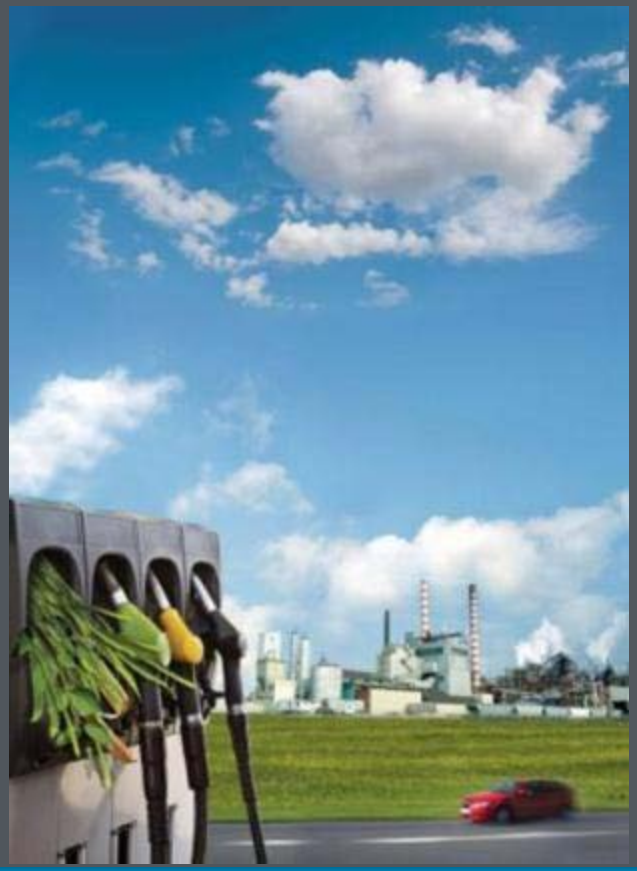
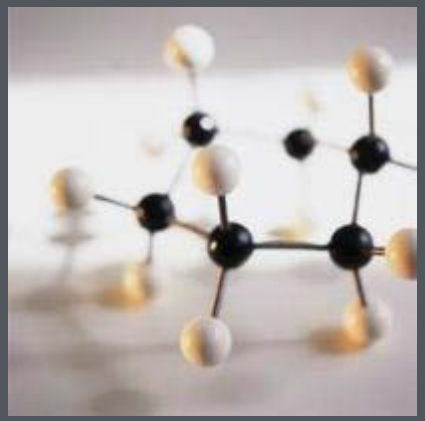
The Future of Biomass-Based Energy: The DOE Perspective

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy





Agricultural Outlook Forum
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DOE Biomass Program

Biomass: Value to the Nation

- Jobs and boost to rural economies
- Reduces GHG emissions from crude oil and coal
- Reduces direct & indirect costs of imported oil
- Reduces risks and damages from oil production & transportation
- Leadership in industrial & agricultural biotechnology

Sustainable Biofuels, Biopower, and Bioproducts

The Biomass Program is working to advance biomass technologies in support of DOE's mission to strengthen America's energy security, environmental quality, and economic vitality through:





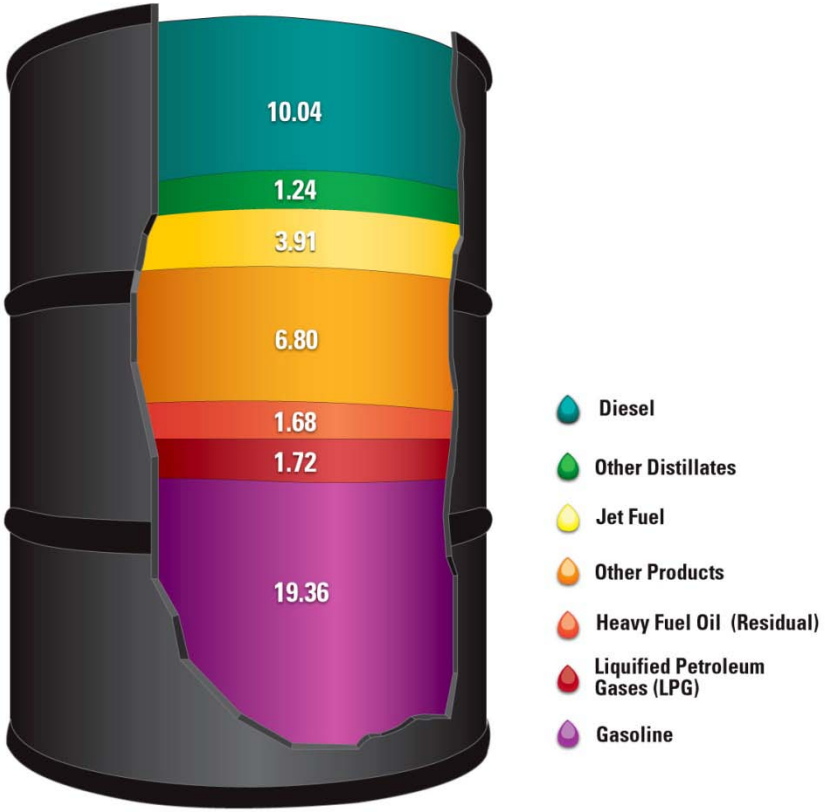

Feedstocks	Conversion technologies	Integrated biorefineries	Infrastructure	Biopower	Advanced biofuels
Developing lower cost feedstock logistics systems	Improving conversion efficiencies and costs	Systematically validating and deploying technology at first-of-a-kind facilities	Evaluating vehicle emissions, performance, and deployment options	Providing a clean, domestic, dispatchable renewable source of power	Expanding portfolio beyond cellulosic ethanol to hydrocarbon fuels

Top Policy Issues

- Ethanol, Drop-In Fuels, and the Portfolio Balance
- Second-Generation Biofuels and Bio-feeds – Getting the Pioneer Plants Up and Running
- Feedstock Supply and Sustainability
- Stable Regulatory Environment

Replacing the Whole Barrel

Products Made from a Barrel of Crude Oil (Gallons) (2009)



Source: Energy Information Administration, "Oil: Crude Oil and Petroleum Products Explained" and AEO2009, Updated February 2010, Reference Case.

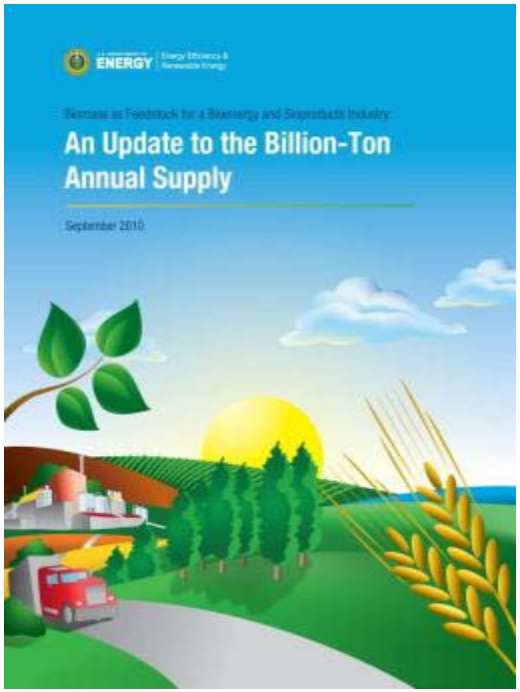
- **At low % blends, refiners can adjust operations**
- **At higher % biofuel, displaced products may be shifted to less-valuable markets**
- **As crude is displaced as a source of one product, there may be shortfalls in other markets**
- **Ethanol is / is not a drop-in fuel?**
- **"HC-X" is / is not a drop-in fuel?**
  - **Paraffin vs. Aromatic**
  - **Single component (volatility)**
  - **Acceptable "contaminant" in other fuels?**
  - **Combustion behavior?**
  - **Refinery adaptability?**

Commercializing Advanced Biofuels: Industry Growth is Anemic

- Cellulosic Fuel Production
  - Stood at <10% of EISA target in 2010,
  - Target doubled, no new production: <5% in 2011,
  - Gap is likely to widen without intervention
- Industry will not grow robustly in a risk-averse credit market
- Near-term capacity is mostly ethanol, exacerbating blend-wall issue
- Industry kick-start, including drop-ins, would cost ~$5 billion *tota*

