Intermediate-Level Blends of Ethanol in Gasoline, and the Ethanol "Blend Wall"

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Summary

On March 6, 2009, Growth Energy (on behalf of 52 U.S. ethanol producers) applied to the Environmental Protection Agency (EPA) for a waiver from the current Clean Air Act limitation on ethanol content in gasoline. Currently, ethanol content in gasoline is capped at 10% (E10); the application requests an increase in the maximum concentration to 15% (E15). If granted, the waiver would allow the use of significantly more ethanol in gasoline than is currently permitted. The existing limitation leads to an upper bound of roughly 15 billion gallons of ethanol in all U.S. gasoline. This "blend wall" could limit the fuel industry's ability to meet an Energy Independence and Security Act (EISA, P.L. 110-140) requirement to blend increasing amounts of renewable fuels (including ethanol) into motor fuels—thus the interest among ethanol producers in the waiver.

On November, 30, 2009, EPA sent a letter to Growth Energy neither granting nor denying the waiver, stating that studies necessary for the agency to make a decision have not been completed, and that some of that data may be available in May or June of 2010. To meet the high volumes of renewable fuels mandated by EISA, EPA recognized that "it is clear that ethanol will need to be blended into gasoline at levels greater than the current limit of 10 percent."

Under EISA, the EPA Administrator must grant or deny the waiver request within 270 days of receipt (December 1, 2009). The Clean Air Act is silent on the consequences if EPA does not grant or deny the waiver within the 270-day window, as is the case in the Growth Energy petition.

To grant the waiver, the petitioner must establish to EPA that the increased ethanol content will not "cause or contribute to a failure of any emission control device or system" to meet emissions standards. EPA is to consider short- and long-term (full useful life) effects on evaporative and exhaust emissions from various vehicles and engines, including cars, light trucks, and non-road engines (e.g., lawnmowers). In its November 30 letter, EPA noted that long-term testing on newer vehicles has not been completed, but that the agency expects that model year 2001 and newer vehicles "will likely be able to accommodate higher ethanol blends, such as E15." In the letter the agency made no statements about older vehicles or non-road engines, but stated that EPA could "be in a position to approve E15 for 2001 and newer vehicles in the mid-year timeframe."

In addition to the emissions control concerns, other factors affecting consideration of the blend wall include vehicle and engine warranties and the effects on infrastructure. Currently, no automaker warranties its vehicles to use gasoline with higher than 10% ethanol. Small engine manufacturers similarly limit the allowable level of ethanol. In addition, most gasoline distribution systems (e.g., gas pumps) are designed to dispense up to E10. While some of these vehicle and fuel distribution systems may be able to operate effectively on E15 or higher, their warranties/certifications would likely need to be updated.

If EPA were to grant a waiver only for newer vehicles, a key question is how fuel pumps might be labeled to keep owners from using E15 in older vehicles and other equipment. A related question is whether fuel suppliers would even be willing to sell E15 if some of their customers may not use it. Further, it is unclear whether existing fuel distribution systems which were designed to dispense E10 can handle the higher-level ethanol blends.

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Background

There is growing interest in the potential for ethanol to displace petroleum as a transportation fuel.[1] In 2008, the United States consumed roughly 9 billion gallons of fuel ethanol, representing about 6% of all U.S. gasoline consumption (by volume).[2] Fuel ethanol consumption has grown from roughly 1 billion gallons per year in the early 1990s, largely as a result of federal policies promoting its use, including tax incentives and mandates for the use of renewable fuels.[3]

Arguably the most significant incentive for ethanol's use is the renewable fuel standard (RFS) established in the Energy Policy Act of 2005[4] and expanded in the Energy Independence and Security Act of 2007.[5] The RFS mandates the use of 9.0 billion gallons of renewable fuel in 2008, increasing steadily through 2022 (**Figure 1**). While the RFS is not an explicit ethanol mandate, the vast majority of the requirement has been met using corn-based ethanol. Going forward, there are limitations on the amount of corn-based ethanol that may be used to meet the mandate, although it is likely that much of the additional mandate for "advanced biofuels"[6] will be met using ethanol derived from sugarcane and from cellulosic feedstocks such as perennial grasses, fast-growing trees, and agricultural wastes.[7] By 2022, EISA requires the use of 36 billion gallons of renewable fuels, and much of this will likely be ethanol from a variety of feedstocks.

