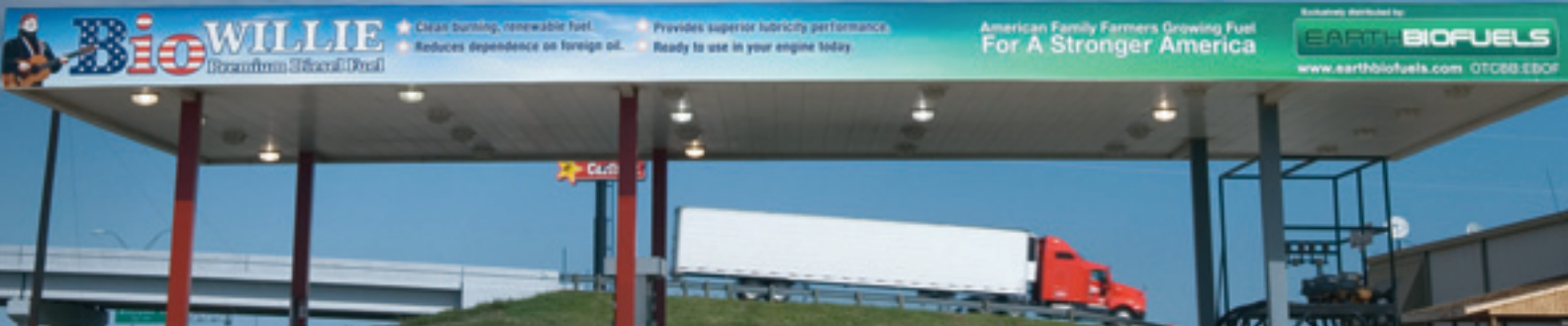


Texas Big Daddy's General Store is among the first gas stations in the world to sell biodiesel, a relatively clean-burning diesel fuel derived from vegetable matter. Unlike many vegetable-based fuels, biodiesel can be used in any diesel engine.

# Biodiesel's Bright Future

**METEORIC RISE IN BIODIESEL OVER THE LAST FEW YEARS SUGGESTS A GOOD OUTLOOK FOR REPLACING GASOLINE.**



SALEM KRIEGER/ZUMA/NEWSCOM

In the past decade, the public's growing interest in ethanol fuel has been a hot topic, and rightly so. Ethanol—a product derived from corn, sorghum, potatoes, wheat, sugarcane, etc.—will play a huge role in the global movement away from fossil fuels. Clearly, the public is eager to run their cars, and the world economy, on something other than oil.

But the media focus on ethanol as the savior for our energy woes ignores the growing importance of another alternative fuel, namely biodiesel, in meeting global energy demand. Few people realize the influence that biodiesel—a bio-based fuel for conventional diesel engines—is already having in global

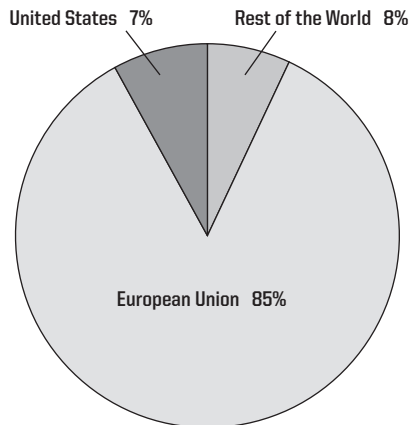
transportation and shipping. To explore the market potential of this ethanol relative, my firm, Emerging Markets Online, undertook a rigorous survey of global biodiesel demand, consumption, and production trends through the year 2020. We determined that biodiesel is poised for explosive growth in the next 10 years.

Although Europe currently represents 90% of global biodiesel consumption and production, the United States is now ramping up production at a faster rate than Europe, and Brazil is expected to surpass U.S. and European biodiesel production by 2015. It is possible that biodiesel could represent as much as 20% of all on-road diesel used in Brazil, Europe, China, and India by 2020.

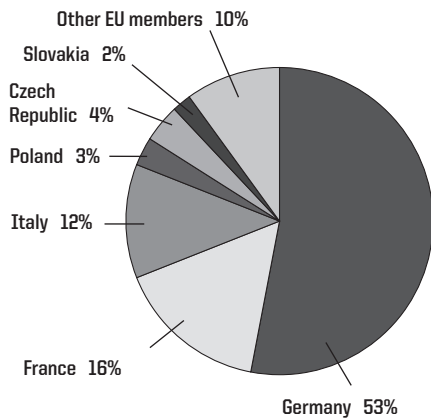
**BY WILL THURMOND**

## GLOBAL BIODIESEL PRODUCTION

Global biodiesel production reached 3.8 million tons in 2005. Approximately 85% of biodiesel production came from the European Union.



A breakdown of biodiesel production in the European Union for 2005.



