Southern Alliance for the Utilization of Biomass Resources Conference

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University of Alabama

Pearson Technologies, Inc.

When Henry Ford told a New York Times reporter that ethyl alcohol was "the fuel of the future" in 1925, he was expressing an opinion that was widely shared in the automotive industry. "The fuel of the future is going to come from fruit like that sumach out by the road, or from apples, weeds, sawdust -- almost anything," he said.

Bill Kovarik, "Henry Ford, Charles F. Kettering and the Fuel of the Future," Automotive History Review, Spring 1998, No. 32, p. 7 - 27

Pearson Technologies is making ethyl alcohol from “almost anything” a reality.

Who is Pearson Technologies, Inc.?

- Pearson Technologies, Inc. ("PTI") is a privately held corporation based in Aberdeen, Mississippi whose mission is to research, develop, optimize and commercialize the Pearson Process for producing ethanol using gasification and catalytic conversion. Stan Pearson is the founder and developer of the Pearson Process.

- The PTI process uses a unique combination of technologies to produce ethanol from a wide variety of non-corn biomass feedstocks at a lower price per gallon than any existing fermentation technologies.

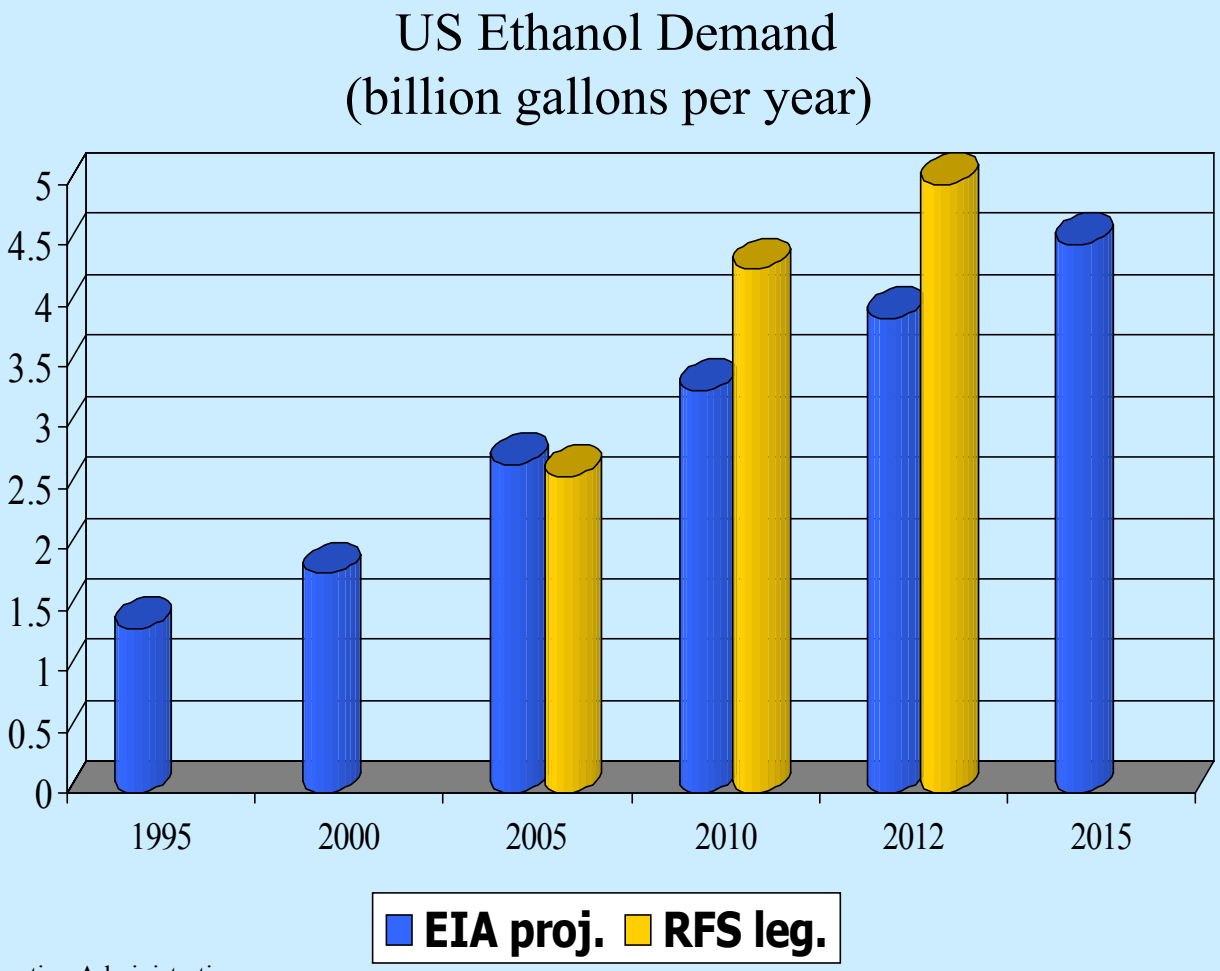
Technology Development

- **1989-1995** - Initial pilot plant (400 lbs per hour) work by PTI on gasification of various feedstocks including woodwaste, bagasse, rice hulls and straw, kennaf, and sewer sludge to form CO and H2 mixtures.
- **1996-1997** - Two years of laboratory scale reactor studies completed for converting various mixtures of CO and H2 to ethanol using proprietary catalysts.
- **1999-2001** - 30 ton-per-day development facility tests started converting syngas (from methane reforming) to ethanol. Initial results encouraging; reactor modifications for heat rejection required.
- **2002 to present** - Facility built to further develop "new" feedstocks; conversion of the 30 ton-per-day facility to woodwaste currently in progress

Market Drivers for Fuel Ethanol

- National Security >> less reliance on Middle East Region
- Economy >> reduce imported oil to improve trade balance
- Environment >> reduced air pollution from gasoline
- Social >> support rural agricultural jobs

