UNITED STATES OF AMERICA
ENVIRONMENTAL PROTECTION AGENCY

Notice of Receipt of a	**)**	**Docket ID No.:**
Clean Air Act Waiver Application	**)**	**EPA-HQ-OAR- 2009-0211**
To Increase the Allowable Ethanol	**)**	**FRL–8894–5**
Content of Gasoline to 15 Percent	**)**	**74 Fed. Reg. 18228 (April 21, 2009)**

COMMENTS OF ALLIANCE FOR A SAFE ALTERNATIVE FUELS ENVIRONMENT (ALLSAFE) AND THE OUTDOOR POWER EQUIPMENT INSTITUTE (OPEI)

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On April 21, 2009, EPA issued a Federal Register notice requesting comment on a waiver request for fuels containing 15% ethanol submitted by Growth Energy pursuant to section 211(f)(4) of the Clean Air Act. 74 Fed. Reg. 18228 (April 21, 2009).

The Alliance for a Safe Alternative Fuels Environment ("AllSAFE") is made up of the national consumer and manufacturing associations whose members' products consume gasoline and ethanol fuel blends. AllSAFE speaks on fuel-related legislation for over 250 million Americans that own and operate over 400 million products, including recreational boats and marine engines, chainsaws, lawnmowers, motor vehicles, motorcycles, all-terrain vehicles ("ATVs"), snowmobiles, generators, and related vehicles and equipment. AllSAFE appreciates and understands all the compelling reasons that support expanding the market for renewable fuels, including ethanol. In fact, AllSAFE wants to avoid potential consumer rejection of all ethanol blends (including E85) that could occur if mid-level ethanol blends (above 10% ethanol) ultimately damage consumer products – for example, as a result of increased heat and corrosion when mid-level fuels are used in engines, boats, equipment, and vehicles designed for *conventional* gasoline. The use of ethanol blends in these conventional vehicles is totally different from using these fuels in flexible fuel vehicles ("FFVs"), which are specifically designed to run on any level of ethanol up to *E85*.

Members of AllSAFE include:

Alliance of Automobile Manufacturers
American Motorcyclist Association
Association of Marina Industries
Association of International Automobile Manufacturers
Boat Owners Association of the United States
Engine Manufacturers Association
International Snowmobile Manufacturers Association
Motorcycle Industry Council
Motor & Equipment Manufacturers Association
National Marine Manufacturers Association
Outdoor Power Equipment Institute
Personal Watercraft Industry Association
Specialty Vehicle Institute of America

Most of the individual associations that belong to AllSAFE will be submitting separate comments that address their industries' concerns and the specific impacts of mid-level ethanol blends on their very different engines, vehicles, boats and equipment. These comments will serve as the sole comments of the Outdoor Power Equipment Institute ("OPEI"). OPEI represents the manufacturers of lawn, garden and forestry equipment (such as chainsaws, lawnmowers and utility vehicles) as well as the manufacturers of engines and other components that are used in these products.

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I. OVERVIEW

Growth Energy's waiver application requests EPA approval under section 211(f)(4) of the Clean Air Act ("CAA") to allow 15% ethanol in gasoline as a "general purpose" fuel for use in on-road and non-road engines, vehicles, and equipment. In its waiver request, Growth Energy never raised directly or indirectly whether EPA should issue a "partial waiver" that would approve the use of E-15 for some limited subset of the on-road, vehicle fleet.

In its notice announcing Growth Energy's application, EPA requested comments on two very different categories of issues. The first set of issues involves technical responses to Growth Energy's waiver application in terms of the impacts of E-15 on on-road and non-road engines, vehicles, and equipment. These technical issues are addressed in Sections IV through XI.

In its notice, EPA unexpectedly also requested comments on a potential "partial fuel waiver" that would in concept only apply to certain newer on-road vehicles. EPA's novel "partial waiver" concept would be based on somehow bifurcating the national production, distribution, blending, and marketing of separate ≤ E-10 fuels (for non-road products and older automobiles) versus E-15 fuels for some yet-to-be fully defined group of newer automobiles.[1] EPA expressed the hope that misfueling risks could be addressed through unspecified legal authority, controls, and procedures. These "partial waiver" and misfueling issues are addressed in Sections II and III.

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[1] EPA suggests in its separate RFS II rulemaking that Tier 2 vehicles might be able to accommodate E15 but provides neither data to support this proposal nor a well-defined boundary of the subset, for example, whether it would include all types of vehicles within this group. See 74 Fed. Reg. 24904, 25016 (May 26, 2009.

II. A PARTIAL FUELS WAIVER COULD RESULT IN MASSIVE MISFUELING PROBLEMS

EPA has not developed an administrative record at this time or in this waiver-review proceeding that would indicate that any controls – including incredibly expensive and intricate controls – could ultimately prevent substantial misfuelings. Under a "partial waiver" for E-15, misfueling would likely occur at even higher rates than when there were separate pumps dispensing unleaded and leaded fuels in the 1970s and 1980s, in part because the pump nozzles will be the same for both E-15 and fuels containing 10% ethanol or less. During this timeframe, the fuel inlets for new motor vehicles were totally redesigned with narrower diameters in order to prevent the insert of the larger diameter nozzles that dispensed leaded gasoline. However, in 1984 (12 years after the initial lead phase-out), EPA concluded that widespread "intentional misfueling" by consumers continued to circumvent these controls through "funneling leaded gas in the gas tank," or "removing or damaging the nozzle restriction in the fuel filler inlet of a vehicle."[2]

In 1982, EPA completed a comprehensive misfueling study based on 2,637 vehicles (comprising the 1975 to 1982 model years of production). EPA concluded that 13.5% of the vehicles (on average across the nation) designed for unleaded fuel were being misfueled with leaded fuels in 1982.[3] EPA recognized that this misfueling rate probably underestimated actual misfueling.[4] EPA recognized that despite the Agency undertaking "vigorous enforcement of the misfueling regulations, misfueling is expected

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[2] See 49 Fed. Reg. 31032, 31034 (August 2, 1984).

[3] See 49 Fed. Reg. 31032, 31034 (August 2, 1984).

[4] *Id.*

to persist as long as leaded gasoline with a higher octane rating and a lower price than unleaded gasoline remains available on the market."[5]

Even if EPA similarly requires sophisticated gas inlets and nozzle controls to be in place under a "partial waiver" for E-15, consumers will find a way to misfuel – particularly if E-15 is less expensive than E-10. In EPA's proposed Renewable Fuels Standard ("RFS-II") proposal, EPA states it expects that mid-level ethanol blends would be marketed as the less expensive regular-grade fuels.[6] In this same proposal, EPA also recognizes that (just as occurred with leaded gasoline) many consumers will intentionally misfuel to save only a few cents per gallon. Conservatively, assuming the 13.5% misfueling rate cited above (and roughly 400 million legacy products), over 50 million legacy products would be misfueled with E-15 under a "partial waiver."

Even assuming EPA can develop a workable system for protecting the legacy vehicle fleet, AllSAFE cannot envision a practical system to protect off-road engine or equipment from the improper use of a mid-level ethanol fuel. Off-highway engines are generally fueled from portable containers which are in turn fueled at the same time and location as the vehicle utilized to transport the container from the filling station to the off-road equipment location. In fact, many types of non-road products, including lawn, garden, and forestry products and off-road vehicles like ATVs and utility vehicles, are exclusively refueled from portable containers. Portable fuel containers have a range of opening sizes for refueling of the container and clearly any fuel dispensing nozzle that could be utilized to fill a vehicle could, and would, also be utilized to fill the portable container. Pump labeling warning the user about misfueling will be helpful to guide

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5 *Id.* at 31035.

6 See 74 Fed. Reg. 24904, 25017 (May 26, 2009).

vehicle owners but will likely have minimal influence on the consumer's perceived convenience of filling both the vehicle and portable container from the same nozzle, especially during a single transaction at the fuel retailer.

In addition, off-highway fuel use is a very small percentage of the total fuel delivered by any given fueling station. The incentive for fueling stations to maintain a separate tank and pump for off-highway equipment is minimal and most likely would result in higher unit fuel costs to provide sufficient operating margin for the station to offer off-highway fuel. The additional cost would provide an additional disincentive for consumers to locate and utilize a special off-highway fuel. There is also a strong potential that the reduced volume of fuel required in the marketplace would result in elimination of supply, further eroding special off-road fuel availability. This potential is heightened by the fact that the base fuel utilized for an E15 blend would not be a legally viable fuel for blending and distribution with lower ethanol concentrations required for off-highway engines and equipment.

Even if the market preserves one grade of gasoline as an E10 fuel, as EPA suggests in its RFS II proposed rule preamble, this will not address the concern about misfueling. Indeed, this will likely exacerbate the risk of misfueling because E10 will be uniformly more expensive than E15.

