



U.S. Department of Energy
Energy Efficiency and Renewable Energy

biomass program

Looking Ahead at Feedstock Supply System Designs for Lignocellulosic Biomass

**7th Annual Southern BioProducts &
Renewable Energy Conference**

Choctaw, MS

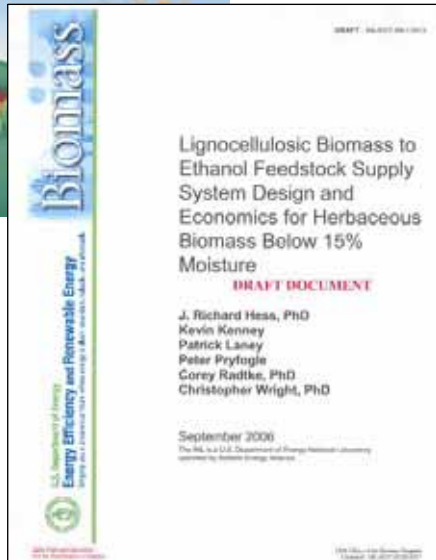
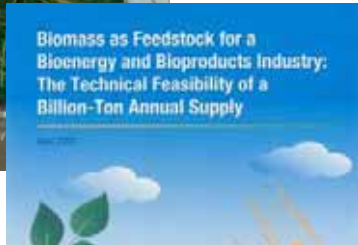
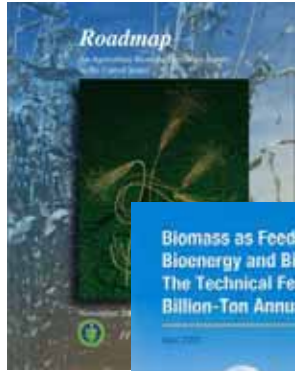
April 14-15, 2008

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Idaho National Laboratory**



DOE Cellulosic Biofuels Goals

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0.5 billion gallons in 2012
5.5 billion gallons in 2017
16 billion gallons in 2022
~40 billion gallons in 2030

Energy Independence & Security Act of 2007
Cellulosic Part of RFS



~1.3 Billion tons/yr biomass potential in the U.S.

Sugar Platform

Syngas Platform



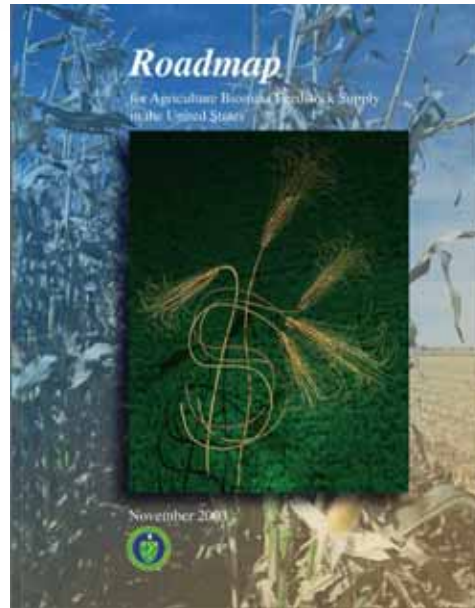


Supply System Overview

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- Industry
- SunGrant Universities
- Other Universities
- USDA-ARS/NRCS Labs.

- Biomass Production
- Agricultural Resources:
 - Forest Resources:



Harvest & Collection

- Equipment Capacity
- Compositional Impacts
- Pretreatment Impacts

- Shrinkage
- Compositional Impacts
- Pretreatment Impacts
- Soluble Sugar Capture

Storage

- Equipment Capacity
- Equipment Efficiency
- Material Bulk Density
- Compositional Impacts
- Pretreatment Impacts

Preprocessing

Transportation

- Truck Capacity
- Loading compaction
- Loading efficiencies

Handling & Queuing at the Biorefinery

- Handling efficiencies
- Handling compaction
- Material Bulk Properties

Feedstock Interface Boundary

Biomass Conversion:

- Biochemical
- Thermochemical

- Industry
- National Labs.
- Universities

Performance Metrics:

- Efficiency (\$/hr)
- Equipment Capacity (ton/hr)
- Biomass Quality (\$/ton)



