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Ethanol: A Renewable Option

Smart Energy Smart Growth

Laura Scott

Director of Business Development & Biofuels

Gulf Oil Limited Partnership

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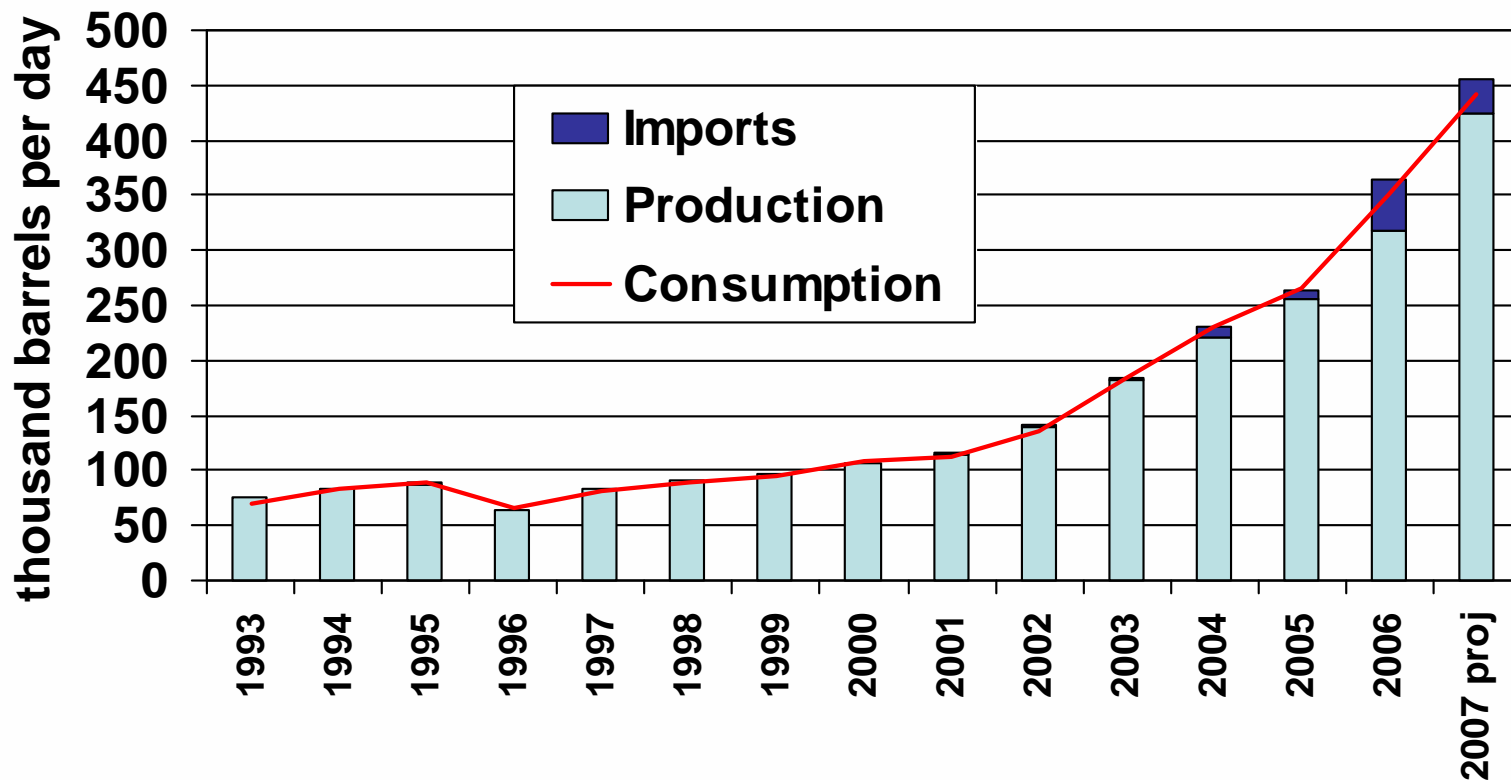
What is Ethanol?

