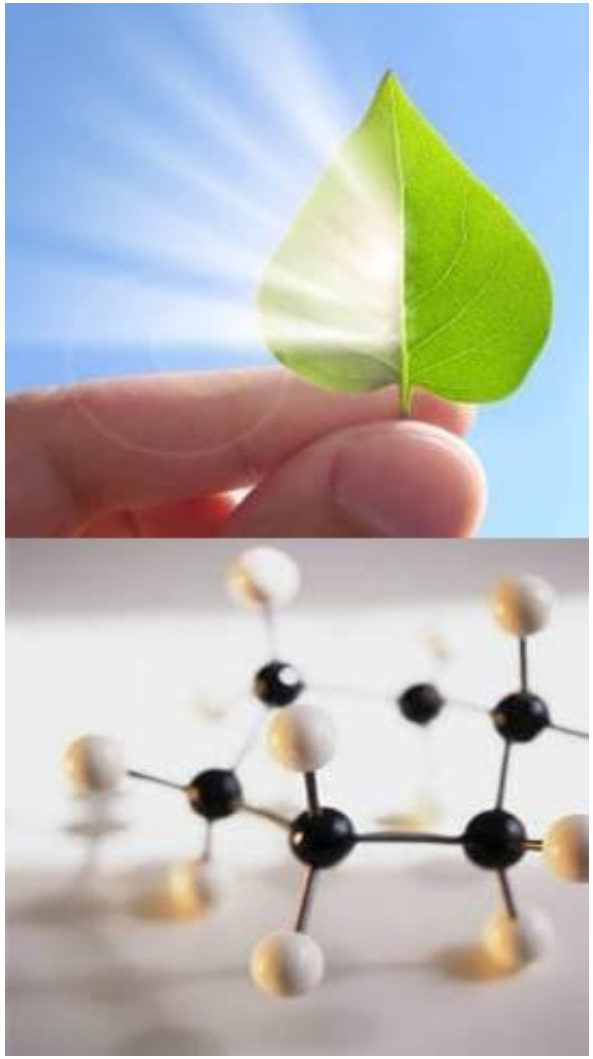


U.S. Department of Energy, Biomass Program

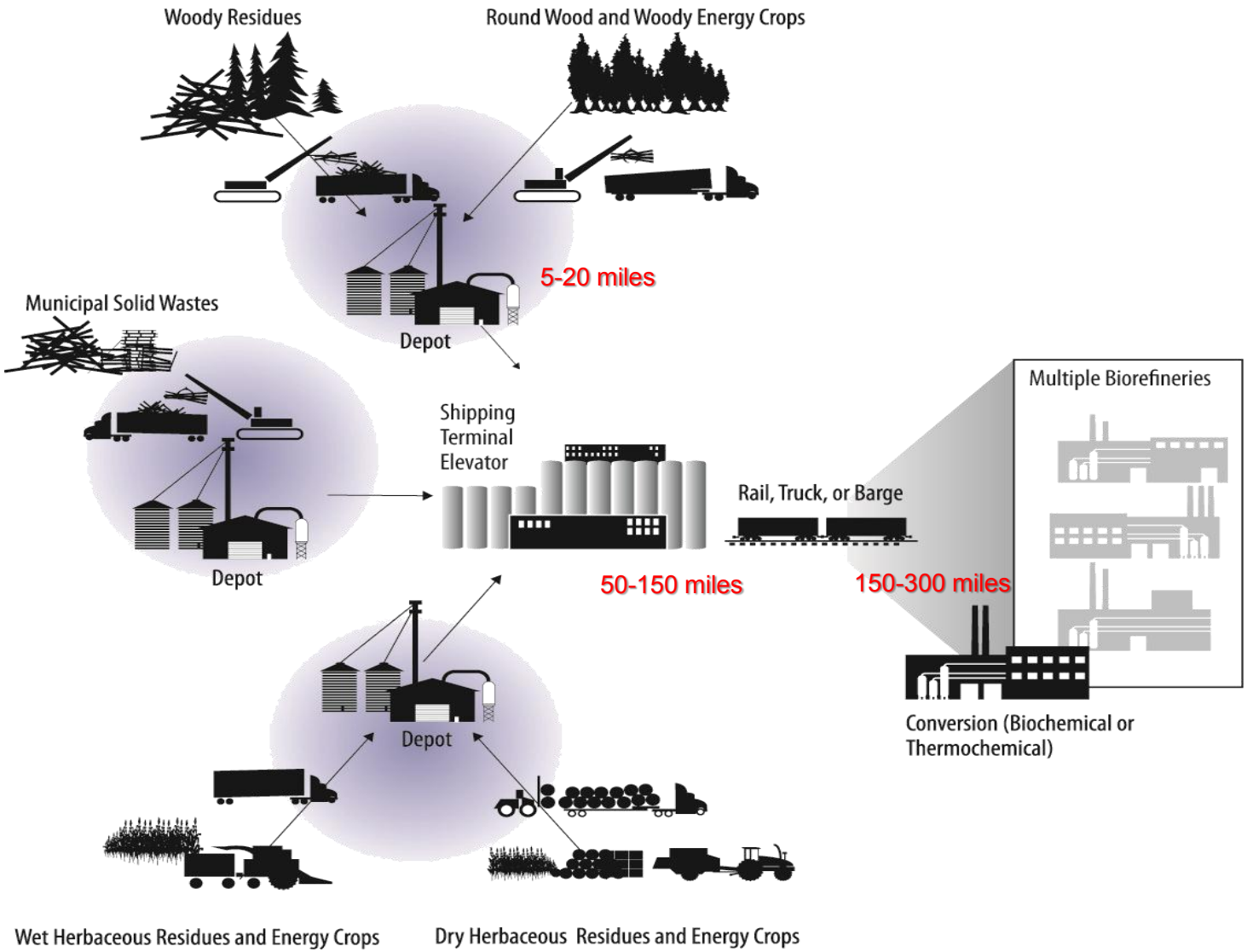
John Ferrell
Feedstock and Sustainability Platform

March 2, 2011

Biomass R&D Board: Feedstock Logistics Working Group

Issue/Focus Area	Deliverable/Date	Participants
Feedstock Logistics	FY 11 Deliverables	**Leads in bold; agencies only**
Feedstock logistics systems approach to lower costs, improve delivered properties and extend potential collection range Explore linkages between the supply and conversion scale of supply and conversion technologies.	DOE Feedstock Platform Peer Review 4/11 – USDA and DOT involvement USDA Feedstock Logistics Projects Update – ARS, FS, and NIFA, 4/11 1 ½ day visit, Board and/or Operations Committee, Idaho National Laboratory Process Demonstration Unit, 7/11 Site Visits to major DOE industrial projects – TBD Board Brief: Bioenergy Feedstock Logistics Program Inventory and status – 9/11	**John Ferrell, DOE** **Richard Hegg, USDA** Bob Rummer, USDA/FS Bob Fireovid, USDA/ARS Shawn Johnson, DOT Steve Thomas, DOE/GO Richard Hess, DOE/INL Sam Tagore, DOE/EERE Bryce Stokes, DOE Cont.

Unlocking the Resource – Addressing Stranded Feedstock Resources with a Depot Supply System



Ensuring a High-Quality, High-Density, Stable Feedstock Supply

Existing Feedstock Supply System	Uniform Format Supply System Solution
~ 75% of total feedstock resource can be utilized	~ 90% of total feedstock resource can be utilized
Dry matter loss during storage ~ 10%	Dry matter loss during storage ~ 5%
Average Transport Distance ~ 100 miles	Average Transport Distance ~ 300 miles
Achieved density target of 12 lbs/cubic foot in 2010 (improved from 9 lbs/cubic foot in 2009)	Pioneer depot design needs to achieve 20+ lbs/cubic foot