However, there is a key obstacle to the use of so much ethanol in gasoline. Currently, although some ethanol is sold as an alternative fuel (E85),[8] most is sold as an additive in conventional and reformulated gasoline. At present, the amount of ethanol that may be blended in gasoline is limited to 10% by volume (E10) by guidance developed by the Environmental Protection Agency (EPA) under the Clean Air Act, as well as by vehicle and engine warranties, and certification procedures for fuel dispensing equipment.

Under the RFS, assuming that most of the mandate is met using ethanol, gasoline blenders are likely to hit a limit in the next few years. In 2012, the RFS will require over 15 billion gallons of renewable fuel, while projected gasoline consumption in 2012 is slightly less than 150 billion gallons.[9] After 2012, the renewable fuel mandate will continue to increase. However, a limit of 10% ethanol means that ethanol for gasoline blending (not including E85) likely cannot exceed

[1] For more information on fuel ethanol, see CRS Report RL33290, *Fuel Ethanol: Background and Public Policy Issues*, by Brent D. Yacobucci.

[2] Renewable Fuels Association (RFA), Industry Statistics, http://www.ethanolrfa.org/industry/statistics/, accessed September 10, 2008.

[3] CRS Report R40110, *Biofuels Incentives: A Summary of Federal Programs*, by Brent D. Yacobucci

[4] EPAct 2005, P.L. 109-58.

[5] EISA, P.L. 110-140.

[6] Biofuels produced from feedstocks other than corn starch and with 50% lower lifecycle greenhouse gas emissions compared to gasoline.

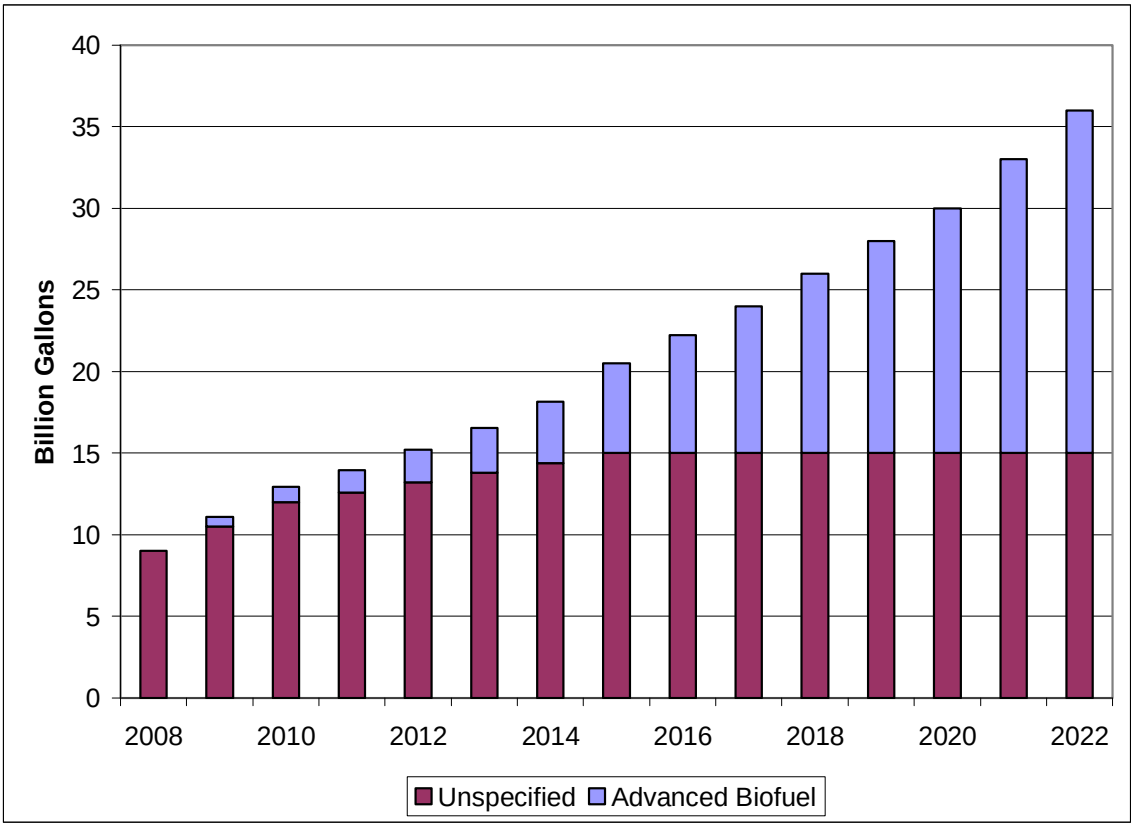
[7] For more information on the RFS, see CRS Report R40155, *Selected Issues Related to an Expansion of the Renewable Fuel Standard (RFS)*, by Brent D. Yacobucci and Randy Schnepf.