As documented in Sections VI through XI of these comments, misfueling non-road and on-road equipment with fuels with ethanol content higher than 10% could cause serious, permanent damage to millions of legacy products, emission – related failures, and increased operating hazards for millions of consumers, notwithstanding that up to

E10 is acceptable today for vehicles and some non-road products.[7] There is no meaningful discussion or review of these adverse impacts in Growth Energy's waiver application, in EPA's Notice in response to that application, or even in EPA's RFS-II proposal, which provides more information about EPA's thinking regarding possible implementation approaches.

III. PRACTICAL AND LEGAL REASONS EPA MUST NARROW THE SCOPE OF E-15 WAIVER REVIEW PROCESS

As explained below, for legal and practical reasons, an individual section 211(f)(4) fuel waiver is an inappropriate and ill-suited process to seek comments and develop an administrative record that would address broad fuel segregation and related misfueling controls across the country at over 175,000 gasoline retailers. If EPA wants to pursue such a "bifurcated fuels" program with different ethanol blends for different products, then EPA should initiate a separate major rulemaking process under section 211(c), rather than bootstrapping these broad issues into the narrow section 211(f)(4) waiver-review process.

First, because of explicit concerns about the adverse impacts of mid-level ethanol on non-road products, in 2007, Congress expanded and strengthened Section 211(f)(4).[8] Congress specifically directed EPA to only approve a fuel waiver if all non-road and on-road engines or vehicles would <u>not</u> be adversely impacted with regard to their applicable emission standards. EPA would be acting in direct contradiction to these new statutory requirements if it now failed to address impacts on any portion of the onroad and non-

[7] See Dr. Sahu's Technical Study attached as Exhibit A.

[8] See Section 251 of the Energy Independence and Security Action of 2007 (EISA).

road vehicle and engine population, by instead relying on an unjustified and vague "partial waiver" concept.

Second, Section 211(f)(4) is simply designed to address whether a new proposed fuel or fuel additive (when used as a "general purpose" fuel) will likely cause or contribute to an emission-related failure, or operational or "materials compatibility" problems. Section 211(f)(4) does not create the legal authority for EPA to establish a "partial waiver" based on a bifurcated fuel "concept." When EPA has tried to consider and address other broader public policy issues in an individual fuel waiver determination, the federal courts have: 1) struck down EPA's expansion of its limited discretion and authority under section 211(f)(4); and 2) directed EPA to address those issues in the context of another CAA authority (such as section 211(c)).[9]

Third, Section 251 of EISA amended section 211(f)(4) to allow 270 days for EPA to either "grant or deny" the submitted waiver application, which is more time than afforded EPA for a waiver decision before the amendment but which remains an expedited schedule. In this case, EPA will be hard-pressed to respond (within the remaining 130 days) to all the legal and technical issues directly raised in the Growth Energy waiver application and in thousands of responsive comments. To date, EPA has not yet proposed a program whereby it could address all the various market issues, leaving stakeholders with nothing to evaluate. EPA has too little time before the waiver's December 1 deadline to propose and finalize such a program, with associated compliance and enforcement mechanisms. Without a fully defined implementation program, EPA

[9] Ethyl Corporation v. EPA, 51 F. 3d 1053, (D.C. Cir. 1995); MVMA vs. EPA, 768 F. 2d 385 (D.C. Cir. 1985).

may be unable to prevent misfuelings and avoid related damage to millions of products and repeated violations of applicable standards under the CAA.

Fourth, Section 211(f)(4) does not provide the regulatory process and legal safeguards needed to address bifurcated fuels and misfueling in a thoughtful manner. In fact, EPA has consistently claimed that Section 211(f)(4) fuel waivers do not rise to the level of a "rulemaking" subject to a "cost-benefit" analysis and the other protections provided under section 553 of the Administrative Procedures Act ("APA"). However, the absence of such a formal, comprehensive rulemaking (or any related criteria) means that EPA would fail to develop, much less evaluate, the costs, benefits, safety risks, consumer impacts, and practicability of potential controls designed to prevent misfueling and other related liabilities under a bifurcated fuel system and stakeholders would be unable to evaluate EPA's analyses and program design.

Fifth, it is unclear whether EPA would have the legal authority (under section 211(f)(4)) to adopt or enforce any labels or misfueling controls at a gasoline retailer – given that a fuels waiver is only granted to the "manufacturer" of the new fuels or additives. EPA admits in its Notice that there "may be legal and practical limitations on what a fuel manufacturer may be required or able to do to ensure compliance with the conditions of the waiver, including preventing misfueling." While EPA has managed market fuel transitions under other CAA authorities through pump labeling, consumer education and other approaches, it has never in the thirty year history of waiver proceedings established downstream conditions on fuel *retailers* in a waiver proceeding specifically addressed to, and authorizing the production by the *manufacturers,* of the fuels or fuel additives. We recognize that EPA has proposed a labeling scheme in its

RFS II rulemaking,[10] but the labeling proposal lacks detail about how it would work with any of the possible waiver outcomes EPA identifies in the waiver notice.

Sixth, EPA should address controls on the "sale" of any bifurcated fuels through a major rulemaking under section 211(c) of the CAA, not through section 211(f)(4). EPA has long recognized that regulation of the "sale" of fuels clearly falls under 211(c). Section 211(c) covers regulatory programs that "control or prohibit the manufacture, introduction into commerce, offering for sale, or sale of any fuel or fuel additive…." Thus, EPA's proposal – to issue a bifurcated waiver that would somehow "control the sale or offering for sale" of E-15 – would fall squarely within the 211(c) provisions.

Seventh, in analogous circumstances, EPA has completed various extensive rulemakings under 211(c) to manage bifurcated fuel markets to minimize the risk of misfueling. When EPA proposed labeling, reporting, and other requirements for diesel fuel producers, marketers and retailers under the Ultra Low Sulfur Diesel rule, it did so through a comprehensive 211(c) rulemaking that considered a multitude of related issues, including the cost-effectiveness of the program, misfueling concerns, liability concerns, and the effects upon small businesses. Similarly, EPA engaged in a series of 211(c) rulemakings during the phaseout of leaded gasoline in order to address labels and misfueling controls, including different nozzle and fuel-inlet configurations. Before completing these rulemaking proposals, EPA conducted years of outreach with stakeholders, including the auto industry and the automotive fuel marketing industry, in an effort to determine the feasibility of various control methods to combat misfueling.

[10] See § 80.1469 – (74 Fed. Reg. at 25143).

Eighth, in all these prior 211(c) rulemakings that involved phasing in new fuels and bifurcated markets, EPA provided engine and equipment manufacturers, fuel distributors, and gasoline retailers with the needed lead-time to implement all the different misfueling controls as well as certain accommodations regarding compliance with regulations during the transition periods. It is unclear how EPA could create such a transition process (with future effective dates for misfueling controls) under a section 211(f)(4) waiver – given that these waivers typically would become immediately effective if granted.

Ninth, all the affected stakeholders would need much greater specificity on EPA's proposed "bifurcation structure," and on proposed alternative control measures and their projected costs and impacts – in order to develop meaningful responsive comments. Growth Energy's waiver application, EPA's notice of the application, and the RFS II rulemaking do not provide any details on how EPA could practically bifurcate the fuel supply and avoid misfueling under any conditional waiver. There is no practical means to respond to EPA's vague "bifurcated fuels" concepts.

Tenth, further complicating this situation is the fact that on May 5th, EPA solicited similar, but broader, comments on addressing misfueling (under an E-15 "partial waiver" option) as part of its RFS-II proposal. AllSAFE appreciates the fact that the RFS-II proposal at least generally identifies several different types of potential misfueling controls and recognizes their limitations and challenges. However, the RFS-II proposal does not explain whether or how EPA will integrate or consider comments received over the next few months on the RFS-II proposal in its expedited E-15 waiver review process. It is not clear whether Section 211(o), which is the basis for the RFS-II regulations, could somehow serve as the legal framework to develop, implement, and enforce misfueling

controls for mid-level ethanol blends that are specifically approved under a section 211(f)(4) waiver.

EPA admits in its RFS-II proposal that "it is not possible at this time to know the contours of a partial waiver with conditions, or even if one might be appropriate."[11] In that same proposal, EPA also recognizes it is unclear how any conditions in a partial waiver – that would only apply directly to the "manufacturer" of the fuel – could somehow be expanded to essentially regulate the activity of consumers, gasoline retailers, and the manufacturers of all the affected products.[12]

Finally, to the extent EPA wants to pursue a "partial waiver" approach, EPA should initiate a separate future rulemaking process (under section 211(c)) and develop a well-supported, specific proposal and administrative record that carefully evaluates all the complex issues associated with potentially bifurcating the national fuel supply system through practical and specific proposals to avoid misfueling.

From a legal and public policy standpoint, EPA would need to first adopt a federal regulatory program that addressed misfueling through practical and legally enforceable controls before EPA could ever rely on such controls in any fuels waiver decision under section 211(f)(4). In other words, EPA should not approve any "partial" mid-level ethanol fuel waiver until after EPA has developed and implemented a comprehensive and effective regulatory program under section 211(c) to prevent misfueling.