Lignocellulosic Feedstock Types

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- Dry Herbaceous – Feedstock < 15-20% moisture
- Wet Herbaceous - Feedstock > 15-20% moisture
- Woody – Forest resources and woody energy crops





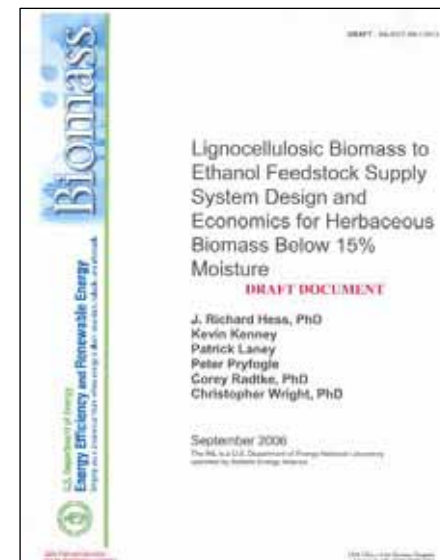
Feedstock Platform Mission

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- Improve and optimize current biomass infrastructure for pilot and demonstration scale cellulosic biorefineries
 - These systems are unique to biomass types
 - Locating depends on feedstock volume, supply distance, and cost
- Develop a uniform feedstock supply system that uses all feedstock types, handled as a commodity, and controls/maximizes four key parameters:
 - Feedstock moisture (mitigation, stability, and value add)
 - Feedstock bulk density (defined by storage and transportation systems)
 - Feedstock flowability (pumped or gravimetrically moved)
 - Feedstock quality (functional conversion yield)

Uniform System allows locating biorefineries based on

- Economy of scale
- Utility and transportation infrastructure
- Permitting requirements
- Product distribution infrastructure
- *Not just feedstock type, volume, and supply distance*

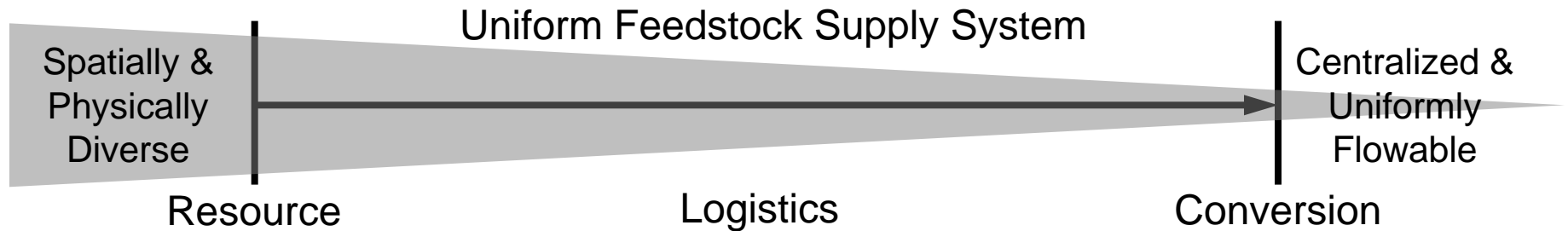




Feedstock Logistics R&D Scope

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- Connect Feedstock Supply System to Diverse Feedstock Resources
- Improve Feedstock Supply System Logistics
- Develop a Uniform Lignocellulosic Commodity Supply System
- Connect Feedstock Supply System to Biorefinery Conversion Facility



