

Biopower Work Session

Bioenergy: The Big Picture

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MS Public Service Commission



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25x'25: A National Alliance

- Formed in 2005; special initiative of Solutions from the Land (SfL)
- Organized to explore agriculture and forestry's role in America's energy future
- Evolved to include conservation, environment, business, defense, consumer, and rural development organizations and leaders

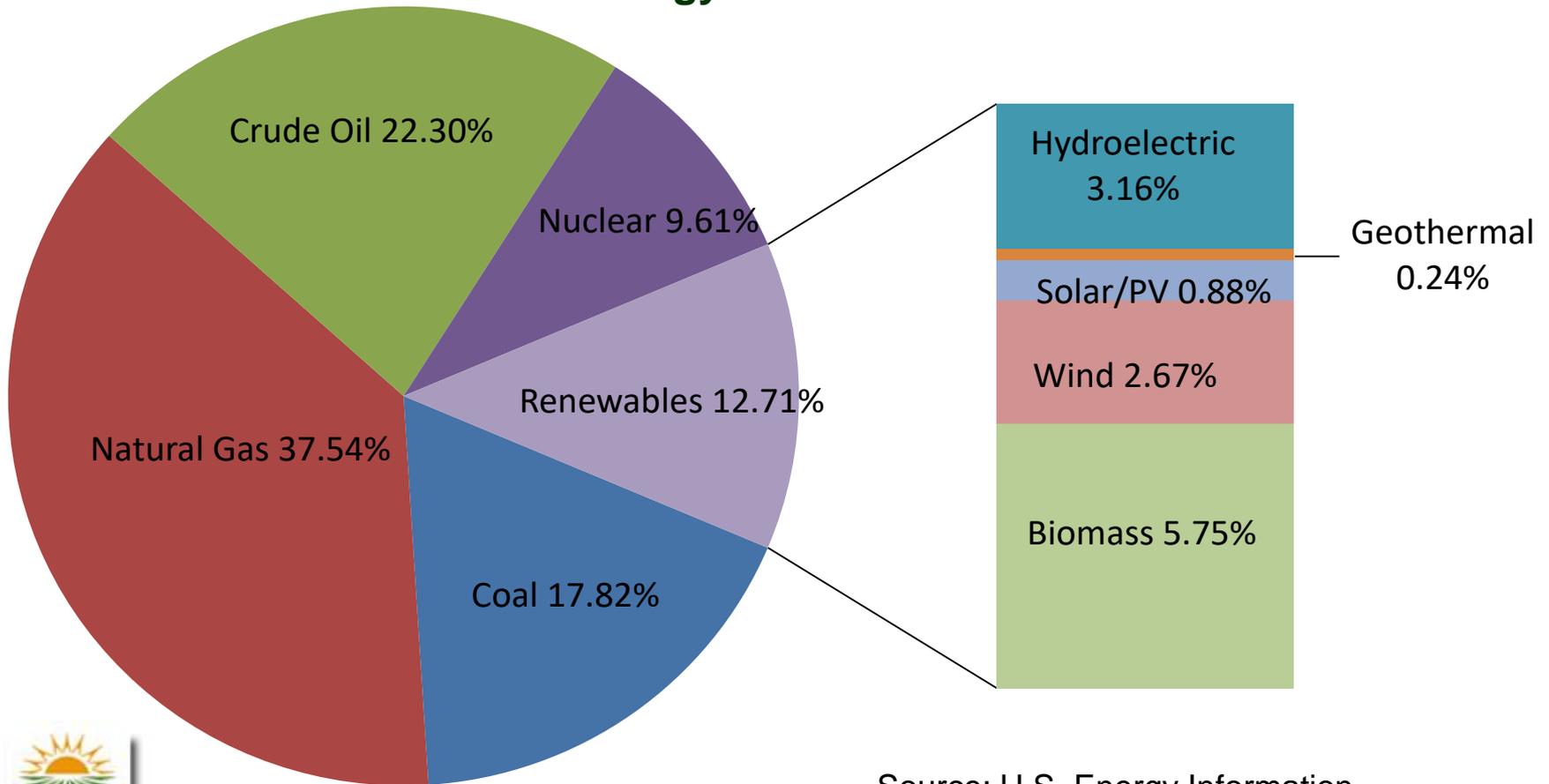


Where are we now?