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[11] See 74 Fed. Reg. 25017, FN 251 (May 26, 2009).

[12] 74 Fed. Reg. 25016-25017 (May 26, 2009).

IV. SECTION 211(F)(4) – FUELS WAIVER CRITERIA

Pursuant to Section 251 of the 2007 Energy Independence and Security Act (EISA), EPA must consider the impacts of the proposed fuel or additive on all the affected non-road engines, products, vehicles and equipment, as well as on motor vehicles. Off-highway engine/equipment categories requiring evaluation will be significantly greater than on-highway test fleet due to the diversity of engines/equipment included in the off-highway category. For example, handheld lawn and garden equipment engines now include approximately eight different engine design technologies, all of which may be designed to any of three different life categories. This means a possible 24 different engine designs which may be included in multiple application usages. (See illustrative test plans summarized in Section X below). Below in Table 1 is a detailed list of the different types of off-road equipment that must be evaluated by the waiver application.

Table 1

Types of Off-Road Equipment

Broad Categories

- Lawn and Garden
  - Hand-Held (chainsaws, trimmers, blowers, edgers, etc.)
  - Ground-Supported (lawn mowers, rider mowers, etc.)
- Industrial Equipment (generators, forklifts, etc.)
- Snow (snowmobiles, etc.)
- Marine (outboard/PWC, inboard, stern-drive)
- Off-Road Motorcycles
- All Terrain Vehicles

B. Detailed List

2-Wheel Tractors	Other Agricultural Equipment
Aerial Lifts	Other Construction Equipment
Agricultural Mowers	Other General Industrial Equipment
Agricultural Tractors	Other Lawn & Garden Equipment
Air Compressors	Other Material Handling Equipment
Air Conditioners	Paving Equipment
Air Start Units	Personal Water Craft
All-Terrain Utility Vehicles	Plate Compactors
Asphalt Pavers	Pressure Washers

Baggage Tugs	Pumps
Balers	Rear Engine Riding Mowers
Belt Loaders	Rollers
Bobtails	Rough Terrain Forklifts
Bore/Drill Rigs	Rubber Tired Loaders
Cargo Loaders	Sailboat Auxiliary Inboard Engines
Cement and Mortar Mixers	Sailboat Auxiliary Outboard Engines
Chainsaws	Shredders
Chippers/Stump Grinders	Signal Boards
Combines	Skid Steer Loaders
Commercial Turf Equipment	Snowblowers
Concrete/Industrial Saws	Snowmobiles
Cranes	Specialty Vehicles
Crushing/Processing Equipment	Sprayers
Deicers	Surfacing Equipment
Dumpers/Tenders	Swathers
Forklifts	Sweepers/Scrubbers
Front Mowers	Tampers/Rammers
Fuel Trucks	Tillers
Generator Sets	Tractors/Loaders/Backhoes
Golf carts	Transport Refrigeration Units
Ground Power Units	Trenchers
Hydro Power Units	Trimmers/Edgers/Brush Cutters
Lav Carts	Vessels w/Inboard Engines
Lav Trucks	Vessels w/Inboard Jet Engines
Lawn & Garden Tractors	Vessels w/Inboard/Outboard Engines
Lawn Mowers	Vessels w/Outboard Engines
Leaf Blowers/Vacuums	Water Trucks
Minibikes	Welders
Motorcycles	Wood Splitters

Under Section 211(f)(4) of the federal Clean Air Act, the waiver applicant must prove that the use of the fuel additive "will not cause or contribute to the failure of any emission control device or system...to achieve compliance…with the [applicable] emissions standards" – at any point throughout the useful life of the product. Courts have held that EPA must deny waiver applications for fuels or additives that would result in any emission-related failure or exceedance of a standard – even when EPA believes such failures are not "significant."[13]

To supplement these comments, we are submitting a comprehensive legal analysis of binding judicial precedent that governs the application of Section 211(f) waiver criteria

[13] See MVMA v. EPA, 768 F.2d 385 (D.C. Cir. 1985).

in this waiver application and any future waiver application.[14] Part I of that analysis documents the compelling reasons why any EPA approval of the Growth Energy application, or similar action, would not withstand judicial review. Part II of the enclosed analysis documents the functional relationship between Section 211 waivers and the vehicle and engine remedial provisions, such as recall, under other Sections of the CAA.

As explained in the enclosed legal analysis, because in this waiver application, there is evidence of "the potential for harm" to engines, and their emission control devices or systems, "the applicant has the burden of proving that such harm will not occur."[15]

The available test data and studies indicate that E-15 will result in widespread "potential harm" to the types of emission-related components used in non-road and on-road engines, vehicles and equipment.[16]

V. GROWTH ENERGY'S APPLICATION FAILS TO MEET THE MINIMUM CRITERIA THAT EPA HAS SET FORTH AS BEING APPLICABLE TO ANY MID-LEVEL ETHANOL WAIVER.

A. EPA Test Program and Waiver Criteria

To implement Section 211(f)(4), EPA has developed and applied four separate "waiver criteria" in 24 previous waiver applications. The four "waiver criteria" are adverse impacts on: 1) engine exhaust emissions; 2) evaporative emissions; 3) "materials compatibility" with fuel-system components; and 4) the "drivability/operability" of the engine/vehicle/equipment. (Each of these four criteria are applied to the major studies on non-road engines, vehicles and equipment in Section VI through XI, below).

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[14] See "Supplemental Statutory Appendix" attached as Exhibit B.

[15] See MVMA, 768 F.2d at 400.

[16] See Dr. Sahu's Technical Study attached as Exhibit A, and Sections VI through XI below.

In public presentations,[17] and public letters,[18] EPA has given more specific direction as to the data submission required to support a 211(f)(4) waiver request for mid-level ethanol blends. This data submission can be divided up into four components. These are tests required, test fuel characteristics, fleet composition, and statistical interpretation.

In the recent RFS-II proposal, EPA cites to an influential "EPA staff recommendation" on the testing framework needed to support a mid-level ethanol waiver (See attached Exhibit I).[19] This 2008 EPA recommendation confirms that a waiver applicant for mid-level ethanol would have to provide test data on operability, compatibility, exhaust emissions, and evaporative emissions from a representative group of both on-road and non-road engines and equipment categories. In this guidance, EPA has specified that the applicant's test programs must include "a complete cross-section of the impacted engine/equipment categories," in order to represent a sufficient number of models in terms of:

- Major sales models;
- Variety of Engine technologies;
- HP range, speed range;
- Applications, markets

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[17] Jim Caldwell, Office of Transportation and Air Quality, SAE Government/Industry Meeting, May 13, 2008.

[18] Christine Todd Whitman, Response to Ethyl Corporation Petitions Denying Reconsideration of Three EPA regulations: CAP 2000, Heavy Duty Gasoline, and OBD/IM, http://www.epa.gov/oms/standards.htm, August 23, 2001.

[19] Mid Level Ethanol Blend Experimental Framework – EPA Staff Recommendations, Karl Simon, EPA Office of Transportation and Air Quality, API Technology Committee Meeting, Chicago, June 6, 2008 (Exhibit I).

For each engine/equipment category (and for each waiver criteria), EPA must evaluate: 1) new equipment/vehicles; 2) legacy equipment/vehicles; and 3) future technologies that will be required for upcoming new emission regulations.[20]

For each test category, the applicant must include durability testing based on field-aging.[21] The applicant must provide "an engine tear down and inspection," including "wear and deposit" evaluations.[22]

EPA has typically required a fuel waiver petitioner to demonstrate durability impacts through the operation of complete engines and vehicles as operated for their useful lives under actual, real-world conditions. For example, in 2001, the EPA Administrator rejected a petition from Ethyl, a fuel additive manufacturer, to rely on accelerated aging procedures to predict the impact of a new fuel additive. In its response to Ethyl, EPA explained that in order to show that their fuel additive does not cause additional deterioration to vehicles:

> [A] fuel or fuel additive manufacturer would likely evaluate the effect of their fuel or fuel additive by using a whole vehicle aging procedure. A whole vehicle aging procedure would show the effects of the fuel or fuel additive under more real-world driving conditions. Moreover, as stated before, the real-world effects of contaminants or additives are best evaluated after operating vehicles for an extended period of time such that engine and emission control system cycle through a variety of normal operating procedures.[23]

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20 *Id*.

21 *Id*.

22 *Id*.

23 Response to Ethyl Corporation Petitions Denying Reconsideration of Three EPA regulations, *supra* note 6, at 55-56.

B. Growth Energy Application

Growth Energy has failed to provide test data or cite any studies that would meet EPA's test criteria outlined above or cited in EPA's recommended test program.

Table 2 below compares Growth Energy's application to the EPA waiver requirement for *non-road* products. Table 5 in Exhibit K provides a similar comparison of EPA's criteria to the Growth Energy's application vis-à-vis *on-road* products. Each EPA requirement is given a reference and an item number and each is discussed individually either below or in the next few sections.