Source: *Biodiesel 2020: A Global Market Survey*

**“In Europe, biodiesel represents 2% of total transportation consumption . . . and is expected to reach 6% by 2010.”**

## THE UNITED STATES AND EUROPE: CHANGING ECONOMIES, CHANGING NEEDS

The nascent U.S. market for biodiesel is growing at a staggering rate—from 25 million gallons per year in 2004 to 78 million gallons by the beginning of 2005. The amount of biodiesel produced in the United States then grew more than threefold to 240 million gallons over the course of that year. By the end of 2006, biodiesel production was estimated to increase fourfold to more than 1 billion gallons.

While the numbers are impressive, the total amounts of biodiesel being sold in the United States equals less than half of 1% of all diesel consumption. In Europe, biodiesel represents 2% of total transportation consumption (900 million gallons) and is expected to reach 6% by 2010.

In China, India, Brazil, and Europe, economic and environmental security concerns are giving birth to new government targets and incentives aimed at reducing petroleum imports and increasing the consumption and production of renewable fuels. Each have targets to replace from 5% to 20% of total petro-diesel consumption with biodiesel.

From 2006 to 2020, the global energy market is expected to grow at about 1.5% per year on average, with higher or lower projections depending on which energy expert, government forecast, or think tank report you read. The U.S. energy market is expected to grow at 1.7% per year to 2020, while Europe will grow at a slightly slower rate (1.3%). Estimates for growth in the Chinese energy market range from 3.8% to 8% per year to 2020; for India, 3%; and Brazil, 3% to 4%.

In Europe and in the United States, the markets have a long way to grow to reach these targets. Though Europe reached its first target, 2% by 2005, achieving its next targets (5.75% by 2010 and 20% by 2020) will depend on feedstock availability, government commitment, and market economics. Using current consumption figures, Europe would need to replace approximately 3 bil-

lion gallons by 2010 and 20 billion gallons by 2020.

In the U.S. market, biodiesel and ethanol are mandated under the United States Renewable Energy Standard. Ethanol (rather than biodiesel) is expected to address 97% of the U.S. consumer automotive market because only 3% of all cars on U.S. roads run on diesel. However, more than 80% of all commercial trucks and major bus networks in municipal areas are diesel based. That, more than anything else, suggests a huge potential market for this fuel in the world’s most energy-hungry nation.

Currently, the first task of biodiesel programs in the United States is to replace fuels used in school buses, metro buses, 18 wheelers, and large commercial vehicles. There is a relatively small U.S. market for diesel in passenger cars compared with Europe (where more than 50% of all cars run on diesel), China, and India where diesel is the dominant on-road fuel for passenger cars. However, the U.S. market share of diesel cars is also expected to grow, from 3% in 2005 to 11% by 2010.

## FUELING THE DEVELOPING WORLD

Brazil, China, and India are just getting started with their biodiesel development plans. In each of these countries, there is not yet any large-scale biodiesel production, but governments have large-scale plans to use biodiesel in a big way. Each of these countries has established a “National Biodiesel Plan” with mandates and targets aimed at reducing import dependency on petroleum products with biodiesel and ethanol. These plans are designed to replace fuels that release carbon (such as petroleum-based diesel fuel) and gasoline used by consumers and commercial vehicles. In every case, for India, Brazil, and China, the targets and programs are ambitious but achievable, given the right variables.

## WHAT WILL THE BIODIESEL MARKET LOOK LIKE 2020?

Based on the findings of our report *Biodiesel 2020: A Global Market Survey*, it is clear that the period of 2010

to 2015 will experience significant growth in the United States, Europe, China, and Brazil for this fuel.

Another key observation: Most of the biofuels targeted by the United States, Brazil, and India are for blending purposes and not strictly for B100 use (B100 refers to fuels that are 100% composed of renewable fuel, as opposed to petroleum and biofuel blends). It seems unlikely that most of the world will use B100 as a first choice for biodiesel fuel for autos. Instead, most nations are now following the blending model used by the United States and France for B2, B5, and B20. Brazil, China, and

India are also following this route forward and are starting their National Biodiesel Plans with blending targets first.

By 2015, as energy demands for soybean, canola, and jatropha oil surpass the available land to plant these energy-rich crops, alternative feedstocks such as palm oil and algae-based biodiesel will help to meet growing demands. The U.S. National Renewable Energy Lab forecasts that soybean and canola-based biodiesel will only be able to supply 10% of the total market for energy needs in the United States. However, new feedstocks such as

algae-based biodiesel will go into mass production in the United States and could provide 30% or more of all transportation energy needs from biodiesel by 2020. Algae is one of the most promising alternative biodiesel feedstocks and could produce more than 10 times more oil per acre than soybeans or canola.

