

Wood-based Biomass in the U.S. An Emphasis on Wood Energy



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Presentation Outline

- Overview
- Wood Biomass
- Energy Options
- Recent Events
- Issues & Challenges
- Concluding Observations



There is a great future in plastics.....think about it.



There is a great future in wood.....think about it.



Wood-based Biomass Types

Primary mill residues

Wood materials and bark generated at manufacturing plants (primary wood-using mills) when round wood products are processed into primary wood products.

Slabs, edgings, trimmings, sawdust, veneer clippings and cores, and pulp screenings.



Wood-based Biomass Types

Secondary mill residues

Wood scraps and sawdust from woodworking shops, furniture factories, wood container and pallet mills, etc. that use lumber, plywood and other “primary” raw materials.



Wood-based Biomass Types

Urban wood waste

Discarded wood, tree trimmings, material from construction and demolition sites, etc.



Wood-based Biomass Types

Forest residues

Logging residue, unused portions of trees, cut or killed during logging or silvicultural activities and left in the woods; unutilized volume of trees cut or killed during logging operations.

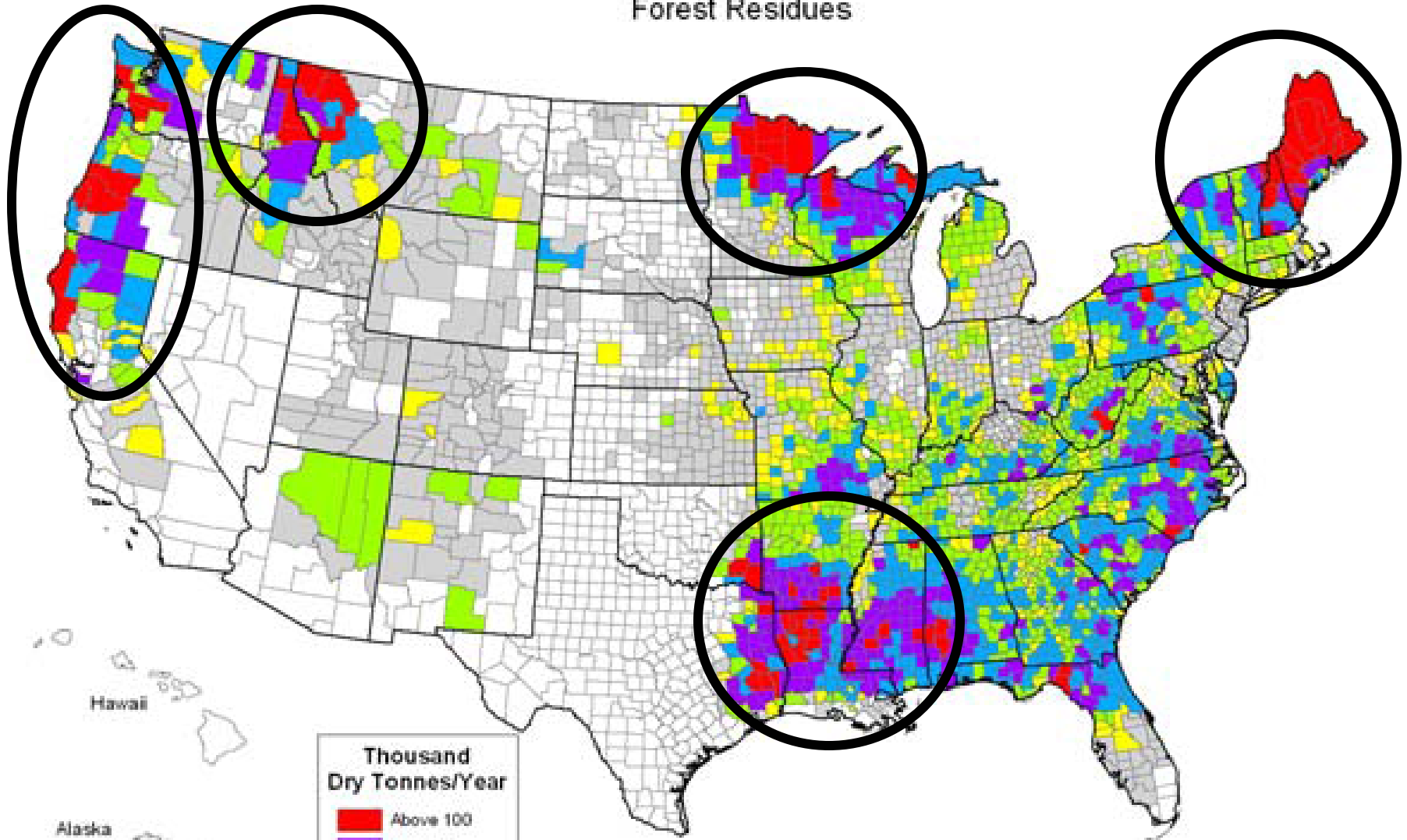
Different Types of Slash



Wood-based Biomass Sources



Forest Residues

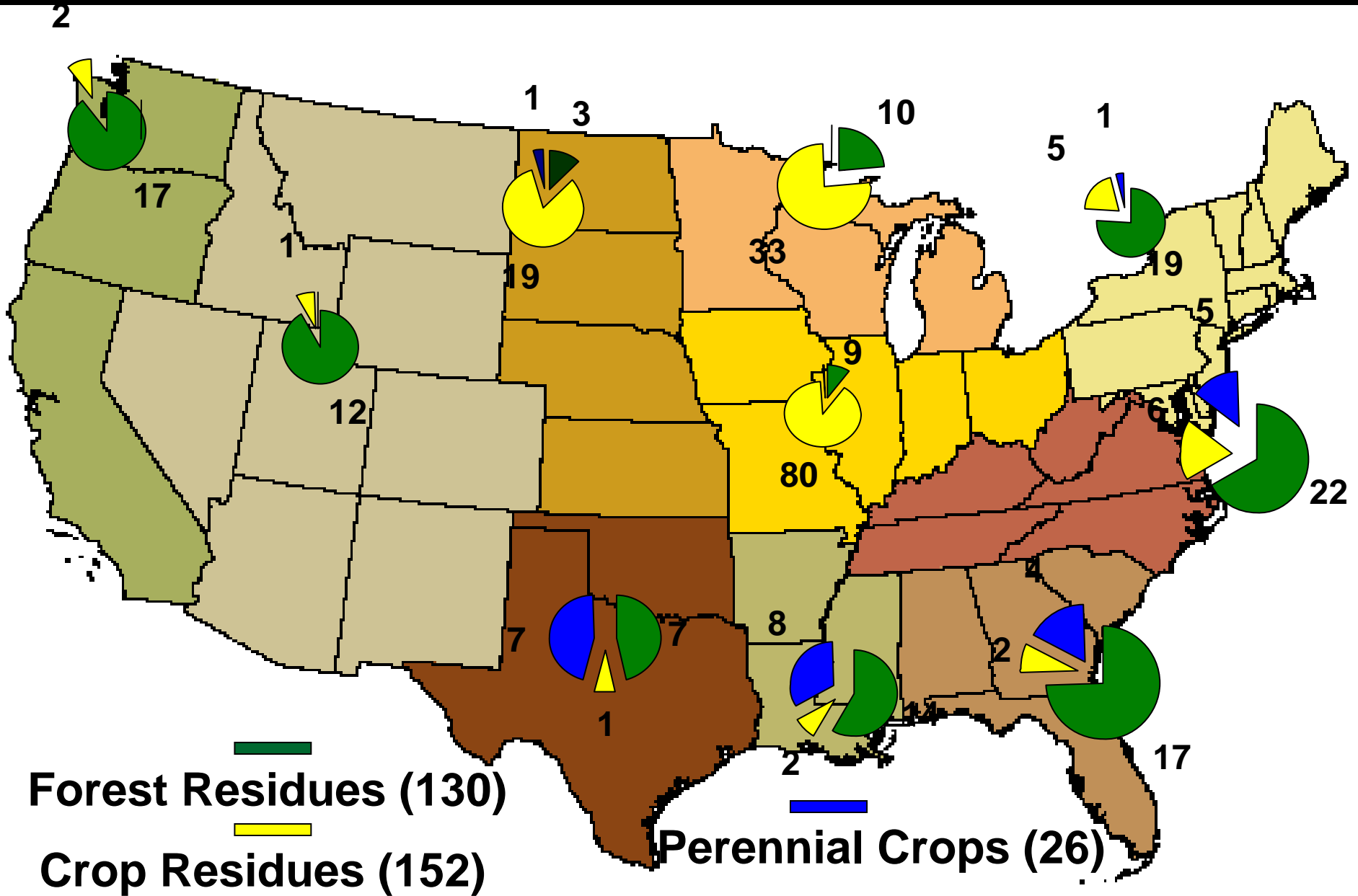


Forest residues are logging residues and other removable material left after carrying out silviculture operations and site conversions. Logging residue comprises unused portions of trees, cut or killed by logging and left in the woods. Other removable materials are the unutilized volume of trees cut or killed during logging operations.

Source: USDA, Forest Service's Timber Product Output database, 2002



Comparative Advantage in Feedstock Production



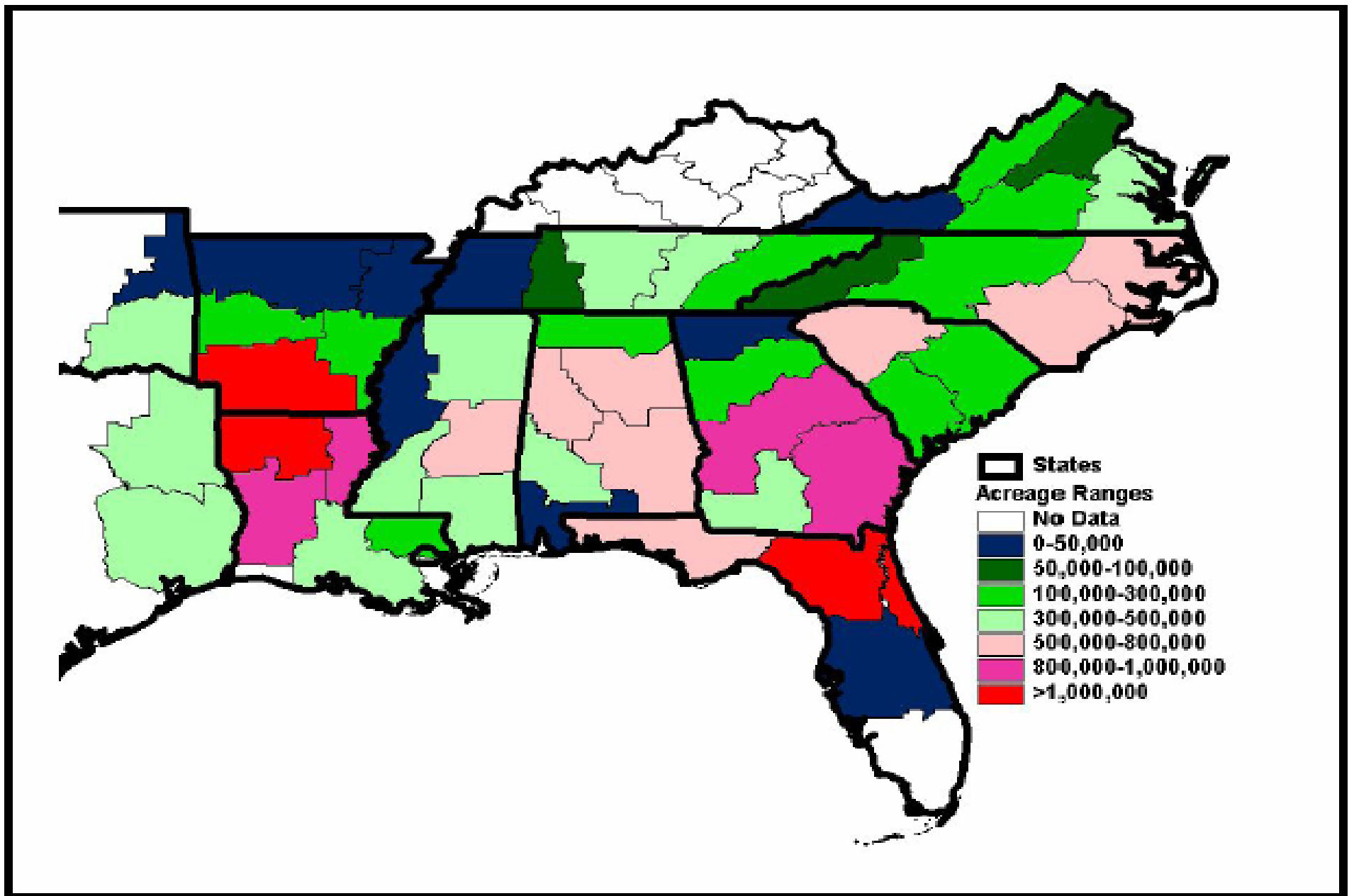
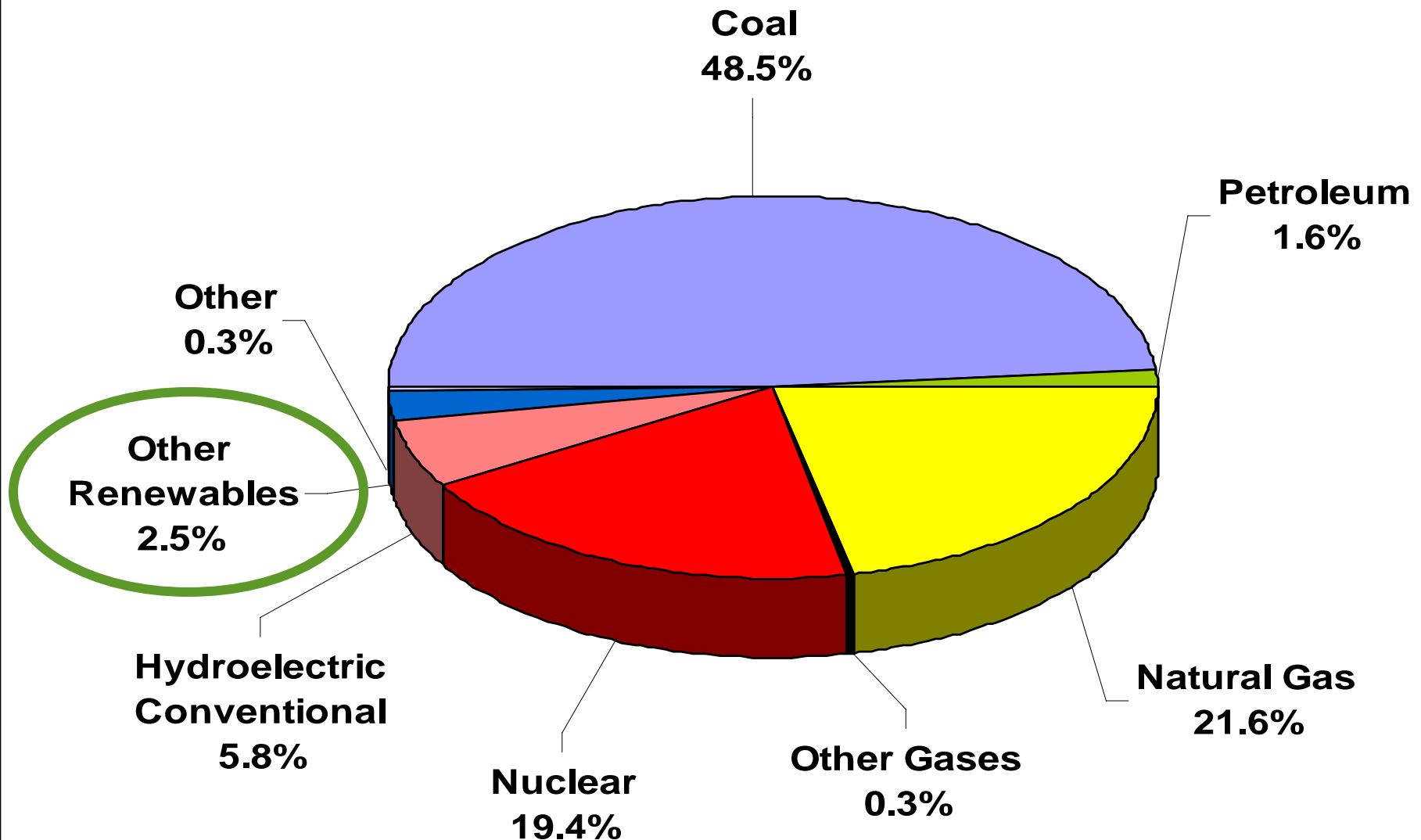


