***Advanced Biofuels USA**, an educational nonprofit organization, advocates for the adoption of advanced biofuels as an energy security, economic development, military flexibility, climate change mitigation/pollution control solution. The key tool to accomplish this mission is our web site, www.AdvancedBiofuelsUSA.org, a one-stop-shop library for industry professionals and the general public; from teachers and students to journalists, legislators, policy-makers, and others.* Contact us at 301-644-1395 or info@AdvancedBiofuelsUSA.org

The Pathway to a Sustainable "Total Biomass" Advanced Ethanol Industry is one in a series of papers published by Advanced Biofuels USA exploring the technologies, products and policies related to the development, deployment and use of advanced biofuels.

The Pathway to a Sustainable "Total Biomass" Advanced Ethanol Industry

Demand in the US ethanol market has stagnated at approximately 12 BGY. This ethanol demand is being met by corn ethanol without exceeding the Renewable Fuel Standard (RFS) for corn ethanol.

*This stagnated demand has significantly diverted the investments needed to commercialize and deploy **non-food 2nd generation "total biomass" production** systems that would bring long term climate change, land-use, and economic benefits while also meeting current and future demand. Rather than relying on short-term fixes such as the E-15 waiver to increase demand, the advanced biofuels community needs to adopt a long-term plan if it wants ethanol to become the primary automobile and light-duty truck fuel in North America.*

Advanced Biofuels USA proposes a Six-Point Pathway that could make this happen.

1. The advanced ethanol community must adopt a long term plan to greatly increase the number of North American cars and light duty trucks that can **run on E30** (30%) and higher ethanol mixtures **while achieving parity mileage with current gasoline**.

2. The advanced ethanol community must have the patience to stick with this long term plan even if the results are at first slow.

3. To build a long term high (30% and higher) blend ethanol market, the ethanol community should make clear the benefits of ethanol as a very good primary fuel, not just as an additive. These benefits include:

- Higher octane that can result in higher efficiency and mileage, and
- A chemical structure and combustion characteristics that result in lower emissions and improved health effects.

4. To kick start this effort, the advanced ethanol community needs to work closely with motor vehicle manufacturers and governments, both state and federal, to bring "Optimized Flex-Fuel Vehicles" to market through First Adopter programs.

Two First Adopter programs should be used.

A. **Optimized E30 Flex Fuel Vehicles (FFVs) Based on Current FFVs**: Test data has shown that existing computer controlled/fuel injected FFVs can get the same mileage on E30 as E0 or E10. The minimal modifications required are changes to the on-board computer software that adjusts fuel delivery and ignition timing depending on the amount of ethanol in the fuel.

To get these sales started, vehicle orders placed by federal agencies or state and local governments for their FFV and **Clean Fleet Partnership**

programs should include this software requirement in their RFPs.

B. **Optimized E30+ Vehicles:** The Ford EcoBoost and GM Ecotech engines are being rapidly introduced. These systems include:
   a. variable intake/exhaust valve timing,
   b. direct fuel injection,
   c. turbocharging, and
   d. computer control.

The combination of these systems allows the engines to utilize the higher octane of E30+ mixtures to produce increased power, efficiency, and comparable mileage while also adjusting to use low octane E10 or less mixtures.

A low-risk way to introduce E30+ optimized EcoBoost or Ecotech engines would be in limited production, high performance models.

For example, the 2.0L EcoBoost Focus ST is being introduced in 2012 as a higher performance model. Introducing a limited-edition high performance *"Green Focus ST*" (at a higher price) with an engine system modified to optimize up to E50/60 would create a small but growing market for higher blends and blender pumps.

For the manufacturers, initial liability would be limited by the low number of vehicles and the restrictions they usually place on performance car warranties.

5. In conjunction with government fleets buying optimized E30 vehicles, those fleets should also begin purchasing blender pumps as replacements to their current pumps. These blender pumps would be able to fuel all vehicles with blends ranging from E10 to E85.

- In addition, fuel stations adjacent to dealerships selling one or both of the optimized FFVs should be given incentives to install blender pumps to serve the owners of these new vehicles as well as all of their existing customers.

6. As the number of these optimized FFVs and new tech E30+ vehicles increase, the advanced ethanol community should identify where concentrations of those vehicle are located and work with stations and governments in those areas to get more blender pumps installed.

These integrated initiatives combining optimized ethanol vehicles and blender pumps will create a steady, sustainable growth path that will lead to a large, long term ethanol market. Once the North American fleet turns over to include all optimized E30+ vehicles, annual ethanol demand would increase to a ***minimum of 36 BGY****.* ***This exceeds the total ethanol values in the Renewable Fuel Standard (RFS).***

Putting the North American car and light duty truck fleet on this pathway would provide the incentive for investments to fund an economically and environmentally profitable 2nd generation total biomass (cellulose, hemicellulose, pectin, and lignin) ethanol industry for the long term.

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