U.S. Primary Energy Production by source, 2017

2017 Total Energy Production: 87.611 Quad BTU

2017 Renewable Energy Production: 11.140 Quad BTU



Source: U.S. Energy Information Administration



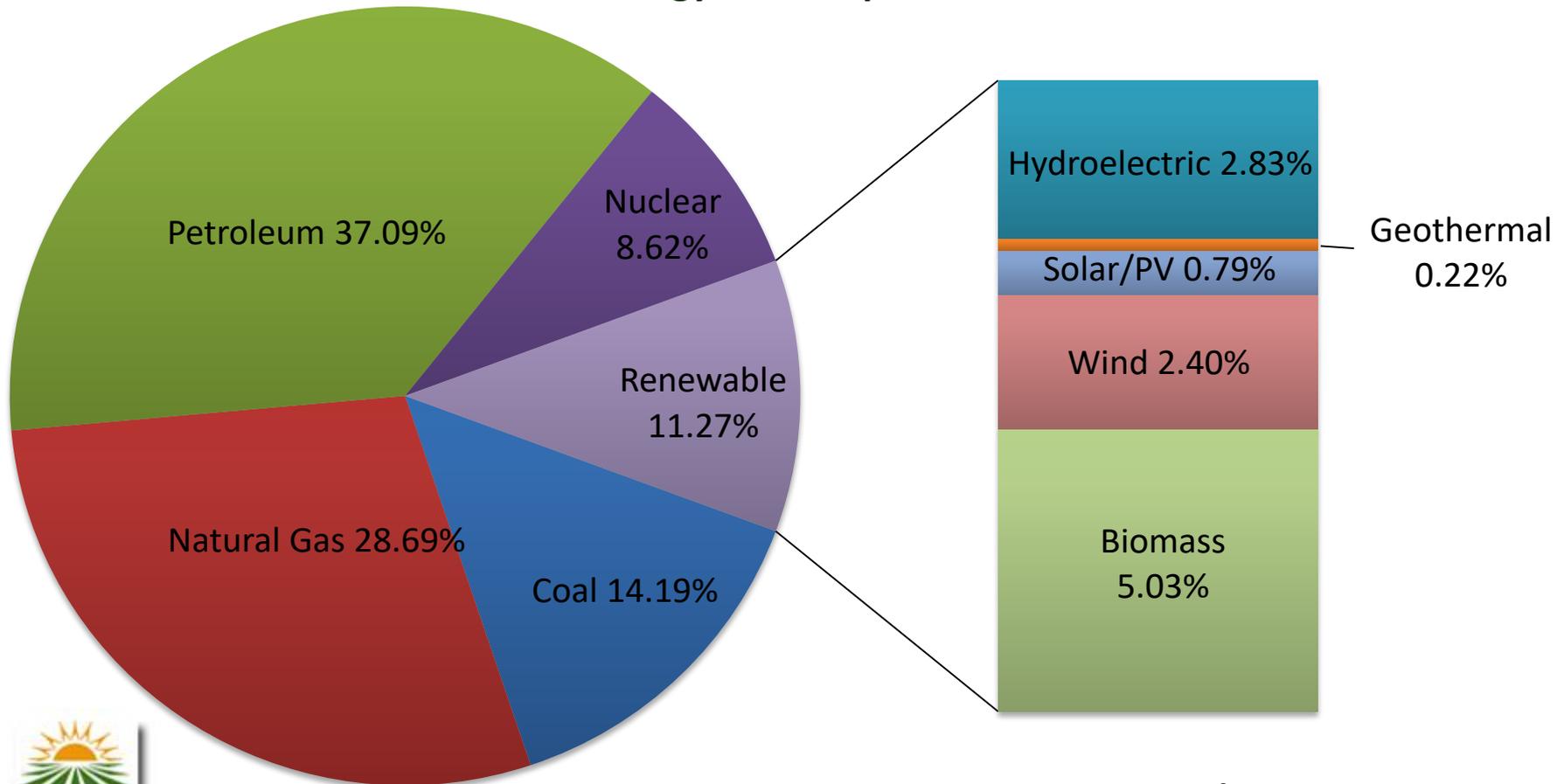
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Where are we now?