As Table 2 shows, Growth Energy has presented very limited data on an unrepresentative and incomplete group of non-road engines, vehicles and equipment. For example, Growth Energy has failed to cite to any test data or studies that evaluate the impacts of ethanol fuels on the operability or the evaporative emissions of any class or category of non-road engines, vehicles or equipment. Growth Energy has not cited to any tests or evaluations of most of the unique plastics, polymers, and rubbers (including nylon) that are used in non-road engines and products. Growth Energy has <u>not</u> cited to any test data on evaluations of the impacts on exhaust emissions from any of the non-road categories – except for small spark-ignited engines (SSIE). Even these SSIE exhaust tests did not include a representative or statistically significant group of products. These SSIE tests failed to meet EPA's recommended test requirements and actually indicate substantial engine durability, operability and emission-related failures.

Item	EPA Requirements for OFF-ROAD	TABLE 1 - OFF-ROAD Growth Energy Petition - Supporting Studies (from www.growthenergy.org)											Orbital Studies[1]	Auto/Oil/ AllSAFE Test Plan[2]
		DoE/ORNL (10/08)	EERC/MCAR (10/07)	MN/RFA (3/08)					CRC (12/06)	RIT (10/08)	MCRA (7/99)	SU (2004-05)	-	-
	Ref. # Below	[GE-1]	[GE-2]	[GE-3a]	[GE-3b]	[GE-3c]	[GE-3d]	[GE-3e]	[GE-4]	[GE-5]	[GE-6]	[GE-7]	-	-
1	Representative Fleet[13]	No	No	N/A	N/A	N/A	N/A	No	N/A	No	No	No		Yes
2	Tailpipe Emissions[7]	See Cmts	No	N/A	N/A	N/A	N/A	N/A	N/A	No	No	No		Yes
2A	Comparison to E0 and E10	See Cmts	No	N/A	N/A	N/A	N/A	N/A	N/A	No	No	No		Yes
2B	Full Useful Life[8]	See Cmts	No	N/A	N/A	N/A	N/A	N/A	N/A	No	No	No		Yes
3	Evaporative Emissions[9]	No	No	N/A	N/A	N/A	N/A	N/A	No	No	No	No		Yes
3A	Comparison to E0 and E10	No	No	N/A	N/A	N/A	N/A	N/A	No	No	No	No		Yes
3B	Full Useful Life[10]	No	No	N/A	N/A	N/A	N/A	N/A	No	No	No	No		Yes
4	Durability[3]	See Cmts	No	N/A	N/A	N/A	N/A	No	N/A	No	No	No		Yes
5	Materials Compatibility[6]	No	No	See Cmts	See Cmts	See Cmts	No	N/A	N/A	No	No	No		Yes
5A	Real Use Conditions[4]	No	No	No	No	No	No	N/A	N/A	No	No	No		Yes
5B	Engine Teardown with Rating[5]	No	No	No	No	No	No	N/A	N/A	No	No	No		Yes
6	Safety[11] Simon, Slide 14	No	No	N/A	N/A	N/A	N/A	No	N/A	No	No	No		No
7	Oil and Fuel Aging Interaction[12]	No	No	N/A	N/A	N/A	N/A	No	N/A	No	No	No		Yes

N/A **Not Applicable**

No **This report or study did not consider Off-Road or did not consider the EPA Item for Off-Road**

[1] Orbital Engine Studies

[2] Dr. Sahu's Compability Report attached as Exhibit C

[3] Karl Simon, EPA OTAQ - Mid Level Ethanol Blend Experimental Framework – EPA Staff Recommendations, API Technology Committee, June 6, 2008 Slide 14 & 18

[4] Simon, Slide 14, 16, 19

[5] Simon, Slide 16 & 20

[6] Whitman; Caldwell, Slides 9 & 12; Simon, Slide 5

[7] Whitman; Caldwell, Slide 10;Simon, Slides 16, 18 & 19

[8] Simon, Slides 16, 18 & 19

[9] Simon, Slides 16 & 18

[10] Simon, Slides 16 & 18

[11] Simon, Slide 14

[12] Simon, Slide 20

[13] Simon, Slides 14-17

Study Ref.	Study Full Title
[GE-1]	Effects of Intermediate Ethanol Blends on Legacy Vehicles and Small Non-Road Engines, Report 1, prepared by Oak Ridge National Laboratory for the U.S. Department of Energy (October 2008). This peer-reviewed study regarding the effects of E15 and E20 on motor vehicles and small non-road engines concludes that when E15 and E20 were compared to traditional gasoline, there are no significant changes in vehicle tailpipe emissions, vehicle driveability, or small non-road engine emissions.
[GE-2]	Optimal Ethanol Blend-Level Investigation, Final Report, prepared by Energy & Environmental Research Center and Minnesota Center for Automotive Research for American Coalition for Ethanol (October 2007). This report studied the effects of ethanol blends ranging from E10 to E85 on motor vehicles and found that exhaust emissions levels for all vehicles at all levels of ethanol blend were within the applicable Clean Air Act standards.
[GE-3]	The Feasibility of 20 Percent Ethanol Blends by Volume as a Motor Fuel, Results of Materials Compatibility and Driveability Testing, prepared by the State of Minnesota and the Renewable Fuels Association (March 2008):
[GE-3a]	The Effects of E20 on Metals Used in Automotive Fuel System Components. The study compared the effects of E0, E10 and E20 on 19 metals and found that the metals tested were compatible with all three fuels;
[GE-3b]	The Effects of E20 on Elastomers Used in Automotive Fuel System Components. The study compared the effects of E0, E10 and E20 on eight elastomers and found that E20 caused no greater change in properties than E0 or E10;
[GE-3c]	The Effects of E20 on Plastic Automotive System Components. The study compared the effects of E0, E10 and E20 on eight plastics and found that there was no significant difference in the properties of the samples exposed to E20 and E10;
[GE-3d]	The Effects of E20 on Automotive Fuel Pumps and Sending Units. The study compared the effects of E0, E10 and E20 on the performance of 24 fuel pumps and nine sending units and found that E20 has a similar effect as E10 and E0 on fuel pumps and sending units;
[GE-3e]	Demonstration and Driveability Project to Determine the Feasibility of Using E20 as a Motor Fuel. The study tested 40 pairs of vehicles on E0 and E20 and found no driveability or operational issues with either fuel).
[GE-4]	Fuel Permeation from Automotive Systems: E0, E6, E10, E20 and E85, prepared by the Coordinating Research Council, Inc. (CRC Report No. E-65-3) (December 2006). This study evaluated effects of E0, E6, E20 and E85 on the evaporative emissions rates from permeation in five newer California vehicles and found that there was no statistically significant increase in permeation rates between E6 and E20.
[GE-5]	Report to the US Senate on E20 Ethanol Research, prepared by the Rochester Institute of Technology (October 2008). This study evaluated effects of E20 on 10 legacy vehicles. Initial results after 75,000 collective miles driven found no fuel-related failures or significant vehicle problems and documented reductions in regulated tailpipe emissions when using E20 compared to E0.
[GE-6]	Use of Mid-Range Ethanol/Gasoline Blends in Unmodified Passenger Cars and Light Duty Trucks, prepared by Minnesota Center for Automotive Research (July 1999). This one-year study evaluated the effects of E10 and E30 in 15 older vehicles in "real world" driving conditions. It found no effect on driveability or component compatibility from either fuel and found that regulated exhaust emissions from both fuels were well below federal standards.

[GE-7] Blending of Ethanol in Gasoline for Spark Ignition Engines: Problem Inventory and Evaporative Measurements, prepared by Stockholm University et. al., (2004 - 2005). This study tested and compared evaporative emissions from E0, E5, E10 and E15 and found lower total hydrocarbon emissions and lower evaporative emissions from E15 than from E10 and E5.

C. Growth Energy Has Failed to Compare Differences From EPA Certification Fuels

Growth Energy insinuates that the "baseline" fuel should be E-10 and that it only has to prove that there is not a significant difference in performance between E-10 and E-15 fuels.[24] In fact, in many instances Growth Energy only provides information on the projected impacts of shifting from E-10 to E-15, rather than comparing E-0 to E-15.[25]

Carbureted engines must be set at a fairly lean air-fuel ratio to ensure emissions compliance when the engine is run on the EPA "certification" and "confirmatory" test fuel. Indolene (E-0) remains the principal EPA certification fuel used for all on-road and non-road EPA engine exhaust certifications. EPA's emission standards are typically based on test data that has been generated with the engine operating on Indolene or E-0. Many non-road carbureted handheld engines experience difficulty running on E-10 fuels – in part because they already have very lean air-fuel ratios in order to meet EPA emission standards when operating on E-0 certification fuel.[26]

In order to determine the impacts that E-15 would have on EPA's existing emission-related programs and on certified products, EPA would have to compare E-15 fuels with its E-0 certification fuels.[27] For that reason, CAA Section 211(f)(1)(A) makes it unlawful to introduce into commerce or increase the concentration of any fuel or fuel additive which is not "substantially similar" to any fuel or fuel additive utilized in the "certification of any vehicle or engine."