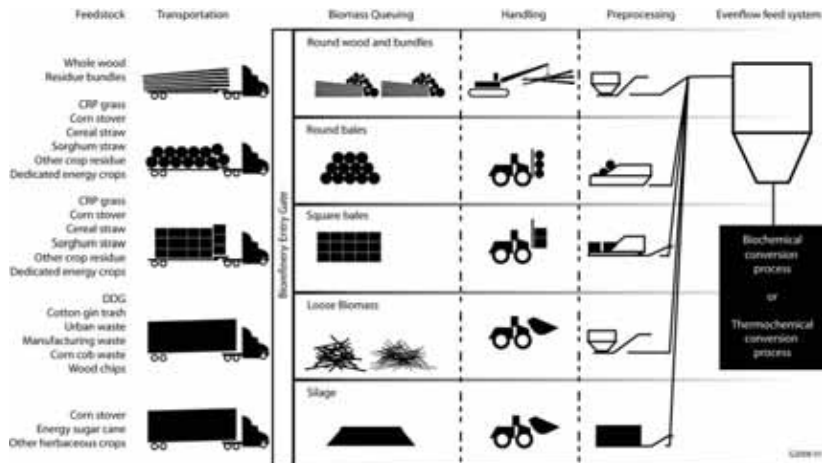


Pioneer Feedstock Supply System

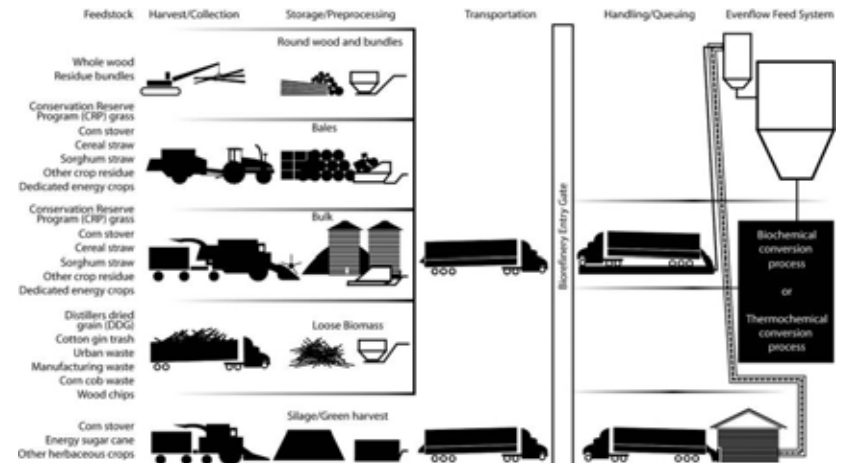
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- Pioneer systems
 - are ideal for the current bale-based or low volume infrastructures
 - are relatively low risk based on technology and precedence
 - still have opportunities for advancements and optimizations
- Pioneer systems are limited by
 - moisture
 - bulk density
 - flowability
 - vertical storage (footprint)
 - infrastructure variations