U.S. Primary Energy Consumption by source, 2017

2017 Total Energy Consumption: 97.716 Quad BTU

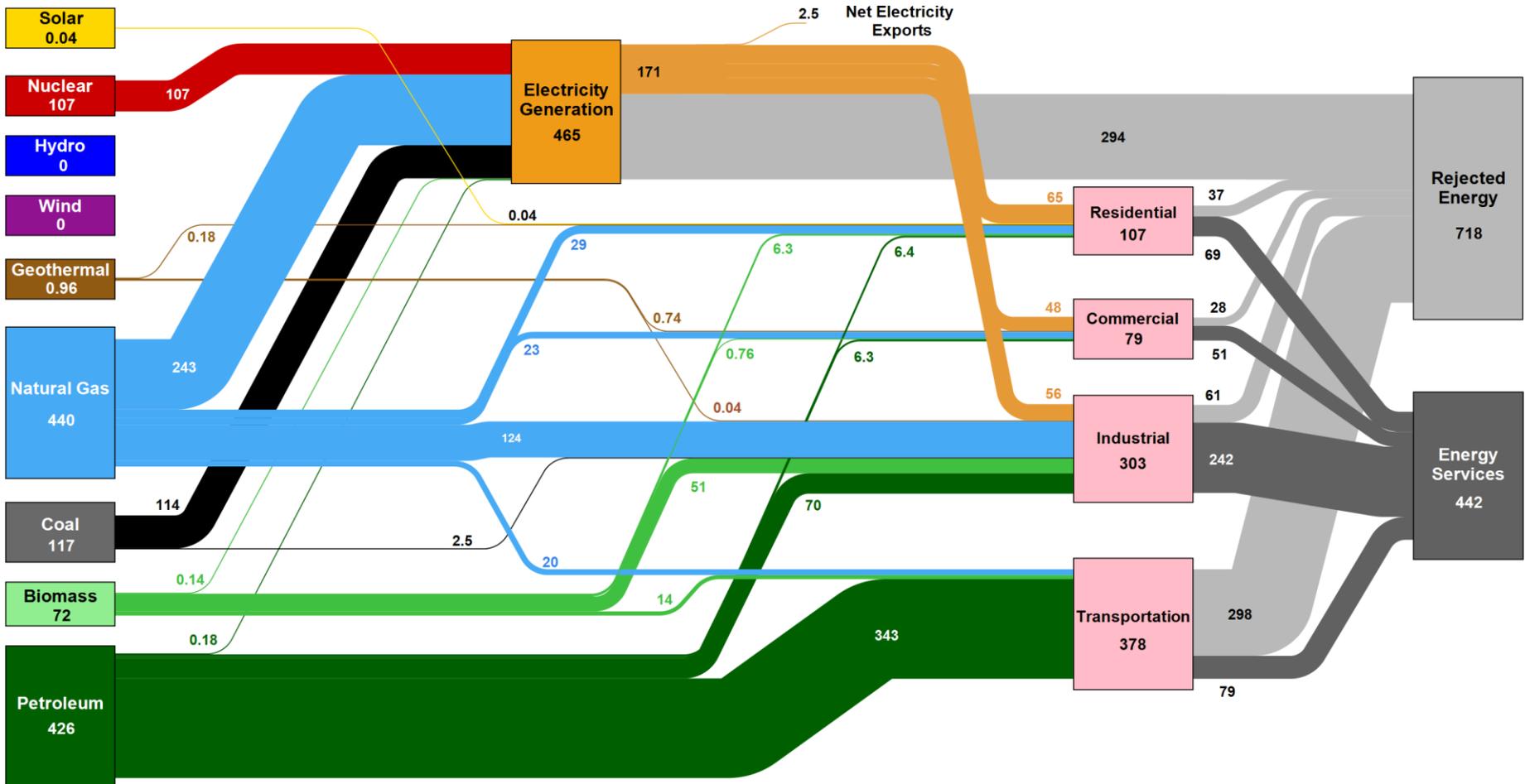
2017 Renewable Energy Consumption: 11.106 Quad BTU



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Source: U.S. Energy Information Administration

Mississippi Energy Consumption in 2014: ~ 1162 Trillion BTU



Source: LLNL August, 2016. Data is based on DOE/EIA SEDS (2014). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential sector, 65% for the commercial sector, 80% for the industrial sector, and 21% for the transportation sector. Totals may not equal sum of components due to independent Rounding. LLNL-MI-410527



Today's Energy Paradigm

- Fossil fuel **resources are finite**
- Global energy **consumption is increasing** (nearly 28% by 2040)
- The world **population is growing** (9.8 billion by 2050)
- Fast-developing **economies** like India and China **are demanding more resources**
- Global greenhouse gas **emissions are increasing** (US CO₂ emissions actually dropped last year)



America's Mega Concerns

National Security



Economy



Environmental Concerns



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Challenges

- **Infrastructure:** Grid modernization needed; Biogas entry points; Blender pumps and FF vehicles.
- Significant long term *public and private investment* is needed to overcome **technological** hurdles.
- **Economics:** Competing with entrenched systems is difficult; Find niche markets.
- **Policy Uncertainty:** Federal policy has created significant uncertainty for the future of biomass energy