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[24] See p. 5-7 of waiver application.

[25] See evaporative emissions evaluation on page 23-27 of waiver application.

[26] See Exhibit A, Section A.

[27] Many non-road manufacturers are currently obtaining EPA evaporative certifications based on California's certification fuel which also does not contain any ethanol. See Section IX below.

In its prior waiver-review process, EPA has consistently required the waiver applicant to submit comparison "baseline" tests using Indolene as EPA's certification fuel.[28]

EPA (and manufacturers of ethanol) have consistently recognized (for the last 28 years) that E-10 is not "substantially similar" to EPA "certification fuels," which typically do not contain any ethanol whatsoever.[29] For that reason, a waiver application (under Section 211(f)(4)) had to be filed for 10% ethanol. Moreover, EPA has previously recognized that – "consistent with Congressional intent," even new fuels containing less than 10% ethanol "are best addressed in the Section 211(f)(4) waiver process" (given the substantial "uncertainties" with their environmental impacts).[30]

EPA has also recognized that "Congress intended only to include as 'substantially similar' those fuels chemically and physically similar to fuels used in certification."[31] According to EPA, "it is not an issue of whether mid-level ethanol blends are substantially similar to a fuel that has received a waiver."[32] Fuels or fuel additives (like E-10) that are ultimately granted a waiver under Section 211(f)(4) do not somehow become "substantially similar" to the EPA certification fuel.[33] Nor do such "waived" fuels become the "baseline fuel" on which future "substantially similar" comparisons are based.[34] Such a flawed approach would allow "incremental creep" which would undermine the purpose of the waiver process.

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[28] See EPA's Guidelines for Section 211(f) Waivers for Alcohol-Gasoline blends, 43 Fed. Reg. 24131, 24132 (June 2, 1978).

[29] See 40 C.F.R. § 86.113.

[30] See 46 Fed. Reg. at 38582, 38584 (July 28, 1981).

[31] *Id.* at 38583.

[32] See 74 Fed. Reg. 25019, FN 260 (May 26, 2009).

[33] 46 Fed. Reg. at 38583.

[34] *Id.*

D. Instead of Conducting Tests on E-15 fuels, Growth Energy Would Inappropriately Require EPA to Extrapolate or Interpolate Results Based on Different Ethanol Blends than E-15

Throughout its waiver application, Growth Energy relies on test data on the impacts of ethanol-gasoline blends other than E-15. For example, all of the compatibility and driveability studies performed by Minnesota State University ("MSU") only considered the impacts of E-20 and not E-15. In other cases, for example, to show evaporative emissions, Growth Energy relies mainly on pre-existing E10 data from conventional vehicles. Growth Energy failed to conduct the required testing with E-15 fuel blends. According to EPA's waiver precedent, the applicant must submit data on the specific concentration of the requested fuel additive (i.e., E-15); EPA does not contemplate having to extrapolate data based on different concentration levels.[35] From a technical standpoint, properties of gasoline-alcohol mixtures are often non-linear, and there can be uncertainties when interpolating or extrapolating results.

VI. NON-ROAD MATERIALS COMPATIBILITY STUDIES

The well-established chemical properties and principles that cause mid-level ethanol blends to result in "material compatibility" problems are discussed and documented in Dr. Sahu's Technical Study attached as Exhibit A (particularly in Sections A, G, D, and F).

A. Existing Major Studies on Non-road and Marine Small-Engines

1. Orbital-Engineering Reports (2003)

The most comprehensive and complete study on the "materials compatibility" problems with small engines and marine outboard engines is the May 2003 Orbital Engine Report to the

[35] See 43 Fed. Reg. 11258, 11259 (March 17, 1978).

Australian Government based on 2,000 hours of extensive "materials compatibility" testing.[36] This report concluded that "E-20 fuel is incompatible with both base engine components and with fuel system components utilized in the Mercury outboard and Stihl line trimmer engine."[37] Specifically, E-20 caused the following documented problems on EPA-certified outboard marine engines and Stihl line trimmers:

- Severe corrosion, rusting and pitting of metallic and brass components – such as the carburetor body and throttle, piston rings, crankshaft seal housing, crankshaft bearings and surfaces, connecting rod, cylinder liner, throttle blades
- Swellings, distortion and degradation of fuel delivery hose, fuel primer bulbs, fuel line connector, and crankshaft seal

The Orbital report concluded these problems would likely cause: 1) oxides that may dislodge and damage the engine; 2) the loss of intended fuel-air metering and control, and 3) fuel leakage.[38]

2. Briggs and Stratton Study (2007)

In a 2007 study, Briggs and Stratton completed evaluations of the impacts of E-20 on EPA-certified engines – through soaking fuel components and evaluating the heat-related damage caused by:

- Substantial distortion and swelling of elastomers, rubbers and plastics;
- Metals, expoxy and other materials that dissolved or corroded to the point that several components failed and could cause fuel leaks; and

[36] Market Barriers to the Uptake of Biofuels Study – A Testing Based Assessment to determine impacts of a 10% and 20% Ethanol Gasoline Fuel Blend on Non-Automotive Engines, Orbital Engine Company, (May 2003). (http://www.environment.gov.au/atmosphere/fuelquality/publications/).

[37] *Id.* at 20.

[38] See 2003 Orbital Report at p. 4-6.

- Higher operating temperatures resulting in damage to gaskets resulting in a head gasket failure after only 25 hours of light duty testing.[39]

Thus, the Briggs study confirms the conclusions of the Orbital Studies. (See Briggs study attached as Exhibit A).

B. Growth Energy's Application

To support its claims that there are not "materials compatibility" problems with all non-road products, Growth Energy relies on the following 3 inter-related studies prepared by MSU from March 2008:

- A metals study which allegedly concluded that 18 of 19 tested metals exposed to E-20 were compatible (with problems only observed on Zamak 5);
- An elastomer study which allegedly concluded that the magnitude of the changes observed on eight elastomers exposed to E-20 were "not great enough to represent a concern."
- A plastics study which allegedly concluded that there was no significant differences for eight plastics exposed to E-20.

C. Critique of Growth Energy Waiver

First, Growth Energy has failed to address any of the comprehensive Orbital compatibility studies, attached to these comments cited above.

Second, the MSU study only focused on components used in automobiles. The Alliance of Automobile Manufacturers ("AAM") has thoroughly critiqued the 2008 Minnesota compatibility studies to assess the actual detected compatibility-impacts vis-à-vis motor vehicles. In spite of soliciting information on the types of materials used in non-road applications, MSU did not test most of the plastics, polymers and elastomers that are typically used in *non-road* products. Dr. Sahu has determined that MSU failed to evaluate 19 of 22

[39] See Briggs report at p. 3.

plastics/polymers/elastomers that AllSAFE had specifically identified as being used in non-road products.[40] All these typical non-road components still need to be evaluated for materials-compatibility.[41]

Third, even for the materials tested by MSU, there are significant technical and interpretive flaws in the MSU report. Some of the major flaws include:

a. Failure to use E15 fuels as discussed earlier;

b. Although simple coupon testing was used to simulate actual operating conditions, the metals results still demonstrated that significant corrosion would occur. Real world testing with loads/stresses, temperatures, pressures, etc. associated with actual operations should result in actual operation failures were true fleet testing to be done using these fuels.

c. Relevance of the test cycles chosen by MSU and associated parameters such as the length of the test; the MSU work does not address how these choices are predictors of compatibility, durability, or functional performance;

d. The summary-conclusions in most instances that the tested E20 fuel is "compatible" without any discussion of what "compatible" means in each instance. The authors seem to imply that E20 is compatible with the performance of the equipment that uses the tested materials – yet, as noted, the test conditions have no correlation to equipment performance;

e. The repeated statements noting that the degradation associated with E20 are somehow marginally higher than those observed with E10, when in fact, the analysis of the actual test data in the reports does not support this conclusion. For example, when analyzed with a percent-change criteria, 14 out of 19 metal coupons exhibited higher (greater than 50%) measurable mass change. Metals experiencing a reduction in mass indicate both a reduction in the strength of the remaining metal component and an increase in the contamination of the corresponding fuel. The study did not evaluate metal engine or fuel system components to identify if either the reduced physical properties or corresponding contamination of the fuel on contact with the metal components would result in engine or fuel system failure to function or result in an unsafe condition.

[40] See Dr. Sahu's Compability Report attached as Exhibit C.

[41] See Sahu Report attached as Exhibit D.