[8] A blend of 85% ethanol and 15% gasoline. Ethanol-gasoline blends are designated with an "E" followed by a number—the percentage ethanol concentration by volume. For example, a blend of 10% ethanol and 90% gasoline is referred to as "E10."

[9] U.S. Energy Information Administration (EIA), *Annual Energy Outlook 2010 Early Release*, December 2009, Reference Case Table 11.

15 billion gallons per year.[10] This "blend wall" is the maximum possible volume of ethanol that can be blended into U.S. motor gasoline. It is likely that the actual limit is lower since older fuel tanks and pumps at some retail stations may not be equipped to handle ethanol-blended fuel.

Figure 1. Renewable Fuel Standard Under the Energy Independence and Security Act



Source: CRS Analysis of P.L. 110-140.

Because of this "blend wall," there is interest, especially among ethanol producers, in increasing the allowable concentration of ethanol in gasoline. Research is ongoing on intermediate-level blends including 15%, 20%, 30%, and 40% ethanol (E15, E20, E30, and E40, respectively).

On March 6, 2009, Growth Energy (on behalf of 52 U.S. ethanol producers) applied to the Environmental Protection Agency (EPA) for a waiver from the current Clean Air Act E10 limit.[11] The application requests an increase in the maximum concentration to 15% (E15). If granted, the waiver would allow the use of significantly more ethanol in gasoline than is currently permitted.[12]

[10] If gasoline demand were to increase, the maximum amount of ethanol that could be blended into that gasoline would increase proportionally. Likewise, if gasoline demand were to decrease, the maximum amount of ethanol that could be blended would decrease proportionally.

[11] Growth Energy on Behalf of 52 United States Ethanol Manufacturers, *Application for a Waiver Pursuant to Section 211(f)(4) of the Clean Air Act for E-15*, March 6, 2009.

[12] Instead of the roughly 15 billion gallon limit in 2012 discussed above, ethanol could represent up to roughly 22 billion gallons of gasoline content.

Under EISA, EPA had 270 days (December 1, 2009) to grant or deny the waiver. On November, 30, 2009, EPA sent a letter to Growth Energy neither granting nor denying the waiver, stating that studies necessary for the agency to make a decision have not been completed, and that some of that data may be available in May or June of 2010. To meet the high volumes of renewable fuels mandated by EISA, EPA recognized that "it is clear that ethanol will need to be blended into gasoline at levels greater than the current limit of 10 percent."[13] In the letter, EPA noted that long-term testing on newer vehicles has not been completed, but that the agency expects that model year 2001 and newer vehicles "will likely be able to accommodate higher ethanol blends, such as E15."[14] In the letter the agency made no statements about older vehicles or non-road engines, but stated that EPA could "be in a position to approve E15 for 2001 and newer vehicles in the mid-year timeframe."

If EPA were to grant Growth Energy's petition to increase gasoline ethanol content to 15%, that would address only one component of the blend wall. The other impediments—vehicle and engine warranties, distribution infrastructure, and the ability of older vehciles and non-road equipment to use the fuel—would likely still need to be addressed before ethanol use in gasoline were taken beyond 10%.

What Is the "Blend Wall"?

The "blend wall" is the upper limit to the total amount of ethanol that can be blended into U.S. gasoline. Currently, gasoline ethanol content is limited to 10% by volume, and in 2008 gasoline consumption was roughly 140 billion gallons.[15] Therefore, the current blend wall is roughly 14 to 15 billion gallons of ethanol that could be blended into gasoline.[16] The blend wall is largely driven by three factors.