Figure 1. Thematic map depicting acres of timberland sales by state and survey unit across the south.

U.S. Electric Power Industry Net Generation, 2007



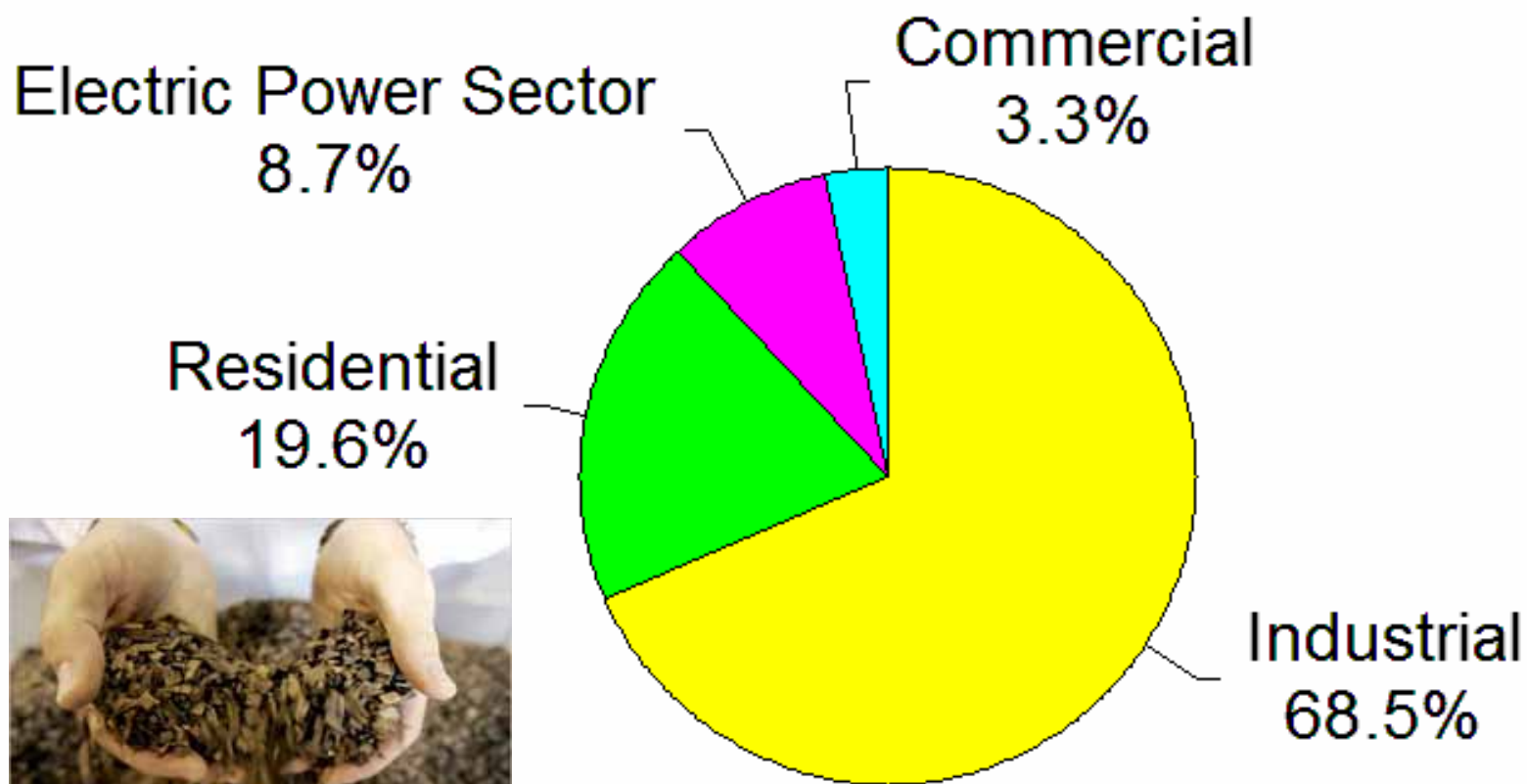
Source: Energy Information Administration, Form EIA-923, "Power Plant Operations Report" and predecessor form(s) including Energy Information Administration, Form EIA-906, "Power Plant Report;" and Form EIA-920, "Combined Heat and Power Plant Report."

Wood Energy in the U.S.

- Wood is the most commonly used biomass fuel for heat and power in the U.S.
- About 84% of the wood and wood waste fuel used in the U.S. is consumed by industry, electric power producers, and commercial businesses.
- Most of this is used at wood product manufacturing facilities in cogeneration.