- Ethanol is an alcohol-based fuel made by fermenting and distilling biomass that has been broken down into simple sugars
- In the United States, ethanol is generally made from starch crops such as corn or sorghum
- In Brazil ethanol is made from sugar cane.
- Cellulosic ethanol
 - Corn stover, switchgrass, miscanthus, woodchips
 - Cannot be economically produced today



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U.S. Ethanol Supply and Use



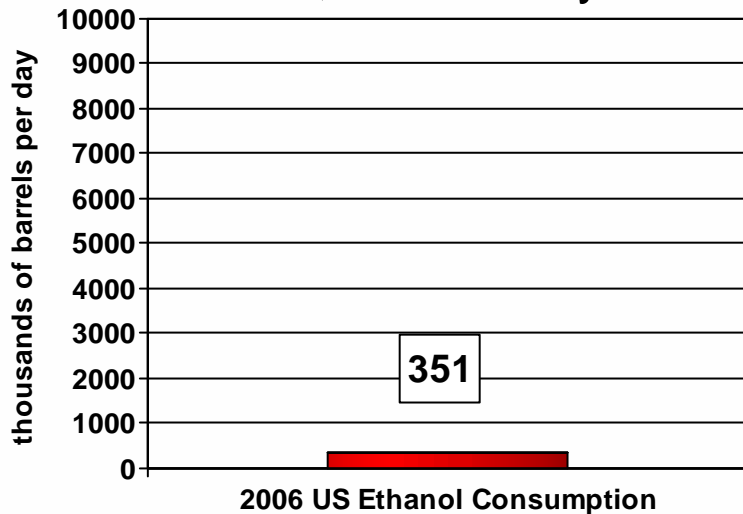
Sources: U. S. Department of Energy (historical); Gulf Oil (projected)



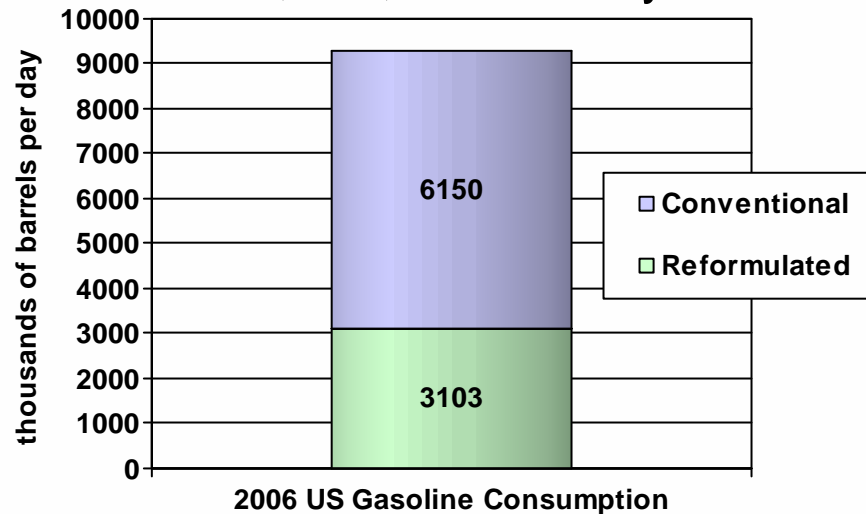
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How Much Ethanol Do We Use in Gasoline Today?