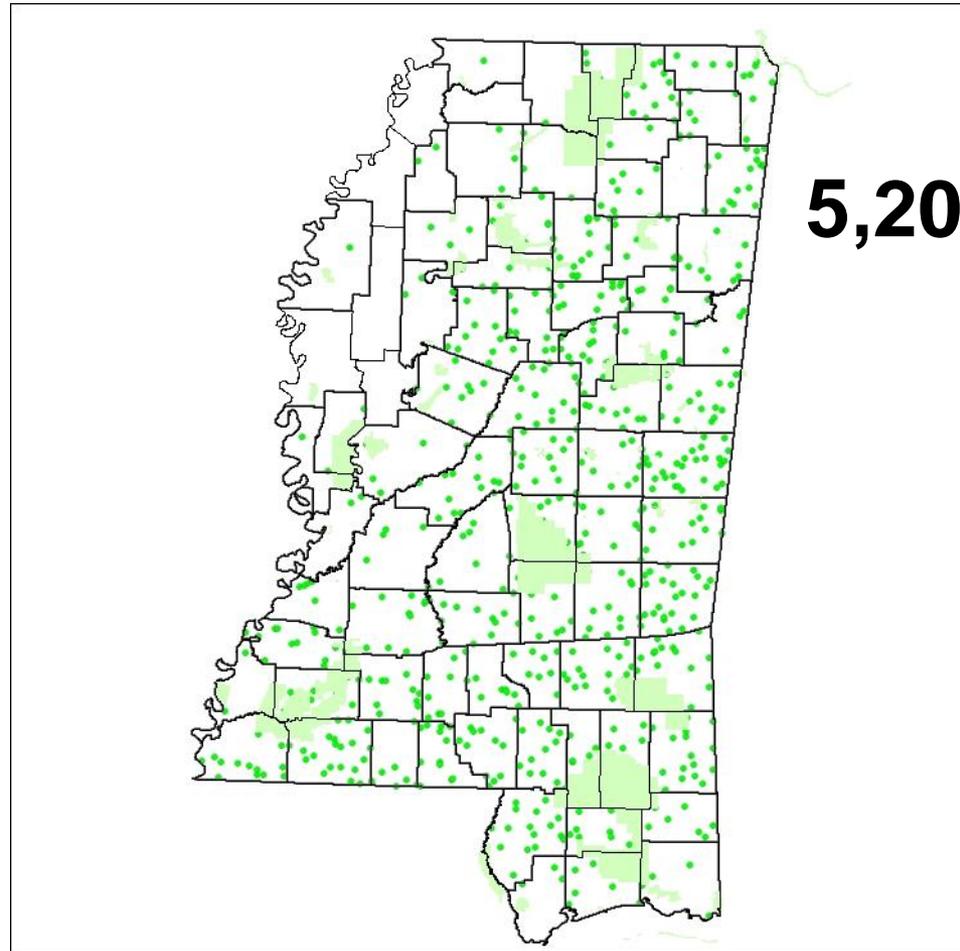


Renewable Fuel Standard

- Enacted in 2005 and strengthened in 2007
- Sets pathway for increased use of biofuels – up to 36 billion gallons by 2022
- Eligible biofuels are defined by their lifecycle greenhouse gas (GHG) profile
- “Renewable biomass” definition places limits on the feedstocks that can be used



Mississippi Timberland Qualifying as “Renewable Biomass” under 2007 Energy Independence and Security Act