USA Ethanol Market Projections

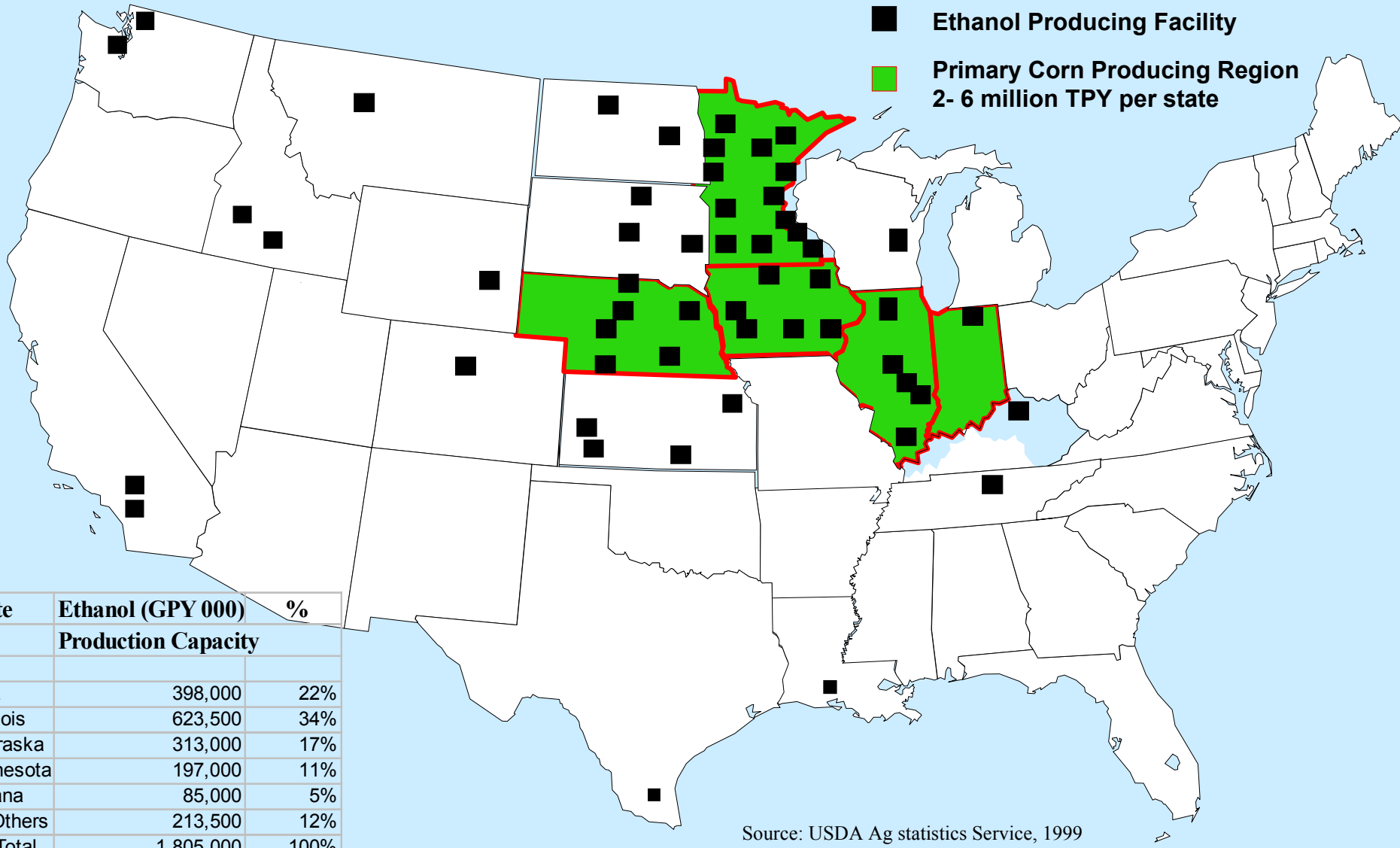


Source: Energy Information Administration

Problems with Existing Ethanol Production

- Geographically constrained