> f. Elastomers were tested utilizing an arbitrary test time and temperature without any corresponding determination of acceptable elastomer component function. Because none of the elastomers were evaluated for their influence on their related components performance, MSU's conclusion is not justified. Many fuel system elastomer components utilized in off-highway engines are significant for both product operation/function and safety. For example, a gravity feed fuel system relies on the seal of the carburetor fuel inlet needle to seal, preventing additional fuel from entering the carburetor, at the prescribed fuel level. Elastomers are also utilized in crankcase vacuum pulse actuated fuel pumps that are sensitive to changes in elastomer properties including swell and strength.

VII. NON-ROAD DRIVABILITY/OPERABILITY STUDIES

"Materials incompatibility" typically results in problems in engine operation and performance. EPA and the federal courts have recognized that the fuel's impacts must be considered on both engine emissions as well as engine performance or "drivability." This is because "drivability can directly result in increased emission due to constant misfires and repeated stalling, and possibly lead to tampering with the emission controls of the vehicle."[42] Accordingly, EPA has stated:

> EPA believes that harm to emission control devices or systems which adversely effects vehicle performance, such that removal or rendering inoperative of such devices or systems may be reasonably expected, should be considered a basis under Section 211(f)(4) for denying a waiver. **Where the potential for such harm is evidenced, the applicant has the burden of proving that such harm will not occur**. [emphasis added].[43]

The chemical properties and scientific principles that cause mid-level ethanol blends to result in "operability" and drivability" problems are discussed in the study attached as Exhibit A – particularly in Section F, G and H.

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[42] See Motor Vehicle Mfrs. Ass'n v. EPA, 768 F.2d 283, 401 (D.C. Cir. 1985).

[43] 34 Fed. Reg. 24132 (June 2, 1978).

A. Existing Non-road, Small Engine and Marine Studies

1. Orbital Studies (2002 and 2003)

The most comprehensive study on the impacts of mid-level ethanol on the "operability" of small non-road and marine engines is the Orbital Engine's Report to Environment Australia entitled "Testing Based Assessment to Determine Impacts of a 10% and 20% Ethanol Gasoline Fuel Blend on Non-Automotive Engines" (January, 2003).[44] That report (which was part of the same May 2, 2003 Orbital compatibility report cited above) concluded that E-20 fuel caused the following adverse operational impacts on Stihl line trimmers and on outboard Mercury Marine engines:

- increases in engine misfires and stalling
- difficulty in maintaining constant engine operating speed
- damage to the engine, including piston ring and exhaust port deposits increasing wear rates
- damage to the engine carburetor diaphragm resulting in the loss of internal and external sealing and likely fuel leakage
- corrosion of metallic engine components.[45]

In 2002, Orbital Engine Company prepared a related comprehensive "Technical Assessment" and "Failure Mode and Effects Analysis" (FMEA) on the impacts of E-20 on Stihl line trimmers and Mercury Marine outboards.[46] That FMEA analysis concluded that E-20 would cause "material degradation" (like "corrosion or perishing" of the piston, piston rings and crankshaft) in 62% of the total affected "mechanisms." Other very high percentages of "mechanism failures" included "gumming," "lubricant deficiency," and "altered combustion."[47]

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[44] See http://www.environment.gov.au/atmosphere/fuelquality/publications/.

[45] See 2003 Orbital Report at p. 2-3.

[46] See http://www.environment.gov.au/atmosphere/fuelquality/publications/.

[47] See p. 26 of 2002 Orbital Report.

According to the Orbital-FMEA report, these "mechanism of failures" caused the following "effects of failure" (at the following "percentage of total effects"):

- A lack of power (32%)
- Rough engine operation (19%)
- Fuel leaks (which would be a safety hazard and an evaporative emissions failure) (17%)
- Engine seizure (13%)
- Engine stops (11%)[48]

The problems documented in the Orbital Studies would likely be even more pronounced for more recent EPA-certified products. Since 2004, the EPA exhaust regulations applicable to non-road products (including small engines and outboard marine engines) have become increasingly more stringent, requiring catalysts and other emission-related modifications. Current EPA-certified engines must run under leaner operating conditions.

These leaner conditions result in narrower acceptable tolerance limits for increasing the oxygen content in the fuel without causing excessive heat and other operational problems.[49]

2. Briggs and Stratton Study (2007)

In its 2007 study, Briggs and Stratton identified the following operability features resulting from E-20 fuels on their EPA-certified engines:

- head gasket failure after 25 hours (due to high temperatures so that gases escaped past the gasket);
- loss of power;
- decreases in RPM stability and audible speed oscillations;
- poor acceleration;
- damages to rubber and plastic fuel system components, causing leaks due to alcohol swelling and degradation.[50]

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[48] See 2002 Orbital Report at p. 30.
[49] See Study attached Exhibit A, Sections A and B.

B. Growth Energy Position

In its petition, Growth Energy does not address the comprehensive Orbital studies summarized above. In fact, for non-road products, Growth Energy solely argues that the DOE small engine study concluded that "it is not possible to isolate the effects of ethanol on the operability of SNRE [small non-road engines] because of the great variance in performance among small non-road engines, regardless of the fuel used." On that basis, Growth Energy incorrectly claims that "E-15 will not have a discernable impact on the performance and operability of SNREs." Growth Energy also claims that the recent DOE study on small engines "concluded that no obvious materials compatibility issues were observed during testing."

C. Critique of DOE Study and Growth Energy Waiver

In the enclosed 2009 critique of the DOE study (see Exhibit B), Dr. Sahu documents the following operability and performance problems on the SNREs that were tested in the DOE study:

- Substantially higher temperatures which will cause long-term damage to the engines and their emission-control systems;
- The total failures (at around 25 hours) of the 2 Weed Eater leaf blowers running on E-15;
- The failure of the Weed Eater blower to idle on E-20;
- The degraded performance of the Poulan leaf blower at 30-55 hours on E-15 fuels;
- The stalling, loss of power and abrupt stopping of the Briggs and Stratton 3500 kw generator on E-20;[51]
- The high idle speeds leading to improper clutch engagement both on the Stihl trimmers (in the Pilot study and the complete study).

[50] See Briggs Report, Exhibit C, at p. 3-5.

[51] The 2008 DOE report hypothesizes that the Briggs engine stalled probably due to the swelling of the elastomeric needle for the carburetor (similar to the same problems discussed above).

In its final report, even DOE recognizes that some of these operational problems could directly lead to tampering – which could increase emissions in contradiction to the very purposes of EPA's fuel-waiver criteria. For example, the DOE contractors had to adjust the "low-idle adjustment" and the "low-speed screws" to prevent unintended clutch engagement.[52] The similar operational problems with other engines would likely result in owners tampering with their products' carburetor settings so that they would run "richer" to accommodate E-15. These richer settings could cause an emission exceedance if those tampered products were run on E-0 fuels.

VIII. EXHAUST EMISSIONS STUDIES

The well-established chemical properties and principles that result in mid-level ethanol blends causing increased exhaust emissions are discussed in the Study attached as Exhibit A, Sections A and B.

A. Existing Studies

1. Briggs and Stratton Study (2007)

The 2007 Briggs and Stratton study concluded that E-20 caused a 10.5% increase in HC + NOx emissions because NOx increased by 233%. This increase would apparently constitute a "failure" or exceedance of the EPA standard for that certified engine family.

B. Growth Energy's Application

For all non-road applications, Growth Energy exclusively relies on the recent DOE small engine report as concluding that E-15 does <u>not</u> cause engines to emit greater combined concentrations of HC + NOx. Accordingly, Growth Energy argues E-15 would <u>not</u> cause an exceedance or failure of an applicable standard.

[52] See p. 3-19 of the DOE study.

C. Critique of Waiver Application and DOE Study

First, Growth Energy has failed to test a representative mix of all the diverse categories of affected non-road engines, equipment, and recreational boats. It has only tested a discrete group of small engines that excluded certain sensitive products like chainsaws. Accordingly, Growth Energy would still need to implement a comprehensive test program to evaluate engine exhaust impacts across all these different non-road categories.[53]

Second, the DOE report incorrectly indicates that HC+NOx emissions decrease in most cases. However, in every case involving ground-supported lawn and garden products – the use of mid-level ethanol resulted in increased emission levels, and significant increases in emission control deterioration over the useful life of the tested product:

Engine	Figure	HC+NOx new	HC+NOx full life
Briggs & Stratton Pressure Washer	D.3.	Increase w/ increasing ethanol content	Decrease w/ increasing ethanol content[54]
Briggs & Stratton Pressure Washer	D.7.		Increase w/ increasing ethanol content
Honda Generator	D.11.	Increase w/ increasing ethanol content	Increase w/ increasing ethanol content[55]

Third, the DOE test program was flawed and deficient for all the additional technical reason set forth in Dr. Sahu's 2009 enclosed Critique.[56] In particular, DOE's test program failed to accurately evaluate the increased emissions resulting from the degradation and deterioration of the tested engines and fuel systems over their useful lives. In fact, the significant heat increases

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53 See suggested test programs for certain non-road product categories discussed below in Section X.

