasoline and diesel fuel.

Validation Results

Data cells that failed edits or validation were reviewed by analysts. In some cases, the value was manually adjusted. This usually occurred because of an incorrect unit of measure, e.g. the form asked for thousands of barrels per day and the respondent obviously reported barrels per day.

One question was disqualified from the PI-588 survey responses. Question 4.13 "How many RINS did you separate through blending in 2009?" was the source of 13 invalid and 7 valid responses. The overwhelmingly problematic response was not included in the analysis. With the removal of question 4.13, the overall invalid response rate for the survey was 13.4 percent.

For other edit or validation errors, the analysts determined if the response was reasonable or consistent with other available information or if the difference between the expected response and reported response was significant enough to change the determination of disproportionate economic hardship. None of the edit or validation failures were found to be significant enough to impact the refinery ranking scores in the scoring matrix developed to evaluate the individual degree of impairment of disproportionate economic hardship. A summary of the responses by participant may be found in Table E-3.

Table E-3. PI-588 Survey Response and Disposition

[Redacted]

Appendix F. Small Refinery Profiles

These profiles contained Business Confidential information and have been redacted.

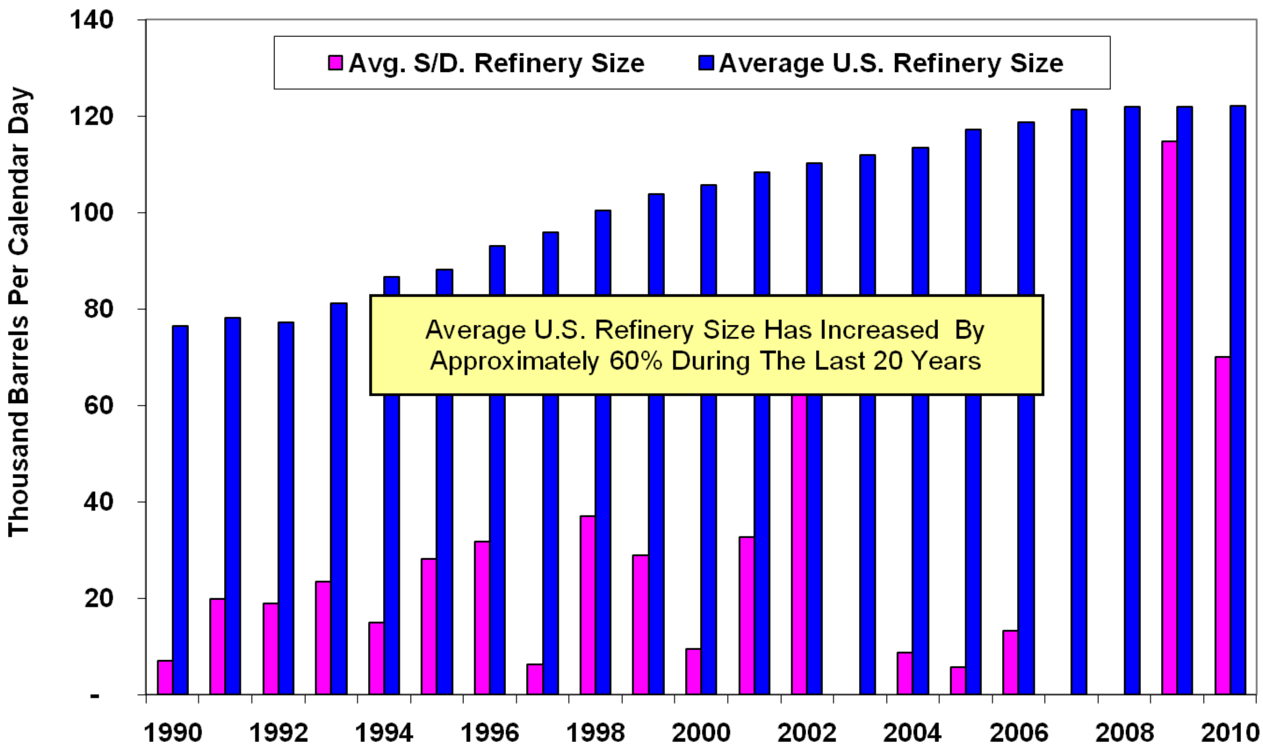
Appendix G. Shutdown Refineries

The past two decades have witnessed the permanent shutdown of 66 refineries in the United States. This appendix expands the discussion of shutdowns that appeared in Section X "Refinery Viability".

Shutdown U.S. Refining Capacity

As discussed in the Section X, refiners have experienced increasing costs due to environmental regulations and periods of low U.S. refining margins over the past two decades. During the period from 1990 to 2010 approximately 1.7 million barrels per day of U.S. refining capacity was shut down (see Figure G-1). The majority of the shut down capacity consisted of small to medium sized refineries. The loss of these smaller refineries, as well as existing refinery expansions, contributed to an increase in the average U.S. refinery size – up by approximately 60 percent over the last 20 years.

