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Regulation of Fuels and Fuel Additives: 2011 Renewable Fuel Standards; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 80

[EPA–HQ–OAR–2010–0133; FRL–9234–6]

RIN 2060–AQ16

Regulation of Fuels and Fuel Additives: 2011 Renewable Fuel Standards

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: The Environmental Protection Agency is required to set the renewable fuel standards each November for the following year based on gasoline and diesel projections from the Energy Information Administration (EIA). Additionally, EPA is required to set the cellulosic biofuel standard each year based on the volume projected to be available during the following year, if the projected volume is less than the applicable volume provided in the statute. These cellulosic biofuel volume projections are to be based in part on EIA projections as well as assessments of production capability from industry. This action establishes annual percentage standards under Clean Air Act section 211(o) for cellulosic biofuel, biomass-based diesel, advanced biofuel, and renewable fuels that apply to all gasoline and diesel produced or imported in calendar year 2011. We have determined that the applicable volume of cellulosic biofuel on which the percentage standard should be based is 6.0 million ethanol-equivalent gallons. We believe that available volumes of cellulosic biofuel could be significantly higher in 2012. This action also finalizes two changes to the Renewable Fuel Standard program regulations: modifications to the delayed RINs provision which provides a temporary and limited means for certain renewable fuel producers to generate RINs after they have produced and sold renewable fuel, and a new process for parties to petition EPA to authorize use of an aggregate approach to compliance with the renewable biomass provision for foreign feedstocks akin to that applicable to the U.S. Finally, this action makes two administrative announcements, one regarding the price for cellulosic biofuel waiver credits for 2011, and another regarding the status of the aggregate compliance provision for domestic crops.

DATES: This final rule is effective on December 9, 2010.

ADDRESSES: EPA has established a docket for this action under Docket ID No. EPA–HQ–OAR–2010–0133. All documents in the docket are listed on the www.regulations.gov website. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically through www.regulations.gov or in hard copy at the Air and Radiation Docket and Information Center, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air Docket is (202) 566–1742.

FOR FURTHER INFORMATION CONTACT: Julia MacAllister, Office of Transportation and Air Quality, Assessment and Standards Division, Environmental Protection Agency, 2000 Traverwood Drive, Ann Arbor, MI 48105; Telephone number: 734–214–4131; *Fax number:* 734–214–4816; *E-mail address: macallister.julia@epa.gov,* or Assessment and Standards Division Hotline telephone number: (734) 214–4636; *E-mail address: asdinfo@epa.gov.*

SUPPLEMENTARY INFORMATION:

I. General Information

A. Does this action apply to me?

Entities potentially affected by this final rule are those involved with the production, distribution, and sale of transportation fuels, including gasoline and diesel fuel or renewable fuels such as ethanol and biodiesel. Potentially regulated categories include:

Category	NAICS [1] codes	SIC [2] codes	Examples of potentially regulated entities
Industry	324110	2911	Petroleum Refineries.
Industry	325193	2869	Ethyl alcohol manufacturing.
Industry	325199	2869	Other basic organic chemical manufacturing.
Industry	424690	5169	Chemical and allied products merchant wholesalers.
Industry	424710	5171	Petroleum bulk stations and terminals.
Industry	424720	5172	Petroleum and petroleum products merchant wholesalers.
Industry	454319	5989	Other fuel dealers.

[1] North American Industry Classification System (NAICS).
[2] Standard Industrial Classification (SIC) system code.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this final action. This table lists the types of entities that EPA is now aware could potentially be regulated by this action. Other types of entities not listed in the table could also be regulated. To determine whether your activities will be regulated by this action, you should carefully examine the applicability criteria in 40 CFR part 80. If you have any questions regarding the applicability of this action to a particular entity, consult the person listed in the preceding section.

Outline of This Preamble

I. Executive Summary

EPA issued comprehensive regulations in 2007 to implement the Renewable Fuel Standard (RFS1) program in Section 211(o) of the Clean Air Act, as required by the Energy Policy Act of 2005 (EPAct). The statutory requirements for the RFS program were subsequently modified through the Energy Independence and Security Act of 2007 (EISA), resulting in the publication of revised regulatory requirements (RFS2) on March 26, 2010.[1] In general, the transition from the RFS1 requirements of EPAct to the RFS2 requirements of EISA occurred on July 1, 2010.

EPA is required to determine and publish the applicable annual percentage standards for cellulosic biofuel, biomass-based diesel, advanced biofuel and total renewable fuel for each compliance year by November 30 of the previous year. The determination of the applicable cellulosic biofuel standard under RFS2 requires that EPA first project the volume of cellulosic biofuel production for the following year. If the projected volume of cellulosic biofuel production is less than the applicable volume specified in Section 211(o)(2)(B)(i)(III) of the statute, EPA must lower the required volume used to set the annual cellulosic biofuel percentage standard to the projected available volume. If we lower the applicable cellulosic biofuel volume, we must also determine whether the advanced biofuel and/or total renewable fuel volumes should be reduced by the same or a lesser amount. We provided our volume projections and proposed percentage standards for 2011 in a Notice of Proposed Rulemaking (NPRM) on July 20, 2010 (75 FR 42238). Today's action provides our final projection of cellulosic biofuel production for 2011, and final percentage standards for all four categories of renewable fuel for compliance year 2011. The final 2011 standards have been based upon statutory requirements, comments received in response to the NPRM, the estimate of projected gasoline, diesel, and biofuel volumes that the EIA provided to EPA on October 20, 2010, and other relevant information.

Today's rule does not include an assessment of the impacts of the standards we are finalizing for 2011. All of the impacts of the RFS2 program associated with the applicable volumes of biofuel specified in the statute were addressed in the RFS2 final rule published on March 26, 2010.

Today's notice also finalizes two changes to the general RFS2 program regulations. The first change modifies a regulatory provision for "delayed RINs" that we implemented through a previous action on September 28, 2010.[2] This provision provides a temporary and limited means for certain renewable fuel producers to generate RINs after they have produced and sold renewable fuel. In today's action we are modifying this regulatory provision to be more broadly applicable as described more fully in Section V.A. The second regulatory provision we are finalizing today establishes a petition process and criteria for EPA to use in determining whether to authorize the use of an aggregate approach to verify that feedstocks from foreign countries meet the definition of renewable biomass that would be akin to that applicable to producers using crops and crop residue grown in the United States. Further discussion of these provisions can be found in Section V.B.

Finally, in today's rulemaking we are announcing the price for cellulosic biofuel waiver credits, and are also announcing the results of our annual assessment of the aggregate compliance approach for U.S. crops and crop residue. These announcements are provided in Section VI.

A. Statutory Requirements for Renewable Fuel Volumes

The volumes of renewable fuel that must be used under the RFS2 program each year (absent an adjustment or waiver by EPA) are specified in CAA 211(o)(2)(B). These volumes for 2011 are shown in Table I.A–1.

TABLE I.A–1—REQUIRED VOLUMES IN THE CLEAN AIR ACT FOR 2011
[Billion gal]

	Actual volume	Ethanol equivalent volume
Cellulosic biofuel	[a] 0.25	0.25
Biomass-based diesel	0.80	1.20
Advanced biofuel	1.35	1.35
Renewable fuel	13.95	13.95

[a] This value assumes that all cellulosic biofuel would be ethanol. If any portion of the renewable fuel used to meet the cellulosic biofuel volume mandate has a volumetric energy content greater than that for ethanol, this value will be lower.

By November 30 of each year, the EPA is required under CAA 211(o)(3)(B) to determine and publish in the **Federal**

[1] 75 FR 14670.

[2] 75 FR 59622.

Register percentage standards for the following year that will ensure that the applicable volumes of renewable fuel are used. These standards are to be based in part on transportation fuel (i.e. gasoline and diesel) volume estimates provided by the Energy Information Administration (EIA). The calculation of the percentage standards is based on the formulas in 40 CFR 80.1405(c) which express the required volumes of renewable fuel as a volume percentage of gasoline and diesel sold or introduced into commerce in the 48 contiguous states plus Hawaii.

The statute requires the EPA to determine whether the projected volume of cellulosic biofuel production for the following year is less than the minimum applicable volume shown in Table I.A–1. If this is the case, then the standard for cellulosic biofuel must be based upon the projected available volume rather than the applicable volume in the statute. In addition, if EPA reduces the applicable volume of cellulosic biofuel below the level specified in the statute, the Act also indicates that we may reduce the applicable volume of advanced biofuels and total renewable fuel by the same or a lesser volume.

B. Assessment of 2011 Cellulosic Biofuel Production

To estimate the projected available volume of cellulosic biofuel in the U.S. in 2011, we researched potential production sources by company and facility. This included sources that were still in the planning stages, those that were under construction, and those that are already producing some volume of cellulosic ethanol, cellulosic diesel, or some other type of cellulosic biofuel. We considered all pilot and demonstration plants as well as commercial plants. From this universe of potential cellulosic biofuel sources we identified the subset that had a possibility of producing some volume of qualifying cellulosic biofuel for use as transportation fuel in 2011. Further analysis and investigation allowed us to determine which ones were actually in a position to produce and make available any commercial volumes of cellulosic biofuel in 2011. In this process we also considered factors such as the current and expected state of funding, the status of the technology and contracts for feedstocks or product sales, and progress towards construction and production goals. This assessment formed the basis of our projection for potentially available 2011 volumes.

In our assessment we evaluated both domestic and foreign sources of cellulosic biofuel. We determined that five U.S. facilities have the potential to make volumes of cellulosic biofuel commercially available for transportation use in the U.S. in 2011. We also identified three international facilities, two in Canada and one in Germany, that we expect will produce cellulosic biofuel in 2011. While these facilities may also be able to produce cellulosic volume in 2011, we determined that they are unlikely to make the fuel available to the U.S. market. Based on our assessment for this rulemaking, we are lowering the applicable volume of cellulosic biofuel for 2011 from the statutory volume of 250 million gallons to 6.0 million ethanol-equivalent gallons. This volume is the basis for the percentage standard we are setting for cellulosic biofuel in 2011. As with any projections of future production there is some uncertainty associated with these volumes. These uncertainties in our 2011 cellulosic volume projection are discussed in more detail in Section II.A. Nevertheless, we believe that 6.0 million ethanol-equivalent gallons represents a reasonable projection of potential 2011 cellulosic production volume for use in setting the standard.

EPA is currently aware of more than 20 facilities representing over 300 million gallons of production that are targeting commercial production of cellulosic biofuels in 2012. As a result, although the cellulosic biofuel standard we are setting for 2011 is considerably less than the applicable volumes established in EISA, EPA believes there is reason for optimism when looking at the plans for the cellulosic biofuel industry in 2012 and beyond.

C. Advanced Biofuel and Total Renewable Fuel

As described in Section I.A above, the statute indicates that we may reduce the applicable volume of advanced biofuel and total renewable fuel if we determine that the projected volume of cellulosic biofuel production for 2011 falls short of the statutory volume of 250 million gallons. Since we are setting the cellulosic biofuel standard significantly below the statutory volume of 250 million gallons, we also needed to evaluate whether we should lower the required volumes for advanced biofuel and total renewable fuel.

We first considered whether it appears likely that the required biomass-based diesel volume of 0.8 billion gallons can be met with existing biodiesel production potential in 2011, as biodiesel is currently the predominant form of biomass-based diesel. As discussed in Section II.C, we believe that the 0.8 billion gallon standard can indeed be met. Since biodiesel has an Equivalence Value of 1.5, 0.8 billion physical gallons of biodiesel would provide 1.20 billion ethanol-equivalent gallons that can be counted towards the advanced biofuel standard of 1.35 billion gallons. Of the remaining 0.15 billion gallons (150 million gallons), 6.0 million gallons will be met with cellulosic biofuel. Based on our analysis as described in Section II.B, we believe that there are sufficient sources of other advanced biofuel, such as additional biodiesel, renewable diesel, or imported sugarcane ethanol, such that the standard for advanced biofuel can remain at the statutory level of 1.35 billion gallons. We have also determined that there is sufficient qualifying domestic corn ethanol production capacity to meet the balance of the total renewable fuel standard that is not satisfied with advanced biofuel. Therefore, in today's final rule neither the 2011 volumes for advanced biofuel nor total renewable fuel are being lowered below the volumes specified in the statute.

D. Final Percentage Standards

The renewable fuel standards are expressed as a volume percentage, and are used by each refiner, blender or importer to determine their renewable fuel volume obligations. The applicable percentages are set so that if each regulated party meets the percentages, and if EIA projections of gasoline and diesel use are accurate, then the amount of renewable fuel, cellulosic biofuel, biomass-based diesel, and advanced biofuel used will meet the applicable volumes required on a nationwide basis. To calculate the percentage standard for cellulosic biofuel for 2011, we have used the volume of 6.0 million ethanol-equivalent gallons (representing 6.6 million physical gallons). We are also specifying that the applicable volumes for biomass-based diesel, advanced biofuel, and total renewable fuel for 2011 will be those specified in the statute. These volumes are shown in Table I.D–1.

TABLE I.D–1—FINAL VOLUMES FOR 2011

	Actual volume	Ethanol equivalent volume
Cellulosic biofuel	6.6 mill gal	6.0 mill gal.
Biomass-based diesel	0.80 bill gal	1.20 bill gal.
Advanced biofuel	1.35 bill gal	1.35 bill gal.
Renewable fuel	13.95 bill gal	13.95 bill gal.

Four separate standards are required under the RFS2 program, corresponding to the four separate volume requirements shown in Table I.D–1. The specific formulas we use to calculate the renewable fuel percentage standards are contained in the regulations at § 80.1405 and repeated in Section III.B.1. The percentage standards represent the ratio of renewable fuel volume to non-renewable gasoline and diesel volume. The projected volumes of gasoline and diesel used to calculate the standards are provided by EIA. Because small refiners and small refineries are also regulated parties beginning in 2011 [3], there is no small refiner/refinery volume adjustment to the 2011 standard as there was for the 2010 standard. Thus, the increase in the percentage standards relative to 2010 appears smaller than would otherwise be the case, since more obligated parties will be participating in the program. The final standards for 2011 are shown in Table I.D–2. Detailed calculations can be found in Section III.

TABLE I.D–2—FINAL PERCENTAGE STANDARDS FOR 2011

	Percent
Cellulosic biofuel	0.003
Biomass-based diesel	0.69
Advanced biofuel	0.78
Renewable fuel	8.01

E. 2011 Price for Cellulosic Biofuel Waiver Credits

Since we are reducing the required volume of cellulosic biofuel for 2011 below the applicable volume specified in the statute, EPA is required to offer biofuel waiver credits to obligated parties that can be purchased in lieu of acquiring cellulosic biofuel RINs. These waiver credits are not allowed to be traded or banked for future use, and are only allowed to be used to meet the 2011 cellulosic biofuel standard. Moreover, unlike cellulosic biofuel RINs, waiver credits may not be used to meet either the advanced biofuel standard or the total renewable fuel standard. For the 2011 compliance period, we are making cellulosic biofuel waiver credits available to obligated parties for end-of-year compliance should they need them at a price of $1.13 per credit. Further discussion is provided in Section VI.A.

F. Assessment of the Aggregate Compliance Approach

As part of the RFS2 regulations, EPA established an aggregate compliance approach for renewable fuel producers who use planted crops and crop residue from U.S. agricultural land. This compliance approach relieved such producers (and importers of such fuel) of the individual recordkeeping and reporting requirements otherwise required of producers and importers to verify that feedstocks used in the production of RIN-qualifying renewable fuel meet the definition of renewable biomass. EPA determined that 402 million acres of U.S. agricultural land was available in 2007 (the year of EISA enactment) for production of crops and crop residue that would meet the definition of renewable biomass, and determined that as long as this total number of acres is not exceeded, it is unlikely that new land has been devoted to crop production based on historical trends and economic considerations. We indicated that we would conduct an annual evaluation of total U.S. acreage that is cropland, pastureland, or conservation reserve program land, and that if the value exceed 402 million acres, producers using domestically-grown crops or crop residue to produce renewable fuel would be subject to individual recordkeeping and reporting to verify that their feedstocks meet the definition of renewable biomass.

The RFS2 regulations provide that EPA will make a finding concerning whether the 2007 baseline amount of U.S. agricultural land has been exceeded in a given year and will publish this finding in the **Federal Register** by November 30 of the same year. Based on data provided by the USDA, we have estimated that U.S. agricultural land reached 398 million acres in 2010, and thus did not exceed the 2007 baseline acreage.

We also stated in the preamble to the final RFS2 rule that if, at any point, EPA finds that the total agricultural land is greater than 397 million acres, EPA will conduct further investigations to evaluate validity of the domestic aggregate compliance approach. The total acreage estimate of 398 million acres exceeds the trigger point for further investigation, therefore EPA, with the help of USDA, will conduct further investigations into this matter. Additional discussion on this matter can be found in Section VI.B of this preamble.

II. Volume Production and Import Potential for 2011

In order to project production volumes of cellulosic biofuel in 2011 for use in setting the percentage standards, we collected information on individual facilities that have the potential to produce qualifying cellulosic biofuel volumes for consumption as transportation fuel, heating oil, or jet fuel in the U.S. in 2011. We also evaluated the production and import potential for biomass-based diesels, advanced biofuels, and other conventional renewable fuels such as corn-ethanol. This section describes the volumes that we believe could potentially be produced or imported in 2011. As with any projections of future production there is some uncertainty associated with these volumes. Many of the uncertainties associated with our projected volumes are also discussed in this section. Section III describes the derivation of the percentage standards that will apply to obligated parties in 2011.

The 2011 volume projections in today's final rule are based on information from a wide spectrum of sources. For instance, EPA received input on our assessment of 2011 production and import volumes from other government organizations including the Department of Energy (DOE), Energy Information

[3] The Department of Energy concluded that there is no reason to believe that any small refinery would be disproportionately harmed by inclusion in the RFS2 program for 2011 and beyond. See DOE report "EPACT 2005 Section 1501 Small Refineries Exemption Study" (January 2009). We will revisit extensions to the exemption for small refineries if DOE revises their study and provides a different conclusion, or we determine that an individual small refinery has demonstrated that it will suffer a disproportionate economic hardship under the RFS program.

Administration (EIA), and United States Department of Agriculture (USDA). The EIA projections of gasoline, diesel, biomass-based diesel, and cellulosic biofuel provided to EPA on October 20, 2010 were particularly germane. These EIA projections are discussed in more detail in Section II.A.3.

We also received a number of comments related to our proposed volume projections and the associated percentage standards. With regard to the proposed cellulosic biofuel projections, most commenters agreed that the proposed range of 5—17.1 million gallons (6.5—25.5 million ethanol-equivalent gallons) was appropriate, but no commenter suggested a specific volume for 2011 or a clear methodology for determining the appropriate volume. However, several commenters provided qualitative assessments. For instance, refiners suggested that the low end of the range would be more appropriate as it would minimize the possibility that obligated parties would be unable to procure sufficient cellulosic biofuel RINs to meet their obligations. They further stated that the cellulosic biofuel volume used to set the 2011 standard should be based on existing production volumes rather than a projection of potential volume in 2011. In contrast, several proponents of the advanced biofuels industry stated that the cellulosic biofuel standard should be set as high as possible in order to establish the market demand that investors seek before funding cellulosic biofuel projects. They argued that the cellulosic biofuels industry is unlikely to grow without support in the form of a high cellulosic biofuel standard.

Since commenters did not provide their own quantitative assessments of projected cellulosic biofuel volumes for us to consider, we based our assessment of the production capabilities of planned and existing biofuel production facilities on projections provided by EIA as well as data provided by other government agencies and our own contact with many of these companies. In directing EPA to project cellulosic biofuel production for purposes of setting the annual cellulosic biofuel standard, Congress did not specify what degree of certainty should be reflected in the projections. We believe that the cellulosic biofuel standard should provide an incentive for the industry to grow according to the goals that Congress established through EISA. However, we also believe that the cellulosic biofuel standard that we set should be within the range of what can be attained based on projected domestic production and import potential. Any estimate we use to set the cellulosic biofuel standard for 2011 will have some uncertainty in terms of actual attainment, and the level of such uncertainty generally rises with the volume mandate. Our intention is to balance such uncertainty with the objective of providing an incentive for growth in the industry. To this end, we explored the 2011 volumes for individual companies as projected by EIA to determine not only what volumes might be anticipated, but more importantly what volumes were potentially attainable. Our final projected available volume of cellulosic biofuel for 2011 reflects these considerations. Nevertheless, in the event that the biofuel industry ultimately fails to provide sufficient volumes to meet the 2011 standard for cellulosic biofuel, obligated parties can purchase waiver credits from the EPA under the provisions of § 80.1456. The price for such waiver credits is being established in today's action in Section VI.A.

In addition to the sources described above, we had intended to use information provided through the Production Outlook Reports required under § 80.1449 for all registered renewable fuel producers and importers. These reports were due to the Agency by September 1, 2010. While these reports were informative for the companies that did submit them, most potential cellulosic biofuel producers had not yet registered under the RFS program and therefore were not required to submit Production Outlook Reports. Moreover, only a small percentage of the reports were both complete and correct upon initial submission, and about one-fourth of all registered producers and importers failed to submit a report. These issues are likely the result of this being the first time that such reports were due and remedial actions are expected to lead to a more complete set of valid reports later in 2010. However, the Production Outlook Reports were of limited value for development of the biofuel volume projections that we used to set the standards for 2011.

In our analysis, we have focused on biofuel production as required by Section 211(o)(7)(D)(i) of the Clean Air Act. We have not considered the demand for biofuels as a factor in determining the appropriate volume of cellulosic biofuel to require in 2011. However, we note that the volumes of cellulosic biofuel that we proposed and the required volume we are finalizing today are very small in terms of total demand for biofuels, and are thus unlikely to impact issues related to demand for biofuels such as infrastructure for distributing or consuming biofuels.

A. Cellulosic Biofuel

The task of projecting the volume of cellulosic biofuels that could be produced in 2011 is challenging. Announcements of new projects, changes in project plans, project delays, and cancellations occur with great regularity. Biofuel producers face not only the challenge of the scale-up of innovative, first-of-a-kind technology, but also the challenge of securing funding in a difficult economy.

In order to project cellulosic biofuel production volumes for 2011, EPA has tracked the progress of over 100 cellulosic biofuel production facilities. From this large group of over 100 production facilities we identified 35 that had planned to begin cellulosic biofuel production by early 2012. From this smaller list of facilities we used publically available information, as well as information provided by DOE and USDA, to determine which facilities were the most likely candidates to produce cellulosic biofuel and make it commercially available in 2011. Each of these companies was then contacted to provide the most up to date information possible on their current cellulosic biofuel production plans for 2011. Our estimate of the projected available cellulosic biofuel volume for 2011 is based on the information we received in conversations with these companies as well as our own assessment of the potential for these facilities to produce cellulosic biofuel in the volumes indicated. Throughout this process EPA engaged in discussions with EIA to share information and insights into potential cellulosic biofuel production in 2011. For more details on EIA's cellulosic biofuel projections for 2011 and a discussion of the differences between the projections made by EPA and EIA see Section II.A.3.

A brief description of each of the companies we believe has the potential to produce cellulosic biofuel and make it commercially available can be found below. A more in-depth discussion of the technologies used to produce cellulosic biofuels can be found in Section IV. Based on this information, EPA projects that 6.6 million gallons of cellulosic biofuel (corresponding to 6.0 million ethanol-equivalent RINs) could be produced and made available in 2011. This is the number we used as the basis for the percentage standard for 2011. The rest of this section describes the analyses that we used as the basis for this projected available production volume.

1. Domestic Cellulosic Biofuel

Based on our assessment of the cellulosic biofuel industry, we believe that there are four companies in the United States with the potential to produce cellulosic alcohol and make it commercially available in 2011. These companies are DuPont Danisco, Fiberight, KL Energy Corporation, and Range Fuels. EPA also believes that a fifth company, KiOR, will be in a position to produce some cellulosic diesel fuel in 2011. This section will provide a brief description of each of these companies and our assessment of their potential fuel production in 2011 based on information we have acquired to date.

DuPont Danisco Cellulosic Ethanol (DDCE) began start up operations at a small demonstration facility in Vonore, Tennessee in early 2010. This facility has a maximum production capacity of 250,000 gallons of ethanol per year and uses an enzymatic hydrolysis process to convert corn cobs into ethanol. DDCE has indicated that they could produce up to 150,000 gallons of ethanol in 2011 from the Vonore facility.

Fiberight is a company planning to convert MSW to ethanol. Fiberight purchased a small corn ethanol plant in Blairstown, IA and has modified it to produce ethanol from cellulosic biomass. They use an enzymatic hydrolysis process to convert the cellulosic waste materials to simple sugars and then to ethanol. Fiberight plans to initially use a waste cellulose stream from a paper recycling facility as their primary feedstock, and eventually complement that with a sorted MSW stream. Fiberight started producing ethanol in the summer of 2010 and plans to ramp up to full production capacity by late 2011. Fiberight has provided month-by-month production targets for 2011 to EPA. Based on these targets their projected production potential for 2011 is 2.8 million gallons of cellulosic ethanol. While there is still some uncertainty as to whether their supply of waste cellulose from paper recycling meets the regulatory definition of renewable biomass, fuel from such feedstock would only account for about one-fifth of the total ethanol expected to be produced by Fiberight in 2011. Moreover, Fiberight's choice of feedstock for ethanol production could change depending on whether waste cellulose from paper recycling is determined to meet the regulatory definition of renewable biomass. For the purposes of projecting potentially available cellulosic volume for 2011, therefore, we have included in our estimates the portion that could be produced from waste cellulose from paper recycling.

