Advanced Biofuels USA, a nonprofit educational organization, advocates for the adoption of advanced biofuels as an energy security, economic development, military flexibility and climate change solution.

Let's Regulate CO2 Emissions, and Forget the 55.4 MPG 2025 Corporate Annual Fuel Economy Standard: The Inexpensive Way to Quickly Reduce Green House Gases

by Robert Kozak*

The 2025 Corporate Average Fuel Economy (CAFE) standard of 54.5 miles/gallon has become a significant issue since the election of Donald Trump as president of the United States. Besides the Administration's near religious fervor against Climate Change and the reduction of Green House Gases (GHG), the ability to meet the standard is also being negatively affected by the relatively low cost of vehicle fuel.

Since the collapse of fuel prices in 2014, consumers are buying large and really large SUVs while smaller and more fuel efficient sedans are either going out of production or are just sitting on dealers' lots. For example, Ford is rushing to boost the availability of the very large brand new Ford Expedition and Lincoln Navigator (5,800 lbs curb weight, EPA combined mileage 17 mpg), including temporarily suspending the purchase of those vehicles by Ford employees. (1)

Meanwhile, the new model of the once popular high-mileage Ford Fiesta will not be sold in the US. Sales of the Fiesta have fallen 31 percent from their peak in 2013, before the price of fuel fell. (2)

If the gas pump cost of E10 fuel stays below $3.00/gallon, American consumers will likely assure that all major vehicle manufacturers, even Toyota which sold over 7 times as many SUVs (792,94) as Priuses (108,662) in 2017, will not be able to meet the 2025 CAFE standard.

As an historical note, these purchases by US consumers are consistent with those in earlier decades. As long as fuel has been relatively cheap, Americans have always wanted big cars and trucks. In the 1960s, station wagons like the Ford Country Squire held sway in most suburban neighborhoods. And, how many years in a row has the Ford F150 been the best selling vehicle in the US? Looking from that perspective, how different is a 2017 Chevy Traverse SUV from a 1957 Chevy Nomad wagon? The Nomad had two doors, the Equinox four.

So, is the turning away from small cars by the American public a bad thing for GHG reductions? Not necessarily. How can this be you ask? Because of the indirect and counter-productive way the Environmental Protection Agency (EPA) chose to measure and regulate motor vehicle CO_2 emissions.

EPA Regulations of CO2 Emissions: Clean Air Act and CAFÉ

Ever since the passage of the landmark 1970 Clean Air Act, Title II of the Act regulates pollutant emissions from all vehicles in a straight forward manner. A baseline exhaust emission of a specific pollutant; HC, CO, NO_x for example, is measured in terms of grams/mile. As specified in the legislation, an emission standard would be some percentage of that baseline. For instance, if the Clean Air Act called for a 90 percent reduction and the baseline was 100 grams/mile, the standard would be 10 grams/mile for that pollutant. For the auto makers this meant every car and truck that EPA specified as needing to meet the standard had to meet the standard. There was no averaging between vehicles of different weights or with different engines.

While these standards were seen by many as stringent, they were very efficient. Outside of LA, how many in the US have experienced an ozone violation in this century?

Two additional important aspects of EPA automotive emission standards need to be pointed out. First, EPA never specified what technology the auto makers were required to use. Catalytic converters, fuel injection, and on-board computers were selected by manufacturers because of their efficiency and cost-effectiveness; not by EPA.

–EPA Required Fuel Changes

Second, EPA used the regulatory power given it by the Clean Air Act to require fuel manufacturers to modify their fuels to assure that the health benefits of the pollution control systems would be delivered. The most important of these fuel changes was the switch to non-leaded gasoline since the lead compounds in gasoline would quickly disable the catalytic converters.

After the passage of the 1990 Clean Air Act amendments, another fuel change was required – the introduction of oxygenates to improve combustion. Initially, petroleum refiners used a petroleum additive, MTBE (Methyl Tertiary Butyl Ether), for this purpose. This compound, a persistent carcinogen, was soon found in water supplies near leaking fuel tanks. In order to stop the health hazard of MTBE while also retaining the low-emission benefits of oxygenates, ethanol was recognized by EPA as a safe effective compound and beginning in 2004 replaced MTBE in US gasoline. A 10 percent quantity of ethanol was the amount selected.

When the Obama Administration proposed, and the Supreme Court accepted, that the Clean Air Act could be used to regulate CO_2 emissions to produce health and safety benefits, most people associated with motor vehicle emission controls thought a similar approach would be applied.

However, for reasons still not verified, but thought to be motivated by the Obama Administration's emphasis on phasing out the internal combustion engine and phasing in electric vehicles, EPA chose another approach to regulate vehicle CO_2 emissions – the Corporate Fuel Economy approach.

–Vehicle Mileage Standards

When Presidents Nixon and Ford moved to reduce US reliance on Middle Eastern oil in the 1970s, the idea of regulating US gasoline use through vehicle mileage standards quickly gained traction.

Besides the primary goal of reducing oil imports, the idea of using fuel economy standards to push American carmakers toward the production of more efficient vehicles was seen as a way to help them compete with Japanese manufacturers. The recently introduced Honda Civic and other vehicles such as the revolutionary Datsun 510 were quickly becoming best sellers. After much haggling with the US vehicle manufacturers who were producing pick-ups and station wagons as well as smaller sedans, Congress passed legislation that allowed manufacturers to average the fuel economy standard over all vehicles produced. It was called the Corporate Average Fuel Economy (CAFE) Standard.

Simply put, manufacturers did not have to meet the standard with any vehicles. Instead, the mileage of the end of the year sales figures had to average out at the standard or better. As you can guess, the system was easily gamed. If you're running above the average, move the December low-mileage trucks into next year. If you're running below the standard, save the late year sales of high mileage cars for next year. Just in case.