First, under the Clean Air Act, it is currently unlawful to sell gasoline that contains additives at levels higher than those approved by EPA. For ethanol, that limit is 10% by volume. To allow a higher percentage, a fuel manufacturer would need to petition EPA for a waiver. (See "Approval of New Fuels and Fuel Additives.")

Second, automakers currently warranty their vehicles to operate on ethanol/gasoline blends up to 10%. While there is data to suggest that newer vehicles could be operated reliably on higher levels of ethanol without modification, no automaker has yet approved those higher blends for

[13] Gina McCarthy, Notice of a Receipt of a Clean Air Act Waiver Application to Increase the Allowable Ethanol Content of Gasoline to 15 Percent; Letter to Petitioners, U.S. Environmental Protection Agency, Office of Air and Radiation, Washington, DC, November 30, 2009, p. 1, http://www.epa.gov/otaq/regs/fuels/additive/lettertogrowthenergy11-30-09.pdf.

[14] Ibid. p. 2.

[15] Beyond the blend wall, more ethanol could be used in transportation as E85 in flexible fuel vehicles (FFVs) specially designed for its use. However, there are far fewer FFVs than conventional vehicles, and most of these are currently operated on gasoline. If all of the roughly 6 to 7 million FFVs were operated on E85 all of the time, that could represent an additional 5 to 6 billion gallons of ethanol use beyond the limits of the blend wall.

[16] Technically, the blend wall is a number slightly higher than 10% of gasoline consumption. Ethanol has a lower energy content than gasoline, thus one gallon of ethanol does not displace an entire gallon of gasoline. As the share of ethanol in gasoline increases, the total volume must increase to provide an equivalent amount of energy. For example, 140 billion gallons of gasoline would have the equivalent energy to roughly 145 billion gallons of a 10% ethanol blend.

use.[17] Further, small engine manufacturers generally advise against using gasoline with more than 10% ethanol in machines such as lawnmowers, trimmers, and snowmobiles. Even if EPA were to approve higher ethanol blends for sale, it is unclear whether vehicle and machine owners would be willing to use the new fuel without explicit approval from the engine/vehicle manufacturer.[18]

Third, most existing infrastructure (e.g., underground gasoline storage tanks, fuel pumps) are designed and certified to deliver blends up to E10. It is unclear whether they can tolerate higher ethanol concentrations. Underwriters Laboratories (UL), an independent testing and certification company, recently announced guidance supporting the use of ethanol blends up to a maximum of 15% in existing fuel pumps currently certified to dispense E10.[19] However, according to the same announcement, UL stated that "under normal business conditions, E10 at the dispenser can vary from about seven to 13 percent ethanol."[20] Assuming a similar variance would exist for E15, it is likely that under normal conditions, ethanol concentrations would exceed the 15% limit. Therefore, a higher maximum level, perhaps 18%, would be necessary to allow those pumps to be certified to deliver E15.

While all three of these components of the blend wall are relevant, this report focuses on the process for addressing the first component, the current Clean Air Act restriction on ethanol concentration in gasoline.

Approval of New Fuels and Fuel Additives

For a blend of gasoline and gasoline additives to be approved under Section 211(f)(1)(A) of the Clean Air Act, it must be "substantially similar" to unleaded gasoline.[21] EPA has defined "gasoline" to have an upper limit of 2.7% oxygen content (by weight), effectively limiting the ethanol concentration to roughly 7.5% (by volume).[22] However, Section 211(f)(4) of the Clean Air Act (as amended by EISA) allows manufacturers of fuels and fuel additives to apply for a waiver from the "substantially similar" requirement if they can prove that the use of the fuel or additive will not "cause or contribute to" a vehicle not meeting applicable emissions standards over its useful life.

> The EPA Administrator, upon application of any manufacturer of any fuel or fuel additive, may waive the prohibitions established under paragraph (1) or (3) of this subsection or the limitation specified in paragraph (2) of this subsection, if he determines that the applicant has established that such fuel or fuel additive or a specified concentration thereof, and the

[17] For example, in Brazil all gasoline contains between 20% and 25% ethanol. While specific vehicle requirements differ between the United States and Brazil, especially emissions control standards, there is reason to believe that somewhat higher blends could be used in the United States.