U.S. Wood Biomass Energy Consumption by Sector, 2006 (Total = 2.18 Quadrillion BTU)

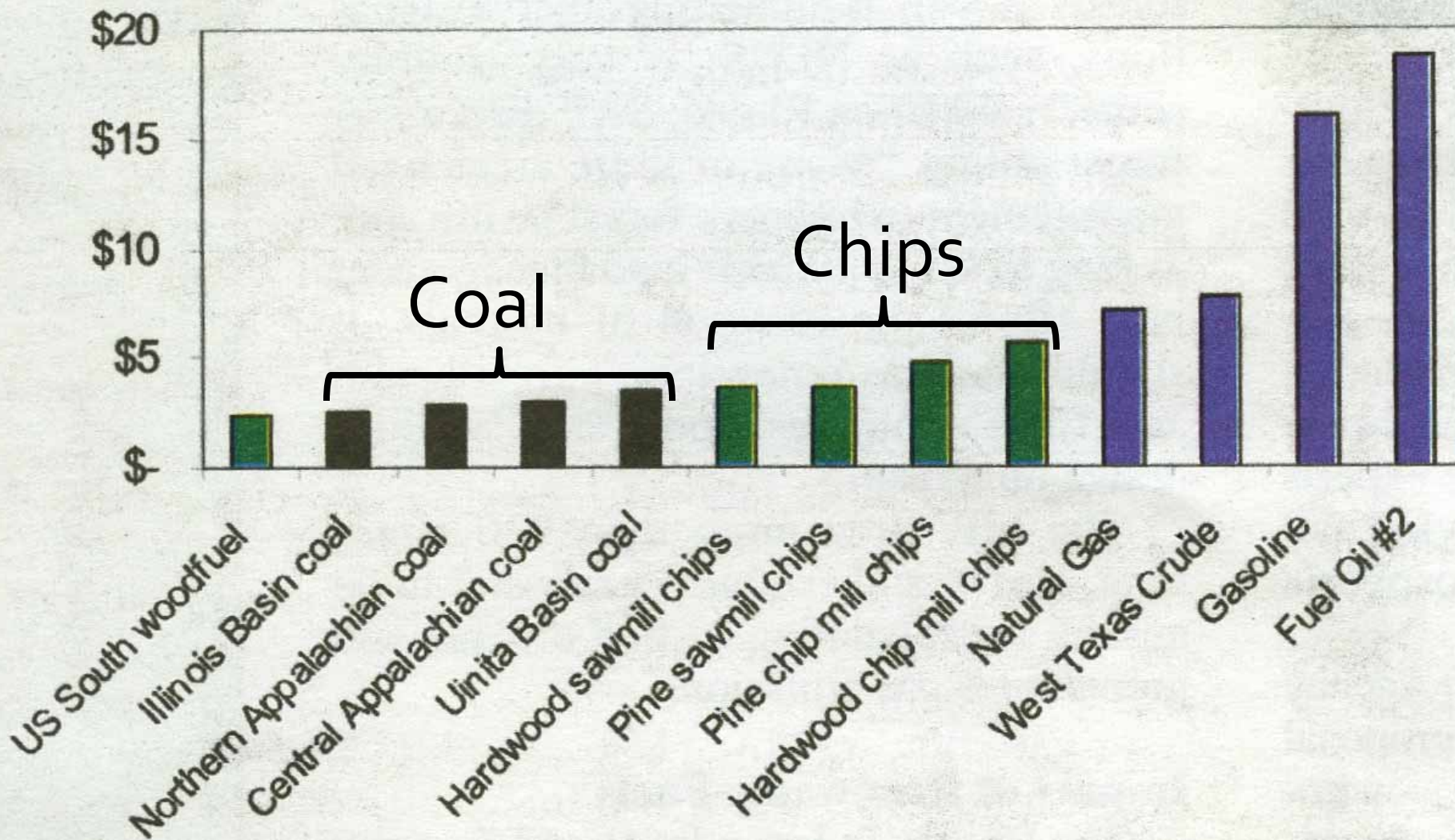


Source: U.S. Energy Information Administration

Why Wood?

- Renewable, carbon-neutral, and locally available compared to most fossil fuels.
- In combustion, wood produces 90% less carbon dioxide (CO₂) than fossil fuels with minimal emissions of sulfur, heavy metals and particulates (USDA 2004).
- Cellulosic content of wood → candidate biomass for transportation fuel production (USDA 2004).

\$/MM Btu for Various Fuel Sources Q4 2008



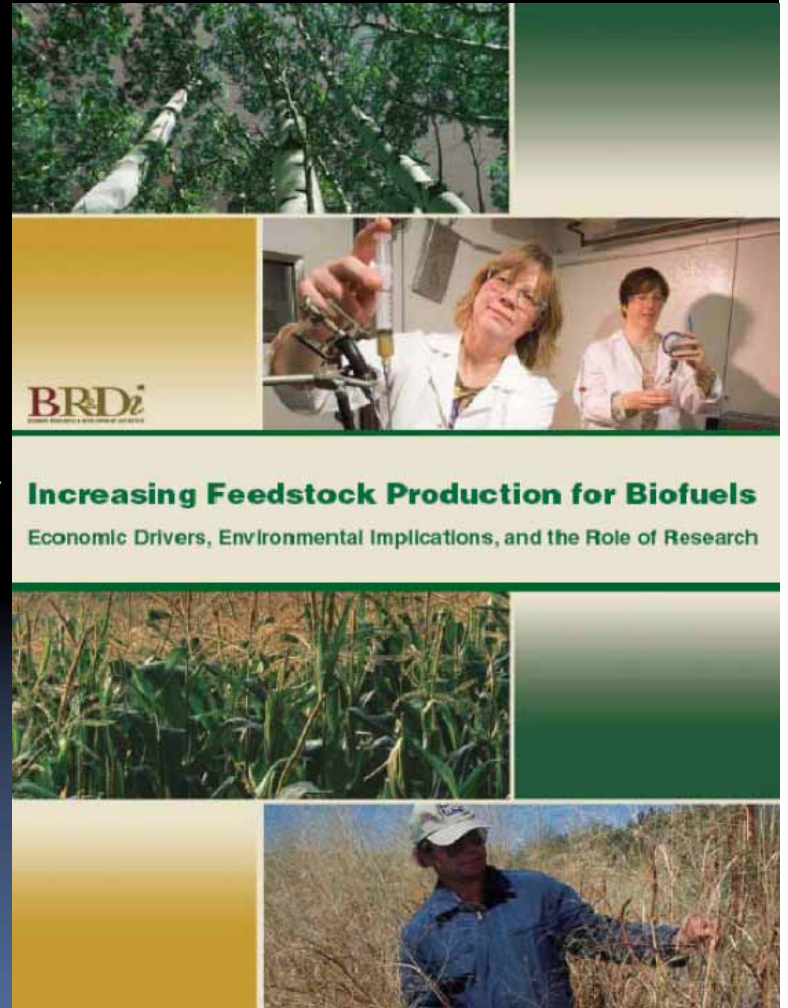
Wood Biomass Supply

Biomass Research & Development Initiative

- Department of Agriculture
- Department of Energy
- National Science Foundation
- Environmental Protection Agency
- Department of the Interior
- Office of Science and Technology Policy
- Office of the Federal Enviro. Exec.
- Department of Transportation
- Department of Commerce
- Department of the Treasury
- Department of Defense

Available at:

www.brdisolutions.com



Wood Biomass Supply Billion –Ton Annual Supply Study

Biomass as Feedstock for a
Bioenergy and Bioproducts Industry:
The Technical Feasibility of a
Billion-Ton Annual Supply