Related Projects

- Deployable Process Demonstration Unit – Replicates one depot preprocessing unit at pilot scale
- 5 Industry and University-led demonstration projects to test logistics units at field scale
- Core Engineering and Design work conducted at Idaho National Laboratory

CONVERSION NEEDS

- Primarily dry herbaceous, woody crops <15% moisture
- Controlled introduction of expanded resources - energy crops, waste streams
- Sufficient, sustainability, invariant supply
- Efficient transportation and storage of processed feedstocks
- Feedstock quality designed for optimal conversion efficiency
- Current cost models are built on debarked poplar or pine to hit quality specifications and cost? Niche model
- Need to move to national models – uniform format feedstock supply is one solution

Tighter specifications, ↑$

Tighter specifications, ↓Supply

Possible progression:

1) Demonstrate feasibility on tighter specifications

2) Expand optimization over robust specifications

Feedstock Logistics Projects

- **Feedstock Logistics Projects will develop systems to handle and deliver high tonnage biomass feedstocks**
  - **Agco Corporation of Duluth, GA (up to $5 million) for agricultural residues (corn stover, wheat straw) and various dedicated herbaceous energy crops)**
  - **Auburn University of Auburn, Alabama (up to $4.9 million) for woody biomass (southern pine)**
  - FDC Enterprises Inc. of Columbus, Ohio (up to $4.9 million) for corn stover and a variety dedicated herbaceous energy crops
  - **Genera Energy, LLC of Knoxville, Tennessee (up to $4.9 million) for energy crops (switchgrass only)**
  - **The SUNY College of Environmental Science and Forestry of Syracuse, New York (up to $1.3 million) for woody biomass (willow and hybrid poplar)**

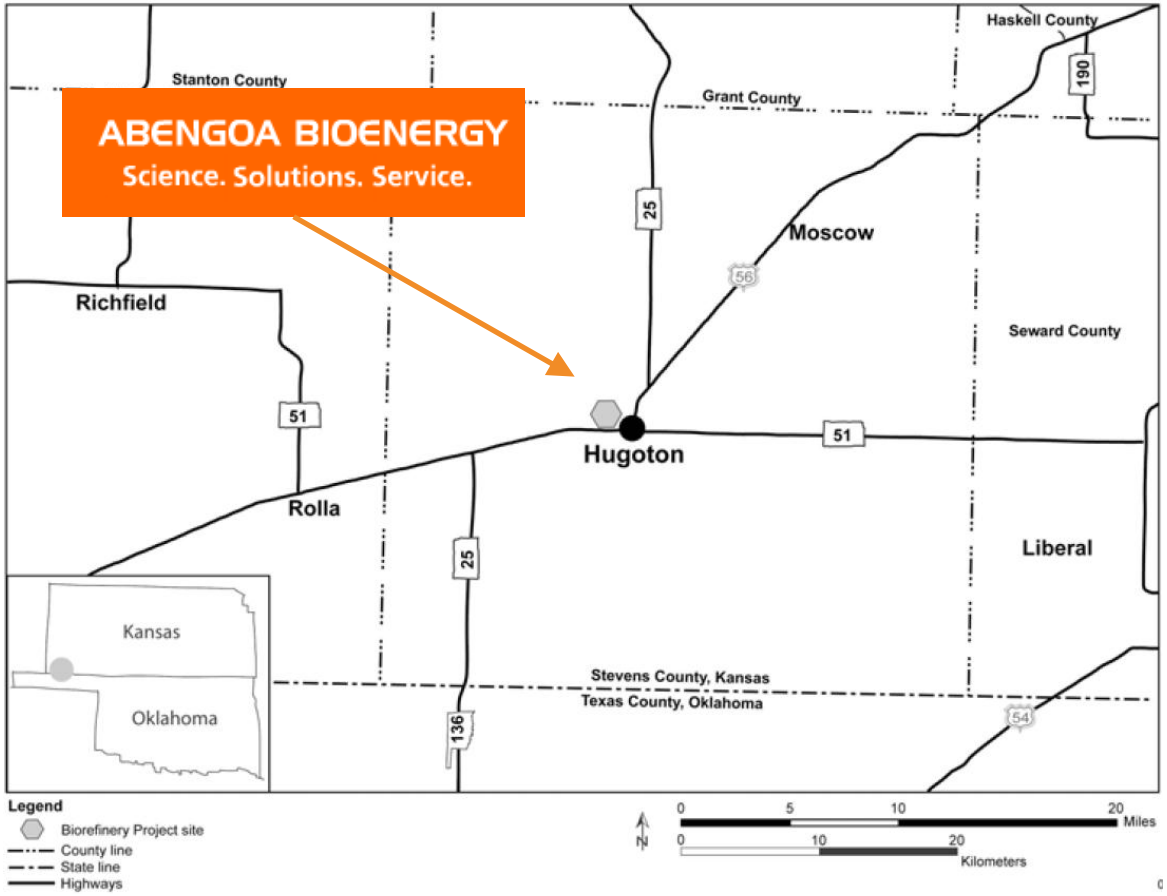
FDC Enterprises Feedstock Logistics Project – –Design and Demonstration of a Comprehensive Biomass Feedstock Supply System”