By 2020, if Europe, the United States, Brazil, China, and India are able to replace between 5% and 10% of automotive fuels on the road with biofuels, the need for alternative biodiesel feedstocks will emerge. It is likely that algae-based biodiesel and other new feedstocks will help to

# HOW TO PRICE BIOFUELS

A FORMER CIA DIRECTOR SHEDS LIGHT ON HOW TO MAKE ALTERNATIVE FUELS MORE ECONOMICALLY VIABLE.

BY ROBERT JAMES WOOLSEY JR.

The United States became interested in a number of petroleum alternative providers, like the Synfuels Corporation, in the 1970s. Then, in 1985, Saudi Arabia dropped the price of their oil down to \$5 a barrel and bankrupted the Synfuels Corporation. The good news is that they bankrupted the Soviet Union, too, but in so doing they certainly undercut alternative fuel efforts.

People became interested in alternative fuels again in the early 1990s, but then in the late 1990s, oil dropped down to \$10 a barrel and people lost interest. We have to make sure that this roller-coaster effect can't happen again.

Some people think the Saudi Arabian oil fields could be peaking, if not now then soon, and that there will also be huge demand for petroleum, not only from the West but from India and China as they start to produce middle classes that drive cars. The Saudis might not be able to drop the price to \$5 or \$10 a barrel by turning on their excess capacity, but they might be able to drop it to \$20 per barrel.

Most of the better alternative fuels are only really viable (as far as we can see) if oil is, say, \$35 per barrel or more. The one that's viable even below that is electricity, because off peak, overnight electricity in many parts of the United States sells

for between 2¢ and 4¢ per kilowatt hour. That is the equivalent to about a penny a mile, whereas gasoline is in the range of 10¢ to 20¢ a mile at today's price.

We need to ensure that some of these other fuels, such as diesel from waste and cellulosic ethanol or butanol, have a chance to develop. We also need a different structure for subsidies. Today, ethanol is being subsidized even though it doesn't need to be with oil that's \$60-\$70 per barrel. What we might do is say no subsidies unless oil drops to \$40 a barrel. You start with small subsidies, and then the subsidies would get larger as the price of oil goes down further. □



#### About the Author

Robert James Woolsey Jr. was director of the U.S. Central Intelligence Agency from 1993 to 1995. He is currently the chairman of the board of Freedom House, the chairman of the advisory boards of the Clean Fuels Foundation and the New Uses Council, a Trustee of the Center for Strategic & International Studies, and vice president of Booz Allen Hamilton. This essay was adapted from an interview with THE FUTURIST. To read the entire interview go to the WFS homepage at [www.wfs.org](http://www.wfs.org).



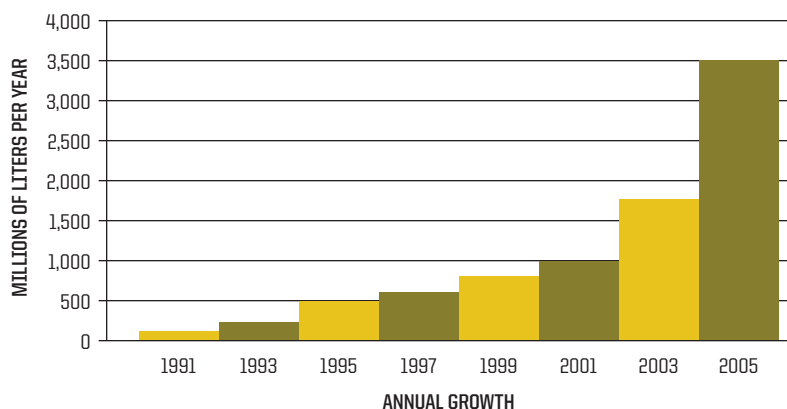
Truck driver Danny Hendricks fills up on biodiesel at Texas Big Daddy's General Store.

meet future biodiesel growth needs at significantly lower production costs. By 2020, use of biodiesel and ethanol technologies combined can replace 20% or more of transportation fuel needs in these major markets.

Most experts and forecasters agree that biodiesel and biofuels will play one part in a bigger picture of multiple alternative fuels, including future fuels from coal-to-gas technology, hydrogen fuel technology, and hybrid-electric technologies. For the next 10 years, soy oil in the United States, canola oil in Europe, and palm oil in China as primary feedstocks are likely to remain the fastest-growing automotive fuel segments in each country's emerging biodiesel markets.

If governments continue to aggressively pursue targets, enact investor-friendly tax incentives for production and blending, and help to promote research and development in new biodiesel feedstocks such as algae biodiesel, the prospects for biodiesel will be realized faster than anticipated. *Biodiesel 2020: A Global Market Survey* finds that each of these variables will be essential to the eventual success of these targets. □

## WORLD BIODIESEL PRODUCTION 1991-2005



Source: *Biodiesel 2020: A Global Market Survey*



### About the Author

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This article was adapted from his study *Biodiesel 2020: A Global Market Survey*,

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