[18] This was a key concern in the state of Minnesota. That state mandates that all gasoline in the state contain 10% ethanol. That mandate is set to increase to 20% in 2013, but only if EPA approves the use of the fuel, and automakers warranty their vehicles to operate on the fuel.

[19] Underwriter's Laboratories, *Underwriter's Laboratories Announces Support for Authorities Having Jurisdiction Who Decide to Permit the Use of Existing UL Listed Gasoline Dispensers with Automotive Fuel Containing up to a Maximum of 15% Ethanol*, Northbrook, IL, February 19, 2009.

[20] Ibid.

[21] 42 U.S.C. 7545(f)(1)(A).

[22] EPA, "Regulation of Fuels and Fuel Additives; Definition of Substantially Similar," Revised Interpretive Rule, Final Action, February 11, 1991. 56 Federal Register 5332-5336.

> emission products of such fuel or fuel additive or specified concentration thereof, will not cause or contribute to a failure of any emission control device or system (over the useful life of the motor vehicle, motor vehicle engine, nonroad engine or nonroad vehicle in which such device or system is used) to achieve compliance by the vehicle or engine with the emission standards with respect to which it has been certified pursuant to Sections 206 and 213(a) of this title. The Administrator shall take final action to grant or deny an application submitted under this paragraph, after public notice and comment, within 270 days of the receipt of such an application.[23]

EPA has twice granted waivers for 10% ethanol under Section 211(f). The first was granted in 1978 to Gas Plus, Inc. for blends of ethanol up to 10%.[24] The second was in 1982 to Synco 76 Fuel Corp. for a blend of 10% ethanol plus a proprietary additive.[25] To allow the use of E15 or E20, EPA would need to revise its definition of "substantially similar" to allow a higher oxygen content, or a manufacturer would need to petition EPA for a waiver under Section 211(f), as Growth Energy has done.

What Studies or Data Must Accompany a Section 211(f) Waiver Request?

According to EPA, there are no specific guidelines for what data must accompany a waiver application. However, based on communication between EPA's Office of Transportation and Air Quality (OTAQ) and the Minnesota Department of Agriculture,[26] as well as a presentation made by a member of OTAQ staff to the American Petroleum Institute Technology Committee,[27] a submission must include data on both evaporative and exhaust emissions. The data must be comprehensive, assessing the emissions effects both short-term and over the full useful life of the vehicle.[28] EPA expects that the aging of the vehicles will occur under both controlled (e.g., dynamometer) and on-road environmental (e.g., hot and cold weather) conditions. Further, the tests must be done for a variety of vehicles (e.g., new and used, car, truck, and motorcycle), and the selection of vehicles should reflect their frequency on the road.

According to EPA, the application must include an assessment of the health effects of the fuel (e.g., inhalation exposure studies), and should also include data assessing the durability of vehicles and vehicle parts using the fuel. These include assessments of the compatibility of the new fuel (or blend level) with engine materials, and the effects on operability and performance.

Because gasoline is also used in other engines (e.g., lawnmowers, snowmobiles, boats, etc.), the long-term effects on emissions and engine durability for these engines must also be studied, according to EPA. In the case of higher-level ethanol blends, this may be a key concern. While newer automobiles have complex fuel systems, including computers that can measure and adjust fuel/air ratios in real time, most small non-road engines have much simpler carburetor systems

[23] 42 U.S.C. 7545(f).

[24] 44 *Federal Register* 20777.

[25] 47 *Federal Register* 22404.

[26] Margo Oge, Environmental Protection Agency (EPA), Office of Transportation and Air Quality (OTAQ), Letter to Gene Hugoson, Director, Minnesota Department of Agriculture, March 6, 2008.

[27] Karl Simon, EPA, OTAQ, "Mid Level Ethanol Blend Experimental Framework – EPA Staff Recommendations," Presentation to the American Petroleum Institute Technology Committee Meeting, Chicago, June 4, 2008.