54 Decreasing trend line is due to E0 testing of engines after aging with E15 and E20 that were significantly out of compliance due to the aging influence of mid-level ethanol blends.

55 E0 testing at full life on engines aged with E15 and E20 fuels showed significantly higher emission levels than engines aged on E0 and E10 fuels.

56 See Exhibit E.

documented in the DOE study would adversely impact numerous emission-related components, including pistons, crankshafts, gaskets, and catalysts (particularly under off-nominal conditions). These effects were well-established in EPA's recent Phase III rulemaking record for small engines.

IX. NON-ROAD EVAPORATIVE EMISSION STUDIES

The well-established chemical properties and principles that cause mid-level ethanol blends to increase evaporative emissions are discussed in the Study attached as Exhibit A – particularly Section E.

A. Scope of Regulated / Affected Small Engines and Products

In prior waiver reviews, EPA has concluded that the applicant must evaluate the impacts of the additive or fuel on "emissions technology that is available and imminent, and is reasonably certain to be applied in a prospective model year."[57]

B. Evaporative Controls + Baseline Fuels

Accordingly, Growth Energy's waiver application would need to include comprehensive test data on all evaporative-regulated products, including, for example:

- All the evaporative systems and designs (i.e., fuel tanks, fuel caps and lines) that have been certified, are being certified, and soon will be certified under the new EPA Phase III standards for small engines and lawn and garden products;
- All the additional diurnal (canister) controls mandated by the CARB Tier 3 small engine regulations since these systems will also be EPA-certified for early banking and other purposes.
- Handheld fiberglass tanks that must be certified with EPA in the 2010 MY. These tanks and their regulated caps and gaskets are particularly sensitive to ethanol.

[57] See 43 Fed. Reg. 41426 (Sept. 18, 1978) (an interpretation that was subsequently upheld in the *Ethyl* decision).

In the 2009 through 2011 model years, EPA evaporative emission certifications for the vast majority of EPA-regulated handheld fuel tanks and caps are based on reciprocal CARB certifications, which, in turn, are based on CARB certification fuels.[58] Thus, for the next several years, the same EPA and CARB certification fuels for most handheld tanks (and many ground-supported tanks that are being certified under "early banking" provisions) will continue to be based on MTBE, which does not contain any ethanol.

Growth Energy therefore would still need to perform evaporative testing on all these currently regulated (and soon to be regulated) evaporative components using CARB's MTBE certification fuel as the "baseline fuel."[59] It is likely that E-15 fuels will cause widespread evaporative emission failures in a substantial number of these EPA and CARB-certified tank families.

In fact, there are relatively tight compliance margins with certain current EPA-certified 2009 MY fuel tank families with evaporative certifications based on MTBE test data from CARB certifications. For example, the enclosed certification application is for a fluorinated, blow-molded, handheld fuel tank that is fairly common. Using MTBE fuels under the CARB procedures, this EPA-certified 2009 MY tank family emits 1.95 gr/m^2/day of HC.[60] Based on this application and the underlying CARB certification, EPA has issued an evaporative emissions certification for the current 2009 model year of this tank family that indicates the applicable EPA certification standard is 2.00 gr/m^2/day.[61]

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[58] See 40 C.F.R. § 1054.154; 73 Fed. Reg. 59034, 59105 and 59117 (Oct. 8, 2008).

[59] See proposed evaporative test programs discussed below in Section X.

[60] See certification application attached as Exhibit F.

[61] See Exhibit F.

If E-15 fuels only increased the certified evaporative emission rate from this tank family by 2.5%, then E-15 fuels would result in an exceedance or failure of the applicable EPA-certified standard. Based on the CARB and EPA test programs summarized below, E-15 would likely increase the evaporative emissions rate for this tank family – compared to its MTBE-based certification – by more than 30% (or more than 10 times the acceptable compliance threshold). OPEI expects that there are many other EPA-certified tank families (based on MTBE certification fuels) that would exceed the applicable EPA standards on E-15.

C. Existing Studies

Because we are not aware of any studies evaluating the impacts of E-15 on any non-road products, below we have included a summary of two E-10 studies that show that the rate of evaporative emissions continues to increase as the concentration level of ethanol increases. In fact, there is every reason to believe that E-15 would result in dramatically greater evaporative emissions than E-10.

1. CARB Study

In the context of developing its current Tier-3 evaporative program, CARB conducted extensive evaporative tests comparing its MTBE certification fuels to 10% ethanol. Based on testing 5 lawnmowers in 2003, ARB concluded E-10 would increase diurnal emissions by an average of 36%:

Table 4

Evaporative Emissions from Off-Road Sources based in ARB's Five Lawnmower study

	Diurnal		
Manufacturer	MTBE	EtOH*	% Diff.
	(g/day)	(g/day)	
Toro	5.5	7.0	+25%
Lawn Boy	2.1	3.1	+49%
Yard Machine	2.5	3.2	+32%
Craftsman #1	2.2	3.1	+44%
Craftsman #2	2.3	3.2	+40%
Average	2.9	3.9	+36%

2. EPA-SAE 2006 Paper

A 2006 paper (authored by Mike Samulski at EPA) documents the substantial evaporative emission increases resulting from E-10 compared to E-0 fuels used in lawn and garden products.[62] This SAE report confirms that the following types of fuel tanks and seals will be the most adversely impacted by ethanol:

- Permeation rates increased by more than 50% for chainsaws, clearing saws and hedge-clippers made from nylon – 6 with less than 35% glass and NBR O-rings and gaskets.
- Permeation rates increased by 80% for CARB-certified portable fuel tanks made from non-continuous barrier platelets;
- Permeation rate increases of 45% for sulfonated HDPE tanks and 30% for fluorinated HDPE tanks.

As a result of these documented impacts, EPA stated in the Phase III small engine regulations that, starting in the 2012 model year, "we are [ultimately] requiring the use of a test fuel containing 10% ethanol . . . because ethanol substantially increases permeation rates for many materials" used in regulated small engines.[63]

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62 "Characterization and Control of Evaporative Emissions from Fuel Tanks in Non-road Equipment." (SAE #2006-32-0094).

63 See 73 Fed. Reg. at 59111.

D. Growth Energy's Application

Growth Energy's application does not provide any studies that address the impact of E-15 on evaporative emissions from any non-road products, which have dramatically less sophisticated and robust evaporative controls than on-road vehicles. Growth Energy fails to evaluate any of these unique and more sensitive tanks, lines, and fuel systems used in non-road products. Instead, Growth Energy relies exclusively on studies of motor vehicles.

In order to address all evaporative concerns, Growth Energy argues that EPA should condition its requested waiver so that E-15 would have to conform to the ASTM fuel volatility specification.

E. AllSAFE's Critique of Growth's Position

First, Growth Energy must conduct confirmatory testing to support the assumption that E-15 would not increase evaporative emissions as long as ASTM fuel volatility specifications are met. Reviewing courts have indicated that assumptions on fuel volatility and evaporative emissions must be supported by confirmatory test data.[64]

Second, matching volatility is not an adequate measure to control the increasing evaporative emissions due to ethanol.

Third, regardless of the proposed vapor pressure cap, evaporative-permeation emissions for certain materials (like nylon and Viton gaskets) will substantially increase from EPA-regulated products – due to the chemical properties of those materials when exposed to alcohol. (See Section B and C above). Accordingly, Growth Energy would need to conduct a substantial evaporative test program in order to quantify these impacts. (See Section X below).

[64] See Motor Vehicle Mfrs. Ass'n v. EPA, 768 F.2d 283, 401 (D.C. Cir. 1985).

X. ILLUSTRATIVE TEST PLANS TO FILL DATA GAPS FOR CERTAIN NON-ROAD PRODUCT CATEGORIES

Enclosed are two illustrative examples of the types of test plans that would need to be implemented in order to address some of the gaping data gaps discussed above:

- OPEI has developed a proposed exhaust and evaporative test plan for handheld lawn and garden products. This plan has been submitted to the Coordinating Research Council (CRC) for review and consideration for implementation. (See Exhibit G).
- EMA has developed a proposed plan for evaporative and exhaust emissions from ground-supported lawn and garden and utility engines. (See Exhibit H). This plan has also been submitted to the CRC for their review.

Many of the other AllSAFE members have developed similar recommended test plans for their industries that try to account for unique considerations with their affected products.

XI. COMPARISON OF GROWTH ENERGY WAIVER TO ON-ROAD CRITERIA

The testing program relied upon by Growth Energy to demonstrate compatibility with on-road vehicles also fails to meet the minimum data requirements that EPA has articulated for a mid-level ethanol waiver. A detailed analysis comparing Growth Energy's on-road testing program to EPA requirements and other test plans is attached as Appendix K.