351,000 bls/day



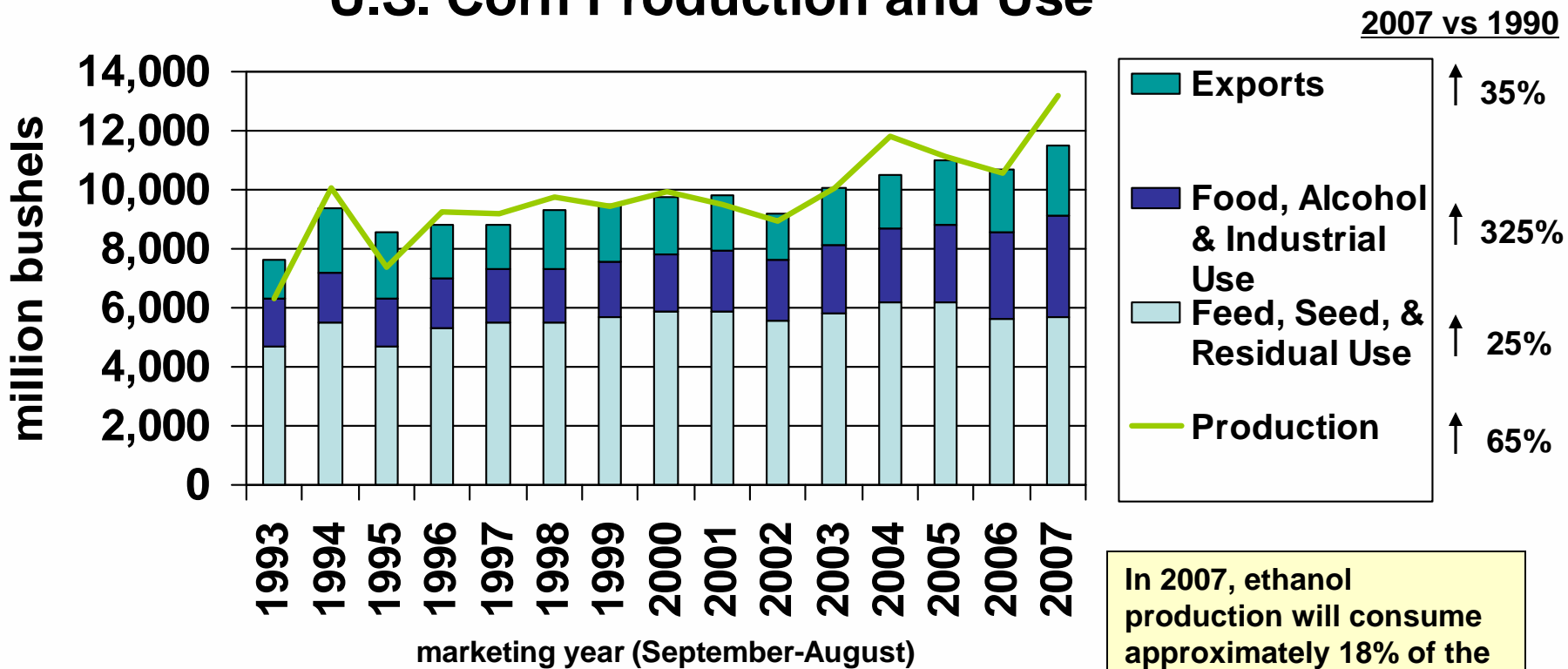
9,253,000 bls/day





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U.S. Corn Production and Use