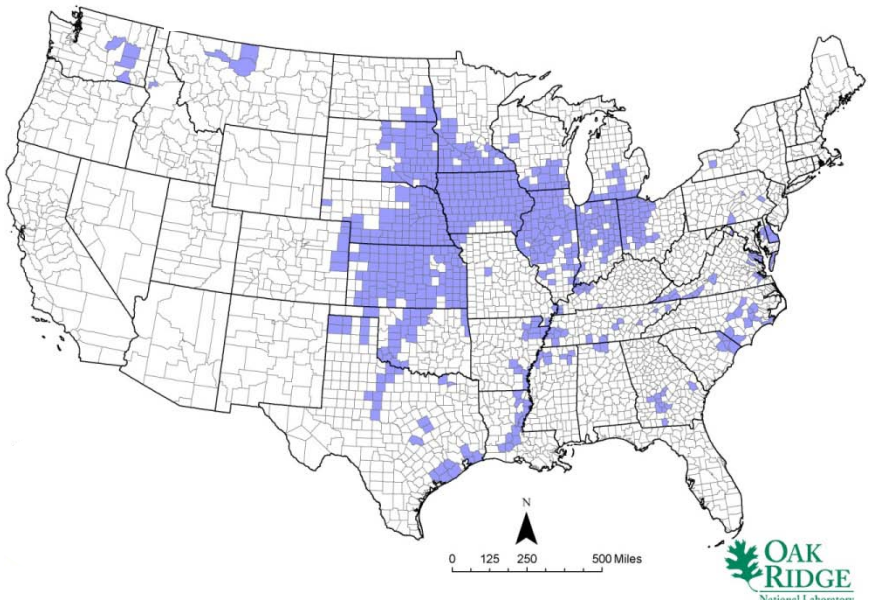
Feedstock Resource Assessment

- **Update to the 2005 Billion Ton Study**
  - Workshops to gain industry perspective were held in December 2009 (“high-yield scenarios”)
  - County-level inventory and costs for all major feedstocks
  - Used POLYSYS agriculture and new forestry economic models
  - Added sustainability criteria
  - Data and maps to be available in KDF
  - Expected publication in 2011 (currently undergoing peer and DOE review)
- **Future Work**
  - Focus on identifying sustainability and feedstock quality criteria, eventually incorporating into resource assessments
  - Intend for primary dissemination of information to be via KDF



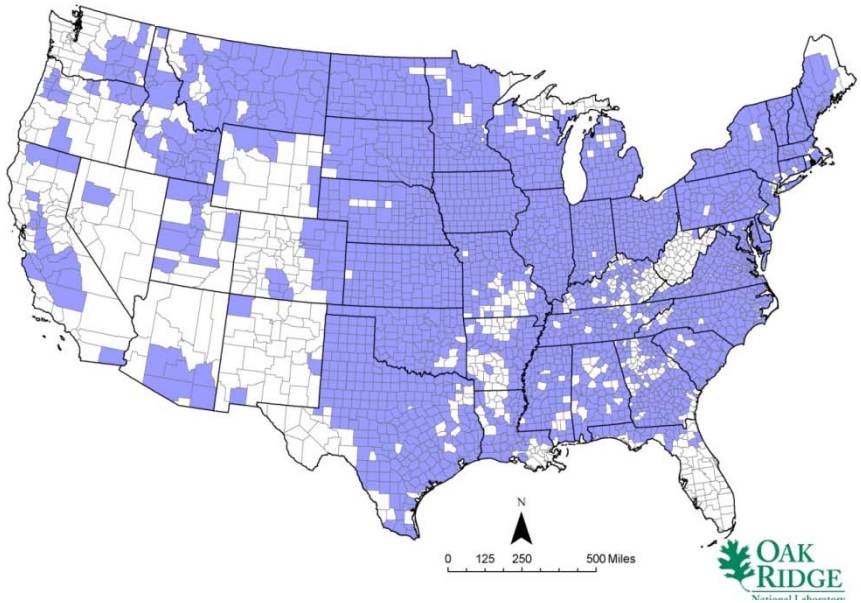
Unlocking the Resource – An Illustrative Example

Number of counties that could potentially produce high-density biomass feedstock resources under existing production and logistics systems