The third company that EPA is aware of with the potential to produce cellulosic ethanol in 2011 is KL Energy Corporation. KL Energy has a demonstration facility in Upton, Wyoming that uses an enzymatic hydrolysis process to convert wood chips and wood waste to ethanol and has just announced a partnership with Petrobras for the construction of additional facilities. The demonstration facility has a maximum annual production volume of 1.5 million gallons and has been operational since the fall of 2007. Since KL Energy completed construction of this facility they have been gradually ramping up production and gathering information to optimize this and future ethanol production facilities. While production levels from this facility have so far been below capacity, KL has informed EPA that they intend to produce up to 400,000 gallons of cellulosic ethanol from their Upton, WY facility in 2011.

A fourth company that EPA expects will produce cellulosic biofuel in 2011 is Range Fuels. Range has a facility in Soperton, Georgia capable of processing 125 dry tons of feedstock per day. This facility completed commissioning in the second quarter of 2010 and began producing cellulosic methanol in the third quarter of 2010. Range initially plans to use wood chips as their feedstock, but will also investigate using different types of woody biomass and herbaceous energy crops. In Phase I of this project, Range will predominantly use a commercial methanol catalyst, but they plan to produce some ethanol using a proprietary mixed alcohol catalyst. No approved pathway currently exists under the RFS program for the generation of RINs for methanol, and the opportunities for using methanol in the transportation fuel market are limited. However, Range does plan on adding capabilities in Phase II that will increase the relative production volume of ethanol versus methanol. Moreover, EPA is evaluating possible RIN-generating pathways for cellulosic methanol, including the potential for cellulosic methanol used in the production of biodiesel to qualify for the generation of cellulosic biofuel RINs.

At this time EPA projects that Range Fuels will produce 0.1 million gallons of ethanol and 2.9 million gallons of methanol from this facility in 2011. Given a methanol equivalence value of 0.75, this fuel represents 2.3 million ethanol equivalent gallons. Based the potential for Range to produce larger proportions of ethanol, and the possibility that RIN-generating pathways for cellulosic methanol could be identified or approved we are projecting production of 2.3 million gallons of RIN-generating cellulosic biofuel by Range Fuels in 2011.

The only company that EPA is aware of that may be a producer of cellulosic diesel in 2011 is KiOR. KiOR has developed a catalytic pyrolysis technology capable of converting cellulosic biomass directly to a bio-crude with a low oxygen content. KiOR currently has a small pilot facility capable of producing 10–15 barrels of bio-crude per day in Houston, Texas. In order for this fuel to be used as a transportation fuel it would have to go through further refining. This could either be done at the KiOR facility if the necessary equipment is installed, or at an existing refinery. While KiOR is not currently producing a finished transportation fuel, this bio-oil could be upgraded and be eligible for RIN generation under the RFS program. EPA projects that this facility can produce 0.2 million gallons of fuel, representing 0.3 million RINs in 2011.

In the proposed rule we also discussed two other potential cellulosic diesel producers, Bell BioEnergy and Cello Energy. Since the publication of the proposed rule the project that Bell BioEnergy had been working on that EPA had identified as a potential source of cellulosic biofuel has been terminated. They are currently exploring other options for locations for their first commercial facility, as well as potential sources of funding. While we are not counting on any volume from Bell BioEnergy for the 2011 projected available volume, it is feasible that they could produce cellulosic diesel or jet fuel in 2011 if they are able to identify a suitable location for their facility and secure the necessary funding in the near future.

The other cellulosic diesel company discussed in the proposed rule is Cello Energy. Cello has a structurally complete facility in Bay Minette, Alabama with an annual production capacity of 20 million gallons of diesel per year. While their facility is structurally complete, they have experienced feedstock preparation and handling issues that need to be resolved before they will be able to again attempt start up and production. Litigation related to contract issues has also provided a set-back likely delaying any potential production from Cello's facility. On October 20, 2010 Cello Energy filed for Chapter 11 bankruptcy, therefore no volume from this facility has been included in our projected cellulosic biofuel volume for 2011.

We are currently unaware of any companies in the United States planning on producing cellulosic biofuel other than ethanol, methanol, and diesel and making it commercially available in 2011. EPA is currently tracking the efforts of 10 companies that plan to produce fuels such as butanol, gasoline, jet fuel, dimethyl ether (DME), and others. Many of these companies have reported that they are still developing their technologies and waiting for funding, and that they are not expecting to make any cellulosic fuel commercially available until 2012 at the earliest. There are several companies with small demonstration facilities who intend to produce biofuels from cellulosic feedstocks, but are currently optimizing their technology with sugar or starch feedstocks. EPA anticipates that in the future this may be a significant source of cellulosic biofuel, however we have not counted these potential volumes in our projections for 2011.

2. Imports of Cellulosic Biofuel

In addition to the companies located in the United States, EPA is also aware of three companies located in other countries with the potential for cellulosic biofuel production in 2011. If this fuel is produced with renewable biomass and imported into the United States for use in transportation fuel, jet fuel, or heating oil, it would be eligible to participate in the RFS2 program. However, for the reasons described below, we have not included any imported cellulosic biofuel in our projections of available U.S. volume for 2011.

Iogen uses a steam explosion pre-treatment process followed by enzymatic hydrolysis to produce cellulosic ethanol from wheat, oat, and barley straw. They have a demonstration facility with an annual production capacity of 500,000 gallons of ethanol located in Ontario, Canada. This facility has been operational and producing small volumes of ethanol since 2004. So far all of the ethanol produced by this facility has been used locally and in racing and other promotional events. In conversations with EPA Iogen has indicated that they do not intend to export any fuel to the United States from this facility in 2011.

Another Canadian company with the potential to produce cellulosic ethanol in 2011 is Enerkem. Enerkem plans to use a thermo-chemical process to gasify separated MSW and other waste products and then use a catalyst to convert the synthesis (syn) gas into methanol and ethanol. Enerkem finished construction on a 1.3 million gallon per year facility in Westbury, Quebec in June 2010 and plans to begin producing methanol and ethanol later in 2010. They are also planning a 10 million gallon per year facility in Edmonton, Alberta, however production from this facility is not expected until 2012. Enerkem has informed EPA that they plan to market their products locally, and do not intend any exports to the United States.

A third international company that may produce commercial volumes of cellulosic biofuel in 2011 is Choren. Choren has completed construction of a facility in Freiberg, Germany with a production capacity of 3.9 million gallons of diesel fuel. This facility used a thermochemical process to convert biomass to syngas and then catalytically converts the syngas to diesel fuel. The facility is currently undergoing commissioning and it is unclear when they will begin commercial production. Additionally, there is likely to be strong local demand for the fuel. Due to these factors, EPA is not projecting that any fuel produced by Choren will be imported into the U.S. in 2011.

While these facilities appear to be the most likely sources of imported cellulosic biofuel, it is possible that cellulosic biofuels produced by other foreign companies may be imported into the United States. One strong candidate as a potential source of cellulosic biofuel imports is Brazil, due to its established ethanol industry and history of importing ethanol into the United States. EPA is aware of several companies planning commercial scale production of cellulosic biofuel in Brazil. It is unlikely these projects will be completed in time to supply cellulosic biofuel to the United States in 2011; however they may be a significant source of cellulosic biofuel imports in future years.

3. Projections From the Energy Information Administration

Section 211(o)(3)(A) of the Clean Air Act requires EIA to "* * * provide to the Administrator of the Environmental Protection Agency an estimate, with respect to the following calendar year, of the volumes of transportation fuel, biomass-based diesel, and cellulosic biofuel projected to be sold or introduced into commerce in the United States." EIA provided these estimates to us on October 20, 2010.[4] With regard to cellulosic biofuel, the EIA estimated that the available volume in 2011 would be 3.94 mill gallons based on their assessment of the utilization of production capacity. A summary of the plants they considered is shown below in Table II.A.3–1.

TABLE II.A.3–1—EIA'S PROJECTED CELLULOSIC BIOFUEL PLANT PRODUCTION ESTIMATES FOR 2011

Company name	Location	Feedstock	Fuel	Capacity (MGY)	Facility status	Expected utilization (Percent)	2011 Production (MG)
DuPont Danisco	Vonore, TN	Corn cobs, then switchgrass.	Ethanol	0.25	Online	10	0.03
Fiberight	Blairstown, IA	MSW	Ethanol	6.0	Online	46	2.76
KL Energy	Upton, WY	Wood	Ethanol	1.5	Online	10	0.15
Range	Soperton, GA	Wood Waste	Methanol, Ethanol	4	Online	25	1.0
Total							3.94

While EIA's projected cellulosic biofuel production estimate for 2011 is, with the exception of KiOR, based on an evaluation of the same companies that EPA evaluated, the production volume assumed by EIA for each company is lower in all cases. We believe that the difference reflects EIA's intention to estimate volumes that each company has a high certainty of reaching in 2011. As described in Section II.A above, we have projected the volume of cellulosic

[4] Letter from Richard Newell, EIA Administrator to Lisa Jackson, EPA Administrator October 20, 2010.

biofuel that we believe is attainable given the issues that each company faces, while recognizing that there is some uncertainty in the projected volumes. We believe that many or all of the uncertainties associated with the potential volume production at each company can be resolved in a positive direction.

We have considered EIA's projection of cellulosic biofuel production for 2011 in the context of setting the 2011 cellulosic biofuel standard, and we believe that it represents a volume that the industry is unlikely to fall below. However, we believe that it is appropriate to set the applicable volume at a level that provides an incentive for developing cellulosic biofuel facilities to come on line as expeditiously as possible, and to provide reasonable assurance that there will be a market for their product if they do. Moreover, we also believe that CAA 211(o)(7)(D) is best interpreted to vest the authority for making the projection with EPA, since it provides that the projection is "determined by the Administrator based on the estimate provided [by EIA]." If Congress intended that EPA simply adopt EIA's projection without an independent evaluation, it would not have specified that the projection is "determined" by EPA. Although the statute provides that our determination must be "based on the estimate provided" by EIA, we believe that our consideration of EIA's estimate in deriving our own projection satisfies this statutory requirement. For the reasons described above, we believe that EPA's projection takes into account uncertainties in a manner that best furthers the objectives of the statute.

4. Overall 2011 Volume Projections

The information EPA has gathered on the potential cellulosic biofuel producers in 2011, summarized above, allows us to project the potential production volume of each facility in 2011. After the appropriate equivalence value has been applied to the volumes from these facilities, the overall projected ethanol-equivalent volume of cellulosic biofuel for 2011 can be totaled. This information is summarized in Table II.A.4–1 below.

TABLE II.A.4–1—PROJECTED POTENTIAL VOLUME OF CELLULOSIC BIOFUEL PRODUCTION IN 2011

Company name	Location	Feedstock	Fuel	Capacity (MGY)	Facility status	Projected potential volume (MG)	Ethanol equiva-lent gallons (MG)
DuPont Danisco	Vonore, TN	Corn cobs, then switchgrass.	Ethanol	0.25	Online	0.15	0.15
Fiberight	Blairstown, IA	MSW	Ethanol	6	Online	2.8	2.8
KL Energy	Upton, WY	Wood	Ethanol	1.5	Online	0.4	0.4
KiOR	Houston, TX	Wood Waste	Diesel	0.2	Online	0.2	0.3
Range	Soperton, GA	Wood Waste	Methanol, Ethanol	4	Online	3.0	2.3
Total						6.6	6.0

While the production volumes in Table II.A.4–1 have some uncertainty, we believe that a total volume of 6.0 million gallons is attainable. By basing the 2011 cellulosic biofuel standard on the attainable volumes rather than discounting projected volumes to account for uncertainty, we aim to avoid the undesirable scenario in which cellulosic biofuel production exceeds the mandated volume. Such a scenario would result in weak demand for cellulosic biofuels and RINs. Additionally, while obligated parties are able to purchase cellulosic biofuel waivers credits in the event that production of cellulosic biofuel is insufficient to meet the 2011 standard, no mechanism exists for this standard to be raised should cellulosic biofuel production exceed the 2011 standard. The intent of Congress in establishing the RFS program through EISA was to provide a reliable market for renewable fuels and in doing so to spur growth in the cellulosic biofuels industry. EPA believes the projected available volume finalized in this rule best reflects these intentions.

Three commenters (Abengoa, Growth Energy, and Unica) supported the range of 6.5–25.5 million gallons that EPA proposed in the NPRM. The Biotechnology Industry Organization and Dupont Danisco Cellulosic Ethanol commented that the EPA's proposed range was a reasonable estimate, but encouraged EPA to consider ways the RFS program can serve a risk mitigation function for the cellulosic biofuel industry. Two commenters, American Petroleum Institute and National Petrochemical & Refiners Association, suggested that EPA consider only companies that have demonstrated, proven production records when setting the cellulosic standard for the following year. The Low Carbon Synthetic Fuels Association suggested EPA set the standard high enough so that any cellulosic biofuel that might be produced in 2011 in the U.S. or internationally would be included in the volume projections. They suggest that this would mean using the high end of the proposed volume, or even some volume above the proposed range.

Based on our assessment of the potential production capabilities of individual companies as described above, EPA is finalizing the cellulosic biofuel standard for 2011 at 6.0 million ethanol-equivalent gallons of cellulosic biofuel. This number represents the volume of RIN-generating cellulosic biofuel that we believe can be made available for use as transportation fuel, heating oil, or jet fuel in 2011. It incorporates some reductions from the annual production capacity of each facility based on when fuel production can begin and assumptions regarding a ramp-up period to full production. We believe that a production volume of 6.0 mill gal is attainable despite the uncertainties, since none of the possible impediments to attaining this volume appear insurmountable. Moreover, by setting the standard for cellulosic biofuel based on the volumes that are attainable, we are providing greater incentives for producers to overcome uncertainties and greater opportunities for funding based on an established demand.

There are also a variety of factors that could lead to production volumes greater than those listed in Table II.A.4–1 and make up for potential shortfalls elsewhere. For instance:

• For each of the facilities listed, with the exception of KiOR, we are projecting that their production will be some volume less than the capacity of their facility. It is possible, however, that these companies could produce a greater volume of fuel than they are currently anticipating or has been projected by EPA.

- It is possible that companies that are currently targeting 2012 for commercial production may produce cellulosic biofuel ahead of schedule and generate RINs in 2011. None of this volume was included in our projection for 2011.
- A high demand for cellulosic biofuels may be sufficient to cause companies to import fuel into the United States, even if they currently have no plans to do so. As described in Section II.A.2 above, there are several foreign producers that are either producing cellulosic biofuel now, or could potentially produce some cellulosic biofuel volume in 2011.

Finally, we note that if the actual volume of cellulosic biofuel RINs that are available in 2011 falls short of the 6.0 million gallon RINs used to derive the 2011 cellulosic biofuel standard, obligated parties have other recourses:

- Purchase cellulosic biofuel waiver credits from the EPA (see further discussion in Section VI.A).
- Carry over a deficit from 2011 into 2012 according to § 80.1427(b).

5. Projections of Cellulosic Biofuel for 2012

In addition to the companies discussed above, EPA also assessed the production capabilities of many other companies to determine their ability to produce cellulosic ethanol in 2011. Many of these companies had at some point planned to produce cellulosic ethanol at commercial scale by 2011, but due to a variety of factors have had their plans delayed. Despite these delays, the outlook for 2012 and later years still looks promising.

Although the cellulosic biofuel standard we are setting for 2011 is considerably below the applicable volumes established in EISA, EPA believes there is reason for optimism when looking at the plans for the cellulosic biofuel industry in 2012 and beyond. EPA is currently aware of more than 20 facilities representing over 300 million gallons of production that are targeting commercial production of cellulosic biofuels in 2012. Many companies, including Abengoa, AE Biofuels, BlueFire Ethanol, Coskata, Fulcrum, POET, and Vercipia, are intending to begin bringing large scale facilities online, with physical capacities of between 10 and 100 million gallons of cellulosic biofuel per year. There is also hope within the industry that as these first-of-a-kind technologies prove commercially viable that new financing opportunities will open up for both new facilities and facility expansion alike. This could lead to rapid growth in the cellulosic biofuel industry as many companies, in addition to those mentioned above, have announced project plans that have been put on hold until funding or project partners can be found.

B. Advanced Biofuel and Total Renewable Fuel

Under CAA 211(o)(7)(D)(i), EPA has the discretion to reduce the applicable volumes of advanced biofuel and total renewable fuel in the event that the projected volume of cellulosic biofuel production is determined to be below the applicable volume specified in the statute. As described in Section II.A above, we are indeed projecting the volume of cellulosic biofuel production for 2011 at significantly below the statutory applicable volume of 250 million gallons. Therefore, we must consider whether and to what degree to lower the advanced biofuel and total renewable fuel applicable volumes for 2011.

As described in the NPRM, because cellulosic biofuel is used to satisfy both the cellulosic biofuel standard and the advanced biofuel standard, it is possible that a required volume of cellulosic biofuel for a given year that is less than the volume specified in the statute could lead to a situation where there is insufficient volume of advanced biofuels to satisfy the applicable volume of advanced biofuel volume set forth in the statute. However, it is also possible that other advanced biofuels, such biomass-based diesel, sugarcane ethanol, or other biofuels, may be available in sufficient volumes to make up for the shortfall in cellulosic biofuel. We believe that it would be consistent with the energy security and greenhouse gas reduction goals of EISA to use the applicable volume of advanced biofuel set forth in the statute to derive the advanced biofuel standard if there are sufficient volumes of advanced biofuels available, even if those volumes do not include the amount of cellulosic biofuel that Congress may have desired.

If we were to maintain the advanced biofuel, biomass-based diesel, and total renewable fuel volume requirements at the levels specified in the statute, while also lowering the cellulosic biofuel standard to 6.0 million gallons, then 1,206 million gallons of the 1,350 million gallon advanced biofuel mandate would be satisfied automatically through the satisfaction of the cellulosic and biomass based diesel standards. An additional 144 million ethanol-equivalent gallons of additional advanced biofuels would be needed. *See* Table II.B–1.

TABLE II.B–1—PROJECTED FUEL MIX IF ONLY CELLULOSIC BIOFUEL VOLUME IS ADJUSTED IN 2011

[mill gallons]

	Ethanol-equivalent volume	Physical volume
Total renewable fuel	13,950	13,500–13,549
Conventional renewable fuel [a]	12,600	12,600
Total advanced biofuel	1,350	903–951
Cellulosic biofuel	6.0	6.6
Biomass-based diesel	1,200	800
Other advanced biofuel [b]	144	[c] 96–144

[a] Predominantly corn-starch ethanol.
[b] Rounded to nearest million gallons for simplicity.
[c] Physical volume is a range because other advanced biofuel may be ethanol, biodiesel, or some combination of the two.

The most likely sources of additional advanced biofuel would be imported sugarcane ethanol and biodiesel. To determine if there are likely to be sufficient volumes of these biofuels to meet the need for 144 million gallons of other advanced biofuel, we examined historical data on ethanol imports and EIA projections for 2011. For instance, as shown in Table II.B–2 below, recent annual import volumes of ethanol were higher than what would be needed in 2011.

TABLE II.B–2—HISTORICAL IMPORTS OF ETHANOL (MILL GALLONS) [5]

2007	439
2008	530
2009	194

Brazilian imports have made up a sizeable portion of total ethanol imported into the U.S. in the past, and these volumes were predominantly produced from sugarcane. These historical import volumes demonstrate that Brazil has significant export potential under the appropriate economic circumstances. However, as shown above, ethanol import volumes decreased significantly in 2009. Moreover, they have dropped to nearly zero in the first half of 2010 according to EIA's Short Term Energy Outlook. Some have speculated that this decline in imports is related to the cessation of the duty drawback that became effective on October 1, 2008, and to changes in world sugar prices.[6] However, Brazil is second worldwide in the production of ethanol, reaching about 6.5 billion gallons in 2008.[7] Thus, by establishing an increased U.S. demand for 144 million gallons of other advanced biofuel in 2011, we believe it may once again be economical for Brazilian producers to export at least this volume of sugarcane ethanol to the U.S. Moreover, California's Low Carbon Fuel Standard goes into effect in 2011, and may compel some refiners to import additional volumes of sugarcane ethanol from Brazil into California. These same volumes could count towards the federal RFS2 program as well.

We also examined the potential for excess biodiesel to help meet the need for 144 million gallons of advanced biofuel. The applicable volume of biomass-based diesel established in the statute for 2011 is 800 million gallons (which corresponds to 1,200 ethanol equivalent gallons). As discussed more fully in Section II.C below, we believe that the biodiesel industry has the potential for producing significant volumes above 800 million gallons if demand for such volume exists.

Finally, there are also other potential sources of advanced biofuels that could contribute to compliance with the advanced biofuels standard in 2011, such as diesel fuel additives made from waste cooking oil or restaurant grease. Given all of these potential sources, we believe that there are likely to be sufficient volumes of advanced biofuels such that the advanced biofuel standard need not be lowered below the 1.35 billion gallon level specified in the Act. Thus, we are not reducing the applicable volume of advanced biofuel for 2011.

If we were reducing the applicable volume of advanced biofuel for 2011, it would follow that there could be a shortfall of RINs capable of satisfying the general renewable fuel volume requirements. However, we are not doing so, and thus there is no need to lower the applicable volume of total renewable fuel below the statutory volume of 13.95 billion gallons.

In response to the NPRM, biodiesel producers, advanced biofuel producers, and UNICA (representing importers of sugarcane ethanol) supported our proposal to maintain the applicable volume of advanced biofuel at 1.35 bill gallons for 2011. They generally agreed that there exists sufficient potential sources of advanced biofuel to make up for the reduction of the applicable volume of cellulosic biofuel for 2011, and that the very existence of a demand for this volume will lead these sources to provide sufficient volume to meet that demand. Other commenters, such as refiners and proponents of corn-ethanol, opposed our proposal for leaving the 2011 applicable volume of advanced biofuel at 1.35 bill gallons on the grounds that other sources of advanced biofuel sufficient to make up for the reduction in the applicable volume of cellulosic biofuel were too uncertain.

We disagree with the suggestion that volumes of other advanced biofuels are too uncertain and that the applicable volume of advanced biofuel should be lowered. As described above, we believe that there are sufficient potential sources of other advanced biofuel to make up for the reduction in the applicable volume of cellulosic biofuel. Moreover, our authority to lower the advanced biofuel and/or total renewable fuel applicable volumes is discretionary, and we believe that actions to lower these volumes should only be taken if it appears that insufficient volumes of qualifying biofuel can be made available, based on such circumstances as insufficient production capacity, insufficient feedstocks, competing markets, constrained infrastructure, or the like. Since this is not the case for 2011, we do not believe that the advanced biofuel applicable volume of 1.35 bill gallons or the total renewable fuel applicable volume of 13.95 billion gallons should be reduced.

Although refiners and proponents of corn-ethanol agreed on the treatment of advanced biofuel for 2011, they differed in their views of how the total renewable fuel standard should be treated. Refiners stated that the advanced biofuel standard and the total renewable fuel standard should be lowered in concert and by the same amount. Proponents of corn-ethanol, on the other hand, stated that the total renewable fuel standard of 13.95 bill gal should be maintained while the advanced biofuel standard should be lowered to reflect the projected shortfall. They argued that excess volumes of corn-ethanol were more certain than excess volumes of advanced biofuel, and that their suggested approach would effectively result in a demand for corn-ethanol above 12.6 billion gallons (see Table II.B–1). They further argued that this approach would generate more GHG reductions than if the advanced biofuel and total renewable fuel standards were lowered in concert. One commenter explicitly opposed any changes to the advanced biofuel and total renewable fuel standards that would increase the demand for corn-ethanol under RFS2 above 12.6 billion gallons (see Table II.B–1).

We agree that there is sufficient corn-ethanol production capacity and feedstocks to produce more than 12.6 bill gallons in 2011. Indeed EIA projects that corn-ethanol production in 2010 will exceed 13 billion gallons.[8] However, as described above, we disagree with the suggestion that there is insufficient volume of advanced biofuels to justify maintaining the advanced biofuel applicable volume at the level specified in the statute. Moreover, since there is no need to waive any portion of the advanced biofuel applicable volume, there is likewise no need to consider the possibility of corn ethanol making up for a shortfall in advanced biofuel volumes. As a result, the demand for corn ethanol will not be greater as a result of today's action than it would be if all applicable volumes as specified in the statute were used in deriving the 2011 standards.

C. Biomass-Based Diesel

While the statutory requirement that we project volumes of cellulosic biofuel for next year does not explicitly apply to biomass-based diesel, we must, as

[5] "Monthly U.S. Imports of Fuel Ethanol," EIA, released 4/8/2010.

[6] Lundell, Drake, "Brazilian Ethanol Export Surge to End; U.S. Customs Loophole Closed Oct. 1," Ethanol and Biodiesel News, Issue 45, November 4, 2008.

[7] Renewable Fuels Association (RFA), "2008 World Fuel Ethanol Production," *http://www.ethanolrfa.org/pages/statistics#E,* March 31, 2009.

[8] EIA STEO, September 2010, Table 8.

discussed above, determine whether the required volumes of advanced biofuel and/or total renewable fuel should be reduced at the same time that we reduce the required volume of cellulosic biofuel. The amount of biomass-based diesel that we project can be available directly affects our consideration of adjustments to the volumetric requirements for advanced biofuel and total renewable fuel discussed above in Section II.B.