T.R. Miles
Consulting
Engineering
Consulting

Target Initial System Application

- Feedstock Required
  - ~ 80 or more deliveries per day (2000 ton/day)

- Focus Feedstocks
  - Corn stover
  - Wheat straw
  - Milo stubble
  - Energy crops
    - Switchgrass
    - Miscanthus
    - Biosorghum



Project Objectives

- Demonstrate all aspects of industrial scale feedstock supply system for Abengoa’s Hugoton, KS, lignocellulosic Biorefinery
- Develop innovative new industrial grade machinery and operational guidance to support commercial operations
- Support Abengoa's development of material quality and sustainability specifications
- Reducing delivered costs of feedstocks

Primary Tasks

- Improve Large Square Balers (Pull-type)
  - High Density Bales, Extended Life, Lower Maintenance
- Develop & Demonstrate New Bale Pick-up Truck (BPT)
- Develop & Demonstrate a Self Loading Trailer (SLT)
- Demonstrate a Self-propelled, Hydraulic Baler
- Develop & Optimize Headers for Specific Feedstocks for ABHK
  - High-yielding energy crops
- Demonstrate Single-pass Harvest System
- Maximize Tons Handled by Equipment (for 3 years)
  - Aimed at improving reliability / reducing downtime & major maintenance
- Measure and document environmental impacts and sustainability of local biomass supply

2010 KEY ACCOMPLISHMENTS

- Fabrication & initial field testing of self-propelled baler
- Round 1 improvements of pull-type balers and field testing
- ~1,800 acre corn stover harvest & extensive data collection & sampling
- Initial deployment of MacDon heavy biofuel crop header (biosorghum)

Key Limitations / Factors to Address

- Lack of overall proven system integration and optimization for industrial scale operations
  - Each operation affects others—can't focus on just one or two operations, they may negatively affect others
- Need reliable high-density baling (~12.5 to 14 lb/ft^3)
- Large annual delivery requirements will require very rugged equipment
  - Longer useful lives (10,000+ hour useful life for balers)
  - Better reliability needed (reduced unplanned downtime)
- Quality routine maintenance is imperative for extending equipment life and reducing downtime (operator issue)

Key Limitations / Factors to Address

- Too many operations currently performed
  - Especially in harvest and bale handling
- No reliable & efficient commercially available harvester for high-yielding agricultural crops (miscanthus, biosorghum)
- Need optimized inventory management & control
  - Improve equipment & labor deployment; reduce fuel use
- Improved operator comfort desirable for field operations
  - Improved suspensions (Due to long operator hours in field)
- Need quality standards/specifications for delivered material and sustainability issues
  - Will provide basis for best practices implementation (equipment and operation)