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CAN BIOFUELS POSE A SERIOUS CHALLENGE TO CRUDE OIL?

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Much has been written about the potential of biofuels. Some sources have gone so far as to say that biofuels have begun to pose the first serious challenge to crude oil-based fuels in a century. They project that biofuels could replace 10% of the global demand for transport fuels by 2025 and 30% of the United States' by 2030. Others by contrast see biofuels as an expensive energy source whose net energy balance is still critical. They also question whether biofuels will be able to take hold without tax credits and subsidies. The reality, as always, is somewhere in between.

With crude oil prices touching \$70/barrel and with energy experts warning of an impending global oil shortage during the first decade of the 21st century, governments around the world are looking for alternative energy resources.

Has the inevitable transition from crude oil to next-generation fuels begun, right under our very eyes? Certainly no one expects oil to disappear overnight or even in the next four or five decades. Even after the recent surge, farm-grown biofuels like ethanol and biodiesel still account for only a small fraction of fossil-fuel use as do other renewables such as wind and solar power. But thanks to skyrocketing oil prices, worries about climate change and growing anxiety over the future security of the world's supply of crude oil, the prospects for biofuels to make major inroads in oil use are bright.

Indeed, what makes biofuels so compelling is that combustion engines can run on gas "stretched" with 10% ethanol or less with no modification. Higher concentrations require "flex-fuel" engines, which automatically adjust fuel injections depending on the fuel mix (more than half of all new cars in Brazil have them). This compatibility is why many countries have picked up on biofuels as an easy way to reduce their import bill for oil.

However, serious questions remain as to whether biofuels can be successfully scaled up to take on oil. Would there, for instance, be enough land on which to grow energy crops without putting the squeeze on food production?

Three decisive factors, namely geography, the size of cultivable land and technology, are key to the development of biofuels as a viable alternative to crude oil. And while technology will continue to evolve over time and become more cost-effective, geography can't change nor could cultivable land expand appreciably in view of a growing world population. In tropical regions with abundant water and land resources, such as Brazil, the viability of producing ethanol from sugar cane is no longer in question. The picture is quite different for other regions. For either the United States or Europe to replace just 10% of transport fuel with biofuels using today's crops and technology would require around 40% of cropland, land that is unavailable.

Proponents even claim that biofuels could help make hydrogen unnecessary. Already, the much-touted "hydrogen economy" looks farther away than ever – it may be 30 years before hydrogen plays any significant role. In the meantime, Brazil now makes biofuels so competitive it could trump gasoline at \$25/barrel. With the rest of the

world hoping to emulate Brazil, hydrogen is going to have to run fast to catch up. At the very least biofuels could act as a bridge toward the hydrogen economy.

But despite the environmental and long-term economic advantages of biofuels over crude oil, worldwide production currently accounts for only 0.61% of the global demand for crude oil.

This paper will argue that while biofuels have achieved some notable successes in the United States, Germany and particularly Brazil, their future potential is overrated and will always be limited by geography, cultivable land and technology. It will also argue that far from making hydrogen unnecessary, biofuels could act as a bridge toward the hydrogen economy and could also be a useful addition to the global energy supply.

The paper will conclude that far from posing a serious challenge to crude oil, biofuels will be hard pressed to replace even 2% of the global demand for crude oil by 2025. It will propose that until the hydrogen economy comes into its own, the hope of reducing the global demand for conventional oil in transport lies in plug-in hybrid cars with a flexible-fuel tank.