April 2005



U.S. Department of Energy

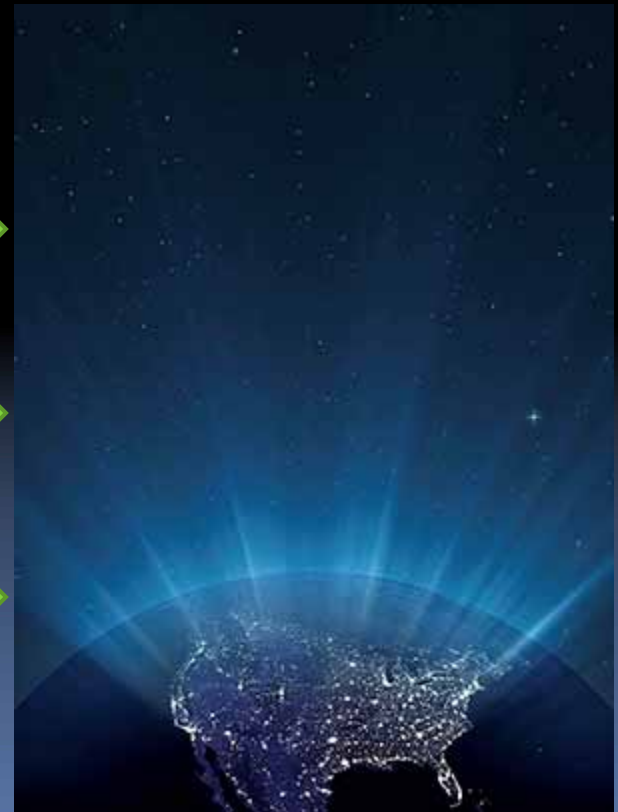
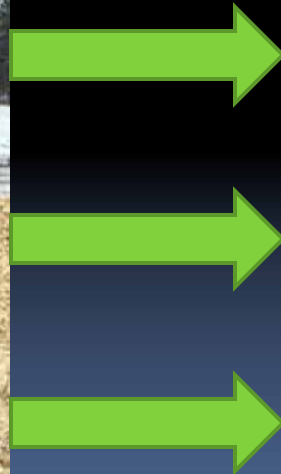
USDA

U.S. Department of Agriculture

Available at:
www.osti.gov/bridge

Wood to Energy

What are the options?

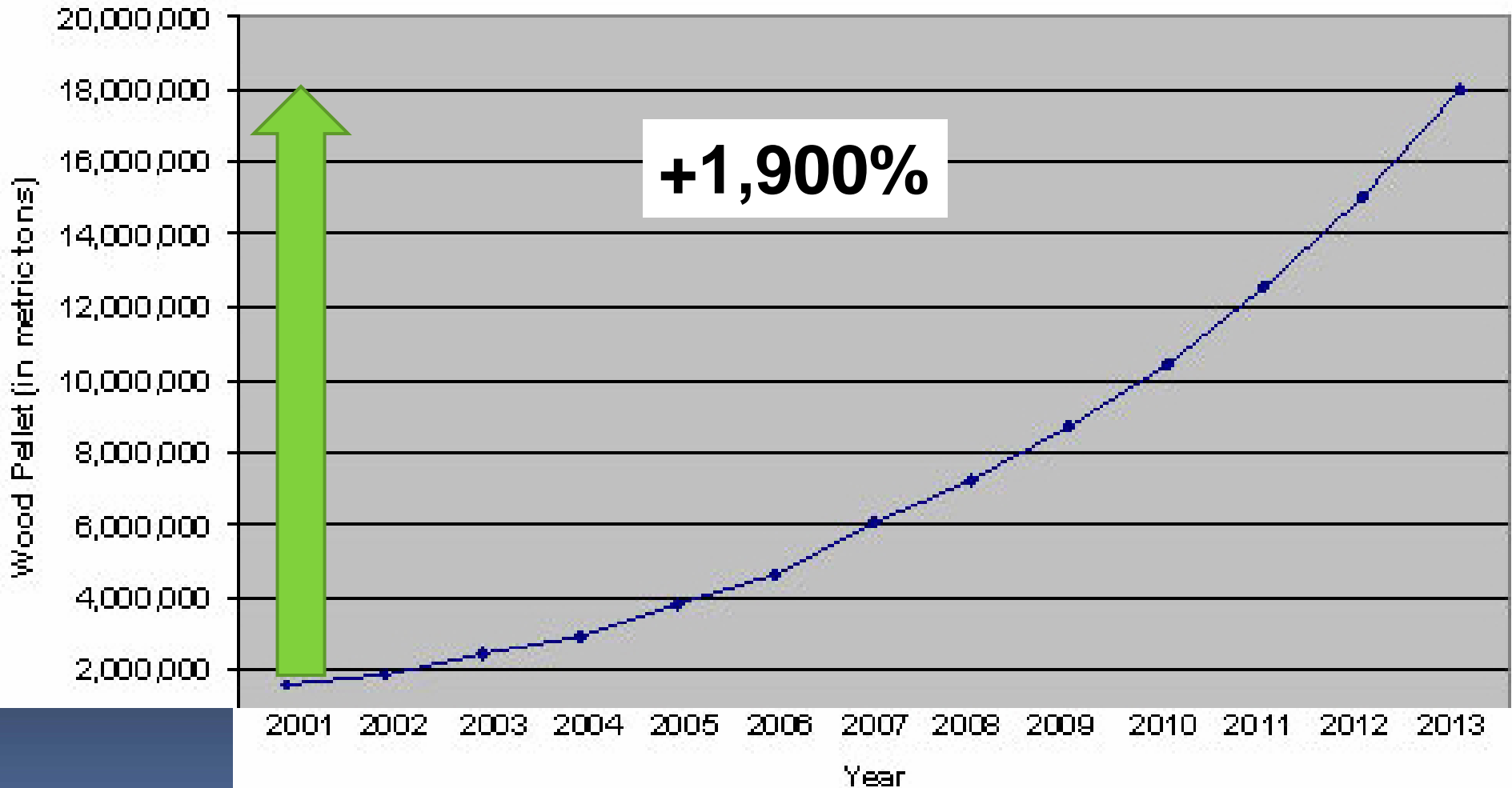


Wood Pellets

- First engineered in the 1970s in response to energy shortage in the US (Ellen 2008).
- In North America, in 2008 there were 80 mills that manufacture wood pellets (Pellet Fuels Institute 2008).
- 450 pellet plants in Europe.
- U.S. Production: home heating, exported to Europe, some electricity production.
- Increased growth in demand in European markets (25-30% expected in Germany & Austria in 2009) (Egger and Oehlinger 2009).



Wood Pellet Demand in Europe



Sources – Pellets@las and Wood Resource Quarterly

Gasification

Converts carbon-based materials, such as coal, petroleum, biofuel, or biomass.....

Into carbon monoxide and hydrogen.....

By reacting the raw material, at high temperatures controlled with oxygen and/or steam.

The resulting gas mixture is called synthesis gas or syngas and is itself a fuel.



Pyrolysis

Chemical decomposition of a condensed substance by heating.

Does not require oxygen.