- Predominant existing technology limits feedstock flexibility
- Expensive
- Environmental wastes

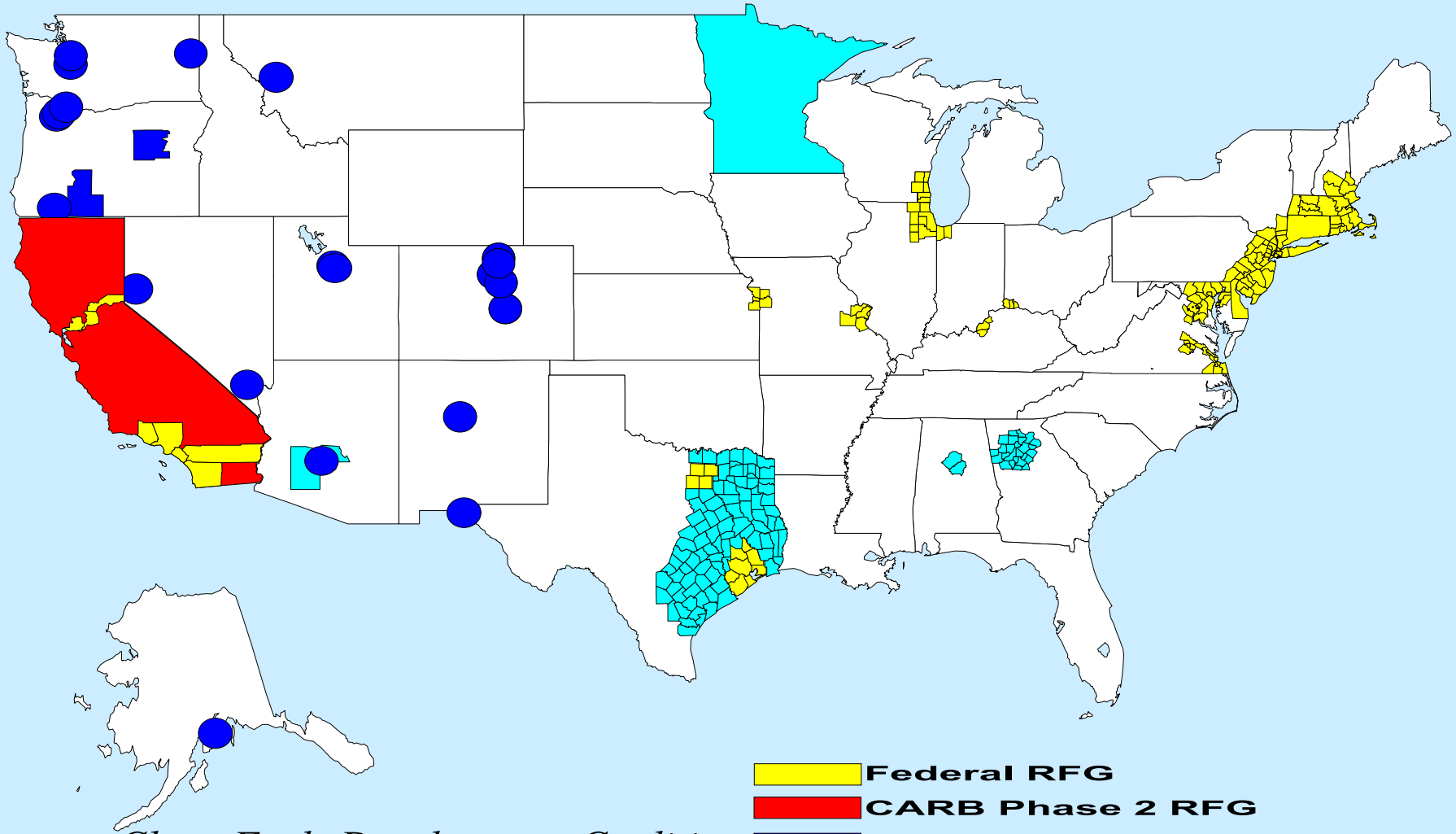
U.S. Ethanol Production Concentrated in Corn-Growing Region