XII. NATIONAL IMPACT OF E-15 FUELS BASED ON PREDICTIVE MODELING

Although emissions test data for on- and non-road gasoline powered vehicles and engines on ethanol gasoline blends above the E10 level are limited, it is possible to estimate the potential impacts on mobile source emissions by extrapolating available algorithms used for purposes of estimating the impacts of gasoline oxygenates on emissions inventories. In order to estimate the potential E15 effect on emissions relative to E10, MOBILE6.2 and NONROAD2008 were used along with input data for estimating emissions on a nationwide basis for calendar years 2010 and

2020. This modeling was performed by Tom Austin of Sierra Research and it is included in the comments submitted by the Motorcycle Industry Council (MIC).

MOBILE6.2 was modified to account for the higher oxygen content of E15 by extending the linear relationships between oxygen content and exhaust HC and CO emissions in the model. As MOBILE6.2 does not account for changes in NOx emissions associated with oxygenates, the model was modified to account for oxygenate impacts on NOx emissions using the California Air Resources Board's Predictive Model.[65] Because the Predictive Model includes non-linear relationships between oxygen content and NOx emissions, two extrapolation methods were used. The first involved direct use of the relationship and the second involved linear extrapolation of the effects based on the slope near the E10 point. A third method, based on the statistical analysis of vehicle emissions data collected on E0, E10, and E20 fuels under the CRC E-74b program, was also used to estimate the potential impact of E15 on exhaust emissions. In this case, MOBILE6.2 was run assuming E0 and then adjusted using the relationships established between oxygen content and emissions from the CRC E-74b data.

Impacts of E15 on non-road emissions were obtained directly from the NONROAD2008 which was specifically configured for that purpose when it was released by EPA in April, 2009. It should be noted that in all cases, no adjustment was made to account for the potential use of E15 to result in greater deterioration of emission control system performance.

With respect to evaporative emissions, the impact of ethanol depends on whether the approximately one pound per square inch increase (psi) in RVP associated with its addition to gasoline at levels that include E15 is allowed to occur of if the ethanol blend is required to meet the same volatility standards as non-oxygenated gasoline. Under existing federal regulations, in

[65] Available at http://www.arb.ca.gov/fuels/gasoline/premodel/premodel.htm.

those areas of the country where reformulated gasoline is required, the RVP of E15 blends (if they are allowed) would be subject to the same RVP requirements that apply to other RFG blends, including E10 blends. In areas where reformulated gasoline is not required, the volatility of most ethanol-gasoline blends is required to be the same as non-oxygenated gasoline. There is however a one psi RVP exemption for ethanol gasoline blends sold in non-RFG areas provided that:

> The concentration of the ethanol, excluding the required denaturing agent, must be at least 9% and no more than 10% (by volume) of the gasoline.

Given the above language, it appears that E15 blends will not be eligible for the 1 psi exemption absent changes to the existing federal regulations. However, the following language in the waiver application makes it appear that the applicant assumes E15 and E10 will be blended to the same RVP – "The volatility of the two fuels also is essentially identical."

In fact, the applicant specifically states on page 25 of the application:

> Growth Energy proposes that this waiver be granted with a condition requiring E-15 to conform to ASTM fuel volatility specifications for the area and time of year where it is used.

With the requested condition, E15 could even have higher volatility than E10. Since there will obviously be pressure on EPA to allow the same RVP exemption for E15 as is allowed for E10, Sierra prepared emission estimates with and without accounting for a 1.0 psi RVP waiver.

The analysis also addressed evaporative emissions related to ethanol permeation. For non-road sources, permeation estimates were obtained from the NONROAD2008 model which, in addition to being configured to estimate impacts of E15 blends, includes an algorithm that adjusts permeation emissions as a function of fuel ethanol content. For on-road vehicles, a

methodology developed by Air Improvement Resource, Inc.[66,67,68] was used along with the algorithm from the NONROAD2008 model for adjusting permeation emission rates as a function of ethanol content. With respect to this assumption, it should be noted that it is consistent with the trend of permeation emissions increasing with increasing ethanol content observed in the CRC E-65-3 study, although that effect was not found in that study to be statistically significant at the 95% confidence level.

The results of the emissions analysis are shown in Table 8 for on-road sources. Table 8 presents nationwide summer emissions of VOC, NOx, and CO for calendar years 2010 and 2020 assuming that all reformulated and conventional gasoline is either E10 or E15. The difference in emissions associated with the substitution of E15 for E10 is shown both on an absolute and on a percentage basis where positive numbers indicate higher emissions with E15 and negative numbers indicate lower emissions with E15. Finally, the effect of eliminating the one psi RVP exemption is shown.

As shown, if E15 is provided an RVP exemption, the increase in on-road NOx emissions estimated using all three methodologies is greater than the estimated reduction in VOC emissions. If E15 is not provided an RVP exemption, the VOC reductions associated with the reduction in volatility are greater than the estimated increases in NOx emissions using two of the three methodologies. The NOx increase still exceeds the VOC reduction for the methodology

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66 "Effects of Gasoline Ethanol Blends on Permeation Emissions Contribution to VOC Inventory from On-Road and Off-Road Sources," prepared by Air Improvement Resource for the American Petroleum Institute, March 3, 2005.

67 "Continuing Ethanol Permeation Issues" presented by Air Improvement Resource to CARB, August 25, 2006. Presentation can be found at *http://www.arb.ca.gov/fuels/gasoline/meeting/2006/mtg2006.htm*.

68 "Updated Final Report Effects of Gasoline Ethanol Blends on Permeation Emissions Contribution to VOC Inventory from On-Road and Off-Road Sources, Inclusion of E-65 Phase 3 Data and Other Updates," prepared by Air Improvement Resource for the American Petroleum Institute, May 24, 2007.

involving the use of MOBILE6.2 with non-linear NOx effects due to oxygenate content. In all cases the higher oxygenate content of E15 leads to greater reductions in CO emissions than estimated with E10.

Table 8
Estimated Nationwide Impacts of E15 on On-Road Gasoline Vehicle Emissions (tons per summer day unless noted)[a]

Method	Fuel	VOC		NOx		CO	
		2010	2020	2010	2020	2010	2020
MOBILE6.2 + Linear NOx Effect	E10	7393	4772	12231	5696	70718	60878
	E15	7264	4655	12441	5812	66819	57807
	Change (TPD)	-129	-117	+210	+116	-3899	-3071
	Change (%)	-1.7	-2.4	+1.7	+2.0	-5.5	-5.0
MOBILE6.2 + Non-Linear NOx Effect	E10	7393	4772	12231	5696	70718	60878
	E15	7264	4655	13016	6195	66819	57807
	Change (TPD)	-129	-117	+785	+499	-3899	-3071
	Change (%)	-1.7	-2.4	+6.4	+8.8	-5.5	-5.0
CRC E-74b	E10	7578	4917	12350	5799	60332	51308
	E15	7537	4870	12637	5978	56527	48021
	Change (TPD)	-41	-47	+287	+179	-3805	-3287
	Change (%)	-0.54	-0.96	+2.3	+3.1	-6.3	-6.4
Additional Change Assuming 1.0 psi RVP Increase Not Allowed in Non-RFG Areas		-489	-269	-	-	-	-

[a]Note plus sign indicates increased emissions with E15.

Table 9 presents the results of the analysis for non-road sources. The results for non-road sources are similar to those observed for on-road sources with estimated NOx emission increases associated with E15 being greater than estimated VOC reductions unless there is no RVP waiver available for E15.

Table 9
Estimated Nationwide Impacts of E15 on Non-Road Gasoline Vehicle Emissions (tons per summer day unless noted)[a]

Method	Fuel	VOC		NOx		CO	
		2010	2020	2010	2020	2010	2020
NONROAD2008	E10	9273	5033	6503	3800	61116	55326
	E15	9134	4951	6675	3947	53578	48150
	Change (TPD)	-139	-82	+172	+147	-7538	-7176
	Change (%)	-1.5	-1.6	+2.6	+3.9	-12.3	-12.9
	Additional Change Assuming +1.0 psi RVP Not Allowed in Non-RFG Areas	-105	-93	-	-	-	-

[a]Note plus sign indicates increased emissions with E15.

XIII. CONCLUSIONS AND RECOMMENDATIONS:

AllSAFE recommends that EPA deny the waiver request based on the following:

- A partial waiver alone cannot legally or practically control the use of E15 without causing widespread misfueling.
- The waiver application does not include most of the information EPA has outlined as required supporting information.
- The data supplied with the waiver application does not support the claims made regarding the emission and operability influence of E15 fuel.
- For non-flexible fuel vehicles, use of E15 fuel is expected to result in "materials incompatibility" and the degradation of critical emission-control components, including catalysts and fuel tank barriers.
- For non-flexible fuel vehicles, use of E15 fuel is expected to cause unacceptable engine and/or equipment "operability"– resulting in an increase in tampering.
- For non-flexible fuel vehicles, use of E15 fuel has been demonstrated to result in increased exhaust emission of HC+NOx and significantly higher exhaust gas temperatures resulting in engine degradation.
- Use of E15 fuel could result in increased evaporative emissions.
- Use of E15 fuel would increase national emissions based on well-established predictive modeling.