Energy Task Force

Overview of Ethanol and Biodiesel

Ethanol

Ethanol is a clean-burning, renewable, domestically produced product made from fermented agricultural products such as corn. Ethanol contains oxygen, which provides a cleaner and more efficient burn of the fuel. When used in vehicles, ethanol reduces carbon dioxide.

How is Ethanol Made?

Ethanol can be produced from any biological feedstocks that contain appreciable amount of sugar or materials that can be converted into sugar such as starch or cellulose. Corn contains starch that can relatively easily be converted into sugar. A significant percentage of trees and grasses are made up of cellulose, which can also be converted to sugar, although more difficult than converting starch to sugar.

The ethanol production process starts by grinding up the feedstock. The sugar is either dissolved out of the material or the starch or cellulose is converted into sugar. The sugar is then fed to microbes that use it for food, producing ethanol, DDGs, and carbon dioxide in the process.

Ethanol Blends

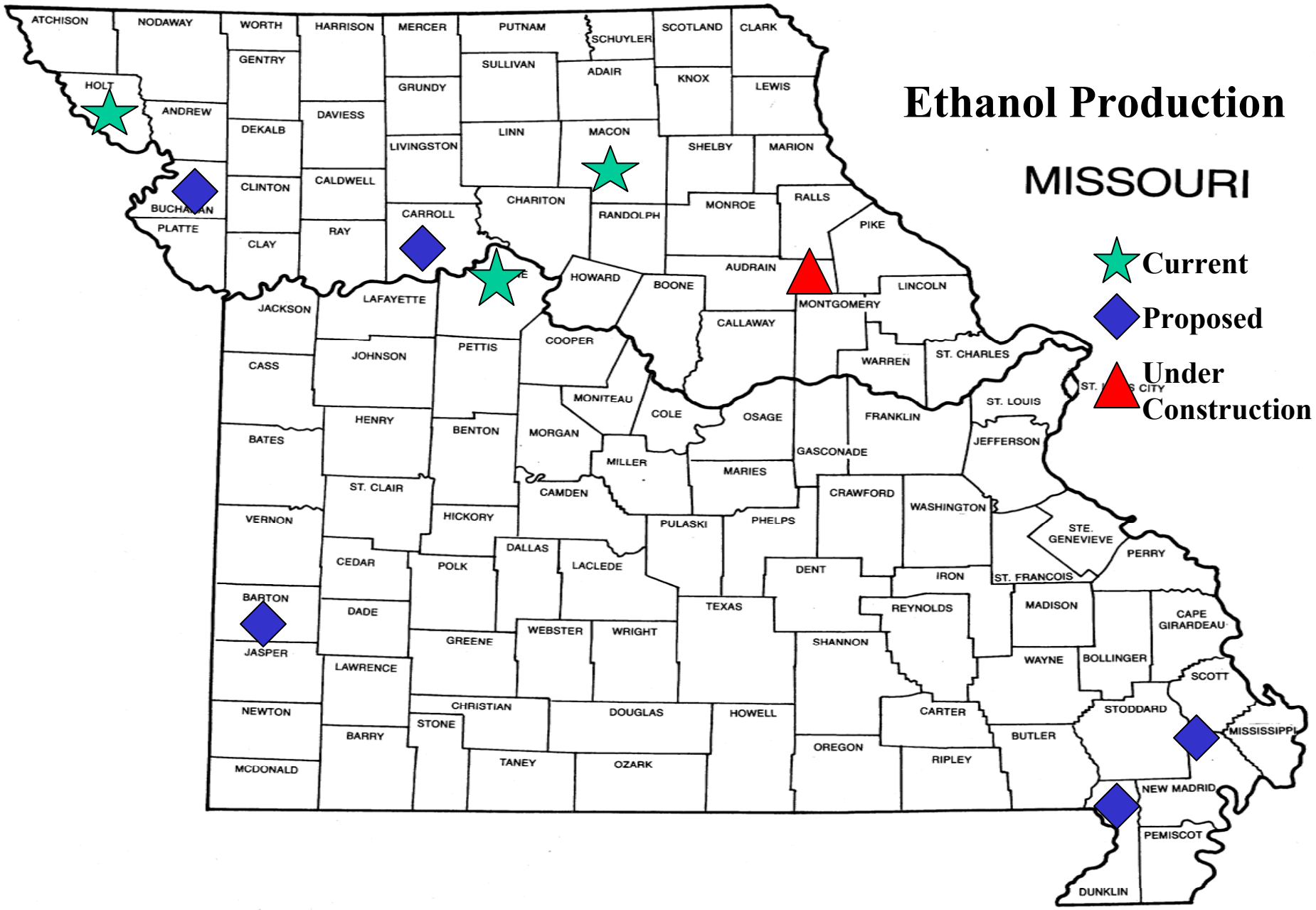
- E10
  - A blend of 10 percent ethanol and unleaded gasoline
  - All motor vehicles manufactured since the 1970s can run on E10
  - Does not require engine modifications