[28] Full useful life for modern cars and light trucks is 150,000 miles. For motorcycles, full useful life is 20,000 miles.

with set fuel/air ratios. One potential problem is that ethanol contains oxygen:[29] by increasing the oxygen content in the fuel—increasing the ethanol content from 10% to 20% effectively doubles the oxygen content—while keeping the amount of air coming into the engine constant, the engine will run much leaner. This could cause the engine to misfire, and/or to run much hotter than originally designed, especially in the case of air-cooled engines.

What Actions Are Federal Agencies Such as the Department of Energy and EPA Taking to Study the Compatibility of Higher Blends of Fuel in Non-flex Fuel Vehicles? What Are the Timelines of These Studies, and Will They Be Comprehensive Enough to Support a Section 211(f) Waiver Request?

Preliminary research has been completed or is ongoing on many of the above data requirements. Much of the preliminary research has been conducted by or for the state of Minnesota. Minnesota has a state law requiring the use of E10 across the state. Assuming E20 is approved as a motor fuel, the state will mandate its use starting in 2013. Therefore, Minnesota has headed much of the research that led to the Growth Energy waiver application. According to the Minnesota Department of Agriculture, some of the preliminary research has been completed or is ongoing on materials compatibility and driveability.[30] Preliminary research has also been conducted on exhaust and evaporative emissions, but this research will likely take the most time, since data must eventually be collected for the test vehicles' full useful life.

In a presentation to EPA's Clean Air Act Advisory Committee's Mobile Sources Technical Review Committee, representatives of Chrysler and Honda highlighted key research areas in assessing mid-level ethanol blends.[31] For cars and trucks they categorized the research into seven main topics: durability, tailpipe emissions, evaporative emissions, driveability, materials compatibility, emissions inventory, and on-board diagnostic (OBD) integrity. For most of these topics, they show that fuel producers, automakers, EPA and/or DOE have completed "preliminary, partial or screening" assessments, but that comprehensive testing has just started in some areas, while other areas may still need to be addressed. According to their timeline, much of the comprehensive research would not be completed before the end of 2009. Similar research must be completed for non-road engines. However, their timeline showed that the planning for that research was incomplete as of mid-2008.

In its November 30, 2009, letter to Growth Energy, EPA noted that durability testing is ongoing at the Department of Energy (DOE). According to the letter, DOE is testing a total of 19 newer

[29] In modern vehicles, additional oxygen is generally a benefit in that it promotes more complete combustion, potentially reducing carbon monoxide and other pollutant emissions.

[30] Ralph Groschen, Minnesota Department of Agriculture, "What's Happening With E20?," Presentation to the Iowa Renewable Fuels Summit, Des Moines, IA, January 31, 2008. In her letter to Gene Hugoson of the Minnesota Department of Agriculture, OTAQ Director Oge stated that "the draft reports presented to us ... are a good first step in beginning the evaluation of the effects of E20. We understand that you consider these test results to be preliminary and not sufficient for a complete waiver application, and we agree with that determination." Margo Oge, op. cit.

[31] Reg Modlin, Chrysler Corporation, and Dave Rainey, Honda Motor Company, "Assessing Effects of Mid-Level Ethanol Blends," Presentation to the Mobile Sources Technical Review Subcommittee Meeting, Arlington, VA, May 8, 2008.

vehicles, has completed testing of two of those vehicles, and expects "testing will be completed on an additional 12 vehicles by the end of May. As a result EPA expects to have a significant amount of the total data being generated through this testing program available to us by mid-June."[32] The letter made no comment on the status of testing for older vehicles or for non-road engines.

What Are the Potential Outcomes of a Waiver Request?

Under Section 211(f)(4), as amended by Section 251 of EISA, the Administrator must grant or deny the waiver request within 270 days of receipt. Before being amended by EISA, the language in Section 211(f)(4) stated that "if the Administrator has not acted to grant or deny an application under this paragraph within one hundred and eighty days of receipt of such application, the waiver authorized by this paragraph shall be treated as granted." The amended section does not now specify the status of a waiver request if EPA neither grants nor denies the request within 270 days, as is the case with Growth Energy's current request.