Although there are a variety of potential fuel types that can qualify as biomass-based diesel, biodiesel is by far the predominant type. To project biodiesel production volumes for 2011, we examined historical and recent production and export rates as well as the production potential of the industry. As shown in Table II.C–1, domestic production of biodiesel in 2007–2009 has ranged from 490 to 678 million gallons.

TABLE II.C–1—HISTORICAL BIODIESEL PRODUCTION, NET EXPORTS, AND CONSUMPTION (MILLION GALLONS)

[*Source:* EIA Monthly Energy Review, August 2010]

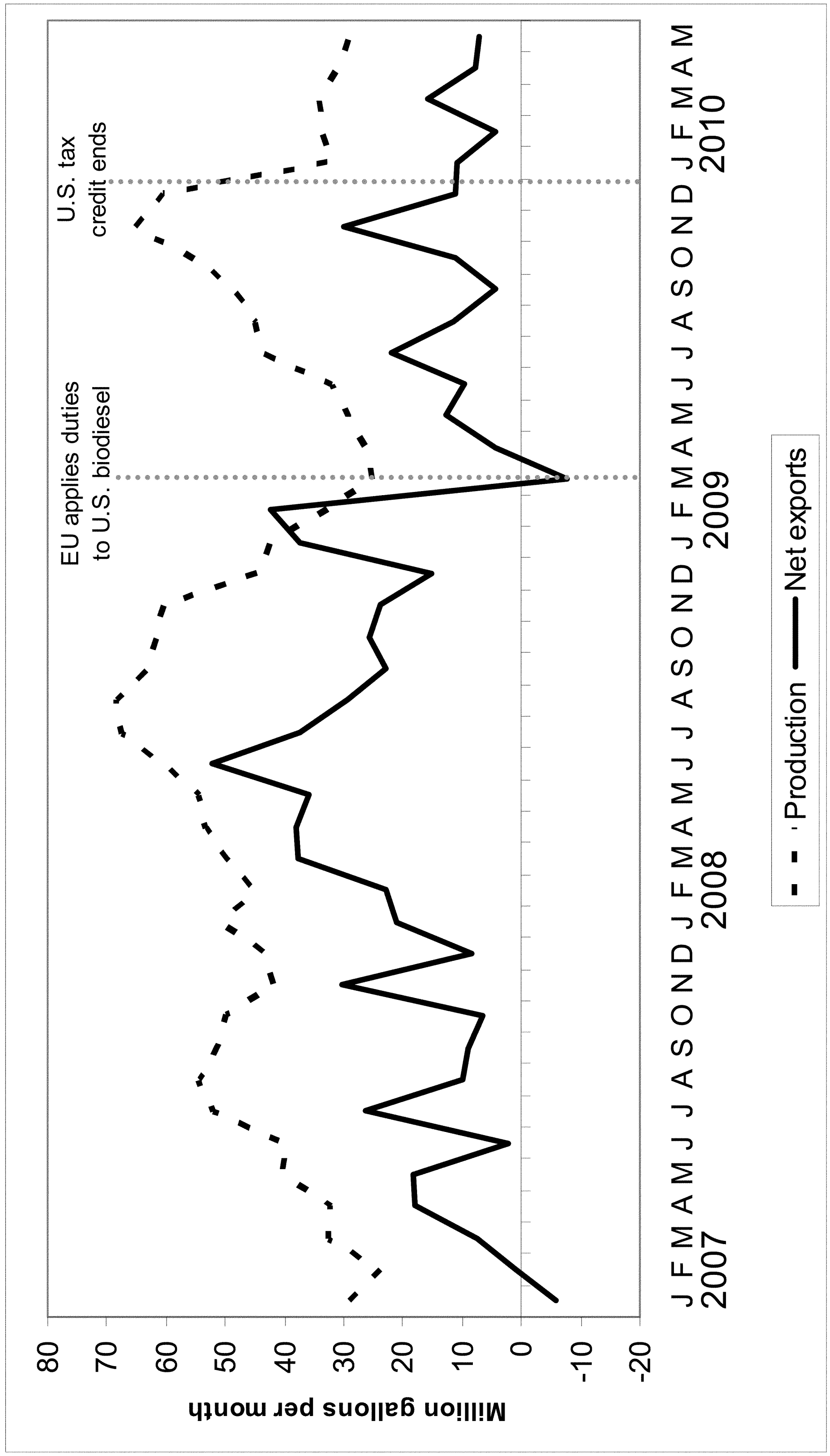
	Domestic production	Net exports	Domestic consumption
2007	490	132	358
2008	678	362	316
2009	505	189	315

The variations in production and net exports appear to be correlated to availability of the U.S. tax subsidy that was effective from 2004 to 2009, "splash-and-dash" activities, and European Union (EU) action to impose duties on exported U.S. biodiesel. In splash-and-dash, biodiesel producers took advantage of the U.S. tax credit for biodiesel even though the biodiesel was not consumed in the U.S., instead exporting the biodiesel to Europe. As can be seen in Figure II.C–1, the EU took action beginning in March 2009 to apply duties/tariffs to biodiesel from the U.S. Exports of biodiesel from the U.S., as well as domestic production volumes, immediately fell following this EU action. Production also fell following the expiration of the biodiesel tax credit at the end of 2009.

Figure II.C-1

Monthly Biodiesel Production and Net Exports (million gallons)

(Source: EIA Monthly Energy Review, August 2010)



Although biodiesel production appears to have been significantly affected by both the EU tariff on biodiesel from the U.S. and the expiration of the biodiesel tax credit, the fact that the U.S. biodiesel industry has produced higher volumes when it was economic for it to do so suggests that the industry may have the capability to produce greater volumes in the future under the appropriate circumstances. According to information from the biodiesel industry, only 52 biodiesel facilities with a production capacity totalling 600 million gallons have been idled. The total biodiesel production capacity at facilities that are still operating is 2.4 billion gallons.[9] Ramping up production will require some time and potentially some reinvestment, but based on feedback from industry we nevertheless believe that it can occur in time to meet a production goal of 800 million gallons.

In response to the NPRM, some commenters suggested that the 2011 volume requirement for biomass-based diesel should be lowered because the biodiesel industry is expected to produce insufficient volumes in 2010 to meet the 2009/2010 biomass-based diesel standard based on an applicable volume of 1.15 billion gallons. This, they argued, demonstrates that the biodiesel industry cannot be expected to meet demand of 800 million gallons in 2011. However, for the first five months of 2010, the average production rate was about 32 million gallons per month.[10] If this production rate continued through the rest of 2010, the total annual production of biodiesel would be approximately 380 million gallons. As described in EPA's Question and Answer document,[11] EPA estimated that the 1.15 bill gal standard for biomass-based diesel in 2010 would generate a demand for about 345 mill gallons of qualifying biodiesel and renewable diesel in 2010. The remaining portion of the 1.15 bill gal standard would be met with previous-year RINs. Thus, an annual production volume of 380 million gallons should be sufficient to enable obligated parties to meet the 2010 biomass-based diesel standard if exports are kept to a minimum. In fact net exports of biodiesel have gone down every year since 2008, due in part to fewer cost-effective opportunities for sale of biodiesel in Europe.

Moreover, we do not believe that the activities of the biodiesel industry in 2009 and 2010 are necessarily an appropriate indicator of its potential for 2011. A regulatory mandate for biomass-based diesel did not exist in 2009, and the mandate for biomass-based diesel in 2010 was a unique circumstance that allowed a significant number of 2008 and 2009 biodiesel RINs to be used for compliance in 2010. Current biodiesel production rates actually suggest that the industry is positioned to put idled capacity into production when demand for greater volumes exist. For instance, despite the expiration of the biodiesel tax credit at the end of 2009, monthly domestic consumption of biodiesel was actually higher in the first 5 months of 2010 than it was during the same period in 2009. One possible reason for this is that 2010 was the first year that the biomass-based diesel standard was in effect. Moreover, for the three years prior to 2010, the monthly average production in the second half of the year was higher than in the first half of the year. Thus, although the annual production total for 2010 would be projected to be 380 mill gal based on monthly production rates between January and May, it could be 500 million gallons or more by year's end if production rates increase in the second half of the year as they have done in the past. An increase in monthly biodiesel production rates later in 2010 would also be consistent with the fact that obligated parties are not required to demonstrate compliance with the 2010 biomass-based diesel standard until February 28, 2011. Thus, the presence of a requirement for biomass-based diesel in 2010 seems to be providing the incentive for greater consumption of biodiesel, which in turn is encouraging higher production volumes.

In addition to current production rates, the biodiesel industry's production potential also supports a finding that it can more than satisfy the applicable volume of biomass based diesel specified in the statute for 2011. In July of 2010, over 1.8 billion gallons of production capacity had been registered under the RFS2 program.[12] As of September 2010, the aggregate production capacity of biodiesel plants in the U.S. was estimated at 2.6 billion gallons per year across approximately 170 facilities.[13] Indications from the biodiesel industry are that idled facilities can be brought back into production with a relatively short leadtime. Imports of biodiesel from foreign countries also has the potential to increase the volume available for consumption in the U.S.

Finally, we believe that there will be sufficient sources of qualifying renewable biomass to more than meet the needs of the biodiesel industry in 2011. The largest sources of feedstock for biodiesel in 2011 are expected to be soy oil, canola oil, rendered fats, and potentially some corn oil extracted during production of fuel ethanol, as this technology continues to proliferate. Moreover, comments we received from a large rendering company after the May 2009 RFS2 proposed rule suggest that there will be adequate fats and greases feedstocks to supply biofuels production as well as other historical uses.[14]

In order to meet a 2011 biomass-based diesel volume requirement of 800 million gallons to be consumed in the United States, approximately 725 million gal of biodiesel would need to be consumed. This value accounts for the production of 75 million gallons of renewable diesel at one renewable diesel facility in Geismar, Louisiana, set to begin operations by 2011.[15] Assuming net exports continue at a rate equivalent to that in the first five months of 2010, biodiesel production in the U.S. would need to total approximately 835 million gal in 2011. Based on the modeling used by EIA to project volumes for its Short-Term Energy Outlook, EIA projects that the 800 mill gallon mandate would be binding, and that this level of consumption would be unlikely to occur in the absence of a mandate. However, the biodiesel industry has demonstrated that it is capable of meeting historic demand for biodiesel, and is in a position to produce significantly more than it has in recent years.

Based on our review of current biodiesel production rates, the production potential of the biodiesel industry, and the availability of qualifying feedstocks, we believe that substantially more than the 800 million gallons needed to satisfy the biomass based diesel standard can be produced in 2011. Today's rule therefore includes a final biomass-based diesel standard that, as proposed, is based on the 800 million gallon applicable volume specified in the Act. We also believe that the excess production capacity can be utilized to help satisfy the 2011 advanced biofuel standard we are finalizing today.

In response to the NPRM, several parties supported our proposal to set the 2011 standard based on the 800 million gallon applicable volume specified in the Act. One party requested that we raise the biomass-based diesel standard for 2011 above the 800 million gallon statutory mandate based on the significantly higher production capacity in the industry. However, the statute specifies the applicable volumes of biomass based diesel that we are to use

[9] Plant List from Biodiesel Magazine (*http://www.biodieselmagazine.com/plant-list.jsp.*)

[10] EIA Monthly Energy Review for August 2010, Table 10.4.

[11] *See* question 6.7 in EPA's "Questions and Answers on Changes to the Renewable Fuel Standard Program (RFS2)", *http://www.epa.gov/otaq/fuels/renewablefuels/compliancehelp/rfs2-aq.htm#6.*

[12] Comments from National Biodiesel Board on the July 20, 2010 NPRM. Submitted to docket EPA–HQ–OAR–2010–0133 on August 19, 2010.

[13] Figures taken from National Biodiesel Board's Member Plant List as of September 13, 2010. *http://biodiesel.org/buyingbiodiesel/plants/showall.aspx.*

[14] *See* **Federal Register** v.74 n.99 p.24903. Comments are available in docket EPA–HQ–OAR–2005–0161.

[15] Project status updates are available via the Syntroleum Web site, *http://dynamicfuelsllc.com/wp-news/.*

in setting the annual standards through 2012. We do not have the authority to raise the applicable volume above the level specified in the statute for 2011.

Another commenter requested that the standard for biomass-based diesel should be tied to the biodiesel tax credit and projections of likely consumption in 2011 assuming no mandate. We disagree. Demand for biomass-based diesel will be a function of the RFS standard we set for 2011. The authority provided under CAA 211(o)(7)(A) to waive any portion of the statutory biomass-based diesel volume mandate is limited to cases in which we determine that the mandate would severely harm the economy or environment, or that there is inadequate domestic supply. Under CAA 211(o)(7)(E) we may also order a reduction in required use of biomass based diesel if we find that there is a significant renewable feedstock disruption or other market circumstances that would make the price of biomass-based diesel fuel increase significantly. No commenter has suggested that any of these conditions exist. The expiration of the biodiesel tax credit is, by itself, an insufficient basis for a waiver, and we do not have the authority to waive a portion of the standard based on projections of what demand would be in the absence of a mandate.

III. Percentage Standards for 2011

A. Background

The renewable fuel standards are expressed as a volume percentage, and are used by each obligated party to determine their renewable volume obligations (RVO). Since there are four separate standards under the RFS2 program, there are likewise four separate RVOs applicable to each obligated party. Each standard applies to the sum of all gasoline and diesel produced or imported. The applicable percentage standards are set so that if each regulated party meets the percentages, then the amount of renewable fuel, cellulosic biofuel, biomass-based diesel, and advanced biofuel used will meet the volumes required on a nationwide basis.

As discussed in Section II.A.4, the cellulosic biofuel volume requirement for 2011 is 6.6 million gallons (6.0 million ethanol equivalent gallons). This volume is used as the basis for setting the percentage standard for cellulosic biofuel for 2011. We have also decided that the advanced biofuel and total renewable fuel volumes will not be reduced below the volumes set forth in the statute. The 2011 volumes used to determine the four percentage standards are shown in Table III.A–1.

TABLE III.A–1—VOLUME REQUIREMENTS FOR 2011

	Actual volume	Ethanol equivalent volume
Cellulosic biofuel	6.6 mill gal	6.0 mill gal.
Biomass-based diesel	0.80 bill gal	1.20 bill gal.
Advanced biofuel	1.35 bill gal	1.35 bill gal.
Renewable fuel	13.95 bill gal	13.95 bill gal.

B. Calculation of Standards

1. How Are the Standards Calculated?

The following formulas are used to calculate the four percentage standards applicable to producers and importers of gasoline and diesel (*see* § 80.1405):

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

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

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

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

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) of the Clean Air Act for year i, in gallons.

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

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

$RFV_{RF,i}$ = Annual volume of renewable fuel required by section 211(o) 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. For 2011, this value is zero. *See* further discussion in Section III.B.2 below.

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. For 2011, this value is zero. *See* further discussion in Section III.B.2 below.

The four separate renewable fuel standards for 2011 are based in part on the 49-state gasoline and diesel consumption volumes projected by EIA. The projected volumes of gasoline, ethanol, and biodiesel used to calculate the final percentage standards are provided by the EIA's Short-Term Energy Outlook (STEO), while the projected volume of transportation diesel used to calculate the final percentage standards is provided by the most recent Annual Energy Outlook (AEO). In the proposal, we used the March 2010 issue of STEO and the Early Release version of AEO2010. For this final rule, we have used the volumes of transportation fuel provided by EIA under CAA 211(o)(3)(A) in a letter dated October 20, 2010.[16] This letter aggregates volume projections from several EIA sources including the most recently available versions of STEO and AEO. Gasoline and diesel volumes are adjusted in the formulas to account for renewable fuel contained in the STEO and AEO projections. Beginning in 2011, gasoline and diesel volumes produced by small refineries and small refiners will generally no longer be exempt, and thus there is no adjustment to the gasoline and diesel volumes in today's final rule to account for such an exemption. However, as discussed more fully in Section III.B.2 below, depending upon the results of a Congressionally-mandated DOE study, it is possible that the exemption for some small refineries could be extended. In addition, we may extend the exemption for individual small refineries on a case-by-case basis if they demonstrate disproportionate economic hardship. If any small refinery exemptions for 2011 are approved after this final rulemaking, the parties in question would be exempt but we would not intend to modify the applicable percentage standards and announce new standards for 2011. EPA believes the Act is best interpreted to require issuance of a single annual standard in November that is applicable in the following calendar year, thereby providing advance notice and certainty to obligated parties regarding their regulatory requirements. Periodic revisions to the standards to reflect waivers issued to small refineries or refiners would be inconsistent with the statutory text, and would introduce an undesirable level of uncertainty for obligated parties.

As described in the March 26, 2010 RFS2 final rule, the standards are expressed in terms of energy-equivalent gallons of renewable fuel, with the cellulosic biofuel, advanced biofuel, and total renewable fuel standards based on ethanol equivalence and the biomass-based diesel standard based on biodiesel equivalence. However, all RIN generation is based on ethanol-equivalence. More specifically, the RFS2 regulations provide that production or import of a gallon of biodiesel will lead to the generation of 1.5 RINs. In order to ensure that demand for 0.8 billion physical gallons of biomass-based diesel will be created in 2011, the calculation of the biomass-based diesel standard provides that the required volume be multiplied by 1.5 under the assumption that biodiesel will predominate the biomass-based diesel market. The net result is that a physical gallon of biodiesel will be worth 1.0 gallons toward the biomass-based diesel standard, but worth 1.5 gallons toward the other standards.

The levels of the percentage standards would be reduced if Alaska or a U.S. territory chooses to participate in the RFS2 program, as gasoline and diesel produced in or imported into that state or territory would then be subject to the standard. Neither Alaska nor any U.S. territory has chosen to participate in the RFS2 program at this time, and thus the value of the related terms in the calculation of the standards is zero.

Note that the equation's terms for projected volumes of gasoline and diesel use include gasoline and diesel that has been blended with renewable fuel. In the equation, the total renewable fuel volume is subtracted from the total gasoline and diesel volume to get total non-renewable gasoline and diesel volumes (because the gasoline and diesel volumes provided by EIA include renewable fuel use), The values of the equation variables for 2011 are shown in Table III.B.1–1.[17] Terms not included in this table have a value of zero.

TABLE III.B.1–1—VALUES FOR TERMS IN CALCULATION OF THE STANDARDS (BILL GAL)

Term	Value
$RFV_{CB,2011}$	0.006
$RFV_{BBD,2011}$	0.80
$RFV_{AB,2011}$	1.35
$RFV_{RF,2011}$	13.95
G_{2011}	139.07
D_{2011}	49.21
RG_{2011}	13.45
RD_{2011}	0.71

Using the volumes shown in Table III.B.1–1, we have calculated the percentage standards for 2011 as shown in Table III.B.1–2.

[16] Letter from Richard Newell, EIA Administrator to Lisa Jackson, EPA Administrator.

[17] To determine the 49-state values for gasoline and diesel, the amounts of these fuels used in Alaska is subtracted from the totals provided by DOE. The Alaska fractions are determined from the most recent (2008) EIA State Energy Data, Transportation Sector Energy Consumption Estimates. The gasoline and distillate fuel oil fractions are approximately 0.2% and 0.7%, respectively. Ethanol use in Alaska is estimated at 5% of its gasoline consumption (based on the same State data), and biodiesel use is assumed to be zero.

TABLE III.B.1–2—PERCENTAGE STANDARDS FOR 2011

	Percent
Cellulosic biofuel	0.003
Biomass-based diesel	0.69
Advanced biofuel	0.78
Renewable fuel	8.01

2. Small Refineries and Small Refiners

In CAA section 211(o)(9), enacted as part of EPAct, Congress provided a temporary exemption to small refineries (those refineries with a crude throughput of no more than 75,000 barrels of crude per day) through December 31, 2010. In RFS1, we exercised our discretion under section 211(o)(3)(B) and extended this temporary exemption to the few remaining small refiners that met the Small Business Administration's (SBA) definition of a small business (1,500 employees or less company-wide) but did not meet the statutory small refinery definition as noted above. Because EISA did not alter the small refinery exemption in any way, the RFS2 program regulations exempt gasoline and diesel produced by small refineries and small refiners in 2010 from the renewable fuels standard (unless the exemption was waived). *See* 40 CFR § 80.1441.

Under the RFS program, Congress has provided two ways that small refineries can receive an extension of the temporary exemption beyond 2010. One is based on the results of a study conducted by the Department of Energy (DOE) to determine if small refineries would face a disproportionate economic hardship under the RFS program. The other is based on EPA evaluation of claims of disproportionate economic hardship, the DOE study, and other economic factors on a case-by-case basis in response to small refinery petitions.

In January 2009, DOE issued a *Small Refineries Exemption Study* which did not find that small refineries would face a disproportionate economic hardship under the RFS program. The conclusions were based in part on the expected robust availability of RINs; DOE further noted that, if the RIN market were to change, individual refineries still have a statutory right to apply for relief on a case-by-case basis. Subsequently, the Senate Appropriations Committee "directed [DOE] to reopen and reassess the Small Refineries Exemption Study by June 30, 2010," listing a number of factors that the Committee intended DOE to consider in the revised study. The Final Conference Report to the Energy & Water Development Appropriations Act added that the conferees "support the study requested by the Senate on RFS and expect the Department to undertake the requested economic review." DOE was directed to complete a reassessment and issue a revised report by June 30, 2010. A revised study had not been issued at the time of the RFS2 final rulemaking, or at the time of this writing.

We have received three petitions from small refineries requesting an extension of their exemption from the RFS2 requirements. In evaluating these petitions, EISA requires that EPA "* * * consider the findings of the [DOE] study * * * and other economic factors." Although the DOE study issued in January 2009 would satisfy the statutory requirement that we consider the DOE study before acting, we believe that our evaluation of these three petitions will be better informed if we consider the findings of the forthcoming revised DOE study. Since the revised study is not yet available, we have assumed that all small refineries and small refiners will be subject to the RFS2 standards in 2011 for the purposes of calculating those standards. If, subsequent to announcing the 2011 standards, we make a determination that one or more hardship petitions should be approved, we do not intend to revise the 2011 standards applicable to other obligated parties to require that they make up for volumes that will not be attained by the exempt refineries.

We received only three comments on the treatment of small refineries in the RFS2 program, and all supported the inclusion of small refineries and small refiners as obligated parties beginning in 2011. API additionally requested that any consideration of extending the exemption for any small refinery into 2011 also take into account the impact that such an action would have on other refineries, specifically with regard to the ethanol blendwall. However, we do not believe that the extension of any small refinery exemptions into 2011 will have a significant impact on the ethanol blendwall. Since the total volume of renewable fuel required under RFS2 is the same regardless of whether any small refineries are exempt or not, such exemptions will have no impact on the relative volumes of ethanol and gasoline in the nationwide transportation fuels market. Thus, the timing of the onset of the nationwide blendwall will not be affected by any small refinery exemptions. We do recognize that any exemption for a small refinery will result in a proportionally higher percentage standard for remaining obligated parties, and that this will affect the degree to which individual obligated parties can acquire sufficient RINs for compliance through blending ethanol into gasoline that they produce. This may be of particular concern to obligated parties whose gasoline production volume is higher than the volume of gasoline that they market, since such parties may have fewer opportunities to blend renewable fuels into their own gasoline and diesel. In such cases, obligated parties also have the option of marketing E85 for use in FFVs, extending their operations to include more gasoline marketing, or purchasing RINs on the open market.

IV. Cellulosic Biofuel Technology Assessment

In projecting the volumes of cellulosic biofuel for 2011, we conducted a technical assessment of the production technologies that are under consideration by the broad universe of companies we investigated. Many of these companies are still in the research phase, resolving outstanding issues with specific technologies, and/or in the design phase to implement those technologies for the production of commercial-scale volumes of cellulosic biofuel. A subset of the companies we investigated have moved beyond the research and design phase and are actively preparing for production. This smaller group of companies formed the basis for our projection of potential 2011 volumes of cellulosic biofuel.

This section discusses the full range of cellulosic biofuel technologies being considered among producers, with reference to those individual companies that are focusing on each technology and those we project will be most likely to use those technologies to produce cellulosic biofuel in 2011.

A. What pathways are currently valid for the production of cellulosic biofuel?

In determining the appropriate volume of cellulosic biofuel on which to base the percentage standard for 2011, it is important to consider the ability of the biofuel to generate cellulosic RINs under the RFS2 program. As of this writing, there are three valid pathways available as shown in Table IV.A–1 below.

TABLE IV.A–1—CELLULOSIC BIOFUEL PATHWAYS FOR USE IN GENERATING RINs

Fuel type	Feedstock	Production process requirements	D–Code
Ethanol	Cellulosic Biomass from crop residue, slash, pre-commercial thinnings and tree residue, annual covercrops, switchgrass, and miscanthus; cellulosic components of separated yard waste; cellulosic components of separated food waste; and cellulosic components of separated MSW.	Any	3 (cellulosic biofuel).
Cellulosic Diesel, Jet Fuel and Heating Oil.	Cellulosic Biomass from crop residue, slash, pre-commercial thinnings and tree residue, annual covercrops, switchgrass, and miscanthus; cellulosic components of separated yard waste; cellulosic components of separated food waste; and cellulosic components of separated MSW.	Any	7 (cellulosic diesel).
Cellulosic Naphtha	Cellulosic Biomass from crop residue, slash, pre-commercial thinnings and tree residue, annual covercrops, switchgrass, and miscanthus; cellulosic components of separated yard waste; cellulosic components of separated food waste; and cellulosic components of separated MSW.	Fischer-Tropsch process.	3 (cellulosic biofuel).