In 2007, ethanol production will consume approximately 18% of the U.S. corn crop

Source: USDA Marketing Year Supply and Disappearance

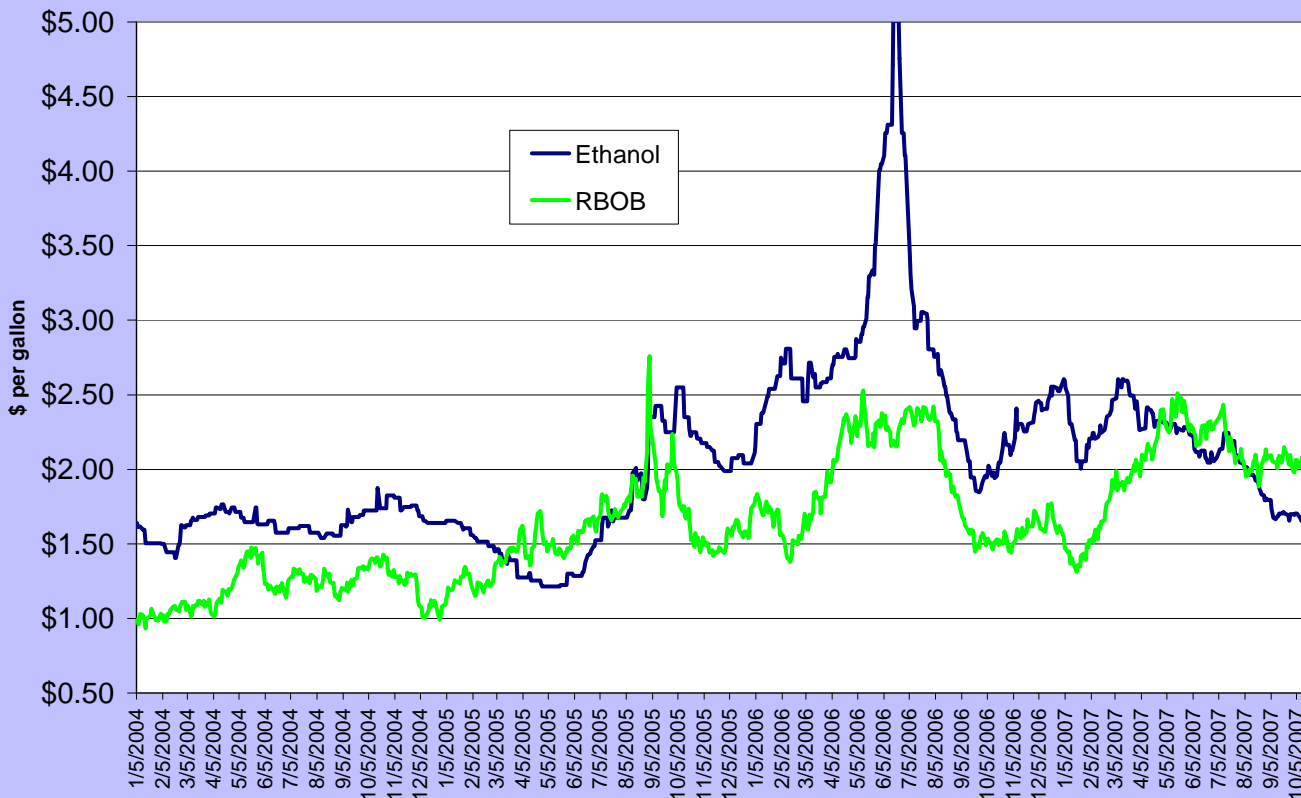


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After a period during which ethanol was more expensive than gasoline, ethanol is now actually cheaper than gasoline

PLATTS New York Harbor Ethanol & RBOB Prices

average of daily low and high prices





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How Much Does E85 Cost?

November 30, 2007

Ethanol Price
Reformulated Blendstock for Oxygenate Blending

Calendar 2008 Tax Credit After Tax Cost
\$1.890 \$0.510 \$1.380
\$2.309

| | Gasoline | E85 | Difference |
|--|---------------|---------------|------------|
| Gasoline Component (90% for gasoline; 20% for E85) | \$2.08 | \$0.42 | |
| Ethanol Component (10% for gasoline; 80% for E85) | \$0.14 | \$1.10 | |
| Net Price | \$2.22 | \$1.52 | |
| Gasoline Equivalent Price (26% efficiency loss) | \$2.22 | \$2.06 | -\$0.16 |
| Gasoline Equivalent Price (20% efficiency loss) | \$2.22 | \$1.90 | -\$0.32 |