Pioneer-Bale



Pioneer-Uniform

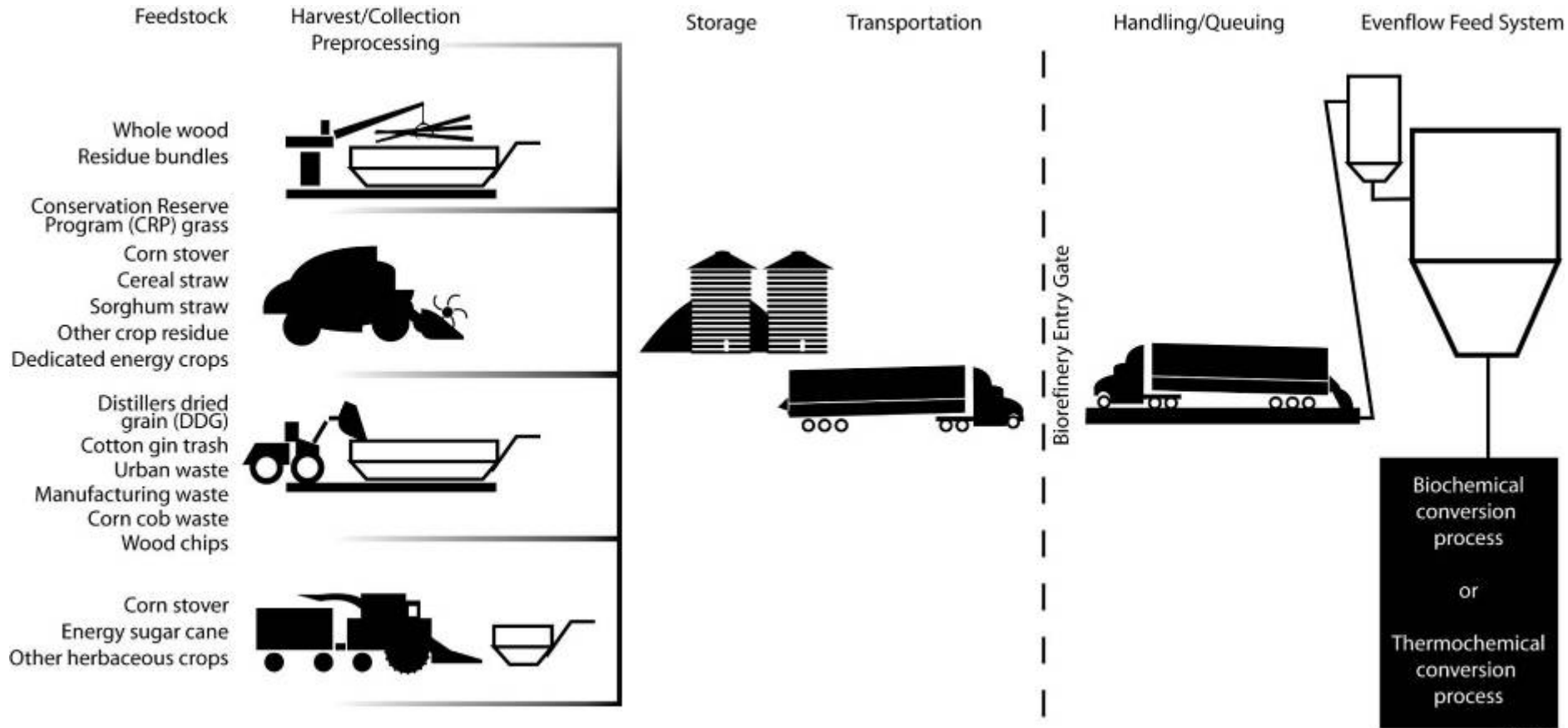




Advanced Feedstock Supply System

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Advanced-Uniform

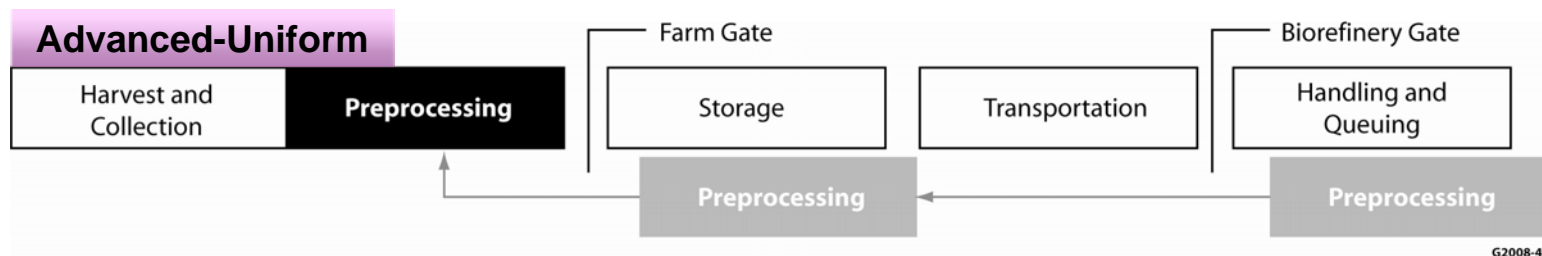
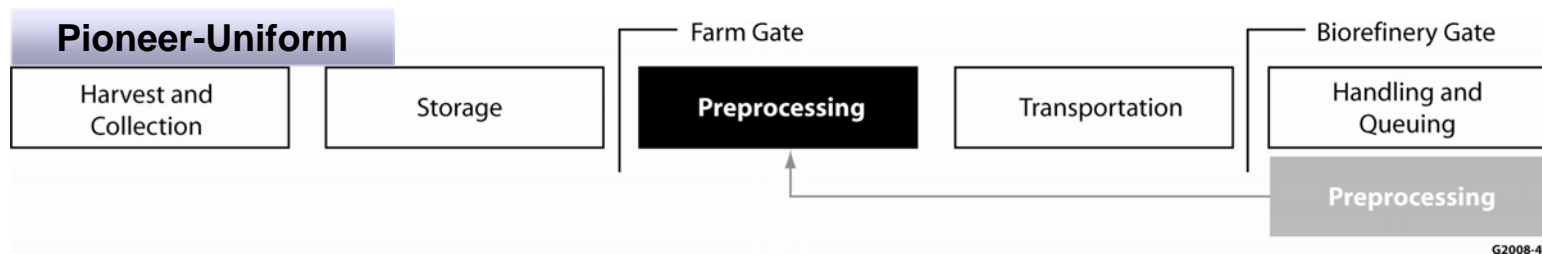
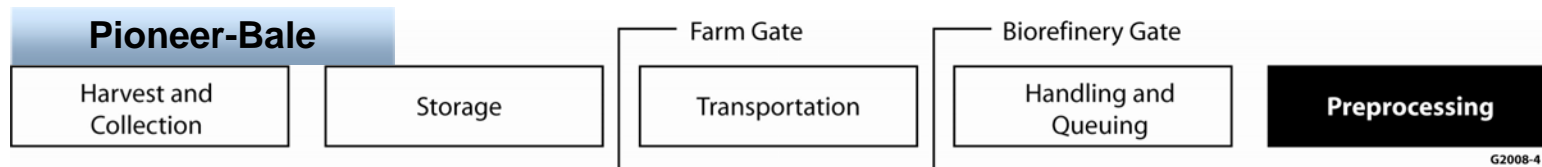