Figure G-1. Average U.S. Refinery and Shutdown Refinery Sizes 1990 - 2010



Source: SAIC Analysis, EIA, Table 15. Refineries Permanently Shutdown By PAD District http://www.eia.gov/pub/oil_gas/petroleum/data_publications/refinery_capacity_data/current/table15.pdf, BP Statistical Review of World Energy – June 2010, U.S. Refining Capacities, http://www.bp.com/sectiongenericarticle.do?categoryId=9023777&contentId=7044465 The Growing Threat to US Refiners – U.S. Policy, Regulation and Low Cost Imports seen Triggering Rationalization, *Brian L. Milne,* http://oilspot2.dtnenergy.com/e_article001715841.cfm, Accessed 10/13/10.

This analysis considered the ownership, geographic location, capacity, and last year of operation for the shutdown refineries. This history can help explain current stresses on refineries suffering "disproportionate economic hardship." Key features of the refinery shutdowns over the past 20 years (from Tables G-1) include:

- Total shutdown capacity of almost 1.7 million barrels per day was nearly equally divided between privately and publicly-owned refineries
- Approximately twice as many private refineries were shut down than public ones
- Almost three quarters (72 percent) of the refineries were shut down in the 1990's. This includes:
    - 81 percent of the lost capacity (37 of 46 refineries) operated by privately-owned
    - 40 percent of the lost capacity (11 of 20 refineries) operated by publicly-owned refineries was shut down during the 1990s
- Average size of privately-owned shutdown refineries were half as large as publicly-owned shutdown refineries
- Average size of shutdown refineries increased over time as the smaller-sized facilities were shuttered
- Large publicly-owned refineries became shutdown targets in 2009

Table G-1. U.S. Shutdown Refineries by Ownership and Date Shutdown, 1990-2010

Measure	Ownership	Date of Shutdown					Total
		1990-1994	1995-1999	2000-2004	2005-2010	Unknown	
Number	Private	23	14	5	3	1	46
	Public	7	4	4	4	1	20
MBD Capacity	Private	326,450	375,350	123,315	32,500	6,100	863,715
	Public	229,675	98,500	83,880	414,000	3,000	829,055
Average Size (MBD)	Private	14,193	26,811	24,663	10,833	6,100	18,776
	Public	32,811	24,625	20,970	103,500	3,000	41,453

In addition to the timing of the shutdowns, the geographic distribution of those shutdowns is important (see Table G-2).

- Most of the shutdown privately-owned refineries were located in PADDs 3 and 5
- Most of the shutdown publicly-owned refineries were located in PADDs 1 and 3
- Privately-owned shutdown refineries appear to be smaller than 33,000 barrels per day on average regardless of the location
- Shutdown privately-owned refineries were largest in PADD 2 are on average, twice as large as those in PADD 1 and three times as large as those in PADDs 3 and 4
- Publicly-owned shutdown refineries were largest in PADD 1 (over 82,000 barrels per day) and PADD 2 (almost 45,000 barrels per day)
- Publicly-owned refineries with capacities averaging 20,000 barrels per day were shut down in PADDs 3, 4, and 5

Table G-2. U.S. Shutdown Refineries by Ownership and PADD, 1990-2010

Measure	Ownership	PADD					Total
		1	2	3	4	5	
Number	Private	4	10	17	1	14	46
	Public	5	4	6	2	3	20
MBD Capacity	Private	57,350	323,815	187,700	10,000	284,850	863,715
	Public	413,000	177,500	132,680	48,000	57,875	829,055
Average Size (MBD)	Private	14,338	32,382	11,041	10,000	20,346	18,776
	Public	82,600	44,375	22,113	24,000	19,292	41,453

Refinery data presented in this appendix was developed from EIA listings of shutdown refineries, enhanced by information gathered from corporate and news websites. The complete listing is shown on Table G-3.