Of the five facilities that we currently believe could contribute to the volume of commercially available cellulosic biofuel in 2011, four would produce alcohols from cellulosic biomass and one would produce diesel from cellulosic biomass. None of the facilities we have evaluated would produce cellulosic naphtha through a Fischer-Tropsch process. In 2011 the primary biofuel Range fuels has indicated will be produced from their facility is methanol. While there is currently no pathway for cellulosic methanol to generate RINs, Range has engaged EPA in discussion regarding the addition of a pathway for cellulosic methanol.

Two of the facilities shown in Table II.A.4–1, KL Energy and Range Fuels, intend to use wood as the primary feedstock. The only types of wood that are currently allowed as a valid feedstock are those derived from various types of waste. If either of these two companies choose to use trees from a tree plantation instead of qualifying waste wood, its pathway would not fall into the any of the pathways currently listed in Table 1 to § 80.1426. However, as described more fully in Section V.A, we are currently evaluating the lifecycle GHG impacts of biofuel made from pulpwood, including wood from tree plantations. If such a pathway is determined to meet the 60% GHG threshold required for cellulosic biofuel, it will be added to Table 1 to § 80.1426 and producers can then make use of it to generate cellulosic RINs.

As described in Section II.A, Range Fuels will begin making predominantly methanol, and no approved pathway currently exists under the RFS program to generate RINs for methanol. However, Range has been in discussions with EPA concerning a petition under § 80.1416 for the generation of RINs for methanol made from woody biomass as well as the generation of cellulosic RINs for the portion of biodiesel made from cellulosic methanol. These pathways are similar to pathways we have modeled in the past. For the purposes of projecting cellulosic volumes for 2011, we believe that the methanol from Range Fuels has the potential for being approved for generation of cellulosic RINs and is therefore appropriate for being included in the volumes that we believe are potentially attainable in 2011.

B. Cellulosic Feedstocks

Cellulosic biofuel technologies are different from other biofuel technologies because they convert the cellulose and other very difficult to convert compounds into biofuels. Unlike grain feedstocks where the major carbohydrate is starch (very simply combined sugars), lignocellulosic biomass is composed mainly of cellulose (40–60%) and hemicellulose (20–40%).[18] Cellulose and hemicellulose are made up of sugars linked together in long chains called polysaccharides. Once hydrolyzed, they can be fermented into ethanol. The remainder of cellulosic feedstocks consists primarily of lignin, a complex polymer which serves as a stiffening and hydrophobic (water-repelling) agent in cell walls. Currently, lignin cannot be fermented into ethanol, but could be burned as a by-product to generate electricity. Thermochemical, pyrolysis and depolymerization processing, however, can convert some or even most of the lignin, in addition to the cellulosic and hemicellulose, into biofuels.

C. Emerging Technologies

When evaluating the array of biofuel technologies which could produce one or more fuels from cellulosic feedstocks that could qualify under RFS2, we found that it is helpful to organize them into fuel technology categories. Organizing them into categories eases the task of understanding the technologies, and also simplifies our evaluation of these technologies because similar technologies likely have similar cost and lifecycle impacts. The simplest organization is by the fuel produced. However, we frequently found that additional subdivisions were also helpful. Table IV.C–1 provides a list of technologies, the fuels produced, and a list of many of the companies which we learned are pursuing the technology (or something very similar to the technology listed in the category). EPA is currently tracking the progress of more than 100 cellulosic biofuel projects, many of which are not listed in the following table. The inclusion of a specific company in the table or technical discussion that follows should not be interpreted as an endorsement of the listed company. The cellulosic biofuel industry continues to progress at a rapid pace and many companies not listed in this assessment may still produce significant volumes of cellulosic fuel in future years.

[18] DOE. "Biomass Program: ABC's of Biofuels". Accessed at: *http://www1.eere.energy.gov/biomass/abcs_biofuels.html#content.*

TABLE IV.C–1—LIST OF TECHNOLOGY CATEGORIES, THE FUELS PRODUCED THROUGH EACH TYPE OF TECHNOLOGY, AND THE COMPANIES PURSUING THEM

Technology category	Technology	Fuels produced	Companies
Biochemical	Enzymatic Hydrolysis	Ethanol	Abengoa, AE Fuels, DuPont Danisco, Florida Crystals, Gevo, Poet, ICM, Iogen, BPI, Energy, Fiberight, KL Energy.
	Acid Hydrolysis	Ethanol	Agresti, Arkenol, Blue Fire, Pencor, Pangen, Raven Biofuels.
	Dilute Acid, Steam Explosion of Cellulose.	Ethanol	Verenium, BP, Central Minnesota Ethanol Coop.
	Consolidated Bioprocessing (one step hydrolysis and fermentation) of Cellulose.	Ethanol	Mascoma, Qteros.
	Conversion of Cellulose via carboxylic acid.	Ethanol, Gasoline, Jet Fuel, Diesel Fuel.	Terrabon, Swift Fuels.
	One step Conversion of Cellulose to distillate.	Diesel, Jet Fuel or Naphtha	Bell Bioenergy, LS9.
Thermochemical	Thermochemical/Fischer Tropsch.	Diesel Fuel and Naphtha	Choren, Flambeau River Biofuels, Baard, Clearfuels, Gulf Coast Energy, Rentech, TRI, Nature's Fuel.
	Thermochemical/Fischer Tropsch.	DME	Chemrec, New Page.
	Thermochemical/Catalytic conversion of syngas to alcohols.	Ethanol	Range Fuels, Pearson Technologies, Fulcrum Bioenergy, Enerkem, and Gulf Coast Energy.
Hybrid	Thermochemical w/Biochemical catalyst.	Ethanol	Coskata, INEOS Bio, Lanzatech.
	Acid Hydrolysis of cellulose to intermediate; hydrogenation using Thermochemical syngas from non-cellulose fraction.	Ethanol, Other alcohols	Zeachem.
Depolymerization	Catalytic Depolymerization of Cellulose.	Diesel, Jet Fuel or Naphtha	Cello Energy, Covanta, Green Power.
	Pyrolysis of Cellulose	Diesel, Jet Fuel, or Gasoline	Envergent (UOP/Ensyn), Dynamotive, Petrobras, Univ. of Mass, KIOR.
Other	Catalytic Reforming of Sugars from Cellulose.	Gasoline	Virent.

Of the technologies listed above, many of them are considered to be "second generation" biofuels or new biofuel technologies capable of meeting either the advanced biofuel or cellulosic biofuel RFS standard. The following sections describe specific companies and the new biofuel technologies which the companies have developed or are developing. This summary is not meant to be a comprehensive list of all new biofuel technologies, but rather a description of some of the more prominent of the new biofuel technologies that serve to provide a sense of the technology categories listed above. The process technology summaries are based on information provided by the respective companies. EPA has not been able to confirm all of the information, statements, process conditions, and the process flow steps necessary for any of these processes and companies.

1. Biochemical

Biochemical conversion refers to a broad grouping of processes that use biological organisms to convert cellulosic feedstocks into biofuels. While no two processes are identical, many of these processes follow a similar basic pathway to convert cellulosic materials to biofuel. The general process of most biochemical cellulosic biofuel processes consists of five main steps: Feedstock handling, pretreatment, hydrolysis, fermentation/fuel conversion, and distillation/separation. The feedstock handling step reduces the particle size of the incoming feedstock and removes any contaminants that may negatively impact the rest of the process. In the pretreatment step the structure of the lignin and hemicellulose is disrupted, usually using some combination of heat, pressure, acid, or base, to allow for a more effective hydrolysis of the cellulosic material to simple sugars. In the hydrolysis stage the cellulose and any remaining hemicellulose is converted into simple sugars, usually using an enzyme or strong acid. In the fermentation or fuel conversion step, the simple sugars are converted to the desired fuel by a biological organism. In the final step the fuel that is produced is separated from the water and other byproducts by distillation or some other means. A basic diagram of the biochemical conversion process can be found in Figure IV.C.1–1 below.

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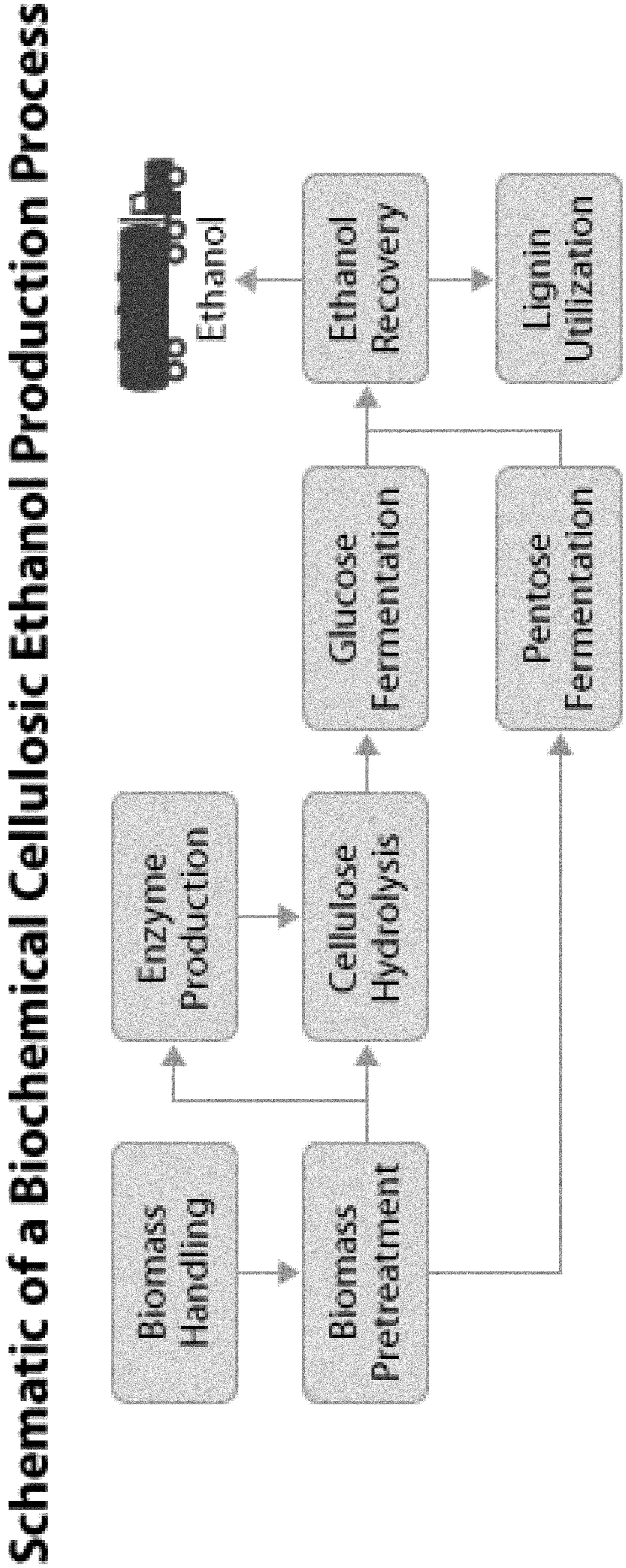
Figure IV.C.1-1[19]



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While this diagram shows the production of ethanol from cellulosic biomass, it is possible to use the same process to produce other fuels or specialty chemicals using different biological organisms.

The following sections will discuss each of these steps in greater detail, some of the variations to this general process, and some of the advantages and disadvantages of the biochemical process of producing biofuel from cellulosic materials as compared to other fuel production processes.

Three of the five companies that EPA believes may produce cellulosic biofuel in 2011 plan to use a biochemical process to produce biofuels. All three of these companies, Dupont Danisco Cellulosic Ethanol, Fiberight, and KL energy, all plan to use an enzymatic hydrolysis. One of the biggest appeals of the biochemical pathway is the relatively low capital costs of these projects compared to other cellulosic biofuel facilities. Biochemical projects are also less dependent on economies of scale for profitability, making smaller and less capital intensive commercial facilities more feasible.

a. Feedstock Handling

The first step of the biochemical conversion process is to insure that the biomass stream can be utilized by the rest of the conversion process. This most often takes the form of size reduction, either by grinding or chipping as appropriate for the type of biomass. While this is a relatively simple process it is essential to allow the following steps of the process to function as designed. It is also a potentially energy intensive process. It may be possible for biofuel producers to purchase cellulosic material that is already of the appropriate size, however we believe that in the near term this is unlikely and most biofuel producers will have to invest in equipment to reduce the size of the material they receive as needed for their process. In coming years, as the market for cellulosic materials expands, purchasing feedstock that has already been ground or chipped may be possible and cost effective, as these processes increase the density of this material and may reduce transportation costs. While this may provide financial benefits for the cellulosic biofuel producer, it will not impact the lifecycle green house gas emissions of the process.

In addition to size reduction, steps must also be taken to remove any material from the feedstock that might be detrimental to the fuel production process. Contaminants in the feedstock, such as dirt, rocks, plastics, metals, and other non-biogenic materials, would at best travel through the fuel production process unchanged, resulting in reduced fuel production capacity. Depending on the type of contaminant they may also be converted to undesired byproducts that must be separated from the fuel. They could also be toxic to the biological organisms being used to convert the sugars to fuel, necessitating a shut down and restart of the plant. Any of these scenarios would result in a significant cost to the fuel producer. Feedstocks such as agricultural residues, wood chips, or herbaceous or woody energy crops are likely to contain far fewer contaminants than more heterogeneous feedstocks such as municipal solid waste (MSW).

b. Biomass Pretreatment

The purpose of the biomass pretreatment stage is to disrupt the structure of the cellulosic biomass to allow for the hydrolysis of the cellulose and hemicellulose into simple sugars. The ideal pretreatment stage would allow for a high conversion of the cellulose and hemicellulose to simple sugars, minimize the degradation of these sugars to undesired forms that reduce fuel yields and inhibit fermentation, not require especially large or expensive reaction vessels, and be a relatively robust and simple process. No single biomass pretreatment method has yet been discovered that meets all of these goals, but rather a variety of options are being used by various cellulosic fuel producers, each with their own strengths and weaknesses. Dilute acid pretreatment and alkaline pretreatment are two methods currently being used that attack the hemicellulose and lignin portions of the cellulosic biomass respectively. Other methods, such as steam explosion and ammonia fiber expansion, seek to use high temperature and pressure, followed by rapid decompression to disrupt the structure of the cellulosic biomass and allow for a more efficient hydrolysis of the cellulose and hemicellulose to simple sugars. Each of these methods is discussed in more detail in a technical memo that has been added to the docket.[20] The cost and characteristics of the cellulosic feedstock being processed is likely to have a significant impact on the pretreatment process that is used.

c. Hydrolysis

In the hydrolysis step the cellulose and any remaining hemicellulose are converted to simple sugars. There are two main methods of hydrolysis: acid hydrolysis and enzymatic hydrolysis. Acid hydrolysis is the oldest technology for the conversion of cellulosic feedstock to ethanol and can only be used following an acid pretreatment process. An alternative method is to use a combination of enzymes to perform the hydrolysis after the biomass has been pretreated. This process is potentially more effective at hydrolyzing pretreated biomass but in the past has not been economically feasible due to the prohibitively high cost of the enzymes. The falling cost of these enzymes in recent years has made the production of cellulosic biofuels using enzymatic hydrolysis possible. The lignin is largely unaffected by the hydrolysis and fuel production steps but is carried through these processes until it is separated out in the fuel separation step and burned for process energy or sold as a co-product.

i. Acid Hydrolysis

Acid hydrolysis is a technique that has been used for over 100 years to convert cellulosic feedstocks into fuels. In the acid hydrolysis process the lignin and cellulose portions of the feedstock that remain after the hemicellulose has been dissolved, hydrolyzed, and separated during the dilute acid pretreatment process is treated with a second acid stream. This second acid treatment uses a less concentrated acid than the pretreatment stage but at a higher temperature, as high as 215 °C. This treatment hydrolyzes the cellulose into glucose and other six-carbon sugars that are then fed to biological organisms to produce the desired fuel. It is necessary to hydrolyze the hemicellulose and cellulose in two separate steps to prevent the conversion of the pentose sugars that result from the hydrolysis of the hemicellulose from being further converted into furfural and other chemicals. This would not only reduce the total production of sugars from the cellulosic feedstock, but also inhibit the production of fuel from the sugars in later stages of the process.

The acidic solution containing the sugars produced as a result of the hydrolysis reaction must also be treated so that this stream can be fed to the biological organisms that will convert these sugars into fuel. In order to operate an acid hydrolysis process cost effectively the acid must be recovered, not simply neutralized. Methods currently being used to recover this acid include membrane separation and continuous ion exchange. The advantages of using an acid hydrolysis are that this process is well understood

[20] Wyborny, Lester. "In-Depth Assessment of Advanced Biofuels Technologies." Memo to the docket, November 17, 2010.

and capable of producing high sugar yields from a wide variety of feedstocks. Capital costs are high however, as materials compatible with the acidic streams must be extensively utilized. The high temperatures necessary for acid hydrolysis also result in considerable energy costs.

ii. Enzymatic Hydrolysis

The enzymatic hydrolysis process uses enzymes, rather than acids, to hydrolyze the cellulose and any remaining hemicellulose from the pretreatment process. This process is much more versatile than the acid hydrolysis and can be used in combination with any of the pretreatment processes described above, provided that the structure of the lignocellulosic feedstock has been disrupted enough to allow the enzymes to easily access the hemicellulose and cellulose. After the feedstock has gone through pretreatment a cocktail of cellulose enzymes is added. These enzymes can be produced by the cellulosic biofuel producer or purchased from enzyme producers such as Novozymes, Genencor, and others. The exact mixture of enzymes used in the enzymatic hydrolysis stage can vary greatly depending on which of the pretreatment stages is used as well as the composition of the feedstock.

The main advantages of the enzymatic hydrolysis process are a result of the mild operating conditions. Because no acid is used, special materials are not required for the reaction vessels. Enzymatic hydrolysis is carried out at relatively low temperatures, usually around 50° C, and atmospheric pressure and therefore has low energy requirements. These conditions also result in less undesired reactions that would reduce the production of sugars and potentially inhibit fuel production. Enzymatic hydrolysis works best with a uniform feedstock, such as agricultural residues or energy crops, where the concentration and combination of enzymes can be optimized for maximum sugar production. If the composition of the feedstock varies daily, as can be the case with fuel producers utilizing MSW or other waste streams, or even seasonally, it will be more difficult to ensure that the correct enzyme cocktail is being used to carry out the hydrolysis as efficiently as possible. The main hurdle to using an enzymatic hydrolysis has been and continues to be the costs of the enzymes. Recent advances by companies that produce enzymes for the hydrolysis of cellulosic materials have resulted in a drastic cost reduction of these enzymes. If, as many researchers and cellulosic biofuel producers expect, the cost of these enzymes continues to fall it is likely that enzymatic hydrolysis will be a lower cost option than acid hydrolysis.

d. Fuel Production

After the cellulosic biomass has been hydrolyzed to simple sugars, this sugar solution is converted to fuel by biological organisms. In some biochemical fuel production processes the sugars produced from the fermentation of the hemicellulose, which are mainly five-carbon sugars, are converted to fuel in a separate reactor and with a different set of organisms than the sugars produced from the cellulose hydrolysis, which are mainly six-carbon sugars. Others processes, however, produce fuel from the five and six-carbon sugars in the same reaction vessel.

A wide range of biological organisms can be used to convert the simple sugars into fuel. These include yeasts, bacteria, and other microbes, some of which are naturally occurring and others that have been genetically modified. The ideal biological organism converts both five and six-carbon sugars to fuel with a high efficiency, is able to tolerate a range of conditions, and is adaptable to process sugar streams of varying compositions that may result from variations in feedstock. Many cellulosic biofuel producers have their own proprietary organism or organisms optimized to produce the desired fuel from their unique combination of feedstock, pretreatment and hydrolysis processes, and fuel conversion conditions. Other cellulosic fuel producers license these organisms from biotechnology companies who specialize in their discovery and production.

The different biological organisms being considered for cellulosic biofuel production are capable of producing many different types of fuels. Most cellulosic biofuel producers are working with organisms that produce ethanol. In many ways this is the simplest fuel to produce from lignocellulosic biomass as the production of ethanol from simple sugars is a well understood process. Others intend to produce butanol or other alcohols that have higher energy content. Butanol has the potential to be blended into gasoline in greater concentrations than ethanol and therefore has a potentially greater market as well as value due to its higher energy content. Yields for butanol, however, are currently lower per ton of feedstock than ethanol.

Other cellulosic biofuel producers intend to produce hydrocarbon fuels very similar to gasoline, diesel, and jet fuel. These fuels command a higher price than alcohols, have a greater energy density, and can potentially be blended into conventional gasoline and diesel for use in any conventional vehicles without strict blending limits. They could also be transported by existing pipelines and utilize the same infrastructure as the petroleum industry. Some of the processes being researched by fuel producers result in a single compound, such as iso-octane, that would need to be blended into petroleum gasoline in order to be used as transportation fuel, while others produce a range of hydrocarbons very similar to those found in gasoline or diesel fuel refined from petroleum and could potentially be used in conventional vehicles without blending. The yields of fuel produced by these organisms through biochemical processes are currently significantly lower than those processes that produce ethanol and other alcohols.

e. Fuel Separation

In the fuel separation stage the fuel produced is separated from the water, lignin, any un-reacted hemicellulose and cellulose, and any other compounds remaining after the fuel production stage. The complexity of this stage is highly dependent on the type of fuel produced. For processes producing hydrocarbon fuels this stage can be as simple as a settling tank, where the hydrocarbons are allowed to float to the top and are removed. Recovering the ethanol is a much more difficult task. To recover the ethanol, a distillation process, nearly identical to that used in the grain ethanol industry, is used. The ethanol solution is first separated from the solids before being sent to a distillation column called a beer column. The overheads of the beer column are fed to a second distillation column, called a rectifier for further separation. The rectifier produces a stream with an ethanol content of approximately 96%. A molecular sieve unit is then used to dehydrate this stream to produce fuel grade ethanol with purity greater than 99.5%. Gasoline, natural gasoline, or some other approved denaturant is then added to the ethanol before the fuel is stored. After the fuel has been recovered the remaining lignin and solids are dried and either burned on site to provide process heat and electricity or sold as a byproduct of the fuel production process. The waste water is either recycled or sent to a water treatment facility.

The distillation of ethanol is a very energy intensive process and new technologies, such as membrane separation, are being developed that could potentially reduce the energy intensity, and thus the cost, of the ethanol dehydration process.

f. Process Variations

While the process described above outlines the general biochemical process used by many cellulosic biofuel producers, there are several prominent variations being pursued. These variations usually seek to simplify the biochemical fuel production process by combining several steps into a single step or using other means to reduce the capital or operating costs of the process. Simultaneous Saccharification and Fermentation (SSF), Simultaneous Saccharification and Co-Fermentation (SSCF), Consolidated Bio-Processing (CBP), and Single Step Fuel Production are all production methods being developed by various biofuel production companies to combine two or more of the steps outlined above. These process variations are discussed in more detail in the aforementioned technical memo to the docket. These modifications are usually enabled by a proprietary technology or biological organism that makes these changes possible.

g. Current Status of Biochemical Conversion Technology

The biochemical cellulosic fuel production industry is currently transitioning from an industry consisting mostly of small scale research and optimization focused facilities to one capable of producing fuel at a commercial scale. Companies such as Iogen, DuPont Danisco Cellulosic Ethanol, Fiberight and KL Energy are just beginning to market the fuel they are producing at their first small scale commercial fuel production facilities. Many other facilities, including some large scale facilities capable of producing tens of millions of gallons of fuel are planned to come online starting in 2012 and in the following years.

There are many factors that are likely to continue to drive the expansion of the cellulosic biofuel industry. The mandates put into place by the RFS2 program have created a demand for cellulosic biofuels, and higher crude oil prices can also make cellulosic biofuels more economically attractive. The biochemical production process also has several important benefits including relatively low capital costs, highly selective fuel production, and flexibility in the type of fuel produced.

While the poor worldwide economy and tight credit markets has had a negative impact on the biofuel industry as a whole, the cellulosic biofuel producers utilizing biochemical processes have not been as hard hit as many others in the industry. This is partially due to the relatively low capital costs of biochemical production plants as a result of the relative simplicity and mild operating conditions of these plants. Several companies have been able to purchase distressed grain ethanol plants and are in the process of modifying them to produce cellulosic ethanol, further reducing the capital costs of their initial facilities. Another advantage that biochemical processes have over other cellulosic fuel production processes is their high selectivity in the fuels they produce. Unlike chemical catalysts, which often produce a range of products and byproducts, biological organisms often produce a single type of fuel, which leads to very high fuel production rates per unit of sugar. Finally, there is a potential to further decrease the production costs of cellulosic biofuels using biochemical processes. Unlike other production methods such as gasification which are relatively mature technologies, biochemical production of fuels from cellulosic feedstock is a young technology. One of the major costs of the biochemical fuel production processes currently are the enzymes. Great strides have been made recently in reducing the cost of these enzymes, and as the price of enzymes continues to fall so will the operating costs of biochemical fuel production processes.

h. Path to Commercialization

While there are many promising qualities of the biochemical fuel production process, we have identified several different aspects of the process which can be further improved. The pretreatment process can be improved to speed the conversion of cellulose and hemicellulose to simple sugars and to minimize the production of other undesired compounds, especially those that may inhibit the fuel production process. The ability of the biological fuel production organisms to process a wide range of both five and six carbon sugars can also be improved. Both these improvements will increase the fuel yield per ton of cellulosic feedstock, reducing the operating costs of the process. Finally, the enzyme production process can be further optimized, which would lower the price for enzymes and improve the economics of hydrolyzing cellulose to sugars.