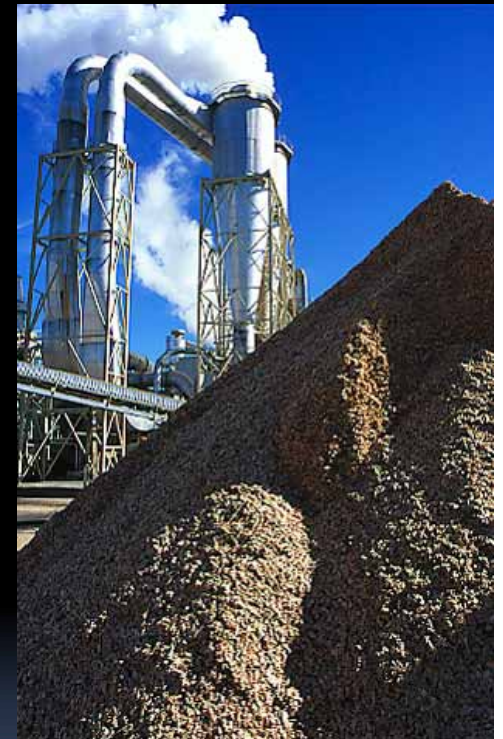
Extreme pyrolysis, which leaves only carbon as the residue, is called *carbonization* and is also related to the chemical process of *charring*.

Pyrolysis is used in the to produce charcoal, activated carbon, methanol and other chemicals from wood.



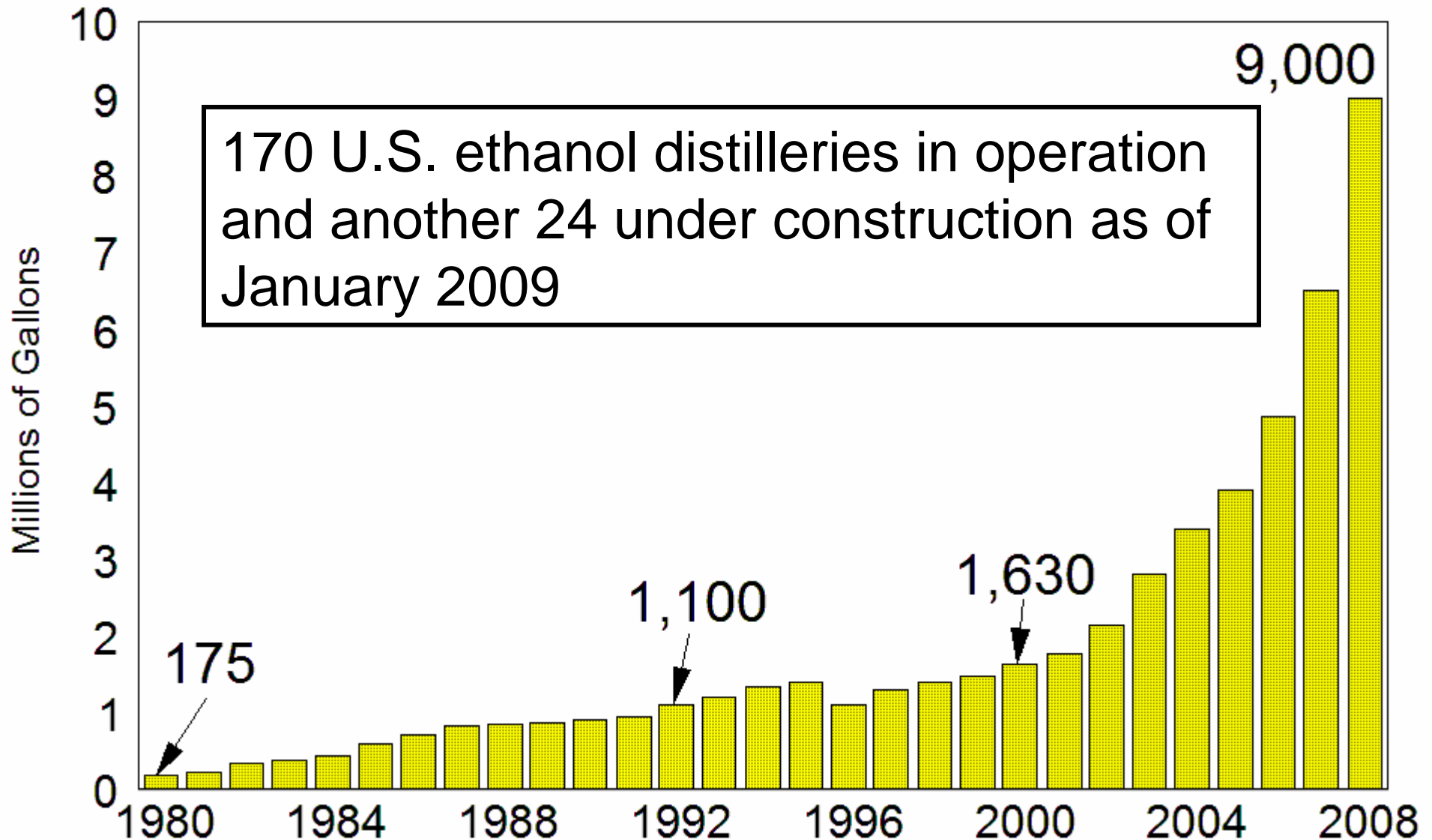
Cogeneration

- Simultaneous production of heat and electricity, commonly called combined heat and power (CHP), from a single fuel.
- Traditionally, a steam turbine is used to produce electricity, although a wood gasification/ internal combustion unit can also be a cogeneration unit.
- Most of **U.S.** CHP capacity is in wood products manufacturing industries.