A question that has been raised is whether EPA can grant a partial waiver. For example, some contend that it is possible for EPA to quickly grant a waiver to allow E12 or E13, and take more time to review Growth Energy's application for E15. In recent press reports, Agriculture Secretary Tom Vilsack supported this strategy.[33] It is unclear whether EPA has authority to grant a partial waiver under the Clean Air Act, although EPA does have the authority to determine that E12 or E13 is "substantially similar" to gasoline.

What Entity Can Make a Request?

According to Section 211(f)(4), the EPA Administrator may waive the limitations "upon application of any manufacturer of any fuel or fuel additive." Therefore, presumably any gasoline or ethanol producer may petition EPA for the waiver, provided they can demonstrate to EPA that the new additive or (in this case) specified concentration of an existing additive will meet the criteria set out in Section 211(f)(4).[34] In the case of the current waiver application, Growth Energy filed the application on behalf of 52 U.S. ethanol manufacturers,[35] in partnership with the

[32] Gina McCarthy, *Notice of a Receipt of a Clean Air Act Waiver Application to Increase the Allowable Ethanol Content of Gasoline to 15 Percent; Letter to Petitioners*, U.S. Environmental Protection Agency, Office of Air and Radiation, Washington, DC, November 30, 2009, pp. 1-2.

[33] Christopher Doering, "USDA Chief Backs Boost of Ethanol Blend in Gasoline," *Reuters*, March 9, 2009.

[34] There has been some confusion over whether the petition would have to come from a gasoline producer (since the waiver is for increased ethanol content in gasoline), but the language in Section 211(f)(4) states that the application may come from "any manufacturer of any fuel or fuel additive."

[35] While the cover page of the application mentions 52 for the number of ethanol manufacturers represented, the text of the application lists 54 companies: Absolute Energy, LLC; Agri-Energy LLC/Dakota Renewable; Amazing Energy, LLC; Arizona Grain Inc.; Arkalon Energy, LLC; Big River Resources, LLC; Cardinal Ethanol, LLC; Castle Rock Renewable Fuels, LLC; Conestoga Energy; DENCO; Didion Ethanol, East Kansas Agri Energy, LLC; Front Range Energy LLC; Golden Grain Energy, LLC; Granite Falls Energy, LLC; Green Plains Renewable Energy, Inc.; Hawkeye Renewables LLC, IBEC Ethanol; ICM; Kansas Ethanol, LLC; LifeLine Foods, Inc.; Little Sioux Corn Processors, LLC; Marquis Energy, LLC; Nesika Energy, LLC; Patriot Renewable Fuels, LLC; Pinal Energy, Poet Biorefining – Alexandria; Poet Biorefining – Ashton; Poet Biorefining – Big Stone; Poet Biorefining – Caro; Poet Biorefining – Chancellor; Poet Biorefining – Coon Rapids; Poet Biorefining – Corning; Poet Biorefining – Emmetsburg; Poet Biorefining – Glenville; Poet Biorefining – Gowrie; Poet Biorefining – Groton; Poet Biorefining – Hanlontown; Poet Biorefining – Hudson; Poet Biorefining – Jewell; Poet Biorefining – Laddonia; Poet Biorefining – Lake Crystal; Poet (continued...)

American Coalition for Ethanol, the Renewable Fuels Association, and the National Ethanol Vehicle Coalition.

Other Than a Successful Section 211 Waiver Request, Are There Other Means to Approve Higher Blends of Ethanol, Such as an Executive Order or Other Administrative Action?

The provisions of Section 211 are explicit, and there seem to be few options outside of the Section 211(f)(4) waiver process for E15 or other intermediate blends to be approved. While there may be no administrative action that could permit the use of E15 other than an EPA waiver or a determination that E15 is "substantially similar" to gasoline, there are potential legislative options. These include

- amending the Clean Air Act to explicitly allow the use of E15 (or some other level of ethanol);
- amending the Clean Air Act to provide expedited approval of higher levels of previously-approved fuel additives; and
- mandating the production and sale of flexible fuel vehicles (since intermediate blends between E85 and E0—straight gasoline with no ethanol—are already approved for use in these vehicles), and promoting (or mandating) the use of E85 fuel.