Another opportunity for improvement would be the profitable utilization of the lignin portion of the cellulosic feedstock. Unlike some of the other cellulosic biofuel production processes, the biochemical process does not convert the lignin to fuel. Cellulosic feedstock can contain up to 40% lignin, depending on the type of feedstock used, so the effective utilization of this lignin is an important component of the profitability of the biochemical process. One option for the use of the lignin is to burn it to provide process heat and electricity, as well as excess electricity to the grid. While this would provide value for the lignin, it would require fairly expensive boilers and turbines that increase the capital cost of the facility. If the lignin cannot be used as part of the fuel production process it may be able to be marketed as a solid fuel with high energy density and low carbon intensity.

These various improvements to cellulosic biofuel plants would make biochemical processes more cost-competitive with petroleum and other cellulosic biofuels. For more details on the potential cost impacts of these improvements, see the aforementioned technical memo which has been added to the docket of this rule.

2. Thermochemical

Thermochemical conversion involves biomass being broken down into syngas (primarily CO and H_2) using heat and upgraded to fuels using a combination of heat and pressure in the presence of catalysts.[21] For generating the syngas, thermochemical processes partially oxidize biomass in the presence of a gasifying agent, usually air, oxygen, and/or steam. It is important to note that these processing steps are also applicable to other feedstocks (*e.g.,* coal or natural gas); the only difference is that a renewable feedstock is used (*i.e.,* biomass) to produce cellulosic biofuel. The cellulosic biofuel produced can be mixed alcohols, an optimized process to produce only one alcohol such as ethanol, or it can be diesel fuel and naphtha. A thermochemical unit can also complement a biochemical processing plant to enhance the economics of an integrated biorefinery by converting lignin-rich, non-fermentable material left over from high-starch or cellulosic feedstocks conversion.[22] Compared to corn ethanol or biochemical cellulosic ethanol plants, the use of biomass gasification may allow for greater flexibility to utilize different biomass feedstocks at a

[21] US. DOE. Technologies: Processing and Conversion. Accessed at: *http://www1.eere.energy.gov/biomass/processing_conversion.html* on October 28, 2008.

[22] EERE, DOE, *Thermochemical Conversion,* & *Biochemical Conversion, Biomass Program Thermochemical R&D. http://www1.eere.energy.gov/biomass/thermochemical_conversion.html. http://www1.eere.energy.gov/biomass/biochemical_conversion.html.*

specific plant. Mixed biomass feedstocks may also be used, based on availability of long-term suppliers, seasonal availability, harvest cycle, and costs.

The general steps of the gasification thermochemical process include: Feedstock handling, gasification, gas cleanup and conditioning, fuel synthesis, and separation. Refer to Figure IV.C.2–1 for a schematic of the thermochemical cellulosic ethanol production process through gasification. For greater detail on the thermochemical mixed-alcohols route, refer to NREL technical documentation.[23]

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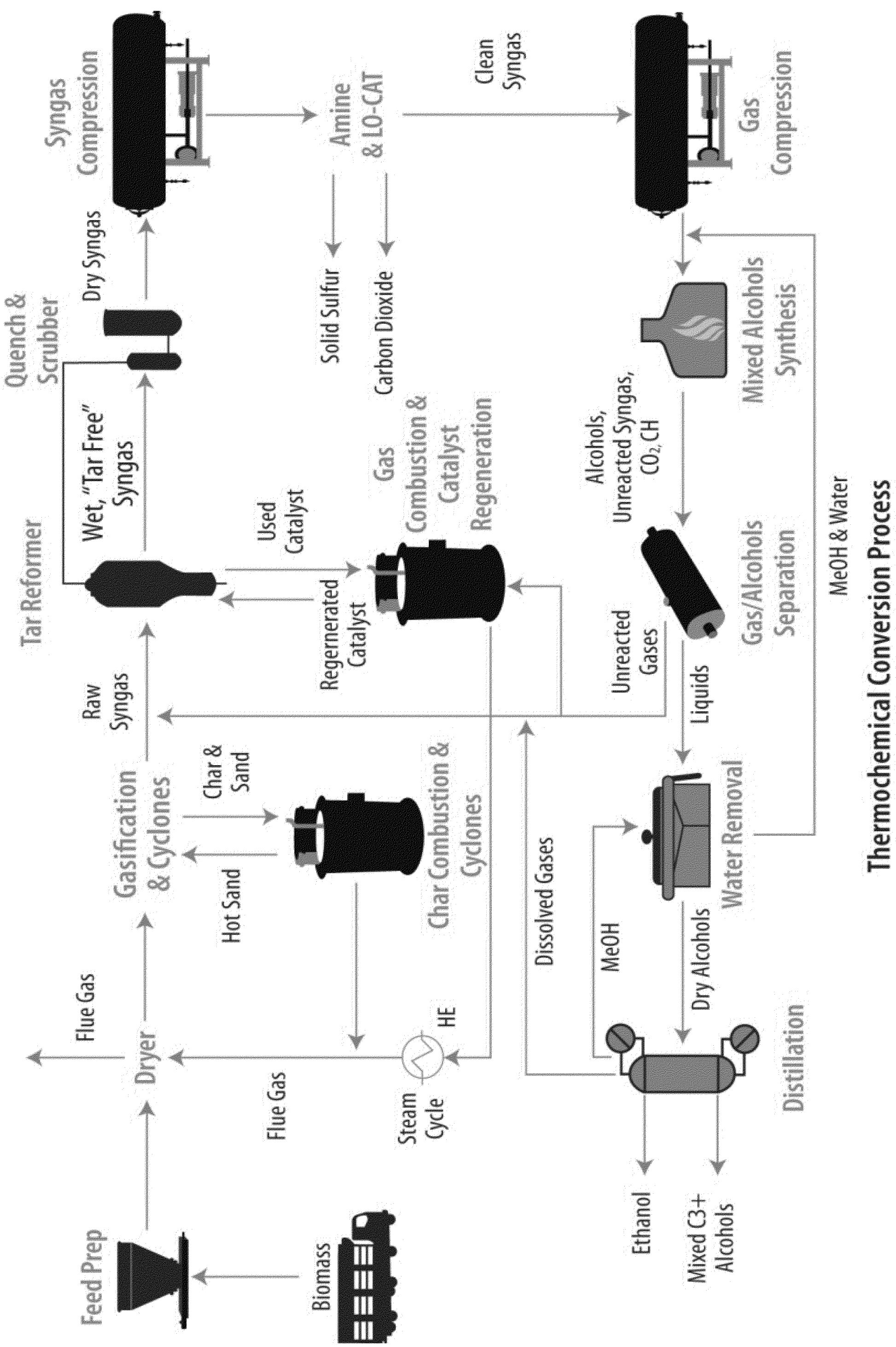
Figure IV.C.2-1

Cellulosic Ethanol Thermochemical Gasification Process

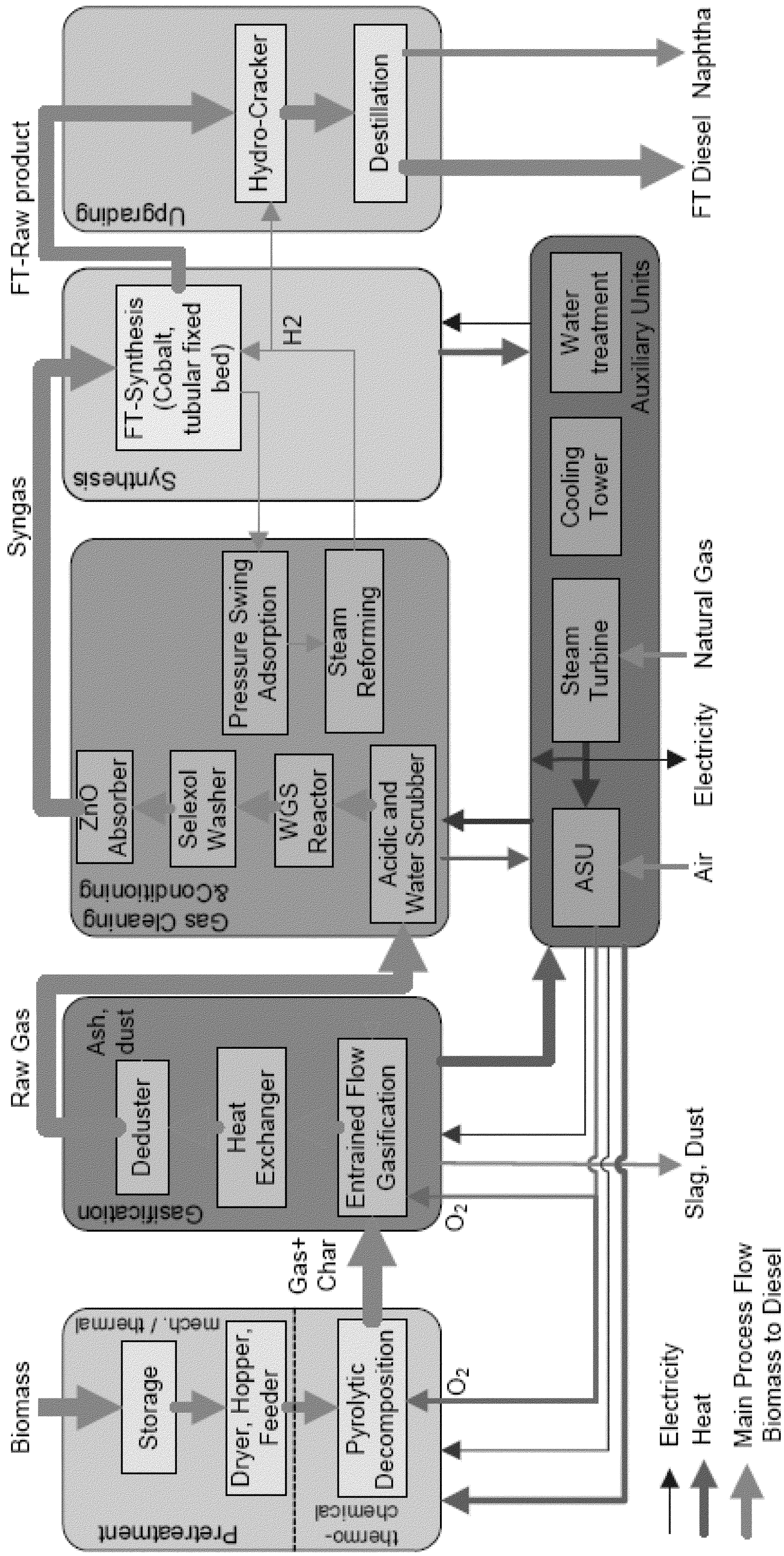


[23] Aden, Andy, Mixed Alcohols from Woody Biomass—2010, 2015, 2022, National Renewable Energy Laboratory (NREL), September 23, 2009.

Figure IV.C.2–2 is a block diagram of a biomass to liquids (BTL) process which produces diesel fuel and naphtha through a thermochemical process.

Figure IV.C.2-2

Biomass to Liquids (BTL) Thermochemical Gasification Process



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The first step in a thermochemical plant is feedstock size reduction. The particle size requirement for a thermochemical process is around 10-mm to 100-mm in diameter.[24] Once the feed is ground to the proper size, flue gases from the char combustor and tar reformer catalyst regenerator dry the feed from the as-received moisture level of around 30% to 50% moisture to the level required by the gasifier.

The dried, ground feedstock is fed to a gasification reactor for producing syngas. There are two general classes of gasifiers: Partial oxidation (PO_X) and indirect gasifiers. Partial oxidation gasifiers (directly-heated gasifiers) use the exothermic reaction between oxygen and organics to provide the heat necessary to devolatilize biomass and to convert residual carbon-rich chars. Indirect gasifiers use steam to accomplish gasification through heat transfer from a hot solid or through a heat transfer surface. Either the byproduct char and/or a portion of the product gas can be combusted with air (external to the gasifier itself) to provide the energy required for gasification. The raw syngas produced from either type of gasifier has a low to medium energy content which consists mainly of CO, H_2, CO_2, H_2O, N_2, and hydrocarbons.

Once the biomass is gasified and converted to syngas, the syngas must be cleaned and conditioned, as minor components of tars, sulfur, nitrogen oxides, alkali metals, and particulates have the potential to negatively affect the syngas conversion steps. Therefore, unwanted impurities are removed in a gas cleanup step and the gas composition is further modified during gas conditioning. Because this step is a necessary part of the thermochemical process, thermochemical plants are good candidates for processing municipal solid waste (MSW) which may contain a significant amount of toxic material. Gas conditioning steps include sulfur polishing to remove trace levels of H_2S and a water-gas shift reaction to adjust the final H_2/CO ratio for optimized fuel synthesis.

After cleanup and conditioning, the "clean" syngas is comprised of essentially CO and H_2. The syngas is then converted into a liquid fuel by a catalytic process. The fuel producer has the choice of producing diesel fuel or alcohols from syngas by optimizing the type of catalyst used and the H_2/CO ratio. Diesel fuel has historically been the primary focus of such processes by using a Fischer Tropsch reactor, as it produces a high quality distillate product.

A carefully integrated conventional steam cycle produces process heat and electricity (excess electricity is exported). Pre-heaters, steam generators, and super-heaters generate steam that drives turbines on compressors and electrical generators. The heat balance around a thermochemical unit or thermochemical combined unit must be carefully designed and tuned in order to avoid unnecessary heat losses.[25] These facilities greatly increase the thermal efficiency of these plants, but they add to the very high capital costs of these technologies.

a. Ethanol Based on a Thermochemical Platform

Conceptual designs and techno-economic models have been developed for ethanol production via mixed alcohol synthesis using catalytic processes. The proposed mixed alcohol process produces a mixture of ethanol along with higher normal alcohols (e.g., n-propanol, n-butanol, and n-pentanol). The by-product higher normal alcohols have value as commodity chemicals and fuel additives.

The liquid from the low-pressure separator is dehydrated in vapor-phase molecular sieves, producing the dehydrated mixed alcohol feed into a methanol/ethanol overhead stream and a mixed, higher molecular weight alcohol bottom stream. The overhead stream is further separated into a methanol stream and an ethanol stream.

Two companies which are pursuing ethanol based on a thermochemical route are Range Fuels and Enerkem. Range Fuels completed construction of their first commercial facility in Soperton, Georgia in the first quarter of 2010 and began the production of cellulosic biofuel in the third quarter of 2010. In the first phase of operation. Range will use wood chips as a feedstock but they also plan to investigate the possibility of using other non-food biomass. In its initial phase, the Range plant is expected to produce up to 4 million gallons per year of primarily methanol as well as a small quantity of ethanol which they intend to sell into the transportation fuel market. After the company is confident in its operations, Range will begin efforts to expand the plant and add additional reaction capacity to increase production of ethanol and other alcohols.

Enerkem is pursuing cellulosic ethanol production via the thermochemical route. The Canadian-based company was recently announced as a recipient of a $50 million grant from DOE to build a woody biomass-to-ethanol plant in Pontotoc, MS. The U.S. plant is not scheduled to come online until 2012, but Enerkem's 1.3 MGY demonstration plant in Westbury, Quebec is currently operational. According to the company, plant construction in Westbury started in October 2007 and it began producing syngas in late 2009. After the successful testing of the syngas unit, Enerkem added methanol production capabilities and began producing methanol in 2010. The last step for the Westbury plant will be for Enerkem to add a reactor to convert the methanol to ethanol and other higher order alcohols. While it is unclear at this time whether any cellulosic ethanol will be produced in 2011, Enerkem has informed EPA that they do not intend to export any cellulosic fuel to the United States. If Enerkem does export some of its cellulosic biofuel to the U.S., however, it could be used to help to enable refiners meet the 2011 cellulosic biofuel standard.

b. Diesel and Naphtha Production Based on a Thermochemical Platform

The cleaned and water-shifted syngas is sent to the Fischer Tropsch (FT) reactor where the carbon monoxide and hydrogen are reacted over a catalyst. Current FT catalysts include iron-based catalysts and cobalt-based catalysts. The FT reactor creates a syncrude, which is a variety of hydrocarbons that boil over a wide distillation range (a mix of heavy and light hydrocarbons) which are separated into various components based on their vapor pressure. The primary products resulting from this separation are liquid petroleum gas (LPG), naphtha, distillate, and wax fractions. The heavier compounds are hydrocracked to maximize the production of diesel fuel. Conversely, the naphtha material is very low in octane; thus, it would either have to be upgraded, blended down with high octane blendstocks (*i.e.,* ethanol), or upgraded to a higher octane blendstock to have much value for use in gasoline.

Choren is a European company which is pursuing a thermochemical

[24] Lin Wei, Graduate Research Assistant, Lester O. Pordesimo, Assistant Professor Willam D. Batchelor, Professor, Department of Agricultural and Biological Engineering, Mississippi State University, MS 39762, USA, *Ethanol Production from Wood: Comparison of Hydrolysis Fermentation and Gasification Biosynthesis,* Paper Number: 076036, Written for presentation at the 2007 ASABE Annual International Meeting. Minneapolis Convention Center, Minneapolis, MN, 17–20 June 2007.

[25] S. Phillips, A. Aden, J. Jechura, and D. Dayton, National Renewable Energy Laboratory, Golden, Colorado 80401–3393, T. Eggeman, Neoterics International, Inc., *Thermochemical Ethanol via Indirect Gasification and Mixed Alcohol Synthesis of Lignocellulosic Biomass,* Technical Report, NREL/TP–510–41168, April 2007.

technology for producing diesel fuel and naphtha. The principal aspect of Choren's process is their patented three-stage gasification reactor which includes low temperature gasification, high temperature gasification, and endothermic entrained bed gasification. Choren designed its gasification reactor with three stages to more fully convert the feedstock to syngas. Choren will be building a commercial plant in Freiberg/Saxony, Germany that is expected to be operational in 2011 or 2012. Initially, the plant will use biomass from nearby forests, the wood-processing industry, and straw from farmland. Although any fuel produced in 2011 by its Freiberg/Saxony plant and marketed commercially would most likely be used in Europe, it is possible that some of that fuel could be exported to the U.S. Choren is also planning to build a commercial thermochemical/biomass-to-liquids (BTL) plant in the U.S. after their Freiberg/Saxony plant is operational in Germany.

Baard Energy is a U.S. company which plans on utilizing a thermochemical technology for producing diesel fuel and naphtha. Baard, however, plans on primarily combusting coal and cofiring biomass with the coal. Cofiring the biomass with the coal will make their first plant more like the coal-to-liquids plants which are operating today, which may help to convince investors that this technology is already tested. Baard's coal and biomass-to-liquids plant is not expected to be operational until at least 2012.

One challenge for the companies pursing the thermochemical route is the significant capital costs associated with these technologies. The capital costs are very high because there are two significant reactors required for each plant—the gasification reactor and the syngas-to-fuel reactor. Additionally, the syngas must be cleaned to protect the catalysts used in the downstream syngas-to-fuel reactor which requires additional capital costs. However, because of this cleaning step, this technology is a very good candidate for processing MSW which may contain toxic compounds. When considering the cost savings for not having to pay the tipping fees at municipal dumping grounds, MSW feedstocks may avoid almost all the purchase costs for MSW feedstocks which would significantly help offset the high capital costs.

3. Hybrid Thermochemical/Biochemical Processes

Hybrid technologies include process elements involving both the gasification stage of a typical thermochemical process, as well as the fermentation stage of a typical biochemical process and therefore cannot be placed easily into either category. For more specific information regarding either biochemical processes or thermochemical, *please see* Sections IV.C.1 and IV.C.2 respectively. Currently, there are several strategies for the production of ethanol through hybrid processes. These strategies are differentiated by the order in which the thermochemical and biochemical steps take place within the process, as well as how the intermediate products from each step are used.

While we do not expect significant commercial production from hybrid processes in 2011, there are several companies pursing this approach for the future. Examples of the first process strategy, described in Section IV.C.3.a below, include both INEOS Bio and Coskata. As of December 4, 2009 INEOS Bio (along with partner New Planet Energy) has been selected for a $50MM DOE grant for the construction of an 8 MGPY plant in River County, Florida. This plant is projected to finish construction in late 2011. Coskata is currently running a 40,000 gallon per year pilot plant that became operational in 2009 in Madison, Pennsylvania. Coskata is targeting to design and build a 50 MGPY commercial plant that it expects to be operational in 2012. A company currently pursuing the second process strategy, described in Section IV.C.3.b below, is Zeachem Inc. Zeachem is currently constructing a 250 KGPY demonstration plant in Boardman, Oregon. They have received a $25MM DOE grant and expect to have a full commercial production facility operational in 2013.

a. Biochemical Step Following Thermochemical Step

One hybrid strategy involves the gasification of all feedstock material to syngas before being processed into ethanol using a biochemical fermenter. After gasification, the syngas stream is cooled and bubbled into a fermenter containing modified microorganisms, usually bacteria or yeast. This fermenter replaces the typical catalysts found after gasification in a traditional thermochemical process. Unlike traditional fermentation (which break down C5 and C6 sugars), these microorganisms are engineered to convert the carbon monoxide and hydrogen contained in the syngas stream directly into ethanol. After fermentation, the effluent water/ethanol stream from the fermenter is separated similarly to a biochemical process, usually using a combination of distillation and molecular sieves. The separated water can then be recycled back into the fermentation stage of the process. Typical yields of ethanol are predicted to be in the 100–120 gallon per ton range.

Since gasification converts all carbonaceous feedstock material to a uniform syngas before fermentation, there is a higher flexibility of feedstock choices than if these materials were to be fermented directly. In addition, processing incoming feedstock with gasification does not require the addition of enzymes or acid hydrolysis necessary in a biochemical process to aid in the breakdown of cellulosic materials. Fermenting syngas also captures all available carbon contained in the feedstock, including lignin that would not be processed in a typical biochemical fermentation. However, more energy is lost as waste heat as well as secondary carbon dioxide production in the gasification process than would be lost for biochemical feedstock preparation. Using a fermenter in a hybrid process replaces the catalyst needed in a typical thermochemical process. These microorganisms allow for a higher variation of the incoming syngas stream properties, avoid the necessity of a water-shift reaction preceding traditional catalytic conversion, and are able to operate at lower temperatures and pressures than those required for a catalytic conversion to ethanol. Microorganisms, unlike a catalyst, are also self-sustaining and do not require periodic replacement. They are; however, susceptible to bacterial and viral infections which requires periodic cleaning of the fermentation reactors.

b. Concurrent Biochemical and Thermochemical Steps

Another hybrid production strategy involves gasification of the typically unfermentable feedstock fraction (lignin) concurrently with a typical fermentation step for the cellulose and hemicellulose fraction. These steps are subsequently combined in a hydrogenation reaction of the lignin-based syngas with the product of the fermented stream. The feedstock first undergoes acid hydrolysis to break down the cellulose and hemicellulose. Before fermentation, the unfermentable portion of feedstock (lignin, ash and other residue) is fractioned and sent to a gasifier. Concurrently, the hydrolyzed cellulose and hemicellulose is fermented using an acetogen microorganism. These acetogens occur naturally, and therefore do not have to be modified for this process. These acetogens convert both five-carbon and six-carbon sugars from the hydrolized feedstock to acetic acid. This reaction creates no carbon dioxide, unlike traditional fermentation using yeast, preserving the maximum amount of carbon for the finished fuel. The acetic acid stream then undergoes esterification to create ethyl acetate. Meanwhile, the syngas stream from the gasification of lignin and other residue is separated into its carbon monoxide and hydrogen components. The carbon monoxide stream can be further combusted to provide process heat or energy. The hydrogen stream is combined with the ethyl acetate in a hydrolysis reaction to form ethanol. Acetic acid and ethyl acetate also form the precursors to many other chemical compounds and therefore may be sold in addition to ethanol or further converted to other compounds for sale in the chemicals market. Typical yields for this technology are predicted in the 130–150 gallon per ton range.

4. Pyrolysis and Depolymerization

Pyrolysis and depolymerization are technologies which are capable of creating biofuels from cellulose by either thermally or catalytically breaking them down into molecules which fall within the boiling range of transportation fuels. Pyrolysis technologies are usually thought of as being primarily a thermal technology, however, newer pyrolysis technologies are being developed which are attempting to integrate the use of some catalysts. These are all unique processes, typically with single companies developing the technologies, so they are discussed separately below.

a. Pyrolysis Diesel Fuel and Gasoline

Pyrolysis oils, or bio-oils, are produced by thermally cracking cellulosic biomass at lower temperatures than the gasification process, thus producing a liquid instead of a synthesis gas.[26] The reaction can occur either with or without the use of catalysts, but it occurs without any additional oxygen being present. The resulting oil which is produced must have particulates and ash removed in filtration to create a homogenous "dirty" crude oil type of product. This dirty crude oil must be further upgraded to hydrocarbon fuels via hydrotreating and hydrocracking processing, which reduces its total oxygen content and cracks the heaviest of the hydrocarbon compounds. While one of the finished fuels produced by the pyrolysis process is diesel fuel, a significant amount of gasoline would likely be produced as well. There are two main reaction pathways currently being explored: A two step pyrolysis pathway, and a one step pyrolysis pathway.