0.98 ethanol
0.02 gasoline

0.8 0.784



1 U.S. Gallon of gasoline contains 114,132 btu
1 U.S. Gallon of ethanol contains 76,000 btu

Ethanol is denatured by adding 2 gallons of gasoline to 100 gallons of ethanol (1.96%), therefore:

| | | |
|------------------------------------|---|--------------------------|
| Ethanol @ 76,000 btu/gal x 98.04% | = | 74,510 |
| Gasoline @ 114,132 btu/gal x 1.96% | = | 2,237 |
| Denatured ethanol | = | 76,747 btu/gallon |

E85 is then a blend of denatured ethanol and gasoline, therefore:

| | | |
|--|---|--------------------------|
| Denatured ethanol @ 76,747 btu/gal x 80% | = | 61,398 |
| Gasoline @ 114,132 btu/gal x 20% | = | 22,826 |
| E85 | = | 84,224 btu/gallon |

84,224 divided by 114,132 = 0.7379553

E85 is not actually E85 because the blend ratio is changed seasonally to adjust volatility to provide adequate cold start + warm up performance. Generally, in the summer, E85 is 85% denatured ethanol, in the winter it is 75% denatured ethanol, and in the spring and fall it is 80% denatured ethanol. On a year-round basis, we therefore assume 80%



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Ethanol Positives

- Reduces greenhouse gas emissions*
- Positive contributor to the US economy
- Improves energy security through reduced need for fossil fuel imports
- Downward price effect on oil by lowering demand

Ethanol Negatives

- Increased use of water & fertilizer
- Conversion of protected land to crop use
- Contributing factor to higher food costs
- Marginal net btu yield with corn

Advantages vs. Disadvantages

* Provided coal isn't used to run the ethanol plants



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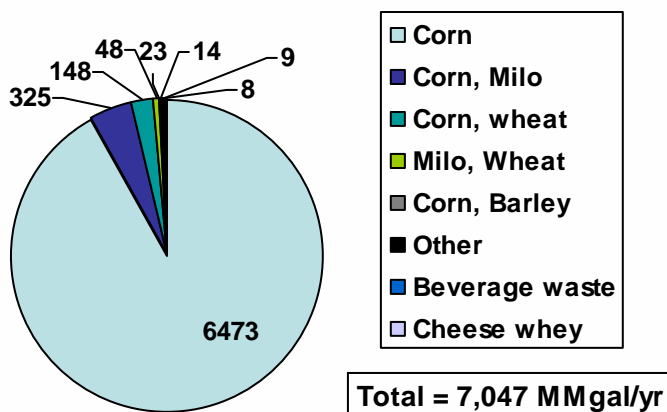
Reference Slides



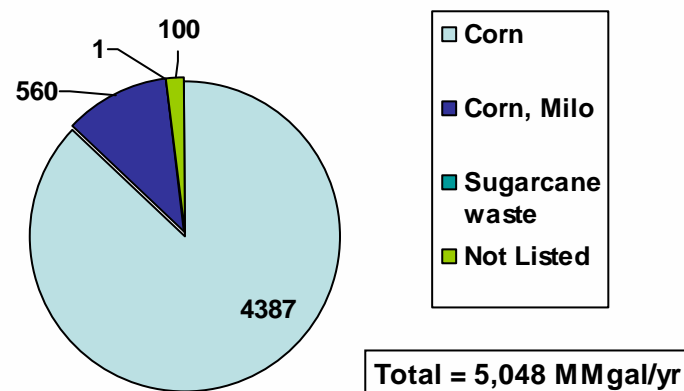
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What is Ethanol Made From?

Existing US Ethanol Production Capacity by Feedstock



Likely Future US Ethanol Production Capacity by Feedstock





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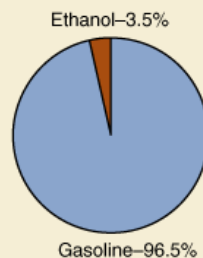
Ethanol accounts for a small share in the overall gasoline market, but its importance to the corn market is relatively large. According to the US Department of Agriculture, in 2006 14 percent of the U.S. corn crop went to ethanol production while ethanol (by volume) represented about 3.5 percent of motor vehicle gasoline supplies.