Many in the vehicle industry could not believe that the Obama Administration was changing emission regulations for CO_2 from the successful grams/mile, no EPA restrictions on technology approach to the CAFE approach.

EPA Technology Restrictions and Tailpipe vs. Life Cycle Emissions Calculations

In addition to the averaging approach, EPA also made two important technology restricting decisions.

First, by limiting the calculation of CO_2 emissions to only those from the tailpipe for electric vehicles, rather than including life-cycle emissions that are required for biofuel pathway approval, electric vehicles were suddenly "Zero CO_2 Emissions" even if their electricity was produced by non-renewable high GHG sources such as coal.

Second, EPA moved to stop vehicle manufacturers from using higher ethanol content fuels to reduce CO_2emissions, including E85 that manufacturers were building "Flex-Fuel" vehicles to use. EPA did this by changing certification calculation variables such as the "R" factor to eliminate the well documented non-renewable GHG CO_2 reductions available from renewable fuels such as ethanol.

The result was that EPA no longer differentiated between non-renewable CO_2 increasing GHG emissions and renewable CO_2 emissions that did not increase GHGs.

This left only two EPA-required ways to reduce CO_2 GHG emissions.

One, expect the minimal yearly GHG CO_2 reductions from new better mileage vehicles to add up over time. The slow rate of this change is seen in EPA data. A 28 percent improvement has been estimated from 2004 to 2017. At this 2.2 percent annually, a fifty percent improvement would take nearly 25 years.

Two, purchase electric vehicles (with $7,500 tax credits) and count the zero GHG CO_2 emissions while ignoring the GHGs produced from electrical production and transmission.

This brings us to where we are now in the winter of 2018. Increased sales of SUVs are

stalling GHG CO_2reductions and electric/hybrid vehicle sales remain at about 5 percent of total vehicle sales.

Regulate Actual Life Cycle CO2 Emissions to Achieve Greater Near-Term CO2 Reduction Goals

As hard as it might be to believe, this unfortunate transportation GHG situation can be overcome quickly and fairly simply. Here's how.

- Keep the motor vehicle CO_2 reduction goals in place.
- Get rid of the CAFE regulatory approach and EPA restrictions on technologies.
- Use the existing gram/mile approach to measure and regulate various vehicle classes.
- Restore renewable fuel GHG reduction variables in fuel efficiency calculations.
- Use higher ethanol and other renewable fuel blends to reduce non-renewable GHG CO_2 emissions instead of more expensive vehicle weight reduction strategies.
- Base new ethanol mixtures on blends shown to produce performance and GHG reduction by US National Labs for both existing lower performance and new high efficiency engines. (3)
- Ethanol and other renewable blends should be based on results from vehicle manufacturers that improve the mileage and performance of small-displacement, high efficiency turbocharged engines such as the eco-boost. (4)

In the following Table 1, potential reductions in non-renewable CO_2 GHG emissions are shown for the current generation of renewable ethanol production. These fuels reduce the amount of GHG CO_2, as compared to gasoline, by up to 50 percent.

As shown, **E30**, a blend identified as bringing both performance and improved mileage, **could *immediately* offer a twenty percent improvement, even if mileage was not improved.** As **for E85, a 58 percent improvement would be available**.

Table 1

Reduction of Non-Renewable CO2 GHG Emissions with Renewable Ethanol Blends

50% of Ethanol CO_2 is Non-Renewable (Approximate EPA Pathway Estimate)					
25 MPG is Used for All Fuels (2016 MPG was 24.7: EPA Data)					
	grams CO_2/mile		grams CO_2/gal		% Reduction
E0	390		9,750		
E10	363		9,079		6.9%
(EPA 2016 CO_2 estimate)	359				
E30	309		7,736		**20.7%**
E85	162		4,045		**58.5%**

The increased demand for these higher blends would draw investment to the renewable biofuel industry.

Higher yield crops and more efficient conversion systems would push the reduction of GHG CO_2 even higher.

Reductions over gasoline, not including improved fuel mileage, could reach up to **80 percent in a decade**. This would be a **significant improvement over the 22 percent available from the current CAFE approach** in the same time frame.

Much can be done to quickly increase the use of these E30 and E85 mixtures in current vehicles, as well. Manufacturers of E30 and E85 "capable" vehicles could offer warranty backed retro-fits to maximize the use of the fuels in those vehicles.

Address Realistic Consumer Preferences and Economic Incentives

And finally, let's get back to the US consumers who like low fuel prices and good performance in their vehicles no matter what size they are. Remember those Lincoln Navigators that Ford Motor can't build enough of? It turns out they don't run at their best on $2.35/gallon regular. Here's what the Lincoln website says the Ford GT engine in the big SUV needs, ***"Horsepower and torque ratings achieved using 93-octane fuel."***

In our part of the country (Maryland), 93 octane premium gasoline is about $3.25/gallon. But E85, which has even higher octane than 93, is about $2.30. Tuners with high performance engines already know this and use E85 to maximize the performance of their turbocharged cars. I think the Navigator owners will also soon find out and wonder why they can't save about $1.00/gallon as well.

Bottom Line

And so, if anyone asks what will be the economic incentive for a revised, more effective CO_2 GHG reduction plan that uses renewable fuels as well as technology, tell them this.

Renewable ethanol is about $1.00/gallon cheaper than high octane gasoline. It's the cheapest way to produce the octane, performance, and efficiency people want.

With GHG reductions coming from renewable fuels, expensive light weight carbon fiber won't be needed to reduce vehicle weight to improve mileage. Cars and trucks will be cheaper.

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