



E85: Spinning Our Wheels

Posted by [Robert Rapier](#) on May 24, 2006 - 12:01pm

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If you listen to the news lately, you know that E85 is going to lead the U.S. to energy independence, just like it did in Brazil. Senator Hillary Clinton has announced that [she is getting into the act](#):

"President Bush and other elected officials have called for a greater expansion of E-85, a fuel made of 85 percent ethanol that can be used in vehicles built to run on both regular unleaded gasoline and E-85. E-85 is currently available in less than one percent of the country's gas stations, and Clinton wants to accelerate the spread of the fuel to half of the nation's gas stations by 2015 by offering a 50 percent tax credit for station owners who install ethanol pumps.

'We've got to take action on this pump issue or we're just spinning our wheels,' she said."

Just spinning our wheels. Indeed. But let's do a reality check and see whose wheels are spinning. These claims deserve a mathematical analysis, which none of the E85 proponents appear to have done.

According to <http://www.corn.org/CRAR2005.PDF> (Warning: 1.9 meg file) the estimated corn harvest in 2005 was 10.35 billion bushels, and corn exports were 1.95 billion bushels. According to the 2002 USDA study [Estimating the Net Energy Balance of Corn Ethanol](#), you can get 2.7 gallons of ethanol from a bushel of corn. That means if we turned the entire corn crop into ethanol, we could make 27.9 billion gallons of ethanol. But as we all know, the BTU value of ethanol is around 67% that of gasoline, meaning that on a BTU basis this much ethanol is equivalent to 18.8 billion gallons of gasoline.

According to the Bureau of Transportation Statistics, our annual gasoline consumption is up to almost [140 billion gallons](#). That means on a BTU equivalent basis, converting the entire corn crop into ethanol would amount to 13.4% of our annual gasoline demand. Putting all of that ethanol into the gasoline supply would mean ethanol could comprise 19% of the gasoline supply on a volumetric basis (while consuming all of our corn production). In other words, all of the gasoline in the country could be E19 if we wanted to use 100% of the corn crop. Of course if we only want to turn all of our current exports into ethanol (ignoring the many implications), that would amount to 2.5% of our annual gasoline demand. In that case, E10 could make up about a third of our gasoline supply on a volumetric basis. If we want to convert all of the corn exports into E85, it could make up 3.3% of our total gasoline pool.

But that's the good news. According to the previously mentioned USDA study, it takes 77,228 BTUs of fossil fuel inputs to make 83,961 BTUs of "green, renewable" ethanol. Ignoring co-products for a moment, that means the created energy was a mere 8% in excess of the input energy. Given that the fossil fuels (primarily natural gas) that went into making the ethanol can usually serve as transportation fuels, the amount of transportation fuel that is displaced is only the 8% that was "created". That means that in reality, using our entire corn crop would only displace 1% of our annual gasoline consumption. If we only decide to use our exports, the net displacement of gasoline would be 0.2% of our annual gasoline consumption.

Now, a word about co-products. Energy balance studies of grain ethanol almost always include a BTU credit for the co-products (mostly animal feed). I think this is appropriate, provided that a proper analysis is made of the energy inputs into the products that were displaced. Let's ignore for a moment the fact that some estimates indicate that the ["byproduct markets could saturate well short of 11 billion gallons of production"](#). Let's give full credit for the byproducts, just as if they are liquid fuels to be burned. This has no effect on the BTU equivalent calculation, but will affect the displacement calculation. With by-products included, the USDA report has 77,228 BTUs of fossil fuel inputs for 98,333 BTUs of total outputs. In this best case scenario, the ratio of energy out/energy in is 1.27. Converting 100% of the corn crop into ethanol, presuming we had a market for the byproducts, would then displace an incredible 2.0% of our annual gasoline consumption.

So, why the big rush to get E85 pumps at 50% of the nation's gas stations? We can't possibly produce enough E85 to justify putting in all those pumps. Wouldn't it be much better just to push for E10 at more locations? In that case, expensive new pumps are not required, and E10 can already be burned in most vehicles on the road. Or how about encouraging more natural gas vehicles, instead of inefficiently and expensively turning natural gas into ethanol? But I suppose those would be rational solutions, as opposed to feel-good solutions that promise energy independence.

* **Acknowledgment**

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