State	Ethanol (GPY 000) Production Capacity	%
Iowa	398,000	22%
Illionois	623,500	34%
Nebraska	313,000	17%
Minnesota	197,000	11%
Indiana	85,000	5%
All Others	213,500	12%
US Total	1,805,000	100%

Source: USDA Ag statistics Service, 1999

U.S. Clean Fuel Requirements are mostly in other regions



Source: Clean Fuels Development Coalition

"Most ethanol use is in the metropolitan centers of the Midwest, where it is produced. When ethanol is used in other regions, shipping costs tend to be high, since ethanol-blended gasoline cannot travel through pipelines."

"This geographic concentration is an obstacle to the use of ethanol on the East and West Coasts. The potential for expanding production geographically is a motivation behind research on ethanol, since if regions could locate production facilities closer to the point of consumption, the costs of using ethanol could be lessened. Furthermore, if regions could produce fuel ethanol from local crops, there would be an increase in regional agricultural income."

Fuel Ethanol: Background and Public Policy Issues

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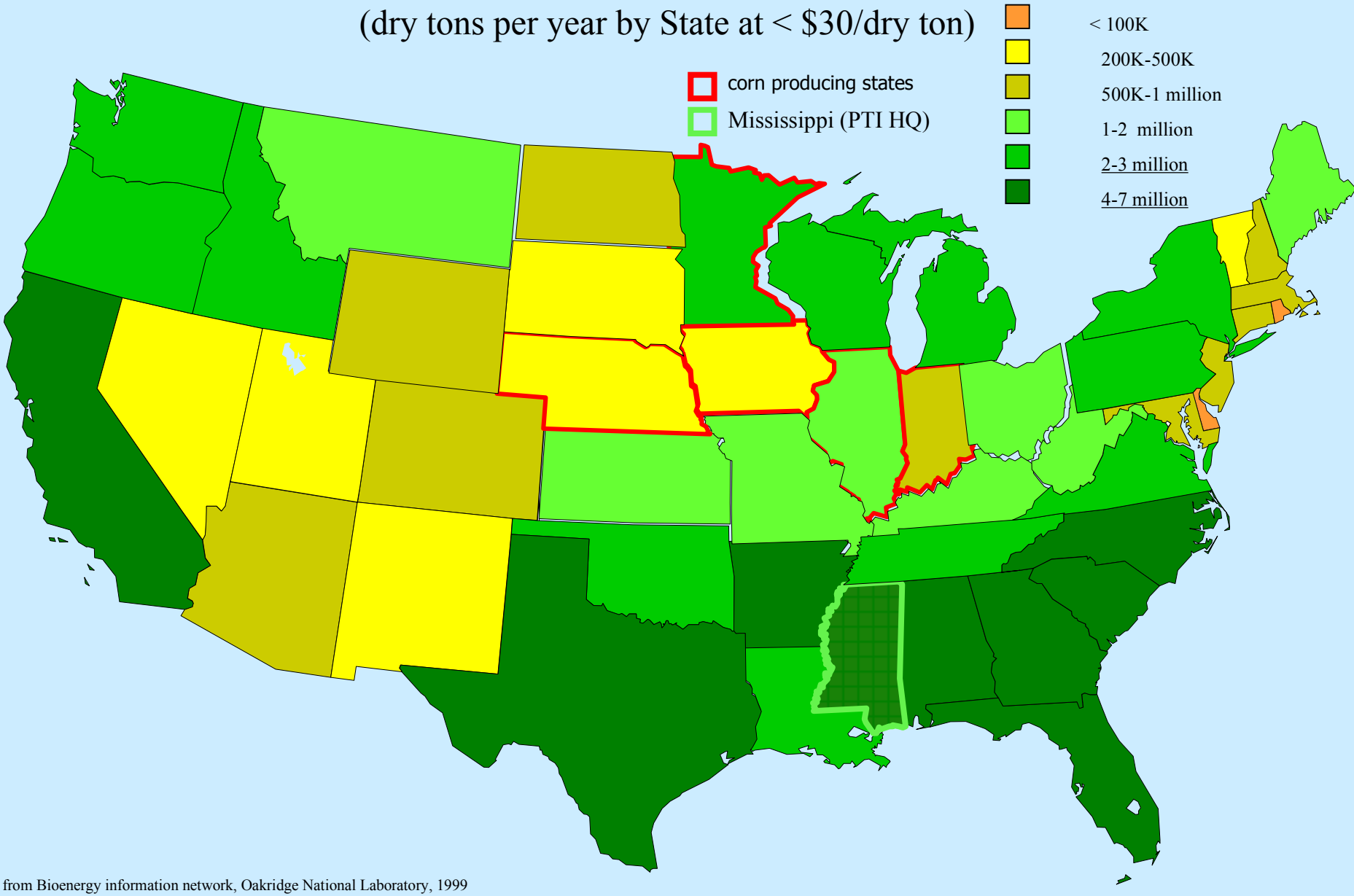
Biomass Feedstocks are available for the PTI Fuel Ethanol Process in a wider geographic region