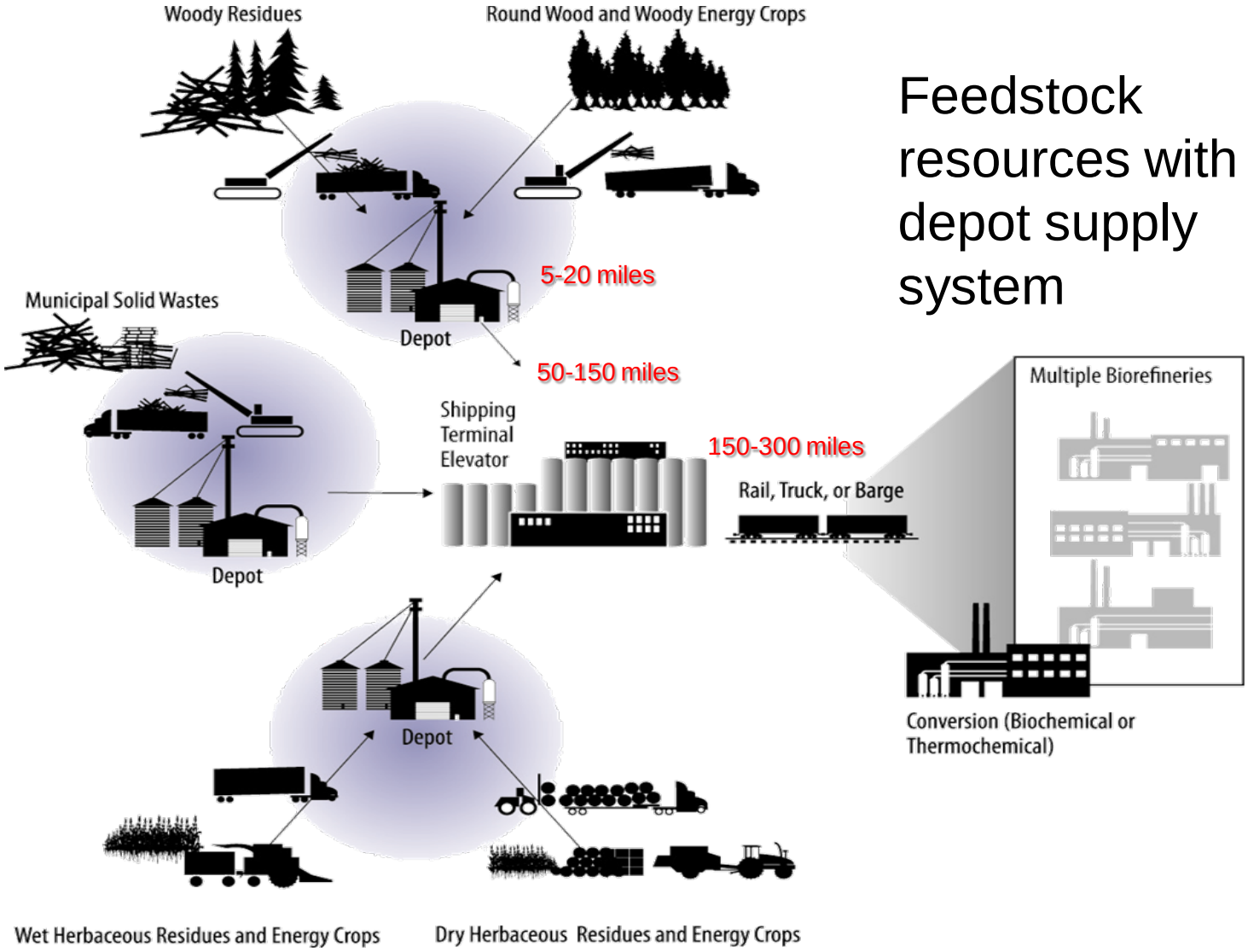
- Little to no improvement in feedstock yield
- Existing harvesting, collection, storage, and transportation techniques
- Sustainability considerations limited
- Conversion specifications for feedstock not addressed
- Supply risk due to price fluctuations, weather events, lack of year-round supply, etc.

Number of counties that could potentially produce high-density biomass feedstock resources under advanced production and logistics systems



- Feedstock yield improved via genetics, genomics, breeding, improved production practices, etc.
- Shift to a uniform-format feedstock preprocessing depot logistics supply system
- Sustainability considerations expanded
- Conversion specifications for feedstock addressed
- Supply risk due to price fluctuations, weather events, lack of year-round supply, etc. decreased

Unlocking the Resource



Feedstock resources with a depot supply system