E85

- E85 is not compatible with all motor vehicles. However, numerous vehicles are able to burn E85. These automobiles, called Flexible Fuel Vehicles (FFV) can run on a combination of ethanol and gasoline of up to 85 percent ethanol blend.
- 27 of the over 500 nationwide E85 stations are located In Missouri.

Ethanol Production

Nationwide 94 ethanol plants have a combined production capacity of more than nearly 4.2 billion gallons a year. There are 30 ethanol plants and nine expansions under construction with a combined annual capacity of more than 1.5 billion gallons.


Ethanol Production
MISSOURI
Current
Proposed
Under Construction
ATCHISON
NODAWAY
WORTH
HARRISON
MERCER
PUTNAM
SCHUYLER
SCOTLAND
CLARK
GENTRY
SULLIVAN
ADAIR
KNOX
LEWIS
HOLT
GRUNDY
ANDREW
DAVIESS
DEKALB
LINN
MACON
LIVINGSTON
SHELBY
MARION
CLINTON
CALDWELL
CHARITON
MONROE
RALLS
BUCHANAN
CARROLL
RANDOLPH
PIKE
PLATTE
RAY
CLAY
AUDRAIN
HOWARD
BOONE
LINCOLN
MONTGOMERY
JACKSON
LAFAYETTE
CALLAWAY
COOPER
PETTIS
WARREN
ST. CHARLES
CASS
JOHNSON
MONITEAU
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OSAGE
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ST. LOUIS
HENRY
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WASHINGTON
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PULASKI
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IRON
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TEXAS
REYNOLDS
MADISON
CAPE GIRARDEAU
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GREENE
WEBSTER
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SHANNON
WAYNE
BOLLINGER
SCOTT
LAWRENCE
CHRISTIAN
DOUGLAS
HOWELL
CARTER
STODDARD
MISSISSIPPI
NEWTON
STONE
BARRY
OREGON
BUTLER
RIPLEY
MCDONALD
TANEY
OZARK
NEW MADRID
PEMISCOT
DUNKLIN

Ethanol Pricing

The net effect of blending ethanol with gasoline is actually a product that costs less. A May 2005 report by the Consumer Federation of America notes that drivers everywhere should be saving as much as eight cents per gallon if petroleum marketers would simply blend ethanol into more gasoline.

Ethanol Efficiency

In June 2004, The U.S. Department of Agriculture determined that the net energy balance of ethanol production is 1.67 to 1. for ever 100 BTUs of energy used to make ethanol, 167 BTUs of ethanol is produced.

These figures take into account the energy required to plant, grow and harvest the corn-as well as the energy required to manufacture and distribute the ethanol.

The net energy balance of ethanol production continues to improve because ethanol production is becoming more efficient. For example, one bushel of corn now yields 2.8 gallons of ethanol.