Table G-3. Refinery Shutdowns 1990-2010

Company	City	State	ACU Capacity (bbl/cd)	Down-stream Charge Cap. (bbl/sd)	Date of Last Operation	S/D Date	PADD	Public or Private	Ownership	Shut Year
Primary Energy Corp	Richmond	VA	6,100	-			1	priv.	PRIVATE	UNK
GNC Energy Corp	Greensboro	NC	3,000	-			1	GNCE	PUBLIC	UNK
Saint Mary's Refining Co	Saint Mary's	WV	4,000	4,480	Feb-93	Mar-93	1	priv.	PRIVATE	1993
Cibro Refining	Albany	NY	41,850	27,000	Jul-93	Sep-93	1	priv.	PRIVATE	1993
Calumet Lubricants Co LP	Rouseville	PA	12,800	26,820	Mar-00	Jun-00	1	CLMT	PUBLIC	2000
Young Refining Corp.	Douglasville	GA	5,400	-	Jul-04	Jul-04	1	priv.	PRIVATE	2004
Valero	Delaware City	DE	182,200	-	Nov-09		1	VLO	PUBLIC	2009
Sunoco Inc	Westville	NJ	145,000	-	Nov-09		1	SUN	PUBLIC	2009
Western Refining	Yorktown	VA	70,000	-	Aug-10		1	WNR	PUBLIC	2010
Coastal Refining and Marketing	El Dorado	KS	20,000	20,000	Sep-04		2	priv.	PRIVATE	2004
Intercoastal Energy Services Corp.	Troy	IN	1,250	2,250	Nov-90	Mar-91	2	priv.	PRIVATE	1991
Farmland Industries	Philipsburg	KS	26,400	22,800	Dec-91	Jul-92	2	priv.	PRIVATE	1992
Coastal Refining and Marketing	Wichita	KS	28,800	41,300	May-93	Jun-93	2	priv.	PRIVATE	1993
Coastal Refining and Marketing	Augusta	KS	21,000	21,000	Jun-93	Jun-93	2	priv.	PRIVATE	1993
Crystal Refining	Carson City	MI	3,000	-	Oct-92	Sep-93	2	priv.	PRIVATE	1993
Marathon	Indianapolis	IN	50,000	68,000	Sep-93	Oct-93	2	MRO	PUBLIC	1993
Indian Refining	Lawrenceville	IL	80,750	103,000	Sep-95	Oct-95	2	priv.	PRIVATE	1995
Cyril Petroleum Corp	Cyril	OK	7,500	-	Sep-95	Oct-95	2	OKOK	PUBLIC	1995
Laketon Refining	Laketon	IN	11,100	-	Jun-95	Jan-96	2	priv.	PRIVATE	1996
Total Petroleum Inc.	Arkansas City	KS	56,000	74,840	Aug-96	Sep-96	2	TPN	PUBLIC	1996
TPI Petro Inc.	Alma	MI	51,000	63,300	Nov-99	Dec-99	2	priv.	PRIVATE	1999
Premcor Refining Group	Blue Island	IL	80,515	124,500	1-Jan	Apr-01	2	priv.	PRIVATE	2001
Premcor Refining Group	Hartford	IL	64,000	116,700	Sep-02	Oct-02	2	PCO	PUBLIC	2002
Imron Refining Inc.	San Leon	TX	7,000	-	Aug-90	Aug-90	3	priv.	PRIVATE	1990
Eagle Refining	Jackson	TX	1,800	1,800	Jan-90	Oct-90	3	priv.	PRIVATE	1990
Vulcan Refining	Cordova	AL	9,500	5,000	Sep-90	Dec-90	3	priv.	PRIVATE	1990
Sabine Resources	Stonewall	LA	12,000	-	Feb-92	Feb-92	3	priv.	PRIVATE	1992
Rattlesnake Refining	Wickett	TX	8,000	10,400	Feb-92	Mar-92	3	priv.	PRIVATE	1992
Texas United Refining Corp.	Nixon	TX	20,900	16,500	Apr-92	Jun-92	3	priv.	PRIVATE	1992
Longview Refining Assoc	Longview	TX	13,300	13,800	Aug-92	Sep-92	3	priv.	PRIVATE	1992
Thriftway Co	Bloomfield	NM	4,000	3,250	Jan-92	Oct-92	3	priv.	PRIVATE	1992
El Paso Refining	El Paso	TX	50,000	76,000	Oct-92	Dec-92	3	EPASZ	PUBLIC	1992
Dubach Gas	Dubach	LA	8,500	3,000	Dec-93	Dec-93	3	priv.	PRIVATE	1993