The simplest technology used for the two-step pyrolysis approach is called fast pyrolysis. The fast pyrolysis technology uses sand in a fluidized bed to transform bio-fuels into bio-oil. This is purely a thermal process, where the sand's (or other solid's) role is to transfer heat to the biomass. For two reasons, the bio-oils from fast pyrolysis technologies must be upgraded. First, fast pyrolysis oil is unstable, acidic, viscous and may separate itself into two phases so it must be immediately upgraded or it will begin to degrade and repolymerize. The second issue is that pyrolysis bio-oil must be upgraded or it won't meet transportation fuel specifications.

Another approach to fast pyrolysis being pursued by several companies would be to substitute a catalyst in place of sand and the catalyst would be able to stabilize the resulting bio-oil in addition to helping depolymerize the biomass to liquids. Although the resulting bio-oil is stable, it still has to be upgraded into a transportation fuel, since it would still have a high level of oxygenated compounds.

The National Renewable Energy Laboratory (NREL) is working on a "hot filtration" technology that is intended to stabilize bio-oil created using the fast pyrolysis process for a very long period of time (years). This would allow the bio-oil to be stored and transported to an upgrading facility without significant degradation.

It may be possible to use a sophisticated catalyst (instead of sand) in a single step pyrolysis reaction to create pyrolysis oils that exhibit much improved bio-oil properties. The catalysts would not only be able to help depolymerize cellulosic feedstocks, but they produce a bio-oil which could possibly be used directly as transportation fuel. Thus, a second upgrading step may not be necessary. The difficulty encountered by this technology is that catalysts which have been used in the one step process are relatively expensive and they degrade quickly due to the metals which are present in the biomass. Development work on the two-step and one-step pyrolysis processes is ongoing.

Dynamotive Energy Systems Corporation is a Canadian company which uses fast pyrolysis to convert dry waste biomass and energy crops into different products including bio-oil. The bio-oil produced is polar due to its high oxygen content and it contains up to 25% water which is intimately mixed and does not easily separate into another phase with time. Since the bio-oil contains significant amounts of both oxygen and water, it is not directly useable as fuel in conventional vehicles and would have to be converted via another catalytic conversion processing step. The additional catalytic step envisioned by Dynamotive to upgrade the bio-oil into a transportation fuel would combust the material into a synthesis gas which would then be converted into diesel fuel or bio-methanol via a catalytic reaction (the BTL process). The diesel fuel produced is expected to be compatible with existing petroleum diesel fuels.

Dynamotive has two small demonstration plants. One demonstration plant is located in Guelph, Ontario, Canada and its capacity is 66,000 dry tons of biomass a year with an energy output equivalent to 130,000 barrels of oil. The other demonstration plant is located in West Lorne Ontario, Canada. Dynamotive continues to work on a technology for converting its bio-oil to transportation fuels, although they have not announced plans for building such a facility due to funding limits. While Dynamotive is expected to continue to sell its fuel into the chemicals market, it would be possible for Dynamotive to set up an agreement with a refining company which could upgrade its bio-oil to a #2 fuel oil or diesel fuel using existing refinery hardware so that the fuel would qualify under the RFS2 program and contribute to meeting the 2011 cellulosic biofuel standard.

Envergent is a company formed through a joint venture between Honeywell's UOP and the Ensyn Corporation. Although Ensyn has been using fast pyrolysis for more than a decade to produce specialty chemicals, UOP is relying on its decades of experience developing refining technologies to convert the pyrolysis oils into transportation fuels. Envergent is also working with U.S. National laboratories to further their technology. Based on their current technology and depending on the feedstock processed, about 70% of the feedstock is converted into liquid products. The gasoline range products produced are high in octane, while the diesel fuel products are low in cetane. Envergen estimates that if it was able to procure cellulosic feedstocks at $70 per ton, their technology would be competitive with #2 fuel oil produced from crude oil priced at about $40 per barrel. Envergent is licensing this technology as well as working with a U.S. oil company

[26] DOE EERE Biomass Program. "Thermochemical Conversion Processes: Pyrolysis" *http://www1.eere.energy.gov/biomass/thermochemical_processes.html,* November 6, 2008.

to test out this technology in a commercial setting in the U.S.

Petrobras is a Brazilian oil company also working to develop a pyrolysis technology. Because of Petrobas' work in this area (and other areas on biofuels), a Memorandum of Understanding was signed by United States' Secretary of State and Brazil's External Relations Minister on March 9, 2007 to advance the cooperation on biofuels. A second Memorandum of Understanding was signed by PETROBRAS and NREL in September 2008 aimed at collaborating to maximize the benefit of their respective institutional interests in second generation biofuels. Petrobras is also negotiating a Cooperation Agreement with NREL to develop a two step pyrolysis route to produce biofuels from agricultural wastes such as sugar cane bagasse, wood chips or corn stover. Petrobras is optimistic that a catalytic pyrolysis technology can be developed that will produce a stable bio-oil (pyrolysis oil). Petrobras is also hopeful that a one-step pyrolysis technology can be developed to convert biomass directly to transportation fuels, but believes that the two step process may be more economically attractive.

b. Catalytic Depolymerization

There are several companies pursuing catalytic depolymerization including Covanta, Cello Energy and Green Power.

Covanta is currently operating 45 energy-from-waste facilities which annually convert 20 million tons of municipal solid waste materials into 9 million megawatt hours of electricity and 10 billion pounds of steam, which is sold to a variety of industries. Covanta has secured license rights to a catalytic depolymerization technology developed by AlphaKat GmbH. Covanta constructed an AlphaKat demonstration plant in West Wareham, Massachusetts designed to process 45 tons of waste per day into renewable diesel fuel. If successful, the total liquid fuel production capacity of this demonstration plant will be 1 million gallons per year. This plant started up in mid-2010 and after experimenting with the technology to further understand its capabilities, Covanta expects to use the liquid distillate fuel produced from this demonstration plant within its own plant as heating oil and nonroad diesel fuel.

The Cello-Energy process is also a catalytic depolymerization technology. At moderate pressure and temperature, the Cello-Energy process catalytically removes the oxygen and minerals from the hydrocarbons that comprise finely ground cellulose. This results in a mixture of short chain (3, 6 and 9 carbon) hydrocarbon compounds. These short chain hydrocarbon compounds are polymerized to form compounds that boil in the diesel boiling range, though the process can also be adjusted to produce gasoline or jet fuel. The resulting diesel fuel meets the ASTM standards, is in the range of 50 to 55 cetane and typically contains a very low concentration of sulfur.

The Cello process is reported to be on the order of 82% efficient at converting the feedstock energy content into the energy content of the product, which is very high compared to most of today's biochemical and thermochemical processes which are on the order of 50% efficient or less. Because of the simplicity of the process, the capital costs are very low. A 50 million gallon per year plant is claimed to only incur a total cost of $45 million. Because of its high efficiency in converting feedstocks into liquid fuel, the production and operating costs are also estimated to be very low.

In December 2008, Cello completed construction of a 20 million gallon per year commercial demonstration plant. However, they are still working to resolve process issues that have arisen upon scaleup from their pilot plant. However, we are doubtful that Cello will be able to produce any volume of cellulosic biofuel in 2011 as described more fully in Section II.

The Green Power process catalytically depolymerizes cellulosic feedstocks at moderate temperatures into liquid hydrocarbon fuels. The proposed feedstock is municipal solid waste (MSW) or other waste material such as animal waste, plastics, agriculture residue, woody biomass and sewage waste. The feedstock is first ground to a size finer than 5 mm. The feedstock is placed along with a catalyst, some lime which serves as a neutralizing agent, and some fuel which provides a liquid medium, into a reactor and heated to around 350 degrees Celsius. As described by the company, this technology may fit the description for catalyzed pyrolysis reactions described above, but we have categorized this as a separate catalytic depolymerization technology due to its unique features. In the reactor, the feedstock is catalytically converted to liquid fuels which primarily fall within the gasoline and diesel fuel boiling ranges, although these fuels may need further upgrading. The liquid fuels are separated from any solids which are present and are distilled into typical fuel streams including naphtha, diesel fuel, kerosene, and fuel oil. According to publically available information about this technology, the process reportedly produces 120 gallons per ton of feedstock introduced into the process. A light hydrocarbon gas, which is mostly methane, is also produced, but this gas is expected to be burned in a turbine to generate electricity and the waste heat would be used for heating the process. Some carbon dioxide may also be formed and released from the process.

Greenpower completed construction of a demonstration plant located in Fife, Washington in March of 2008. Greenpower is working on obtaining additional funding and an air permit through the State of Washington Environmental Office. While we do not expect that Greenpower will have its plant operational in 2011, it is possible that outstanding issues could be resolved to allow this company to produce renewable fuel that could help refiners comply with the cellulosic biofuel volume standard for 2011.

5. Catalytic Reforming of Sugars to Gasoline

Virent Biorefining is pursuing a process called "Bioforming" which functions similar to the gasoline reforming process used in the refining industry. Hence, this is a significantly different technology than the other cellulosic biofuel technologies discussed above. While refinery-based catalytic reforming technologies raise natural gasoline's octane value and produces aromatic compounds, Bioforming reforms biomass-derived sugars into hydrocarbons for blending into gasoline and diesel fuel. The process operates at moderate temperatures and pressures. In March of 2010, Virent announced that they had begun operating a larger pilot plant capable of producing about 30 gallons per day of high octane naphtha. Commercialization of the Virent process is expected to occur sometime after 2011.

For this technology to become a cellulosic biofuel technology, it will be necessary to link this reforming technology with a technology which breaks cellulose down into starch or sugars. In parallel with its Bioforming work, Virent is working on a technology to break down cellulose into sugars upstream of its technology which reforms sugars to gasoline.

V. Changes to RFS Regulations

EPA proposed two revisions to the general RFS program regulations. First, we proposed to allow the generation of "delayed RINs" for fuel produced between July 1, 2010 and December 31, 2010 using certain fuel pathways that were not in Table 1 to § 80.1426 on July

1, 2010, but which could possibly be added after July 1 if they are determined to meet the applicable GHG reduction thresholds. Under the proposal, delayed RINs could be generated only if the pathways were indeed approved, and only for quantities reflecting fuel produced between July 1, 2010 and the effective date of a new RIN-generating pathway. In a previous action, we finalized the provision for delayed RINs for application only to biodiesel produced from canola oil through transesterification using natural gas or biomass for process energy.[27] In today's action we are modifying the delayed RINs provision to make it more broadly applicable to other renewable fuel production pathways.

The second program modification that we proposed would establish procedures and evaluation criteria for petitions requesting EPA authorization of an aggregate compliance approach to renewable biomass verification for feedstocks grown in foreign countries, akin to that applicable to crops and crop residue grown within the U.S. In today's rule we are finalizing amendments to the RFS regulations to implement this provision.

A. Delayed RIN Generation for New Pathways

For the March 26, 2010 RFS2 final rule (75 FR 14670), we attempted to evaluate and model the lifecycle GHG emissions associated with as many renewable fuel production pathways as possible so that producers and importers of qualifying renewable fuels could generate RFS2 RINs beginning on July 1, 2010. However, we were not able to complete the evaluation of all pathways that we had planned. In the preamble to the final RFS2 rule we announced our intention to complete the evaluation of three specific pathways after release of the RFS2 final rule: grain sorghum ethanol, pulpwood biofuel, and palm oil biodiesel (*see* Section V.C of the RFS2 final rule, 75 FR 14796). To this list we later added biodiesel produced from canola oil as this biofuel was produced under RFS1 and was also expected to participate in the RFS2 program at the program's inception.

In the NPRM associated with today's final action, we proposed a new regulatory provision that could potentially allow RINs to be generated for fuel produced on or after July 1, 2010 representing these four fuel pathways even though they were not in Table 1 to § 80.1426 as of July 1, 2010. Under this proposed provision, RINs could be generated only if the pathways were indeed approved as valid RIN-generating pathways, and only for volumes of fuel produced between July 1, 2010 and the effective date of a new RIN-generating pathway added to Table 1 to § 80.1426. Somewhat different procedures were proposed for the generation of delayed RINs for volumes for which RINs had never been generated, and those for which RINs with a D code of 6 had been generated pursuant to § 80.1426(f)(6) by a grandfathered facility. In a final rule published on September 28, 2010, we finalized regulatory provisions for these "delayed RINs" only for application to biodiesel produced from canola oil through transesterification using natural gas or biomass for process energy, since that action added only this one new pathway to Table 1 to § 80.1426. In that final action we also discussed many of the comments received in response to the proposed provision for delayed RINs, our response to relevant comments, and the resulting modifications we made to the regulatory provisions.

However, we deferred for future consideration one set of comments related to delayed RINs in the September 28, 2010 final rule which established a new RIN-generating pathway for biodiesel produced from canola oil. In response to the NPRM, two commenters requested that the provision for delayed RINs be made applicable to pathways other than the four we proposed, such as pathways utilizing camelina and winter barley. We agree with these commenters that the delayed RINs provision should not necessarily be limited to fuel produced by grain sorghum ethanol, pulpwood biofuel, palm oil biodiesel, or canola oil biodiesel (assuming they are ultimately approved for RIN generation). As the commenters suggested the same rationale that justifies authorization of delayed RINs for these pathways could also justify the authorization of delayed RINs for other pathways that were commercially viable at the start of the RFS2 program, but which EPA was unable to address in time for RINs to be generated at the start of the program. Therefore, today's final rule does not limit the applicability of the delayed RINs provision to any particular pathways, but does include general limitations that will ensure that the provision is limited in scope to address difficulties related to RFS2 program startup. Among other provisions, in today's rule we are specifying that the delayed RINs provision is limited to biofuel pathways in use as of July 1, 2010 for the primary purpose of producing transportation fuel, heating oil, or jet fuel for commercial sale. We believe that this criterion, among others discussed below, will properly define those pathways for which fuel producers should be accorded flexibility in light of EPA's inability to finalize its assessments in time for RFS2 start-up, and for which sufficient information likely existed as of July 1, 2010, for EPA to make lifecycle GHG emissions determinations.

The modified provisions will apply equally to EPA approvals of new pathways directly in response to petitions submitted pursuant to § 80.1416, and to those pathways that EPA approves through rulemaking. This could include the three pathways that were identified in the RFS2 final rule (grain sorghum ethanol, pulpwood biofuel, palm oil biodiesel) if they are determined to meet the GHG thresholds, or any other biofuel produced from a pathway that was in use as of July 1, 2010 for the primary purpose of producing transportation fuel, heating oil, or jet fuel for commercial sale. However, since the delayed RINs provision is intended to address program startup issues, we have included provisions in this final rule to ensure that the availability of the provision will be of limited duration and applicability as described below.

We proposed that delayed RINs would be limited to pathways that are approved by December 31, 2010. Under the proposal, delayed RINs would have only been available for volume produced or imported in 2010. Since we are modifying the delayed RINs provision to make it applicable to other biofuel pathways in addition to the four we proposed, we believe it would be appropriate to allow additional time for producers and importers of biofuels produced as of July 1, 2010 through pathways not included in Table 1 to § 80.1426 to both satisfy the eligibility requirements of the delayed RINs provision, and to utilize it. Accordingly, today's rule makes delayed RINs available for volumes produced or imported by eligible parties in either 2010 or 2011. If we approve pathways for sorghum ethanol, pulpwood biofuel, or palm oil biodiesel in time for delayed 2010 and/or 2011 RINs to be used for RFS2 compliance, we will specifically add those pathways to the delayed RINs provisions at § 80.1426(g) in our final actions adding those fuel pathways to Table 1 to § 80.1426. Fuels produced in 2010 or 2010 through other pathways that EPA adds to Table 1 to § 80.1426 or approves pursuant to § 80.1416 will be eligible for delayed RINs if:

[27] 75 FR 59622, September 28, 2010.

(1) EPA finds that the pathway was in use as of July 1, 2010 for the primary purpose of producing transportation fuel, heating oil, or jet fuel for commercial sale, and

(2) A complete petition seeking approval of the pathway is submitted to EPA pursuant to § 80.1416 by January 31, 2011.

These requirements are intended to limit the availability of delayed RINs to RIN-generating pathways that could have participated in the RFS2 program at its inception, and for which producers and importers have taken reasonable and timely measures to seek EPA approval action. We believe, for example, that parties should not be accorded the flexibility to issue delayed RINs if they have not actively pursued EPA approval of their pathways in timely manner pursuant to the petition process in § 80.1416, and has therefore limited the delayed RINs provision to those pathways for which complete petitions are submitted to EPA by January 31, 2011.

The NPRM approach envisioned that all RINs with a D code of 6 that are retired, and all delayed RINs that are generated, must be designated as 2010 RINs. However, since we are allowing delayed RINs to be generated for volumes produced in both 2010 and 2011, we believe that this requirement would no longer be appropriate. Therefore, we have modified the delayed RINs provision so that the generation year associated with delayed RINs must correspond to the year in which the corresponding volume was produced. Delayed RINs generated to represent volume produced in 2010 must be designated as 2010 RINs and delayed RINs generated to represent volume produced in 2011 must be designated as 2011 RINs. Delayed RINs that are generated as 2010 RINs will be valid for use in complying with the standards for calendar years 2010 or 2011, according to § 80.1427(a)(6) and under the rollover restrictions provided at § 80.1427(a)(5). Likewise, delayed RINs that are generated as 2011 RINs will be valid for use in complying with the standards for calendar years 2011 or 2012. Since delayed RINs can only be generated for volumes produced or imported in 2010 or 2011, and a RIN is only valid for compliance for two compliance years, all delayed RINs will be invalid for compliance with the requirements of calendar year 2013 and later.

EPA recognizes that the delayed RINs provision may not provide all biofuel producers the opportunity to generate RINs for all of their biofuel produced on and after July 1, 2010 if, for instance, a new RIN-generating pathway is not approved until after December 31, 2011. EPA has structured the delayed RINs provision in an attempt to reduce the impact of EPA's delay on such parties, while maintaining as closely as possible the relationship of RINs to actual fuel production. Limiting the delayed RINs provision to qualifying fuel produced in 2010 and 2011 appropriately ties the provision to program start-up, and is consistent with the 2-year valid life of RINs. Nevertheless, EPA expects that it will be able to complete its lifecycle assessments of pathways for which petitions are submitted by January 31, 2010 in time for producers using such pathways to avail themselves of the delayed RINs provision as structured in today's final rule.

Today's delayed RIN provision also provides that all requirements that apply under the RFS2 rules with respect to identifying fuels for which RINs may be generated, the generation and use of RINs, and recordkeeping and reporting, also apply in the context of delayed RINs unless specifically provided otherwise in § 80.1426(g). For example, the existing recordkeeping provisions will require parties to maintain documents related to the production and transfer of the volumes of renewable fuel for which they are generating delayed RINs. The required records are necessary to document that the volumes of fuel for which delayed RINs are generated qualify as renewable fuel under the RFS2 program, e.g., that the fuel was produced using feedstocks that meet the definition of renewable biomass, and using feedstocks, process energy, and processes that conform to the applicable pathway in Table 1 to § 80.1426 or approved pursuant to § 80.1416. Furthermore, the requirements concerning the transfer of renewable fuel for which parties are generating delayed RINs is necessary to ensure that the fuel was, in fact, transferred by the delayed RIN-generating party.

B. Aggregate Compliance Approach for Renewable Biomass From Foreign Countries

As part of the NPRM, we proposed new regulatory provisions to establish procedures for submitting petitions to request EPA authorization of an aggregate compliance approach to renewable biomass verification for feedstocks grown in foreign countries,[28] akin to that applicable to planted crops and crop residue from existing agricultural land within the U.S. In the NPRM, we referenced the preamble discussion in the final RFS2 regulations in which we indicated that, while we did not have sufficient data at the time to make a finding that the aggregate compliance approach adopted for domestically-grown crops and crop residues would be appropriate for foreign-grown feedstocks, we would consider applying the aggregate compliance approach for renewable biomass on a country by country basis if adequate land use data becomes available.

In the NPRM, EPA proposed a process by which entities might petition EPA for approval of the aggregate compliance approach for renewable fuel feedstocks either in a foreign country as a whole or in a specified geographical area within a country. The proposed regulations would have allowed petitioners to request authorization of the aggregate compliance approach for specific feedstocks or for all planted crops and crop residue, and EPA sought comment on these options. The proposed regulations also included a general criterion and a number of considerations that EPA would use in evaluating petitions, and specified a list of elements that would be required in a petition. The preamble to the proposed rule included a description of the process by which EPA proposed to make decisions concerning any petitions received.

EPA received a number of comments on the proposal and is finalizing an approach similar to that which was proposed, with some significant modifications, as described below.

1. Criteria and Considerations

In developing the proposed regulations, EPA relied substantially on the approach we used to determine that an aggregate compliance approach was appropriate for planted crops and crop residue from U.S. agricultural land. EPA is finalizing an approach similar to that which was proposed and that which was applied to planted crops and crop residue from U.S. agricultural land. Petition approval for application of the aggregate compliance approach will be based on a finding by EPA that such an approach can provide reasonable assurance that planted crops and crop residue from a given foreign country meet the definition of renewable biomass and will continue to meet the definition of renewable biomass, as demonstrated through the submission of credible, reliable and verifiable data. Based on our experience in making a comparable finding for U.S.-grown crops and crop residues, we are finalizing a number of more specific

[28] 75 FR 42238, 42262, July 20, 2010.

factors that EPA will consider when determining whether this finding should be made, as described below.

- Whether there has been a reasonable identification of the "2007 baseline area of land," defined as the total amount of cropland, pastureland, and land that is equivalent to U.S. Conservation Reserve Program land in the country in question that was actively managed or fallow and nonforested on December 19, 2007, taking into account the definitions of terms such as "cropland," "pastureland," "planted crop," and "crop residue" included in the final RFS2 regulations.
- Whether information on the total amount of cropland, pastureland, and land that is equivalent to U.S. Conservation Reserve Program land in the country in question for years preceding and following calendar year 2007 shows that the 2007 baseline area of land is not likely to be exceeded in the future.
- Whether economic considerations, legal constraints, historical land use and agricultural practices and other factors show that it is likely that producers of planted crops and crop residue will continue to use agricultural land within the 2007 baseline area of land identified into the future, as opposed to clearing and cultivating land not included in the 2007 baseline area of land.
- Whether there is a reliable method to evaluate on an annual basis whether the 2007 baseline area of land is being or has been exceeded.
- Whether a credible and reliable entity has been identified to conduct data gathering and analysis, including annual identification of the aggregate amount of cropland, pastureland, and land that is equivalent to U.S. Conservation Reserve Program land, that is needed for an annual EPA evaluation of the aggregate compliance approach, and whether the data, analyses, and methodologies are publicly available.
- Whether the ministry (or ministries) or department(s) of the national government with primary expertise in agricultural land use patterns, practices, data, and statistics of the country in question supports the petition and have verified in writing the accuracy and veracity of the information submitted in the petition and agreed to review and verify the data submitted on an annual basis to facilitate EPA's annual assessment of the 2007 baseline area of land.

EPA requested comments on the proposed general criteria and specific considerations for approving the aggregate compliance approach for non-domestically grown feedstocks. EPA received a number of comments in support of the proposed general criteria, stating that EPA has outlined a straightforward, science-based approach that is necessary to avoid unfairly disadvantaging foreign renewable fuel producers and to ensure availability of adequate supplies of renewable fuel. Commenters noted that the establishment of a petition process for applying the aggregate compliance approach to foreign grown feedstocks levels the playing field for foreign renewable fuel producers and ensures that the U.S. government is not posing a barrier to trade contrary to its WTO obligations. EPA also received comments in opposition of the proposed petition process that stated that the U.S. aggregate compliance approach is not sound, and that the data that would be relied on to establish the aggregate compliance approach for foreign feedstocks would be even less reliable than that used by EPA to support its finding for the domestic aggregate compliance approach. EPA also received comments arguing that the use of foreign feedstocks and importation of foreign renewable fuels should be disallowed under the RFS2 program.

EPA believes that the aggregate compliance approach for renewable biomass is an appropriate tool that, in the right circumstances, can fully ensure that the EISA renewable biomass requirements are satisfied while easing the burden on renewable fuel producers and their feedstock suppliers. The logic for the approach is described in the preamble to the RFS2 rule. EPA believes that in applying the criteria adopted today for assessing petitions for application of the aggregate approach to foreign countries, and considering the factors specified in the rule, that EPA will be able to properly identify situations where the aggregate compliance approach can be appropriately applied in foreign countries. The public will have an opportunity to review petitions, and to apprise EPA of any concerns regarding the data relied upon, or the logic and rationale for application of the aggregate compliance approach to a particular country.

EPA also believes that establishing the aggregate compliance approach petition process for planted crops and crop residue from foreign countries is appropriate and fair since the renewable biomass verification process is currently streamlined for producers using U.S. planted crops and crop residue, and EPA believes that it should clarify the process and substantive considerations needed to extend this streamlined compliance approach to foreign planted crops and crop residue. The aggregate compliance approach petition process for planted crops and crop residue from foreign countries is intended to provide foreign renewable fuel producers with a similar level of streamlining for qualification of renewable biomass as provided to domestic producers.

EPA disagrees with the commenter that argues that the use of foreign feedstocks and importation of foreign fuels should be disallowed, as nothing in the Clean Air Act (CAA) prevents foreign products from being used towards meeting the RFS2 requirements.