5,200,000 Acres

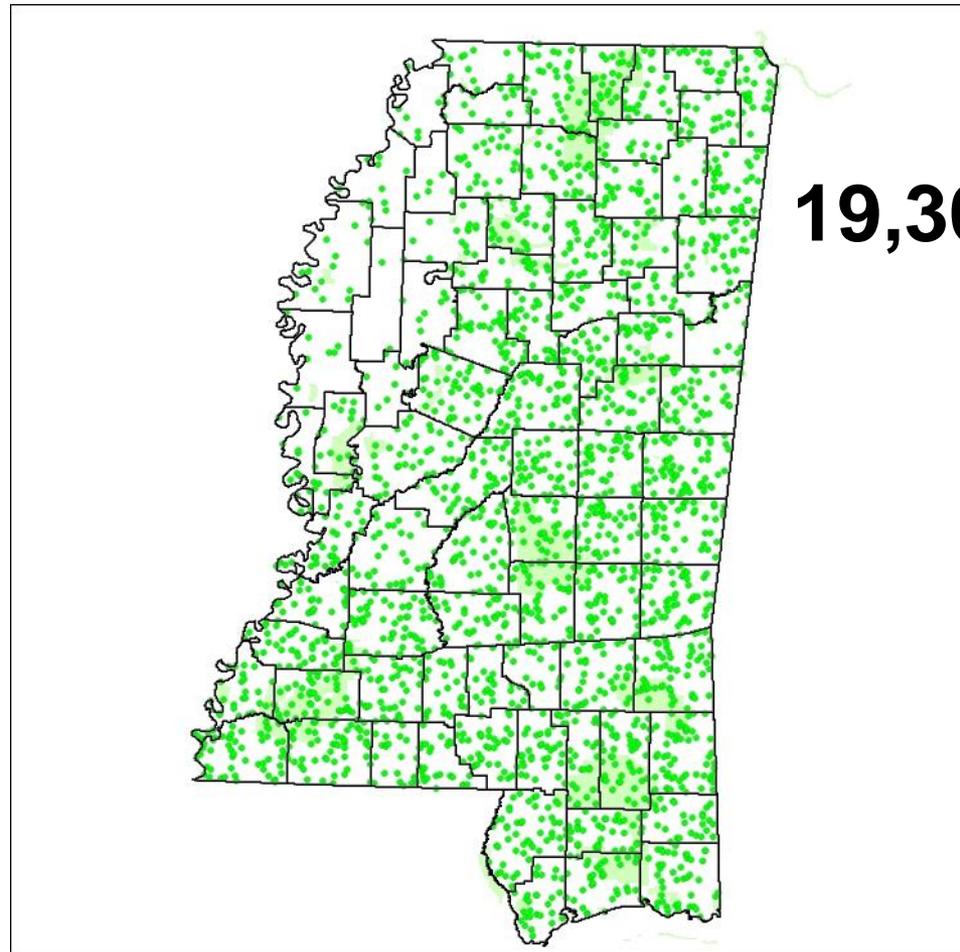
● One dot represents
7,500 acres

■ Federal Land



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Mississippi Timberland Qualifying as “Renewable Biomass” under 2008 Farm Bill



19,300,000 Acres

● One dot represents
7,500 acres

■ Federal Land



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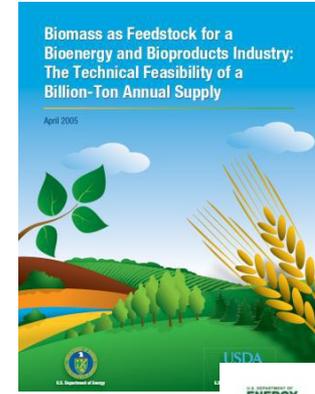
Southeast Biomass Resources

- 220 million acres of forestland
- 89 million acres of traditional cropland
- 150 million acres of pasture/hayland
- 8.5 million acres of CRP land
- 7.5 billion head of poultry
- 43 million head of livestock
- 151 million tons of municipal solid waste
- Many other unique biomass resources



Potential Biomass Resources

- Billion-Ton Study (BTS), 2005



- Billion-Ton Update (BT2), 2011



- Billion-Ton Report (BT16), 2016



BT16 Findings

- Combined forestry resources, agricultural resources and wastes can sustainably contribute between 1.2 to 1.5 billion tons of biomass annually by 2040.

Potential to produce:

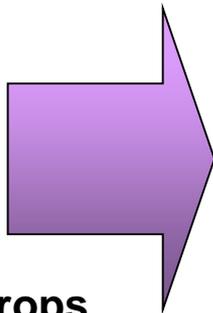
- 85 billion kWhr of electrical power
- 50 billion gallons of biofuels
- 50 billion pounds of bioproducts
- \$250 billion in economic impact & 1.1 million jobs



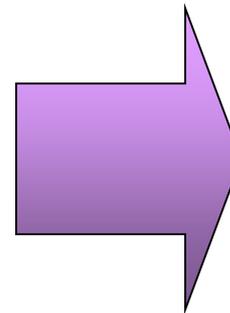
Opportunity & Potential



Biomass Feedstock



Conversion Processes



USES

Fuels:

- Bio/Renewable Diesel
- Ethanol

Electricity and Heat

Biobased Products

- Composites
- Specialty Products
- New Products
- Chemicals
- Traditional Products

- Ded. Energy Crops
- Ag and Forest Residues
- Hazardous Fuel Treatments
- Short Rotation Woody Crops
- Wood Waste

- Co-firing
- Combustion
- Biochemical
- Thermochemical
- Gasification Fermentation
- Catalytic Cracking



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Economically Competitive

Unsubsidized Levelized Cost of Energy Comparison



‡ Denotes distributed generation technology.