(dry tons per year by State at < $30/dry ton)



Data from Bioenergy information network, Oakridge National Laboratory, 1999

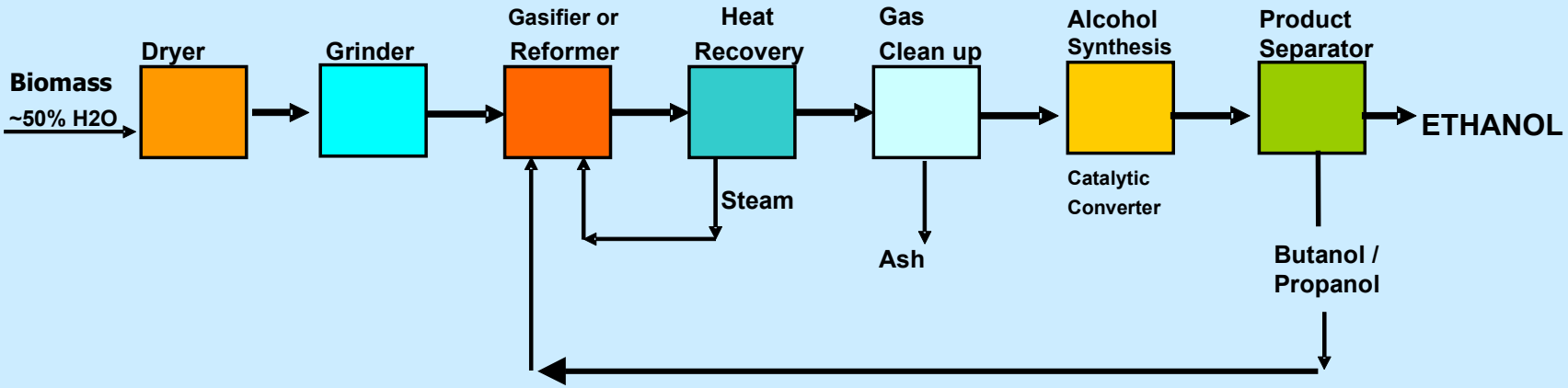
Reduced Ethanol Cost Using PTI Technology

The manufacturing cost of ethanol utilizing the Pearson Process is projected to be between $ 0.50 to $ 0.75 per gallon, depending on facility size, location and cost of feedstock.