Executive Order 05-46

- Lessen Missouri's dependence on oil and other fossil fuels
  - Approximately 40%, 1.2 billion gallons, of the gasoline sold in Missouri is currently blended with ethanol.
  - With the implementation of a 10% ethanol blend standard, almost all of the 3.0 billion gallons of gasoline sold in the state will contain 10% ethanol.

Executive Order 05-46

- Promote the development of alternative fuel sources in ways that strengthen the farm economy of rural Missouri.
- Add value to nearly 23% of Missouri's corn crop.
- Create over 100 new higher paying jobs in rural Missouri
- Increase of $845 million in annual economic output

- Infrastructure investment of over $300 million
- Generate over $87 million in tax revenues
- Produce over 200 million gallons of ethanol
- Over 1,900 Missouri farm families invested
- Over 15,000 Missouri farm families benefit

Biodiesel

Biodiesel is a clean-burning fuel for diesel engines made from domestically produced, renewable fats and oils . Biodiesel has no sulfur and meets the new Environmental Protection Agency (EPA) ultra low sulfur diesel fuel mandate. Biodiesel burns substantially cleaner than petroleum based diesel fuel.

How is biodiesel made?

Biodiesel is made through a chemical process (transesterification) whereby the glycerin is separated from the fat or vegetable oil. The process leaves behind two products- methyl esters (the chemical name for biodiesel) and glycerin (a valuable byproduct usually sold to be used in soaps and other products).

Most of the biodiesel produced today is done with the transesterifiction. One hundred pounds of fat or oil (such as soybean oil) are reacted with 10 pounds of a short chain alcohol in the presence of a catalyst to produce 10 pounds of glycerin and 100 pounds of biodiesel. The short chain alcohol is usually methanol and the catalyst is usually sodium or potassium hydroxide.

Biodiesel Blends

B2: 2% soy biodiesel and 98% conventional diesel

B20: 20% soy biodiesel and 80% conventional diesel

B100:100% soy biodiesel and 0% conventional diesel

Can be used without engine modifications and at any percent blend, making it a very user-friendly fuel. Many original engine manufacturers have endorsed biodiesel for used in their equipment.