2. Applicability of the Aggregate Approach

The aggregate compliance approach for domestic agricultural feedstocks applies to all planted crops and crop residue that could be used in renewable fuel production from existing agricultural land in the U.S. EPA solicited comment on whether the rules establishing the aggregate compliance approach petition process for foreign feedstocks should allow petitions and EPA approval for a single, or limited number, of feedstocks, or for a limited geographic area within a country, or whether we should only allow petitions and EPA approval at the national level and for all planted crops and crop residue.

The proposed rule spoke generally of "feedstocks," and we received one comment in support of our proposed approach to allow petitions to be submitted for specific feedstocks. In particular, the commenter argued that the reduced regulatory burden on U.S.-grown corn should be extended to Brazilian-grown sugarcane. We believe that the rationale underlying the comment is not fully accurate, as the aggregate compliance approach in the U.S. applies to all planted crops and crop residue, not just corn. Upon further consideration, EPA believes that it is highly unlikely that data and analysis could support application of the aggregate approach to feedstocks other than crops and crop residue. Furthermore, we believe that the same data and analysis would be needed to justify application of the aggregate compliance approach to individual crops as would be needed to justify its application to all planted crops and crop residue within a given geographic area. Thus, it would be most efficient, and most consistent with the current approach in the U.S., to authorize the aggregate compliance approach for all planted crops and crop residue within a geographic area at one time, rather than on a crop-by-crop basis. This approach will simplify the regulations, as it permits EPA to specify the data, analyses and considerations related specifically to supporting the aggregate compliance approach for those types of feedstock. We have therefore modified the final rule to specify that petitions and EPA approval will apply to all planted crops and crop residue from existing agricultural land in a foreign country.

Several commenters supported the application of the aggregate compliance approach petition process on a national basis, but not for a geographical subset of a foreign country. These commenters argued that applying the process on a national basis is fair because it is consistent with the U.S. aggregate approach, which was applied on a national level. Furthermore, the commenters argue that geographical subsets should not be allowed because doing so would promote "cherry picking" of data by private parties to show that a certain region is not experiencing conversion of forest and ecologically sensitive lands, even when on a national level, those lands are decreasing. Commenters also argue that local governments do not have the enforcement capability and land management policies that national governments have.

In contrast, one commenter believed that parties should be able to petition for the aggregate compliance approach to apply to specific geographical regions within a foreign country, citing data from Brazil implying that almost all sugarcane is harvested from a certain region and therefore the aggregate compliance approach could successfully be applied to that region only.

EPA agrees with those commenters that believe that the aggregate compliance approach petition process should be allowed only at the national level. Applying the petition process on the national level is consistent with the U.S. approach and will therefore harmonize application of the approach where it has been approved. Moreover, EPA believes that national-scale land use data is typically the most reliable and transparent, and can more easily be confirmed by the national government. Furthermore, national level data most accurately reflects the broader effects of renewable fuel feedstock production on land use patterns.

3. Data Sources

To make the aggregate compliance determination for U.S. agricultural lands, EPA obtained USDA data from three independently gathered national land use data sources (the Farm Service Agency (FSA) Crop History Data, the USDA Census of Agriculture (2007), and the satellite-based USDA Crop Data Layer (CDL)). *Please see* Section II.C.4.c.iii of the preamble to the final RFS2 rule (75 FR 14701 (March 26, 2010)) for a more detailed description of the data sources used. Using these data sources, EPA was able to assess the area of land (acreage) available in 2007 in the United States for production of crops and crop residues that meet the CAA definition of renewable biomass. In the case of a petition to apply the aggregate compliance approach in a foreign country, when considering the information and data submitted by the petitioner, EPA proposed and is finalizing a requirement that data supporting the petition be credible, reliable and verifiable. EPA will evaluate such information on a case-by-case basis, but expects that data supporting petitions will be at least as credible, reliable, and verifiable as the USDA data used to make the determination for U.S. agricultural land.

EPA noted in the preamble to the proposed rule that when evaluating whether the data relied on are credible, reliable, and verifiable, EPA would take into account whether the data is submitted by, generated by, or approved by the national government of the foreign country in question, as well as how comprehensive and accurate the data source is. In the proposal, EPA noted that it is important for the national government of the country seeking consideration to be involved in the petitioning and data submittal process, and sought comment on whether participation by a foreign government should be specifically required. Commenters generally supported requiring the national government's involvement in providing and/or verifying the data used in both the initial petition and in the annual reassessments, but most did not believe that the national government itself needed to be the petitioner. EPA agrees that, in order to ensure a robust and credible data set and analysis, the national government of the country from which the petition is submitted should be involved in the petition process and the annual validation, but need not be the party actually submitting the petition. Thus, in today's final rule, EPA is requiring that the appropriate ministry or department within the national government submit a letter confirming that they have reviewed and verified the petition and the data supporting it, and that the data support a finding that planted crops and crop residue from the country meet the definition of renewable biomass and will continue to do so. Furthermore, EPA is requiring that the responsible national government ministry or department will review and verify the data submitted on an annual basis to facilitate EPA's annual evaluation of the 2007 baseline area of land in that country.

Additionally, EPA indicated in the preamble to the proposed rule that it intended to take into consideration whether the data is publically available, whether the data collection and analysis methodologies and information on the primary data source are available to EPA, and whether the data has been generated, analyzed, and/or approved or endorsed by an independent third party. Commenters generally agreed that data used to support a petition must be publicly available and transparent. EPA agrees that this is highly preferable, so EPA will consider this factor in determining whether to grant a petition. Several commenters suggested that complete transparency requires the data itself as well as the data analysis conducted and methodology used by the petitioner to be made available to the public. EPA agrees that information that is not privileged should be made publicly available, and will publish petitioners' data sources, statistical methodologies and analyses in the public rulemaking docket as part of the public notice and comment process to the extent permissible by law (*see* below for a more detailed description of the public participation process).

EPA also proposed to take into account the quality of the data that is available on an annual basis for EPA's annual assessments of any approved aggregate compliance approach, as well as whether the petitioner has identified an entity who will provide to EPA an analysis of the data updates each year following EPA's approval of the aggregate compliance approach for that country. EPA believes that the data and analyses used for the annual assessments of any approved aggregate compliance approach must be just as robust and transparent as the data used to establish the original baseline amount of agricultural land. Some commenters argue that the national government should be required to play a role in the ongoing land use tracking. As described above, EPA believes it is important to have the involvement of the national government in reviewing the data and analyses for the annual assessments. Other commenters argue that the annual verification should be conducted wholly by an independent third party to ensure accuracy and objectively. EPA has addressed these comments in Section V.B.4. below.

Furthermore, EPA proposed to consider agricultural land use trends from several years preceding 2007, as well as the years following 2007 to the time the petition is submitted in order to evaluate whether or not it is likely that a 2007 baseline would be exceeded in the future. We also proposed that petitioners submit historical land use data for the land in question, such as satellite data, aerial photography, census data, agricultural surveys or agricultural economic modeling data. EPA did not receive specific comments on the consideration of agricultural land use trends or on the requirement to submit data on historical land use trends. EPA believes that this information would be useful in assessing whether the 2007 baseline area of land would likely be exceeded in the future. Thus, as explained further in Section V.B.4 below, EPA is finalizing that, when evaluating petitions, we will take into consideration historical agricultural land use trends in the country in question, and we are requiring that petitioners submit historical land use data for the land in question.

Finally, EPA proposed to consider whether there are laws in place in the country for which the petition was submitted that might prohibit or incentivize the clearing of new agricultural lands, and proposed to consider the efficacy of these laws. EPA also proposed to assess whether any market factors are expected to drive an increase in the demand for agricultural land in the country for which the petition was submitted. Commenters generally supported EPA's consideration of these factors when evaluating petitions, and thus EPA will take them into account when assessing petitions. For further discussion of this issue, *see* Section V.B.4 which follows.

4. Petition Submission

EPA proposed a requirement that all submittals, including the petition, supporting documentation, and annual data and analyses, be submitted in English. One commenter argued that the components of the petition should be submitted both in English and in the original language. We agree that it would be useful and reasonable for EPA to receive and make available to the public the petition and all supporting documents in English and their original language (if not English) in order to verify translation, particularly of technical texts and data. Therefore we are finalizing a requirement that all petitions and supporting documentation should be submitted in English and their original language.

EPA also proposed that petitioners submit specified information as part of their formal petition submission package, or explain why such information is not necessary for EPA to consider their petition. EPA is finalizing the list of information that will be required, absent an explanation by the petitioner as to why any of the information is not necessary, with modifications to reflect that petitions will be considered only for all planted crops and crop residue from foreign countries in their entirety.

First, petitioners will need to submit an assessment of the total amount of land that is cropland, pastureland, or land equivalent to USDA's Conservation Reserve Program land that was cleared or cultivated prior to December 19, 2007, and that was actively managed or fallow and nonforested on that date. For example, in assessing the amount of total existing agricultural land in the U.S. on the enactment date of EISA, EPA used FSA Crop History data to show that there were 402 million acres of agricultural land existing in the U.S. in 2007.

As part of the assessment, the petitioner will be required to submit to EPA land use data that demonstrates that the proposed 2007 baseline area of land is agricultural land that was cleared or cultivated prior to December 19, 2007 and that was actively managed or fallow and nonforested on that date. The data may include satellite imagery or data, aerial photography, census data, agricultural surveys, and/or agricultural economic modeling data. As mentioned above, the FSA crop history data used for the U.S. aggregate compliance approach determination consists of annual records of farm-level land use data that includes all cropland and pastureland in the U.S. EPA also considered USDA Census of Agriculture data, which consists of a full census of the U.S. agricultural sector once every five years, as well as the USDA National Agricultural Statistics Service (NASS) Crop Data Layer (CDL), which is based on satellite data.

In establishing the total amount of existing agricultural land for the U.S. aggregate compliance approach determination, EPA relied on the RFS2 definitions of the relevant terms, including planted crops, crop residue, and agricultural land, which is defined as consisting of cropland, pastureland and Conservation Reserve Program (CRP) [29] land. In the proposal, EPA recognized that the CRP is only applicable to U.S. agricultural land, and thus solicited comment on whether the final rules should allow EPA to consider land that is equivalent or similar to US CRP land as existing agricultural land for purposes of RFS2-compliant feedstock cultivation in a foreign country, and whether EPA should be able to make such a determination in the context of a petition for application of the aggregate approach to a foreign country. Commenters noted that EPA should consider foreign land categories similar to CRP. EPA agrees, and has modified the final regulation to include specific references to "land that is equivalent to U.S. Conservation Reserve Program" land. One commenter also suggested that EPA consider lands falling outside of the definition of "existing agricultural land," including degraded land and land not under primary forest. However, EPA disagrees that the types of land considered should extend beyond those that are equivalent to the land types identified in the final RFS2 definition of "existing agricultural land." If the land in question does not meet the RFS2 definitions of "cropland" or "pastureland" in 40 CFR 80.1401, or it is not equivalent to CRP land, then it is not "existing agricultural land" from which crops or crop residue that meet the definition of "renewable biomass" can be obtained. Therefore, they will not be counted towards the total amount of existing agricultural land in a petition for application of the aggregate approach to a foreign country.

Second, EPA proposed that the petitioner would also be required to provide to EPA historical land use data, covering the years from prior to 2007 to the current year. For the U.S. aggregate compliance approach determination, EPA analyzed the FSA Crop History data from the years 2005 through 2007 and the USDA Census of Agriculture from 1997 through 2007, finding that there was an overall trend of contraction of agricultural land utilization in the U.S. Commenters generally supported this requirement. EPA believes that this will be useful information in considering the likelihood that the 2007 baseline area of land is likely to be exceeded in the future, and is finalizing a requirement that petitioners submit historical land use data as part of their petition.

Third, EPA proposed that the petitioner would need to provide a description of any applicable laws, agricultural practices, economic considerations, or other relevant factors that had or may have an effect on agricultural land use within the foreign country. For the U.S. aggregate

[29] The CRP program is administered by U.S. Department of Agriculture's Farm Service Agency and provides technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner.

compliance approach determination, EPA took into account the CAA renewable fuel obligations, the unsuitability and high cost of developing previously undeveloped land for agricultural purposes, as well as projected increases in crop yields on existing agricultural land. Commenters supported the relevance of this type of information to EPA's action on a petition for application of the aggregate approach to a foreign country. Furthermore, another commenter recommended that EPA consider the efficacy and enforcement of any applicable laws that may have an effect on the use of the land in question. EPA agrees, and has modified this element in the final rule to require the submission of information regarding the efficacy and enforcement of relevant laws.

One commenter suggested that EPA take into consideration the limitations on feedstock growth posed by local climate and soil quality. EPA understands that in some circumstances poor soil quality could be a factor that influences land use practices and, in particular, whether existing croplands continue to be used for crop production as opposed to former forestland. One of the factors identified for EPA consideration in today's rule is whether historical land use and agricultural practices and/or other factors show that it is likely that producers will continue to use agricultural land within the 2007 baseline area of land. In addition, one of the required submission elements is "agricultural practices, economic considerations or other relevant factors that had or may have an effect on the use of agricultural land." Thus, EPA believes that the considerations raised by the commenter can and will be considered by EPA in evaluating petition submittals. EPA urges the commenter to participate in the public notice and comment process that all petitions submitted to EPA will be subject to (*see* discussion of this subject in Section V.B.5), and to provide any information on these issues that the commenter believes may be appropriate for EPA evaluation at that time.

Among the "other relevant factors" that a petitioner must consider, there are a variety of environmental conditions or circumstances that may be relevant. For instance:

- Local variability in weather
- Availability and quality of fresh water as supplied by snow pack, rain, runoff and inundations
- Frost and icing
- Severe winds and fires
- Hail and sleet
- Extended periods of rain or drought
- Other extreme events

Predictions on the seasonal to interannual (El Nino/La Nina) are available to improve the information included in the petition. Weather and water predictions may also be important for shorter term supply management and volume production analyses.

Finally, EPA proposed and is finalizing that the petitioner be required to provide a plan describing an entity who will, on a continuing yearly basis, conduct any data gathering and analysis necessary to assist EPA in its annual assessment of any approved aggregate approach. Additionally, EPA proposed that the plan would describe the data, the data source, and the schedule on which the data would be updated and made available to EPA and the public. One commenter argued that the annual verification should be conducted or reviewed by an independent third party financed by the petitioner through an escrow account. EPA believes that review of the initial and annual data by a qualified independent third party would add credibility and reliability to the process, but does not believe it should be required. EPA believes that providing notice through the **Federal Register** and opportunity for public comment on each petition submitted afford the public ample time to analyze and comment on the data submitted by the petitioner. Furthermore, EPA is adding a requirement, described above, for participation in the process by the national government of the country for which a petition is submitted, and EPA will thoroughly scrutinize the information submitted in the petition prior to making any assessment. Therefore, EPA is not finalizing a requirement that the petition and the annual updates be analyzed by an independent third party, but EPA is reiterating that participation by an independent third party would add credibility to a petition and to annual evaluations.

5. Petition Process

EPA proposed to provide an opportunity for public comment on petitions for approval of an aggregate compliance approach for a foreign country. EPA proposed to publish a **Federal Register** notice informing the public of incoming petitions, with information on how to view the petitions and any supporting information. Additionally, EPA proposed to then accept public comment on the petition. Once the public comment period closes, EPA proposed to make an assessment, taking into account the information submitted in the petition as well as the comments received, and then publish a decision in the **Federal Register** to either approve or deny the petitioner's request.

EPA proposed that, if the petition has been approved, the **Federal Register** notice will specify an effective date at which time producers using the specified feedstocks from the specified areas identified in EPA's approval will be subject to the aggregate compliance approach requirements in 40 CFR 80.1454(g) in lieu of the otherwise applicable individualized renewable biomass recordkeeping and reporting requirements. For the final rule, EPA has made a minor modification to the regulatory language in 40 CFR 80.1454(g) to clarify the recordkeeping requirements from which renewable fuel producers are exempted if their feedstocks are subject to the aggregate compliance approach. Producers using feedstocks subject to the aggregate compliance approach are exempted from the renewable biomass recordkeeping requirements in 40 CFR 80.1454(g)(2), but remain subject to the recordkeeping requirements related to feedstocks in 40 CFR 80.1454(b).

EPA sought and received comments on this proposed petition process. Most commenters agree that each petition submitted should be subject to public notice and comment procedures. Several commenters argued that although there should be a public notice and comment period, it should not cause undue delays in reviewing and publishing a decision on the petitions. One commenter requested that 60 days be provided for public review of the incoming petitions. Another commenter also requested that EPA specify a timeline for the public comment process and the types of issues that will be addressed during the process.

EPA agrees that public notice and comment is necessary and important, and is maintaining that process in today's final rule. Furthermore, EPA intends that decisions on petitions will be made within an amount of time that is reasonable, yet sufficient to conduct a thorough analysis of the incoming data. EPA concurs that 60 days is a reasonably practical amount of time for public review and analysis of the petition and associated data, so today's rule provides for a 60 day comment period on each petition submitted.

EPA does not agree with the comment that the public comments should be restricted to certain issues. EPA will evaluate all comments received to determine if they are relevant to its determination. The petitions and the supporting data will be included in the rulemaking docket in their entirety (excepting only material that is claimed to be confidential business information or which is otherwise privileged), and the public may comment on any aspect of the petitions or the supporting information.

A commenter argued that the public notice and comment procedure should be included in the regulatory language, and that any and all data and calculations in the petitions should be available to the public. EPA generally agrees, and has included provisions concerning public notice and comment in the final regulatory language. Furthermore, EPA will make available in the docket all information submitted in support of each petition unless the material is claimed to be confidential business information or is otherwise legally prohibited from disclosure.

Additionally, EPA proposed three circumstances that could lead EPA to withdraw its approval of the aggregate compliance approach for a foreign country. We received one comment that argued that EPA must withdraw its approval under the three circumstances identified in the proposed regulations at § 80.1457(e)(1)(i)-(iii). Although we generally agree that the three circumstances identified will likely lead EPA to withdraw its approval, we believe it is best to allow EPA the discretion to evaluate these circumstances on a case-by-case basis. Therefore, we have retained in the final rule the provision stating that EPA "may" withdraw its approval in the circumstances identified, in which case producers using planted crops or crop residue from the country in question would be subject to the individual recordkeeping and reporting requirements under §§ 80.1454(g) and 80.1451(d) beginning July 1 of the following year.

Finally, EPA requested comment on whether the burden associated with the proposed petition process is reasonable, and how it might be minimized while still remaining adequately robust. One commenter noted that the burden of the petition process is reasonable as proposed, and could be made more stringent while remaining reasonable. EPA believes the level of burden associated with the proposed petition process was reasonable and appropriate and believes that the requirements set forth in today's final rule do not significantly alter the proposed level of burden.

VI. Annual Administrative Announcements

In the RFS2 final rule, we stated our intent to make two announcements each year:

- Set the price for cellulosic biofuel waiver credits that will be made available to obligated parties in the event that we reduce the volume of cellulosic biofuel below the applicable volume specified in the Clean Air Act (CAA), and
- Announce the results of our annual assessment of the aggregate compliance approach for U.S. planted crops and crop residue.

The biofuel waiver credit price being announced today was calculated in accordance with the specifications in § 80.1456(d). Since the manner in which EPA calculates the waiver credit price is precisely set forth in EPA regulations (which were issued through a notice-and-comment process), and since some of the variables necessary to compute the price have only recently become available, EPA did not propose a waiver credit price for comment. Similarly, because EPA's assessment of the aggregate compliance approach announced today was conducted using data sources, methodology, and criteria that were identified and explained in the preamble to the RFS2 final rule, it was not necessary to present a preliminary annual assessment for comment in the NPRM.

A. 2011 Price for Cellulosic Biofuel Waiver Credits

Section 211(o)(7)(D) of the CAA requires that whenever EPA sets the applicable volume of cellulosic biofuel at a level lower than that specified in the Act, EPA is to provide a number of cellulosic credits for sale that is no more than the EPA-determined applicable volume. Congress also specified the formula for calculating the price for such waiver credits: Adjusted for inflation, the credits must be offered at the price of the higher of 25 cents per gallon or the amount by which $3.00 per gallon exceeds the average wholesale price of a gallon of gasoline in the United States.[30] The inflation adjustment is for years after 2008. EPA regulations provide that the inflation adjustment is calculated by comparing the most recent Consumer Price Index for Al Urban Consumers (CPI–U) for the "All Items" expenditure category as provided by the Bureau of Labor Statistics that is available at the time EPA sets the cellulosic biofuel standard to the comparable value that was reported soonest after December 31, 2008.[31]

In contrast to its directions to EPA for setting the price of a cellulosic biofuel waiver credit, Congress afforded the Agency considerable flexibility in designing regulations specifying the permissible uses of the credits. The CAA states that EPA regulations "shall include such provisions, including limiting the credits' uses and useful life, as the Administrator deems appropriate to assist market liquidity and transparency, to provide appropriate certainty for regulated entities and renewable fuel producers, and to limit any potential misuse of cellulosic biofuel credits to reduce the use of other renewable fuels, and for such other purposes as the Administrator determines will help achieve the goals of this subsection." The final RFS2 provides a detailed discussion of how we designed the provisions for cellulosic biofuel waiver credits in keeping with the statutory language. In short, 2011 cellulosic biofuel waiver credits (or "waiver credits") are only available for the 2011 compliance year. Waiver credits will only be made available to obligated parties, and they are nontransferable and nonrefundable. Further, obligated parties may only purchase waiver credits up to the level of their cellulosic biofuel RVO less the number of cellulosic biofuel RINs that they own. A company owning cellulosic biofuel RINs and cellulosic waiver credits may use both types of credits if desired to meet their RVOs, but unlike RINs obligated parties are not permitted to carry waiver credits over to the next calendar year. Obligated parties may not use waiver credits to meet a prior year deficit obligation. Finally, unlike cellulosic biofuel RINs which may also be used to meet an obligated party's advanced and total renewable fuel obligations, waiver credits may only be used to meet a cellulosic biofuel RVO. An obligated party will still need to additionally and separately acquire RINs to meet their advanced biofuel and total renewable fuel obligations.

For the 2011 compliance period, since the applicable volume of cellulosic biofuel used to set the annual cellulosic biofuel standard is lower than the volume for 2011 specified in the CAA, we are making cellulosic waiver credits available to obligated parties for end-of-year compliance should they need them at a price of $1.13 per gallon-RIN. To calculate this price, EPA first determined the average wholesale

[30] More information on wholesale gasoline prices can be found on the Department of Energy's (DOE), Energy Information Administration's (EIA) Web site at: *http://tonto.eia.doe.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=A103B00002&f=M.*

[31] *See* U.S. Department of Labor, Bureau of Labor Statistics (BLS), Consumer Price Index Web site at: *http://www.bls.gov/cpi/.*

(refinery gate) price of gasoline using the most recent 12 months of data available from the EIA Web site on September 30, 2010. Based on this data, we calculated an average price of gasoline for the period July 2009 to June 2010 of $1.97. In accordance with the Act, we then calculated the difference of the inflation-adjusted value of $3.00, or $3.10, and $1.97, which yielded $1.13. Next, we compared the value of $1.13 to the inflation-adjusted value of $0.25, or $0.26. The Act requires EPA to use the greater of these two values as the price for cellulosic biofuel waiver credits.

The derivation of this value is more fully explained in a memorandum submitted to the docket for this rulemaking,[32] and a more complete description of the statutory requirements and their application can be found in the RFS2 final rule.[33] The price for the 2012 compliance period, if necessary, will be set when we announce the 2012 cellulosic biofuel standard.

B. Assessment of the Domestic Aggregate Compliance Approach

In order to implement the renewable biomass requirements under the RFS2 program as set forth in the CAA, EPA established general requirements for renewable fuel producers to keep records on the types and feedstocks they use to produce their fuel, including specific records related to the land from which the feedstocks were harvested or otherwise obtained, if they generate RINs for the fuel produced from such feedstocks. We also established requirements for renewable fuel producers to report on their feedstocks on a quarterly basis. Similar requirements apply to importers who generate RINs for fuel produced outside of the U.S.

In response to comments we received on the RFS2 NPRM, we also finalized a separate approach for renewable fuel producers who use planted crops and crop residue from U.S. agricultural land. Producers who use such renewable biomass need not maintain documentation about the specific land from which the feedstocks are harvested, relieving them of the individual recordkeeping and reporting requirements. To enable this approach, EPA established a baseline number of acres for U.S. agricultural land in 2007 (the year of EISA enactment) and determined that as long as this baseline number of acres was not exceeded, it was unlikely that new land outside of the 2007 baseline would be devoted to crop production based on historical trends and economic considerations. We therefore provided that renewable fuel producers using planted crops or crop residue from the U.S. as feedstock in renewable fuel production need not comply with the individual recordkeeping and reporting requirements related to documenting that their feedstocks are renewable biomass, unless EPA determines through annual evaluations that the 2007 baseline acreage of agricultural land has been exceeded.

In the final RFS2 regulations, we stated that EPA will make a finding concerning whether the 2007 baseline amount of U.S. agricultural land has been exceeded in a given year and will publish this finding in the **Federal Register** by November 30 of the same year. If the baseline is found to have been exceeded, then producers using U.S. planted crops and crop residue as feedstocks for renewable fuel production would be required to comply with individual recordkeeping and reporting requirements to verify that their feedstocks are renewable biomass. We also stated that if, at any point, EPA finds that the total agricultural land is greater than 397 million acres, EPA will conduct further investigations regarding the validity of the aggregate compliance approach.