Ethanol Plant (25 million gallons per year)	**Shelled Corn to Ethanol (Note 1) 1999 $**	**Wood Waste to Ethanol Pearson Process**
Utilities	$ 0.16	$ 0.14
Labor, Supplies and Overhead	0.13	0.16
Feedstock - Corn at $1.94 per bushel	0.68	-
Feedstock - Wood waste at $15.00 per wet ton	-	0.13
Other Raw Materials	0.06	-
Denaturant	0.03	0.03
Total Operating Costs	**1.06**	**0.46**
Depreciation of Capital	0.11	0.15
Total Operating Cost and Capital Recovery	**1.17**	**0.61**
Byproduct Credit (DDG at $90 per ton)	(0.29)	
Net Cost After Byproduct Credit	0.88	0.61

Note 1: Source of information – Determining the Cost of Producing Ethanol from Corn Starch and Lignocellulosic Feedstocks, A Joint Study Sponsored by: U.S. Dept of Agriculture and U.S. Dept of Energy, October 2000, National Renewable Energy Laboratory

Fuel Ethanol by the Pearson Process



- (1) a proprietary reformer, that "gasifies" biomass and other carbon based substances including wastes, in an oxygen starved environment to produce a targeted synthesis gas or "syngas" (primarily carbon monoxide and hydrogen.)

- (2) The syngas is reacted with a proprietary catalyst in a Fischer-Tropsch synthesis loop to produce ethanol with a conversion of greater than 98% with recycle.

- The balance of the system consists of standard chemical plant components.

Syngas Composition

	Other # 1	Other # 2	NREL	Pearson Ex. # 1	Pearson Ex. # 2
Hydrogen	2 - 10%	11%	18%	34%	51%
Carbon Monoxide	12 - 30%	43%	36%	33%	24%
Methane		18%	15%	10%	6%
Carbon Dioxide	16 - 30%	17%	17%	15%	17%
Nitrogen	30 - 55%	3%	9%	5%*	.65%

* Primarily from instrument purging with nitrogen.

Pearson Ex. # 1 and Pearson Ex. # 2 represent two different sets of operating conditions.

PTI Fuel Ethanol technology - increased yields per ton of biomass

Green is Good. Wasting Waste is Wasteful.

TECHNOLOGY	Uses Total Biomass	Requires Acid	Requires Enzymes	Uses Ferment-ation	Produces 50% CO_2	Conversion Efficiency	Ethanol gal /MAF ton
Dilute Acid Hydrolysis	N	Y	N	Y	**Y**	80%	**40-60**
Conc Acid Hydrolysis	N	Y	N	Y	**Y**	80%	**65-75**
SSF	N	Y	Y	Y	**Y**	80%	**65-75**
Ammonia	N	N	Y	Y	**Y**	70%	**40-50**
Corn	N	N	Y	Y	**Y**	90%	**110-120**
Gasif & Microbial Conversion	**Y**	**N**	**N**	**N**	**N**	70%	**90-110**
Gasif. & Catalytic Conversion	**Y**	**N**	**N**	**N**	**N**	**98%**	**200+**

Pearson Technology Benefits

This is strictly a physical/chemical process plant; it does not utilize any biological processes for the production of ethanol from biomass such as acid hydrolysis and microbial fermentation

- The process works on a much **wider variety of biomass feedstocks** such as woodwaste, rice hulls and straw, bagasse, corn stover and other **waste** biomass feedstocks than presently possible with other processes.

- The process allows use of much more of the carbon in the biomass than fermentation, therefore **raising the potential conversion rates** from less than 50% with existing technologies **to 98%.**

- The power and heat required for the process can be **economically produced** with syngas derived from the feedstock, eliminating the need for the ongoing use of fossil fuels and **reducing variable costs of ethanol production**.

Pearson Process Commercialization

- Currently engaged in process engineering for a 200 ton-per-day (20 million gallons per year) ethanol facility using wood waste as its feedstock
- Currently engaged in process engineering for an ethanol facility with fuel gas and power generation units utilizing bagasse as its feedstock
- Currently in the process of adding biomass-to-syngas portion of the 30 ton-per-day unit in Aberdeen, MS
- Aggressively working on funding for several other ethanol facilities in different parts of the country utilizing various feedstocks

Pearson Technologies, Inc.

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