Soy Biodiesel Efficiency

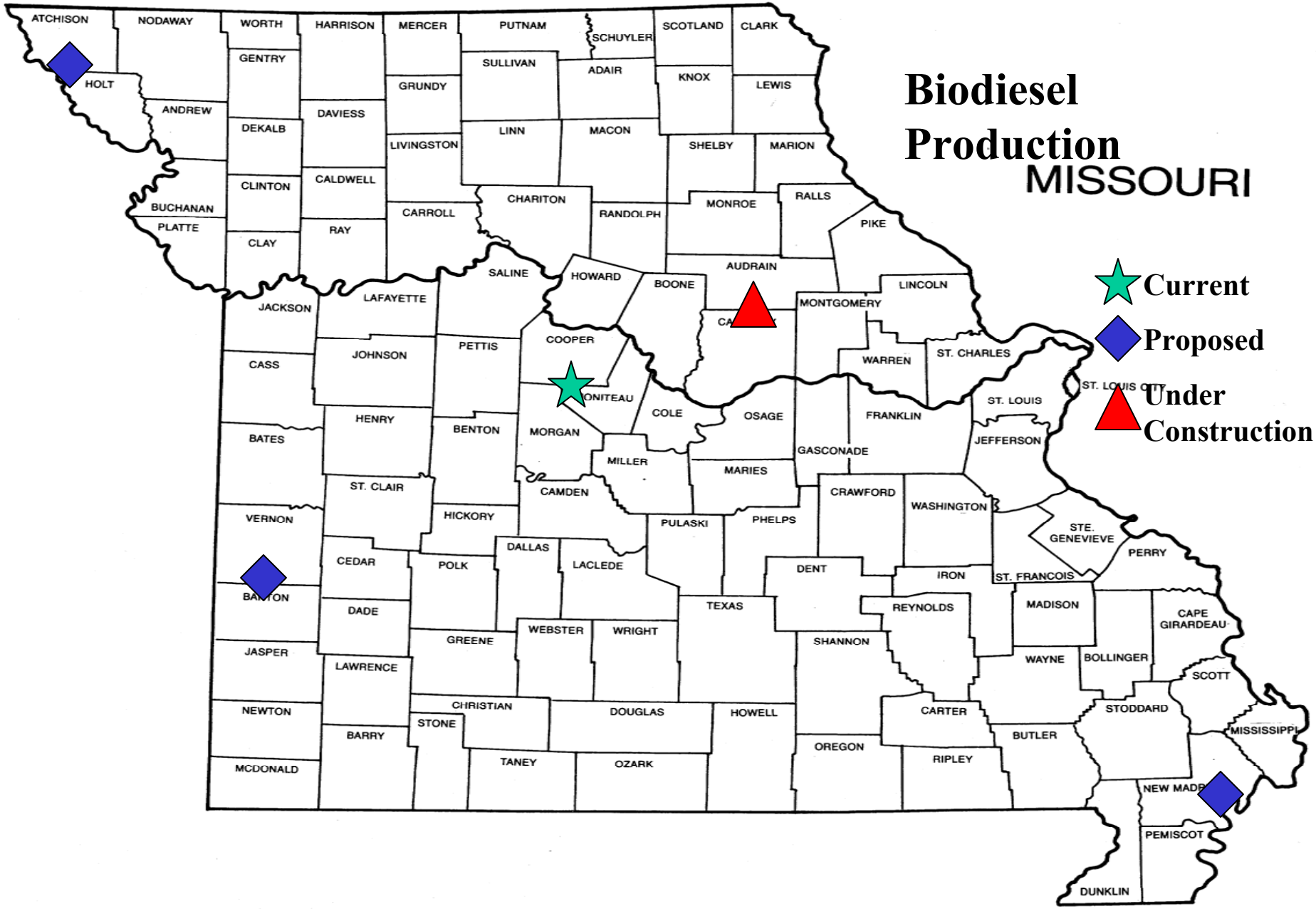
Soy biodiesel has the highest BTU (energy) content of any alternative fuel. For every unit of energy used to produce biodiesel, 3.2 units are gained (based on 1.4 gallons of soy biodiesel/bushel)!

Biodiesel Production

In 2004 the entire country produced approximately 30 million gallons, while 2005 produced approximately 75 million gallons. Early estimates indicate between 120 to 150 million gallons for 2006 with the vast majority being soy-based (85%) and the rest from animal fats, yellow grease and other vegetable oils (15%).

Biodiesel Usage

If all on-road diesel in Missouri was 2% biodiesel it would represent a 22 million gallon market. 2% biodiesel nationwide represents a 760 million gallon market. Note that this doesn't include off-road such as agriculture and construction uses.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LINN
MACON
SHELBY
MARION
LIVINGSTON
CLINTON
CALDWELL
CHARITON
MONROE
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SALINE
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MILLER
MARIES
ST. CLAIR
CRAWFORD
WASHINGTON
VERNON
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PULASKI
PHELPS
STE. GENEVIEVE
PERRY
CAMDEN
DALLAS
LACLEDE
CEDAR
POLK
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IRON
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DADE
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REYNOLDS
MADISON
CAPE GIRARDEAU
JASPER
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Executive Order 05-46

- Lessen Missouri ‘s dependence on oil and other fossil fuels
- Reduce diesel usage by 760 million gallons each year

Executive Order 05-46

- Promote the development of alternative fuel sources in ways that strengthen the farm economy of rural Missouri.
  - Utilization of the oil from 250 million bushels of soybeans

- Add a a minimum of $.35 to the value of a bushel of soybeans.
- Add more than $900 million to gross farm income.
- Potentially reduce fleet operating costs through increased equipment life.