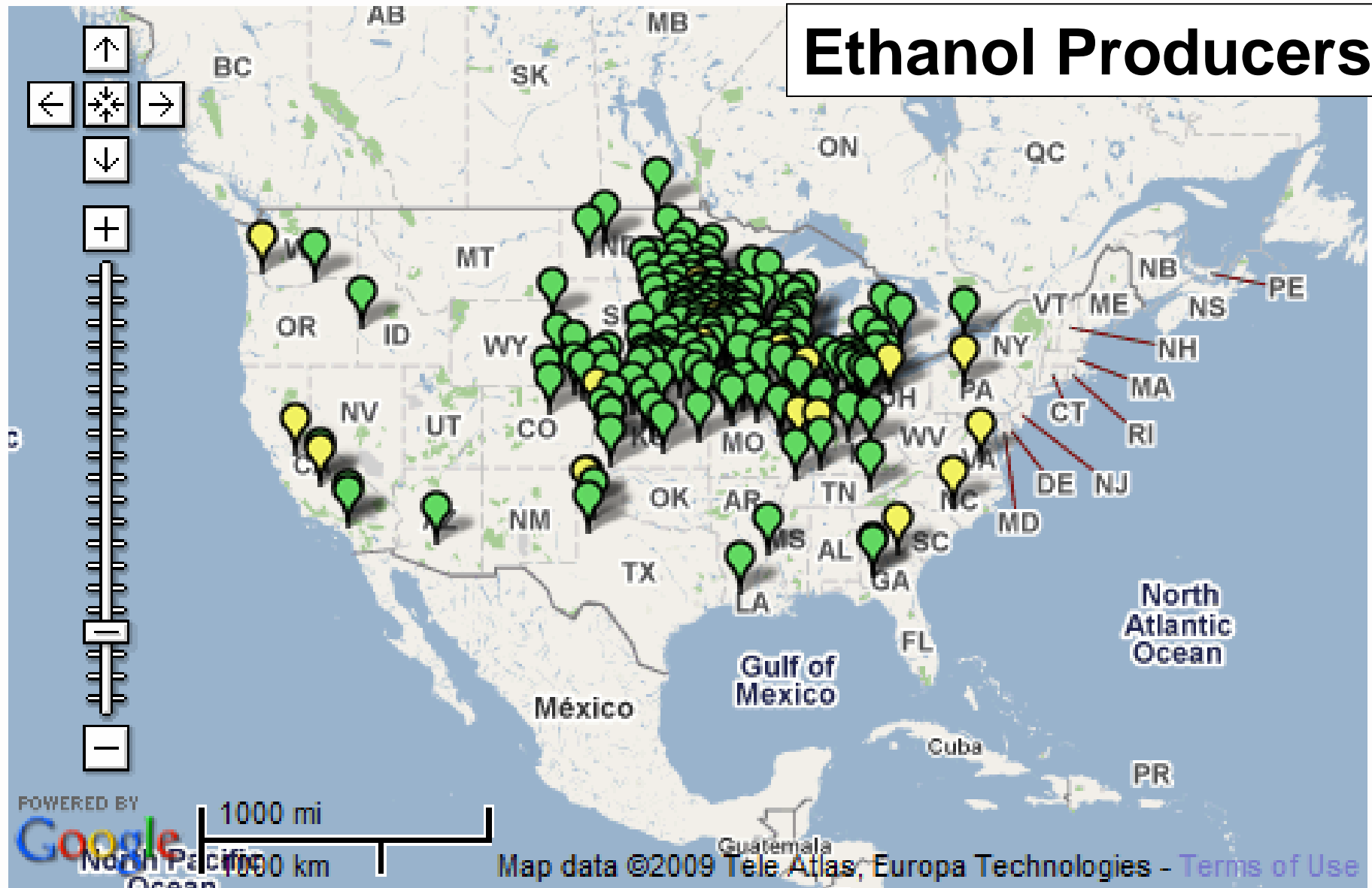



Ethanol Production 1980-2008

Millions of Gallons



Ethanol Producers



-  Currently Operational
-  Under Construction

Ethanol

"Fuel or food debate" – ethical challenges in deciding the best use of natural resources.

There are 13 cellulosic ethanol plants currently operating or under construction in the U.S. that use woody biomass as feedstock (C. Cornell, 2009 in Biofuels Business).



Wood Energy Facilities in the U.S.



Wood Energy Facilities in the U.S.

- There were about 200 wood burning electricity plants in the United States in 2008, including 72 with 40 megawatt capacity or larger (Lindsay 2008).
- At least another 8 wood-burning electricity plants of 40 megawatt capacity or larger have been proposed.
- More than 100 biomass power plants connected to the U.S. electrical grid in 2008 (Galbraith 2008).

Recent Events in Wood Energy in the U.S.

Weyerhaeuser and Chevron Form Biofuels JV

- Catchlight Energy LLC
- 50-50 joint venture
- Develop renewable fuels from nonfood sources.
- Research and develop technology for converting cellulose-based biomass into economical and low-carbon biofuels.

"(The) long view is petroleum prices are going to go back up, and a lot of chemical manufacturers are focused on chemical products that come out of cellulose and lignin"

Dan Fulton, President/CEO Weyerhaeuser

Recent Events in Wood Energy in the U.S.

Duke Energy & French Nuclear Engineering Co. Areva

- ADAGE™
- First biopower ("biomass to electricity") partnership in the United States between major energy companies.
- Plans to build up to 12 wood-electricity plants with roughly 50 megawatt capacity on the Eastern seaboard in the next six years.
- Proposed site of its first U.S. biopower plant in Hamilton County, Florida (50 Megawatt)

Recent Events in Wood Energy in the U.S.



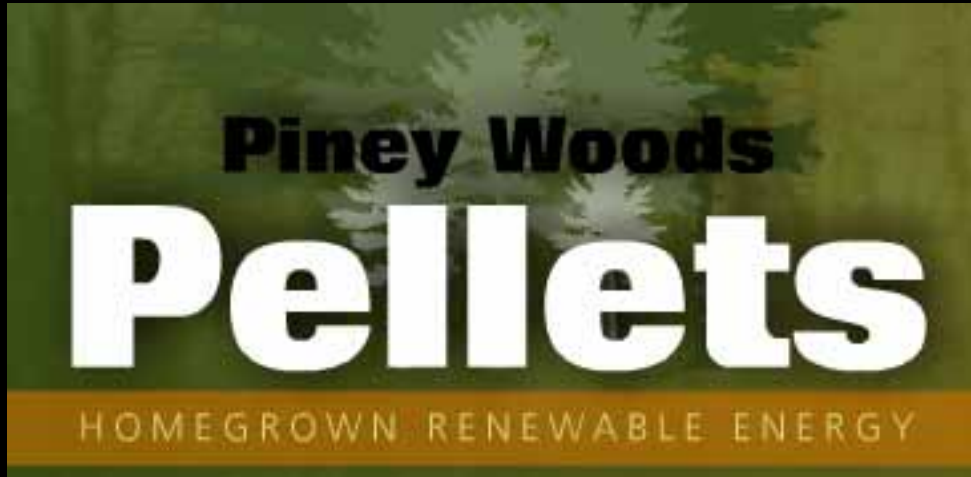
- 1.4 million gallon per year (MGY) cellulosic ethanol plant in Jennings, LA
- Nation's first demonstration-scale plant capable of producing ethanol from non-food cellulosic biomass sources.
- Feedstock: sugarcane bagasse, dedicated energy crops, wood products and switchgrass





LOUISIANA

Recent Events in Wood Energy in the U.S.



- Wiggins, Mississippi
- Produces more than 50,000 tons of wood fuel pellets annually
- Mostly from recycled forest waste material supplemented with green wood

www.pwpellets.com





Point Bio Energy

Recent Events in Wood Energy in the U.S.

www.pbioen.com/

- » 400,000 metric tonnes of wood pellets produced per year
- » Offices in Baton Rouge Louisiana USA plus Hamburg and Munich Germany
- » Operations and shipments start in the 3rd quarter 2010
- » Currently accepting orders
- » Connects growing European wood pellet market to Louisiana-grown timber
- » Superior low cost position for shipments to Europe
- » Expandable to larger capacities



**Port of Greater
Baton Rouge**

**Mouth of the Mississippi
River**



Louisiana Biomass Resources Database

www.lsuagcenter.com/biomass

LSUAgCenter.com
innovate · educate · improve lives

home news publications calendar services about us our offices



environment & natural resources

BIOMass

To Generate the Map use the menu below:

- Choose Data Type - - Select Color - - Map Size -



Select from the list below to view totals per parish:

Parish	Production
ACADIA	
ALLEN	
ASCENSION	
ASSUMPTION	
AVOUELLES	

menu

Parish View
Map View
Search

support provided by



Louisiana Biomass Resources Database

www.lsuagcenter.com/biomass

The screenshot shows the website's navigation and data selection options. On the left, the LSU AgCenter logo is displayed above a menu with options for Parish View, Map View, and Search. Below the menu, logos for the Louisiana Department of Natural Resources, Louisiana Forest Products Development Center, and the Louisiana Department of Agriculture and Forestry are shown. The main content area features a breadcrumb trail for 'environment & natural resources' and 'BIOMass'. A green instruction reads 'To Generate the Map use the r'. A dropdown menu for '- Choose Data Type -' is open, listing various biomass categories such as Pine Logging Residue, Hardwood Logging Residue, and various types of bark, sawdust, wood, and manure. At the bottom of the dropdown, there is a section for 'Choose Totals' with options like 'Total Logging Residue' and 'Total Utilized'. A map of Louisiana is partially visible on the right side of the page.

environment & natural resources

BIOMass

To Generate the Map use the r

- Choose Data Type -

- Choose Data Type -

Pine Logging Residue

Hardwood Logging Residue

Bark Produced

Sawdust Produced

Wood Produced

Bark Purchased

Sawdust Purchased

Wood Purchased

Bark Utilized

Sawdust Utilized

Wood Pieces Utilized

Dry Tons Discarded

Dairy Manure

Commodities

Choose Totals

Total Logging Residue

Total Purchased

Total Woodmill Produced

Total Utilized

Par

to view

P

Recent Events in Wood Energy in the U.S.

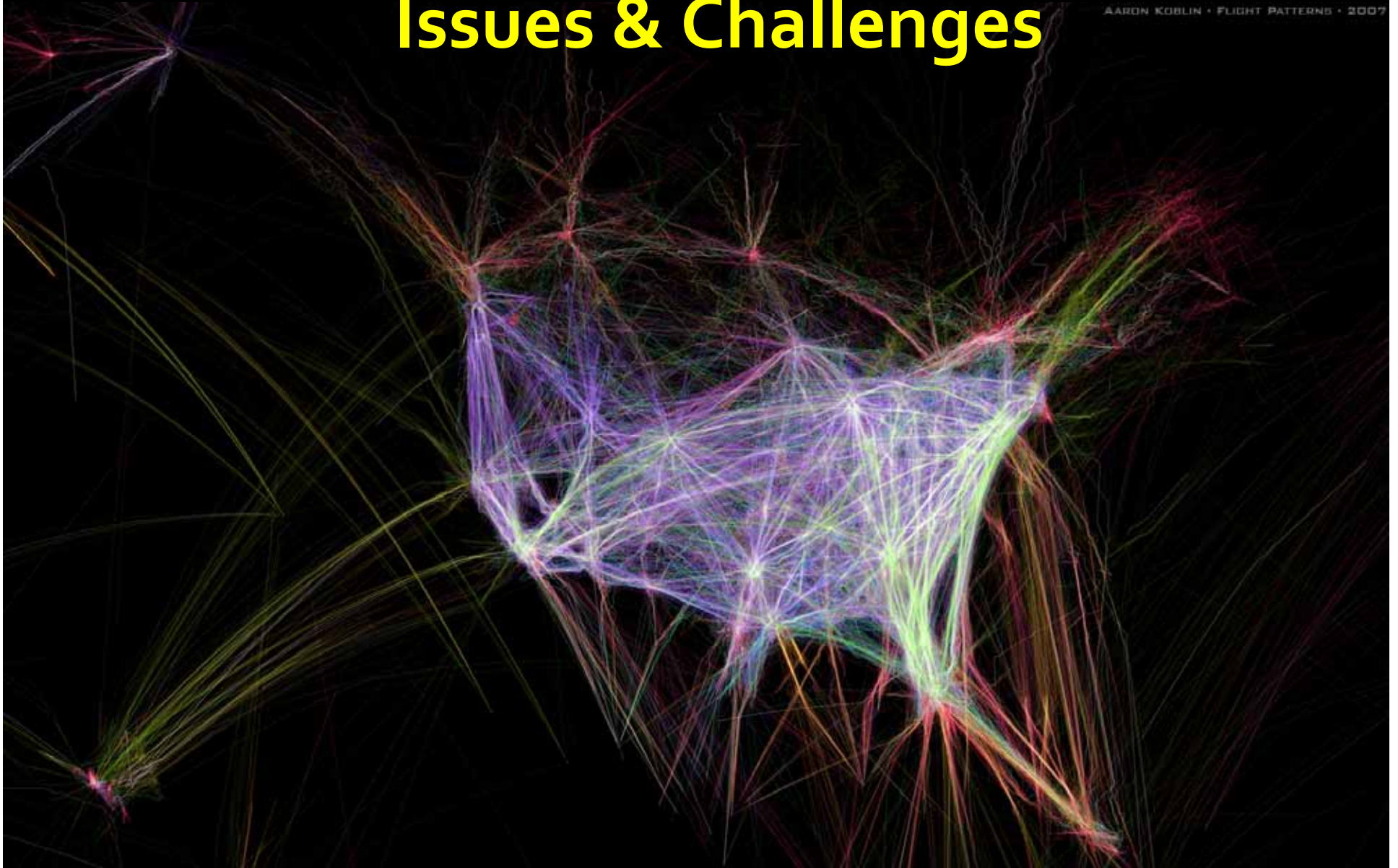
American Recovery and Reinvestment Act

- President Obama announced that \$786.5 million from the will be provided to accelerate advanced biofuels research and development and expand commercialization by providing additional funding for commercial biorefineries.
- The new categories include:
 - Cellulosic biofuels;
 - Biomass-based diesel;
 - Advanced biofuels; and
 - Total renewable fuel.



Issues & Challenges

AARON KOBLIN • FLIGHT PATTERNS • 2007



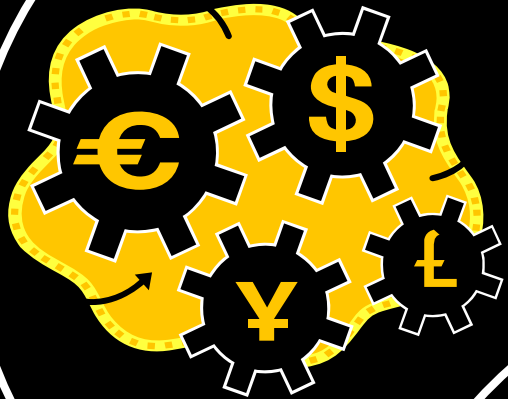
Effects on Forest Sector Structure?

- Federal and state mandates, if fully implemented, would lead to over-harvesting of forests in the United States and are unrealistic.
- Growth for wood-energy industry will be constrained by sustainable harvest levels and wood fiber prices.

Effects on Forest Sector Structure?

- U.S. demand for wood fiber from these emerging biomass markets is expected to rise from 2 million tons in 2008 to at least 13.5 million tons in 2020.
- Higher prices for traditional biomass inputs (chips).
- Demand will be driven by a) wood-burning power companies that produce and sell electricity to public utilities and; b) increasing wood pellets exported to Europe.
- Biomass → cellulosic ethanol for transportation fuel will also impact the forest products industry.

Economics



Alternatives



Market Demand

Environmental / Social Issues



Concluding Observations

- Investors are opportunistic and are seeking competitive advantage.
- First mover advantage is significant.
- Increased demand for wood biomass = increased wood biomass/chip prices.
- Subsidies and other policy instruments can create an uneven playing field.
- Forest landowners (and agricultural producers) are examining restructuring their business portfolios to include biomass → energy.

Final Observation