Company	City	State	ACU Capacity (bbl/cd)	Down-stream Charge Cap. (bbl/sd)	Date of Last Operation	S/D Date	PADD	Public or Private	Ownership	Shut Year
Amerada Hess	Purvis	MS	30,000	50,500	Jan-94	Feb-94	3	HES	PUBLIC	1994
Barrett Refg Corp	Vicksburg	MS	8,000	-	Jun-95	Jan-96	3	priv.	PRIVATE	1996
Arcadia Refining & Mktg	Lisbon	LA	7,350	6,700	Jan-96	Feb-96	3	priv.	PRIVATE	1996
Canal Refg Co.	Churchpoint	LA	9,500	2,100	Jul-95	Sep-97	3	priv.	PRIVATE	1997
Gold Line Refining LTD	Jennings	LA	12,000	-	Jul-97	Jan-98	3	priv.	PRIVATE	1998
Petrolite Corp	Kilgore	TX	600	750	Dec-97	Feb-98	3	priv.	PRIVATE	1998
Pride Refining Inc.	Abilene	TX	42,750	40,500	May-98	Apr-98	3	priv.	PRIVATE	1998
Shell Oil Co	Odessa	TX	28,300	33,500	Oct-98	Nov-98	3	RDS-B	PUBLIC	1998
Berry Petroleum Co.	Stephens	AR	6,700	3,700	Jul-99	Nov-98	3	BRY	PUBLIC	1998
Dow Haltermann Products	Channelview	TX	880	-	Sep-04	Feb-00	3	DOW	PUBLIC	2000
Hunt Southland Refining Co	Lumberton	MS	5,800	-	Mar-05	Dec-05	3	priv.	PRIVATE	2005
Gulf Atlantic Operations LLC	Mobile	AL	16,700	15,400	Mar-06	Sep-07	3	priv.	PRIVATE	2007
Western Refining	Bloomfield	NM	16,800	-	Nov-09		3	WNR	PUBLIC	2009
Amoco Oil Co.	Casper	WY	40,000	44,900	Dec-91	Dec-91	4	BP	PUBLIC	1991
Landmark Refining	Fruita	CO	10,000	25,900	Jan-92	Nov-93	4	priv.	PRIVATE	1993
Pennzoil Producing Co.	Roosevelt	UT	8,000	12,900	Sep-94	Oct-94	4	PZL	PUBLIC	1994
Gibson Oil & Refining	Bakersfield	CA	9,600	-	Jul-87	Dec-90	5	priv.	PRIVATE	1990
Chevron USA Inc	Kenai	AK	22,000	-	Jun-91	Jul-91	5	CVX	PUBLIC	1991
Anchor Refining Co.	McKittrick	CA	10,000	6,000	Jun-91	Aug-91	5	priv.	PRIVATE	1991
Golden West	Santa Fe Springs	CA	47,000	94,300	Feb-92	Mar-92	5	priv.	PRIVATE	1992
Eco Asphalt Inc.	Long Beach	CA	10,550	7,000	Oct-92	Oct-92	5	priv.	PRIVATE	1992
Fletcher Oil & Refining	Carson	CA	29,675	48,100	Sep-92	Oct-92	5	HOG	PUBLIC	1992
Sunbelt Refining	Coolidge	AZ	10,000	7,000	Aug-93	Sep-93	5	priv.	PRIVATE	1993
Chemoil Refining Corp	Long Beach	CA	18,000	-	Feb-94	Apr-94	5	priv.	PRIVATE	1994
Powerine Oil Co.	Santa Fe Springs	CA	46,500	100,300	Jun-95	Sep-95	5	priv.	PRIVATE	1995
Sunland Refining Corp.	Bakersfield	CA	12,000	2,650	Mar-95	Dec-95	5	priv.	PRIVATE	1995
Intermountain Refining Co.	Fredonia	AZ	3,800	2,000	Jan-94	May-96	5	priv.	PRIVATE	1996
Pacific Refining Co.	Hercules	CA	50,000	62,400	Jul-95	Sep-97	5	priv.	PRIVATE	1997
Sound Refining Inc	Tacoma	WA	40,000	45,200	Oct-98	Dec-98	5	priv.	PRIVATE	1998
Chevron USA Inc	Richmond Beach	WA	6,200	6,200	May-00	Jun-00	5	CVX	PUBLIC	2000
Foreland Refining Corp	Tonopah	NV	3,000	3,000	Feb-01	Jan-02	5	priv.	PRIVATE	2002
Tricor Refining LLC	Bakersfield	CA	14,400	14,400	Jul-01	Jan-02	5	priv.	PRIVATE	2002
Paramount Petroleum Corporation	Portland	OR	10,000	10,000	Nov-06	Dec-08	5	priv.	PRIVATE	2008

Notes: Most refineries become terminals after shut down, likely due to expensive cleanup when EPA licenses are revoked.
By converting to terminals, sites keep their licenses, do not have to perform expensive cleanups, and can restart operations without requiring new permits.
Refineries in bold were owned by public companies.
Sources: EIA, corporate and news websites.

Appendix H. Disproportionate Economic Hardship

Refinery Rankings

The scoring matrix contained within the report evaluates the full impact of disproportionate economic hardship on small refiners and assesses the individual degree of potential impairment. The matrix is comprised of two major sections: one section combining the scoring for disproportionate structural and economic weightings, and a separate section regarding the impact of compliance on the viability of the firm. The ranking methodology is fully described within the report. Table H-1 provides the detailed scores, and Figure H-1 provides the disproportionate impacts and viability indices for each of the eighteen refineries that submitted sufficient data to be evaluated.

Table H-1. Refinery Ranking Estimates

[Redacted]

Figure H-1. Refinery Rankings by PADD

[Redacted]