Based on data provided by the USDA Farm Service Agency (FSA) and Natural Resources Conservation Service (NRCS), we have estimated that U.S. agricultural land reached approximately 398 million acres in 2010, and thus did not exceed the 2007 baseline acreage.[34] However, this total acreage estimate is greater than the 397 million acre trigger point for further investigation, therefore EPA, with the help of USDA, will look further into the relevant data and review the factors related to U.S. agricultural land use over the coming months.

The data and methodologies employed to make this determination are described below.

1. Methodology

To set the 2007 baseline acreage for U.S. agricultural land in the RFS2 final rulemaking, we used USDA's Farm Service Agency's (FSA's) crop history data for 2007, which was the most complete, consistent, and reliable dataset available to EPA. From the FSA crop history data total acreage of 404.3 million acres, we subtracted 2.75 million acres, which represented the amount of land enrolled in USDA's Grasslands Reserve Program (GRP) and Wetlands Reserve Program (WRP), neither of which qualifies as existing agricultural land. We therefore established the 2007 baseline amount of existing U.S. agricultural land at 402 million acres. This is the amount of land we determined was available for the production of planted crops and crop residue in 2007 that would satisfy the renewable biomass provisions of the CAA.

To calculate the 2010 U.S. agricultural land acreage estimate, we followed a similar calculation methodology. We started with FSA crop history data for 2010, from which we derived a total estimated acreage of 401.6 million acres. We then subtracted the amount of land estimated to be participating in the GRP and WRP by the end of Fiscal Year 2010, 3.6 million acres, to yield an estimate of approximately 398.0 million acres of U.S. agricultural land in 2010. The USDA data used to make this calculation can be found in the docket to this rule.

In the preamble to the final RFS2 rule, we indicated that we would monitor total U.S. agricultural land annually using FSA crop history data as a primary determinant and USDA's satellite-based crop data layer (CDL) analyses as a secondary source to validate our annual assessment. The CDL data for 2009 were released at the beginning of 2010, and the CDL data for 2010 is similarly expected in early 2011. Because the schedule for the release of 2010 data falls after the date by which the RFS2 regulations state the annual U.S. agricultural land acreage determination must be made, we will use the 2009 and 2010 data, as appropriate and feasible, to validate our 2010 assessment, as discussed below.

2. Further Investigation

EPA stated in the final RFS2 rule that if we find that the total land used for the production of crops is greater than 397 million acres, we will conduct further investigations regarding the validity of the aggregate compliance approach. Because we estimate that total U.S. agricultural land acreage in 2010 was approximately 398 million acres, further inquiry into the aggregate compliance approach is warranted. This inquiry, to be carried out by EPA with assistance from USDA, will utilize other agricultural data, including USDA's 2009 and 2010 CDL data to the extent feasible, to validate the data used to make the U.S. agricultural land

[32] *See* memo to docket number EPA–HQ–OAR–2010–0133 from Scott Christian, on the subject of "Calculating the price for cellulosic biofuel waiver credits for compliance year 2011," dated October 20, 2010.

[33] 75 FR 14726–14728.

[34] *See* memo to docket number EPA–HQ–OAR–2010–0133 from Megan Brachtl, on the subject of "USDA data used for 2010 U.S. agricultural land determination," dated November 9, 2010.

determination for 2010. We will also consider potential uncertainties in the data used to make our determination. We anticipate that this investigation will be completed well before the deadline for publishing next year's agricultural land acreage determination.

VII. Comments Outside the Scope of This Rulemaking

In their comments responding to the NPRM, a number of parties used the opportunity to raise concerns that were not directly related to the issues and provisions we were addressing in the NPRM, such as setting the cellulosic biofuel standard, the proposed provision for delayed RINs, and the proposed provision for aggregate compliance for renewable biomass from foreign countries. Neither did these comments address setting the price for cellulosic biofuel credits or EPA's annual evaluation of the U.S. aggregate compliance approach for renewable biomass. Instead, they addressed issues associated with the following:

- EPA's petition process in § 80.1416 for approving new fuel pathways
- EPA's ongoing lifecycle GHG assessment for grain sorghum
- EPA's economic analyses related to expanded biofuels use and the impact of tax credits and tariffs
- Possible legislative amendments and possible EPA actions favored by commenters that would promote biofuel use

Some commenters also made requests for clarification of key definitions while others suggested modifications to the provisions regarding the use of cellulosic biofuel waiver credits. While we are taking these comments under consideration as we continue to implement the RFS2 program, these comments are outside the scope of today's action, and we are not providing substantive responses to them at this time.

VIII. Public Participation

Many interested parties participated in the rulemaking process that culminates with this final rule. This process provided opportunity for submitting written public comments following the proposal that we published on July 20, 2010 (75 FR 42238), and we considered these comments in developing the final rule. Comments and responses for issues raised in the public comments are included throughout this preamble.

IX. Statutory and Executive Order Reviews

A. Executive Order 12866: Regulatory Planning and Review

Under Executive Order (EO) 12866 (58 FR 51735, October 4, 1993), this action is a "significant regulatory action" because it raises novel legal or policy issues. Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under EO 12866 and any changes made in response to OMB recommendations have been documented in the docket for this action.

The economic impacts of the RFS2 program on regulated parties, including the impacts of the required volumes of renewable fuel, were already addressed in the RFS2 final rule promulgated on March 26, 2010 (75 FR 14670). This action sets the percentage standards applicable in 2011 based on the volumes that were analyzed in the RFS2 final rule or, for cellulosic biofuel, on a lower volume that reflects EPA's projection of cellulosic biofuel production volumes for 2011. The delayed RINs provision and the petition process for applying an aggregate approach to foreign-grown crops and crop residue have no adverse economic impact on regulated parties since they would either relieve a current restriction related to generation of RINs, or would reduce recordkeeping burdens for parties successfully utilizing the petition process. The announcement of cellulosic biofuel waiver credit price and EPA's annual assessment of the U.S. aggregate compliance approach also impose no adverse economic impact. The availability of cellulosic biofuel waiver credits provides increased flexibility to regulated parties, at a price established by a formula set forth in the CAA.

B. Paperwork Reduction Act

This rule contains new information collection requirements which will be submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* These information collection requirements are not enforceable until OMB approves them. The EPA ICR number 2398.02.

Specifically, this rule has a petition provision that EPA will use to authorize renewable fuel producers using foreign-grown feedstocks to use an aggregate approach to comply with the renewable biomass verification provisions, similar to that applicable to producers using crops and crop residue grown in the United States. See discussion in Section V.B. For this authorization, foreign based entities may petition EPA for approval of the aggregate compliance approach for crops and crop residue in a foreign country. If approved by EPA, such a petition will allow crops and crop residue produced in the foreign country to be counted as feedstock to make renewable fuel under the RFS2 program without the otherwise applicable recordkeeping requirements. Other provisions in this regulation will not impose any new information collection burdens on regulated entities beyond those already required under RFS2. The RFS2 information collections are identified by the following OMB control numbers: 2060–0637 (expiring March 31, 2013) and 2060–0640 (expiring July 31, 2013).

The information collection related to this final rule is required in order for EPA to evaluate and act on the petitions. Respondents may assert claims of business confidentiality (CBI) for any or all of the information they submit. We do not believe that most respondents will characterize the information they submit to us under this information collection as CBI. However, any information claimed as confidential will be treated in accordance with 40 CFR Part 2 and established Agency procedures. Information that is received without a claim of confidentiality may be made available to the public without further notice to the submitter under 40 CFR 2.203.

EPA estimates that there will be a total of 15 respondents (petitioners), each submitting one petition, for a total of 15 responses (petitions). The estimated burden annual burden, assuming 15 respondents, will be 200 hours and annual cost is estimated at $14,197. On a per respondent basis, EPA estimates a total annual hour burden per respondent of 13.33 hours and a total annual cost burden per respondent is $946.43. Burden is defined at 5 CFR 1320.3(b).

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business as defined by the Small Business Administration's (SBA) regulations at 13 CFR 121.201; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of today's rule on small entities, we certify that this action will not have a significant economic impact on a substantial number of small entities. This rule sets the annual standards for four types of renewable fuel, modifies the regulatory provision for the generation of delayed RINs, and establishes a process for parties to petition EPA to allow an aggregate approach to compliance with the renewable biomass provision for foreign-grown crops and crop residue that would be similar to that used in the U.S. Today's action also includes two administrative announcements: The price in 2011 for cellulosic biofuel waiver credits, and the results of EPA's annual assessment of the U.S. aggregate compliance approach. The impacts of the RFS2 program on small entities were already addressed in the RFS2 final rule promulgated on March 26, 2010 (75 FR 14670), and today's action does not impose any additional requirements or burdens on small entities.

D. Unfunded Mandates Reform Act

This action contains no Federal mandates under the provisions of Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), 2 U.S.C. 1531–1538 for State, local, or tribal governments or the private sector. The action imposes no enforceable duty on any State, local or tribal governments or the private sector. Therefore, this action is not subject to the requirements of sections 202 or 205 of the UMRA.

This action is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments.

E. Executive Order 13132: Federalism

This rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. Thus, Executive Order 13132 does not apply to this rule.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). This rule does not have tribal implications, as this rule will be implemented at the Federal level and impose compliance costs only on transportation fuel refiners, blenders, marketers, distributors, importers, and exporters. Tribal governments would be affected only to the extent they purchase and use regulated fuels. Thus, Executive Order 13175 does not apply to this action.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying only to those regulatory actions that concern health or safety risks, such that the analysis required under section 5–501 of the EO has the potential to influence the regulation. This action is not subject to EO 13045 because it does not establish an environmental standard intended to mitigate health or safety risks and because it implements specific standards established by Congress in statutes.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This rule is not a "significant energy action" as defined in Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use" (66 FR 28355 (May 22, 2001)) because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (*e.g.,* materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This action does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order (EO) 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it does not affect the level of protection provided to human health or the environment. This action does not relax the control measures on sources regulated by the RFS2 regulations and therefore will not cause emissions increases from these sources.

K. Congressional Review Act

The Congressional Review Act, 5 U.S.C. 801 *et seq.,* as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. EPA will submit a report containing this rule and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the United States prior to publication of the rule in the **Federal Register**. A major rule cannot take effect until 60 days after it is published in the **Federal Register**. This action is not a "major rule" as defined by 5 U.S.C. 804(2) and therefore it is not subject to the Congressional Review Act. Therefore, this rule will be effective on the date of publication.

X. Statutory Authority

Statutory authority for the rule finalized today can be found in section 211 of the Clean Air Act, 42 U.S.C. 7545. Additional support for the procedural and compliance related aspects of today's rule, including the recordkeeping requirements, come from Sections 114, 208, and 301(a) of the Clean Air Act, 42 U.S.C. 7414, 7542, and 7601(a).

List of Subjects in 40 CFR Part 80

Environmental protection, Air pollution control, Diesel fuel, Fuel additives, Forest and forest products, Gasoline, Oil imports, Labeling, Motor vehicle pollution, Penalties, Petroleum, Reporting and recordkeeping requirements.

Dated: November 24, 2010.

Lisa P. Jackson,

Administrator.

■ For the reasons set forth in the preamble, 40 CFR part 80 is amended as follows:

PART 80—REGULATION OF FUELS AND FUEL ADDITIVES

■ 1. The authority citation for part 80 continues to read as follows:

Authority: 42 U.S.C. 7414, 7542, 7545, and 7601(a).

■ 2. Section 80.1405 is amended by revising paragraph (a) to read as follows:

§ 80.1405 What are the Renewable Fuel Standards?

(a) *Renewable Fuel Standards for 2011.*

(1) The value of the cellulosic biofuel standard for 2011 shall be 0.003 percent.

(2) The value of the biomass-based diesel standard for 2011 shall be 0.69 percent.

(3) The value of the advanced biofuel standard for 2011 shall be 0.78 percent.

(4) The value of the renewable fuel standard for 2011 shall be 8.01 percent.

* * * * *

■ 3. Section 80.1426 is amended by revising paragraph (g) to read as follows:

§ 80.1426 How are RINs generated and assigned to batches of renewable fuel by renewable fuel producers or importers?

* * * * *

(g) *Delayed RIN generation.*

(1) Parties who produce or import renewable fuel may elect to generate delayed RINs to represent renewable fuel volumes that have already been transferred to another party if those renewable fuel volumes meet all of the following requirements.

(i) The renewable fuel volumes can be described by a new pathway that has been added to Table 1 to § 80.1426, or approved by petition pursuant to § 80.1416, after July 1, 2010.

(A) For new pathways that EPA approves in response to petitions submitted pursuant to § 80.1416, complete petitions must be received by EPA by January 31, 2011.

(B) [Reserved]

(ii) The renewable fuel volumes can be described by a pathway that:

(A) Is biodiesel that is made from canola oil through transesterification using natural gas or biomass for process energy; or

(B) EPA has determined was in use as of July 1, 2010, for the primary purpose of producing transportation fuel, heating oil, or jet fuel for commercial sale.

(iii) The renewable fuel volumes were not designated or intended for export from the 48 contiguous states plus Hawaii by the renewable fuel producer or importer, and the producer or importer of the renewable fuel volumes does not know or have reason to know that the volumes were exported from the 48 contiguous states plus Hawaii.

(2) When a new pathway is added to Table 1 to § 80.1426 or approved by petition pursuant to § 80.1416, EPA will specify in its approval action the effective date on which the new pathway becomes valid for the generation of RINs and whether the fuel in question meets the requirements of paragraph (g)(1)(ii) of this section.

(i) The effective date for the pathway describing biodiesel that is made from canola oil through transesterification using natural gas or biomass for process energy is September 28, 2010.

(ii) [Reserved]

(3) Delayed RINs can only be generated to represent renewable fuel volumes produced in the 48 contiguous states plus Hawaii or imported into the 48 contiguous states plus Hawaii between July 1, 2010, and the earlier of either of the following dates:

(i) The effective date (identified pursuant to paragraph (g)(2) of this section) of the new pathway through which the fuel in question was produced; or

(ii) December 31, 2011.

(4) Delayed RINs must be generated no later than 60 days after the effective date (identified pursuant to paragraph (g)(2) of this section) of the pathway by which the fuel in question was produced.

(5) A party authorized pursuant to paragraph (g)(1) of this section to generate delayed RINs, and electing to do so, who generated RINs pursuant to 80.1426(f)(6) for fuel produced through a pathway described in paragraph (g)(1) of this section, and transferred those RINs with renewable fuel volumes between July 1, 2010 and the effective date (identified pursuant to paragraph (g)(2) of this section) of that pathway, must retire a number of gallon-RINs prior to generating delayed RINs.

(i) The number of gallon-RINs retired by a party pursuant to this paragraph must not exceed the number of gallon-RINs originally generated by the party to represent fuel described in paragraph (g)(1) of this section that was produced in the 48 contiguous states plus Hawaii or imported into the 48 contiguous states plus Hawaii, and transferred to another party, between July 1, 2010 and the earlier of either of the following dates:

(A) The effective date (identified pursuant to paragraph (g)(2) of this section) of the new pathway through which the fuel in question was produced; or

(B) December 31, 2011.

(ii) Retired RINs must have a D code of 6.

(iii) Retired RINs must have a K code of 2.

(iv) Retired RINs must have been generated in the same year as the gallon-RINs originally generated by the party to represent fuel described in paragraph (g)(1) of this section.

(A) For gallon-RINs originally generated in 2010 to represent fuel described in paragraph (g)(1) of this section, the generation year of retired RINs shall be 2010.

(B) For gallon-RINs originally generated in 2011 to represent fuel described in paragraph (g)(1) of this section, the generation year of retired RINs shall be 2011.

(6) For parties that retire RINs pursuant to paragraph (g)(5) of this section, the number of delayed gallon-RINs generated shall be equal to the number of gallon-RINs retired in accordance with paragraph (g)(5) of this section.

(7) A party authorized pursuant to paragraph (g)(1) of this section to generate delayed RINs, and electing to do so, who did not generate RINs pursuant to § 80.1426(f)(6) for renewable fuel produced in the 48 contiguous states plus Hawaii or imported into the 48 contiguous states plus Hawaii between July 1, 2010 and the effective date (identified pursuant to paragraph (g)(2) of this section) of a new pathway for the fuel in question, may generate a number of delayed gallon-RINs for that renewable fuel in accordance with paragraph (f) of this section.

(i) The standardized volume of fuel (V_s) used by a party to determine the RIN volume (V_{RIN}) under paragraph (f) of this section shall be the standardized volume of the fuel described in paragraph (g)(1)(i) of this section that was produced in the 48 contiguous states plus Hawaii or imported into the 48 contiguous states plus Hawaii by the party, and transferred to another party, between July 1, 2010 and the earlier of either of the following dates:

(A) The effective date (identified pursuant to paragraph (g)(2) of this section) of the new pathway through which the fuel in question was produced; or

(B) December 31, 2011.

(ii) [Reserved]

(8) The renewable fuel for which delayed RINs are generated must be described by a pathway that satisfies the requirements of paragraph (g)(1) of this section.

(9) All delayed RINs generated by a renewable fuel producer or importer must be generated within EMTS on the same date.

(10) The generation year of delayed RINs as designated in EMTS shall be the year that the renewable fuel volumes they represent were either produced or imported into the 48 contiguous states plus Hawaii.

(i) For renewable fuel volumes produced or imported in 2010, the generation year of delayed RINs shall be 2010 and the production date specified in EMTS shall be 07/01/2010.

(ii) For renewable fuel volumes produced or imported in 2011, the generation year of delayed RINs shall be 2011 and the production date specified in EMTS shall be 01/01/2011.

(11) Delayed RINs shall be generated as assigned RINs in EMTS with a batch number that begins with "DRN", and then immediately separated by the RIN generator.

(12) The D code that shall be used in delayed RINs shall be the D code which corresponds to the new pathway.

(13) Except as provided in this paragraph (g), all other provisions in this Subpart M that pertain to the identification of fuels for which RINs may be generated, the generation and use of RINs, and recordkeeping and reporting, are also applicable to delayed RINs.

■ 4. Section 80.1454 is amended as follows:

■ a. By revising paragraph (g) introductory text.

■ b. By revising paragraph (g)(1).

■ c. By revising paragraph (g)(2) introductory text.

§ 80.1454 What are the recordkeeping requirements under the RFS Program?

* * * * *

(g) *Aggregate compliance with renewable biomass requirement.* Any producer or RIN-generating importer of renewable fuel made from planted crops or crop residue from existing U.S. agricultural land as defined in § 80.1401, or from planted crops or crop residue from existing agricultural land in a country covered by a petition approved pursuant to § 80.1457, is covered by the aggregate compliance approach and is not subject to the recordkeeping requirements for planted crops and crop residue at § 80.1454(g)(2) unless EPA publishes a finding that the 2007 baseline amount of agricultural land in the U.S. has been exceeded or, for the aggregate compliance approach in a foreign country, that the withdrawal of EPA approval of the aggregate compliance approach is warranted pursuant to § 80.1457(e).

(1) EPA will make findings concerning whether the 2007 baseline amount of agricultural land in the U.S. or other country covered by a petition approved pursuant to § 80.1457 has been exceeded and will publish these findings in the **Federal Register** by November 30 of the year preceding the compliance period.

(2) If EPA finds that the 2007 baseline amount of agricultural land in the U.S. or other country covered by a petition approved pursuant to § 80.1457 has been exceeded, beginning on the first day of July of the compliance period in question any producer or RIN-generating importer of renewable fuel made from planted crops or crop residue in the country for which such a finding is made must keep all the following records:

* * * * *

■ 5. Section 80.1457 is added to read as follows:

§ 80.1457 Petition process for aggregate compliance approach for foreign countries.

(a) EPA may approve a petition for application of the aggregate compliance approach to planted crops and crop residue from existing agricultural land in a foreign country if EPA determines that an aggregate compliance approach will provide reasonable assurance that planted crops and crop residue from the country in question meet the definition of renewable biomass and will continue to meet the definition of renewable biomass, based on the submission of credible, reliable, and verifiable data.

(1) As part of its evaluation, EPA will consider all of the following:

(i) Whether there has been a reasonable identification of the "2007 baseline area of land," defined as the total amount of cropland, pastureland, and land that is equivalent to U.S. Conservation Reserve Program land in the country in question that was actively managed or fallow and nonforested on December 19, 2007.

(ii) Whether information on the total amount of cropland, pastureland, and land that is equivalent to U.S. Conservation Reserve Program land in the country in question for years preceding and following calendar year 2007 shows that the 2007 baseline area of land identified in paragraph (a)(1)(i) of this section is not likely to be exceeded in the future.

(iii) Whether economic considerations, legal constraints, historical land use and agricultural practices and other factors show that it is likely that producers of planted crops and crop residue will continue to use agricultural land within the 2007 baseline area of land identified in paragraph (a)(1)(i) of this section into the future, as opposed to clearing and cultivating land not included in the 2007 baseline area of land.

(iv) Whether there is a reliable method to evaluate on an annual basis whether the 2007 baseline area of land identified in paragraph (a)(1)(i) of this section is being or has been exceeded.

(v) Whether a credible and reliable entity has been identified to conduct data gathering and analysis, including annual identification of the aggregate amount of cropland, pastureland, and land that is equivalent to U.S. Conservation Reserve Program land, needed for the annual EPA evaluation specified in § 80.1454(g)(1), and whether the data, analyses, and methodologies are publicly available.

(2) [Reserved]

(b) Any petition and all supporting materials submitted under paragraph (a) of this section must be submitted both in English and its original language (if other than English), and must include all of the following or an explanation of why it is not needed for EPA to consider the petition:

(1) Maps or electronic data identifying the boundaries of the land for which the petitioner seeks approval of an aggregate compliance approach.

(2) The total amount of land that is cropland, pastureland, or land equivalent to U.S. Conservation Reserve Program land within the geographic boundaries specified in paragraph (b)(1) of this section that was cleared or cultivated prior to December 19, 2007 and that was actively managed or fallow and nonforested on that date, and

(3) Land use data that demonstrates that the land identified in paragraph (b)(1) of this section is cropland, pastureland or land equivalent to U.S. Conservation Reserve Program land that was cleared or cultivated prior to December 19, 2007, and that was

actively managed or fallow and nonforested on that date, which may include any of the following:

(i) Satellite imagery or data.

(ii) Aerial photography.

(iii) Census data.

(iv) Agricultural survey data.

(v) Agricultural economic modeling data.

(4) Historical land use data for the land within the geographic boundaries specified in paragraph (b)(1) of this section to the current year, which may include any of the following:

(i) Satellite imagery or data.

(ii) Aerial photography.

(iii) Census data.

(iv) Agricultural surveys.

(v) Agricultural economic modeling data.

(5) A description of any applicable laws, agricultural practices, economic considerations, or other relevant factors that had or may have an effect on the use of agricultural land within the geographic boundaries specified in paragraph (b)(1) of this section, including information regarding the efficacy and enforcement of relevant laws and regulations.

(6) A plan describing how the petitioner will identify a credible and reliable entity who will, on a continuing basis, conduct data gathering, analysis, and submittal to assist EPA in making an annual determination of whether the criteria specified in paragraph (a) of this section remains satisfied.

(7) A letter, signed by a national government representative at the ministerial level or equivalent, confirming that the petition and all supporting data have been reviewed and verified by the ministry (or ministries) or department(s) of the national government with primary expertise in agricultural land use patterns, practices, data, and statistics, that the data support a finding that planted crops and crop residue from the specified country meet the definition of renewable biomass and will continue to meet the definition of renewable biomass, and that the responsible national government ministry (or ministries) or department(s) will review and verify the data submitted on an annual basis to facilitate EPA's annual evaluation of the 2007 baseline area of land specified in § 80.1454(g)(1) for the country in question.

(8) Any additional information the Administrator may require.

(c) EPA will issue a **Federal Register** notice informing the public of receipt of any petition submitted pursuant to this section and will provide a 60-day period for public comment. If EPA approves a petition it will issue a **Federal Register** notice announcing its decision and specifying an effective date for the application of the aggregate compliance approach to planted crops and crop residue from the country. Thereafter, the planted crops and crop residue from the country will be covered by the aggregate compliance approach set forth in § 80.1454(g), or as otherwise specified pursuant to paragraph (d) of this section.

(d) If EPA grants a petition to establish an aggregate compliance approach for planted crops and crop residue from a foreign country, it may include any conditions that EPA considers appropriate in light of the conditions and circumstances involved.

(e)(1) EPA may withdraw its approval of the aggregate compliance approach for the planted crops and crop residue from the country in question if:

(i) EPA determines that the data submitted pursuant to the plan described in paragraph (b)(6) of this section does not demonstrate that the amount of cropland, pastureland and land equivalent to U.S. Conservation Reserve Program land within the geographic boundaries covered by the approved petition does not exceed the 2007 baseline area of land;

(ii) EPA determines based on other information that the criteria specified in paragraph (a) of this section is no longer satisfied; or

(iii) EPA determines that the data needed for its annual evaluation has not been collected and submitted in a timely and appropriate manner.

(2) If EPA withdraws its approval for a given country, then producers using planted crops or crop residue from that country will be subject to the individual recordkeeping and reporting requirements of § 80.1454(b) through (d) in accordance with the schedule specified in § 80.1454(g).

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