Path to Uniform Feedstock Supply System

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- Harvesting/Collection, Preprocessing, and Storage are Key Unit Processes.
- Harvesting addresses feedstock diversity.
- Preprocessing creates down-stream uniformity and increases system efficiencies.
- Storage provides access to a stable, year-round feedstock supply.



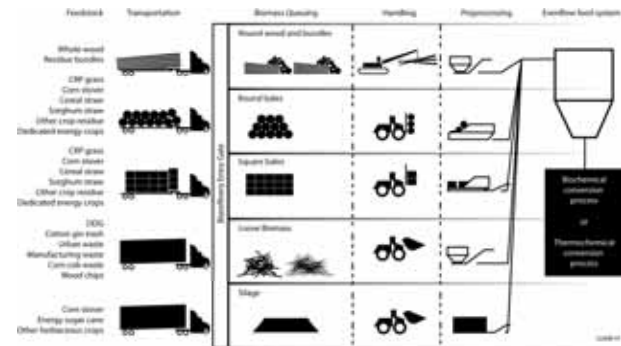


Design Cost Summary

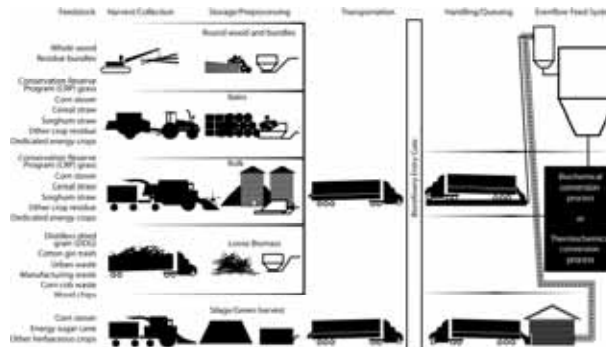
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	Installed Capital Costs (\$/dry ton)	Ownership Costs (\$/dry ton)	Operating Costs (\$/dry ton)	DM Loss (\$/dry ton)	Total Costs (\$/dry ton)	Energy Use (Mbtu/dry ton)
SOT Pioneer-Bale	\$49.16	\$13.49	\$41.08	\$5.37	\$59.94	504.5
SOT Pioneer-Uniform	\$65.65	\$21.99	\$36.04	\$5.17	\$63.20	520.3
Target Pioneer-Uniform					\$32.80	
Target Advanced-Uniform					\$30.70	

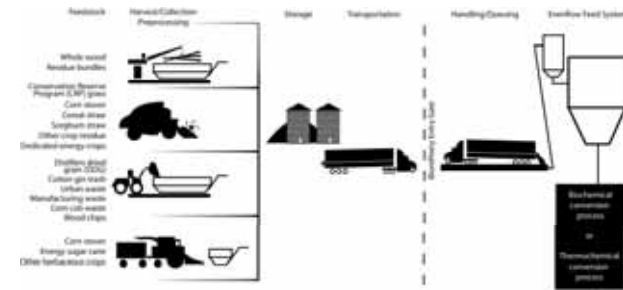
2007\$



Pioneer-Bale



Pioneer-Uniform



Advanced-Uniform



Biorefining Depends on Feedstock