Growth Energy's Waiver Application

As stated above, on March 6, 2009, Growth Energy petitioned EPA for a waiver to allow the use of up to 15% ethanol in gasoline. Under the Clean Air Act, EPA had up to 270 days (December 1, 2009) to approve or deny the waiver request, but on November 30, 2009, EPA sent a letter to Growth Energy stating that it will continue to evaluate the petition and that it may "be in a position to approve E15 for 2001 and newer vehicles in the mid-year [2010] timeframe."[36] In their application, Growth Energy states that "recent and extensive research demonstrates that use of higher ethanol blends will significantly benefit the environment by reducing greenhouse gas emissions, reducing harmful tailpipe emissions, reducing smog, using less energy for an equivalent amount of fuel, and protecting natural resources."[37] Growth Energy contends that

> available data and multiple recent studies[38] regarding the impact of various intermediate blends [of ethanol] on emissions, materials compatibility, durability, and driveability, were

(...continued)

Biorefining – Leipsic; Poet Biorefining – Macon; Poet Biorefining – Mitchell; Poet Biorefining – Portland; Poet Biorefining – Preston; POET Ethanol Products; Prairie Horizon Agri-Energy LLC; Quad County Corn Processors; Renew Energy; Siouxland Ethanol LLC; Sire; and Western Plains Energy, LLC.

[36] Gina McCarthy, op. cit., p. 2.

[37] Growth Energy, op. cit., p. 2.

[38] Growth Energy cites seven studies completed by or for the U.S. Department of Energy, the American Coalition for Ethanol, the State of Minnesota, the Coordinating Research Council, the Rochester Institute of Technology, the Minnesota Center for Automotive Research, and Stockholm University.

> completed on extensive and representative test fleets, provide a reliable comparison to certification conditions, and demonstrate that use of E-15 will not cause or contribute to failure of any emission control device or system to meet its certification emissions standards.[39]

Growth Energy cites a Department of Energy (DOE) study[40] that found a statistically significant decrease in carbon monoxide emissions using E15, and a marginally significant decrease in non-methane hydrocarbon emissions.[41] The same study also found a statistically significant increase in acetaldehyde emissions, and a marginally significant increase in formaldehyde emissions.[42] Both formaldehyde and acetaldehyde are regulated as toxic air pollutants under Sections 202 and 211 of the Clean Air Act. However, the fact that emissions increased using the fuel is not enough for EPA to deny the waiver: EPA would need to prove that that increase in emissions is enough to cause the vehicle or engine to fall out of compliance with emissions standards. Growth Energy asserts that the DOE study and other studies have found that the use of E15 results in emissions within applicable limits.[43] In its November 30 letter to Growth Energy, EPA stated that "we want to make sure we have all necessary science to make the right decision," including more long-term testing data.[44]

Other Issues

As stated above, EPA approval is not the only hurdle in enabling the use of intermediate-level ethanol blends. A key non-vehicle issue is whether existing infrastructure can support ethanol blends above E10. Like automobiles, most existing gasoline tanks and pumps are designed and certified to handle up to E10.[45] Even if the fuel is approved by EPA for use in motor vehicles, presumably fuel suppliers would be unwilling to sell the fuel unless they are confident that it will not damage their existing systems or lead to liability issues in the future. Otherwise, it seems doubtful that fuel suppliers would voluntarily upgrade their systems to handle the new fuel.

In addition to fuel supply concerns, for vehicle and machine owners to accept the new fuel, engine and auto manufacturers would likely need to convince their customers that both new and existing equipment would not be damaged by using the new fuel, and that its use would not void vehicle and equipment warranties. This may be especially difficult for small-engine manufacturers and users who are currently concerned about the effects on their engines from E10, let alone higher blends of ethanol.

[39] Ibid. p 6.

[40] U.S. Department of Energy, *Effects of Intermediate Ethanol Blends on Legacy Vehicles and Small Non-Road Engines*, Report 1, Oak Ridge, TN, October 2008.

[41] Growth Energy, op. cit., p. 16.

[42] Ibid.

[43] Ibid., p. 18.

[44] Gina McCarthy, op. cit., p. 1.

[45] Potential concerns that have been raised include whether the higher ethanol concentration will corrode seals and other components, and whether the higher concentration would lead to stress cracking of tanks and other metal components.

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