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Challenges to Growth

- Renewable Electricity Standards
- Transmission/Distribution (siting and financing)
- Definition of renewable biomass
- Land use issues
- Expired/expiring tax credits (PTC/ITC)
- Biogenic carbon accounting
- Renewable Fuel Standard
- Assessing costs and impacts of GHG regulation and Administration actions



Bioenergy Policy Connections

- Farm Bill (Commodity; Energy; Rural Dev.)
- CAFE Standards/GHG Emissions
- Public Health Considerations
- National/Energy Security
- Forest Health/Habitat Management
- EPA Biogenic Carbon Accounting Framework
- Clean Power Plan (111d Rule)
- **Forest Biomass is Carbon Neutral**



Solutions in Bioenergy

U.S. DOE Bioenergy Technologies Office, 2017
Project Peer Review, February 2018.

- “Our nation’s abundant biomass and waste resources present a tremendous opportunity to sustainably produce high-performance, advanced biobased fuels, products, and renewable chemicals and help realize national goals for the future bioeconomy.”



Solutions in Bioenergy

Indicators of the U.S. Biobased Economy, U.S. Department of Agriculture, Office of Energy Policy and New Uses, Office of the Chief Economist, March 2018.

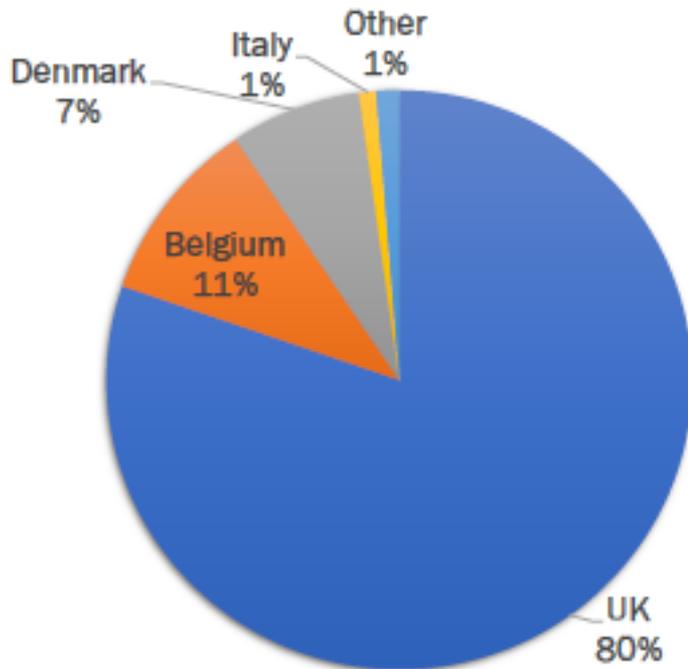
- “The biobased economy is playing an increasingly important role in the American economy. Through innovations in renewable energies and the emergence of a new generation of biobased products, the sectors that drive the biobased economy are providing job creation and economic growth.”



Solutions in Bioenergy

- Virtually all current wood pellet production in the US South is for the industrial export market (95% in 2017 according to EIA survey results). US South industrial pellet production reached 5.5 million MT in 2017.

2017 US Pellet Export Destinations



Source: FutureMetrics
North American Pellet
Markets Quarterly
Q1 2018

Biomass Utilization in Mississippi

- Wood pellets – Drax and Enviva
- Cogeneration – 298 MW from wood, biomass or waste materials (DOE-CHP-TAP)
- Thermal – Recast Energy (steam to mill)
- Biofuels – Ergon (ethanol) and Scott (biodiesel); Velocys (renewable diesel and jet fuel)
- Biogas – 6 landfills collecting methane (3.6 MW); Sanderson Farms Biogas (thermal)



Bioenergy Realities

- Renewable sectors such biomass, biogas and waste-to-energy continue to stall without long-term policy support. Large-scale biomass, biogas and waste-to-energy combined added 176 MW in 2017. (Solar installed 11,000 MW and wind installed 7,300 MW)
- Several biopower plants have closed over the past few years with utilities choosing not to renew contracts due to energy market changes.



Solution Pathways



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Thank you!

www.25x25.org



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