Ethanol's share of the corn crop is expected to grow to more than 30 percent by 2009/10 and to remain at that level in subsequent years. Even so, by the middle of the next decade, ethanol production (by volume) is expected to represent less than 8 percent of annual gasoline use in the US. Thus, while the growth in corn-based ethanol can contribute to the Nation's fuel supply, that contribution is relatively small in the gasoline market, but can have large effects in the agricultural sector.

Ethanol's role increases in gasoline and corn markets

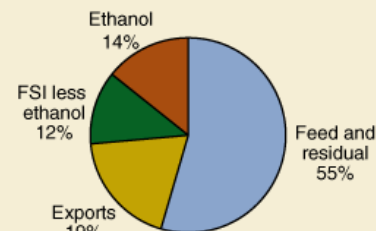
Current relationships

Ethanol is small relative to overall gasoline use...



2006

...but it accounts for a growing share of corn use



2005/06

Stocks-to-use ratio, 17.5%

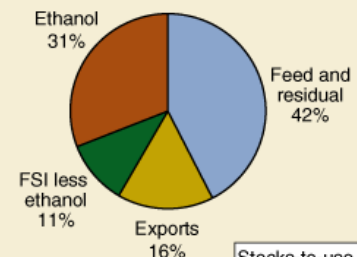
Projected relationships in 10 years

Ethanol still small relative to overall gasoline use...



2017

...but it accounts for over 30 percent of corn use



2016/17

Stocks-to-use ratio, 5.7%

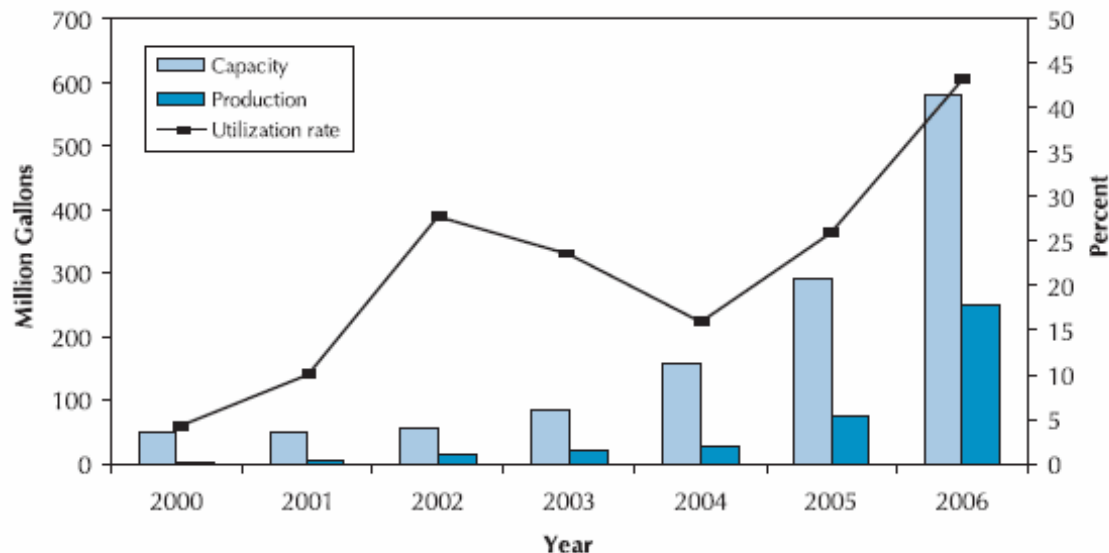
Note: FSI=food, seed, and industrial.

Source: USDA Agricultural Projections to 2016, February 2007.



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Biodiesel Production Overcapacity



Source: National Biodiesel Board.

Note: Capacity given is on September 1 of each year.

Figure 1. U.S. biodiesel production and installed capacity for 2000 to 2006

Licensed FFVs/Licensed Vehicles



Source: National Ethanol Vehicle Coalition 2007 Handbook