

Genera Energy



- Privately held biomass supply company operating since 2008, based in Vonore, TN
- Bringing an industrial approach and experience to agricultural biomass supply
 - Crop production, harvesting & logistics, biomass pre-processing, management services
 - Most experienced company in the U.S. producing, managing & processing a wide variety of biomass feedstocks
- Custom-tailored biomass supply chain solutions
 - Design, develop and implement project- and customer-specific feedstock supply solutions
 - Focus on reliable supply, consistent quality, highest feedstock value to customer
 - Still looking for that one-size fits all supply chain!
- Front-end and back-end feedstock portfolio approach
 - Multiple feedstock sources reduce risks and costs with year-round just-in-time supply
 - Early fractionation allows highest value use for each biomass component stream, including biomass-based materials & products
- Extensive partnerships all along the supply chain









Genera's Biomass Scope



Perennial Herbaceous Crops



- Switchgrass
- Miscanthus
- Energy Cane
- Tropical Grasses

Annual Herbaceous Crops



- High Biomass
 Sorghum
- Sweet Sorghum
- Tobacco
- Kenaf
- Industrial Hemp

Crop Residues



- Corn Stover
- Wheat Straw
- Sugarcane Bagasse

Woody Biomass



- Forest Residues
- Secondary Processing Residues
- Short Rotation Hybrid Poplar & Willow

- Feedstock opportunities are region-specific
- Imperative that biomass feedstock systems are sustainable
- A feedstock portfolio solution is generally most efficient and lowest risk

Benefits of Purpose-Grown Crops

"Feedstock Portfolio"

Utilization of multiple crops

- Lengthens harvest window
- Increases the number of direct delivered,
 JIT tons to the facility
- Reduces storage requirements and storage loss
- Reduce impacts of climatic variation and weather risks

A mix of annual and perennial crops

- Improves access to land
- Offers potential to adjust acres planted in annuals to buffer supplies
- Perennials reduce quantity and price risk with long term contracts and structured pricing
- Density of yield can make harvesting and collection more economical









Genera's Integrated Solution



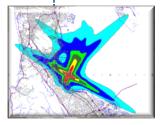
Proprietary GIS Model

Energy Grange™ Management

Supply ASSURE™ System

BIN-SPEC™ Processing

Planning Land Production Harvest Logistics Storage Inventory Transport Milling Handling



Data-Rich Feedstock Supply & Cost Model



>95% establishment rate success



Max Axle Weight per Truck Increases Efficiency



Moisture Management & Optimized Location



Project-Specific System Design



Land Accumulation & Control Model



Optimized Harvesting Across Multiple Systems



Moisture management, safety & security are critical



Maintain Quality & Minimize Cost



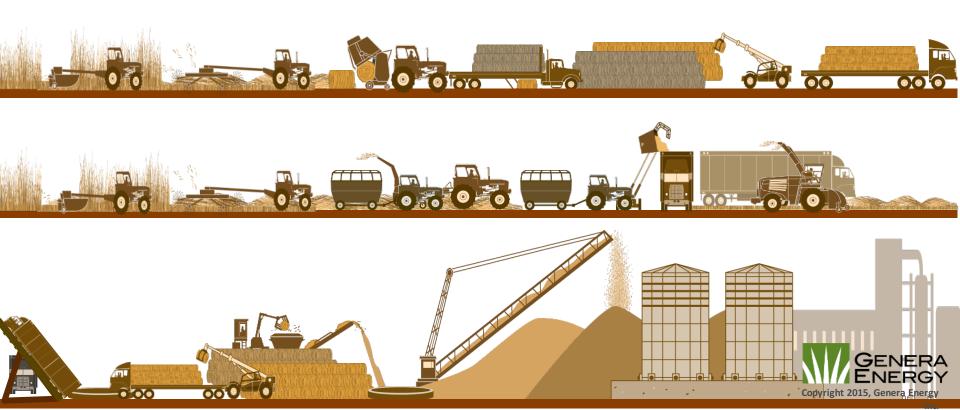
Risk Management & QA/QC

Operational & Cost Improvement Opportunities



- Year-round just-in-time supply
- Efficiency in daily operational schedules (in spite of the weather)
- True understanding of the cost of each process

- Minimize non-biomass material in feedstock
- Minimize the cost of capital
- Cost effective dry-down solutions
- Cost effective buffer stock solutions



High Biomass Sorghum



- New variety trials
- Improved harvesting equipment to address moisture challenges







High Biomass Sorghum



- Improved harvesting equipment to address moisture challenges
- New biomass head with double conditioning roller to facilitate stalk dry down



High Biomass Sorghum



- Baling dry biomass sorghum offers increased flexibility
- Produced large square bales averaging 1,350 lbs at 15% moisture



Baling Operations



 Continue to evaluate bale harvesting equipment and improvements on bale operations of perennial grasses



Forage Chopping Switchgrass



- Forage chopped switchgrass with a single pass system
- High throughput bulk handling system reduces time and labor



Forage Chopping Switchgrass



- Trucks filled in under 5.5 minutes, traveled ~7 miles to receiving depot, round trips averaged 46 minutes
- Moisture content averaged 13.7%



Bulk Chop Material Handling



• Average time to weigh in, unload, weigh out: just over 7 minutes



Proving New Harvest Technologies





Bulk Biomass Storage Opportunities



- Evaluating suitability of pile storage for forage chopped biomass
- Comparison to coal and wood chip industry methods and technologies



Bale Storage R&D



- Evaluating bale storage scenarios and bale wrap products
- Partnered with IBSS to evaluate moisture accumulation, dry matter loss, costs, air flow inside and around stacks, moisture accumulation and condensation
- Storage is expensive, so how much does dry matter loss cost?



So which is best???



Field Access Complications

- Direct truck loading can be an option for forage harvesting if fields permit
- Tip wagons typically used when fields are wet

Storage complications

- Field chopped biomass is typically direct delivered
- Round bales store outdoors well, but geometry is inefficient
- Square bales have efficient geometry, but are not forgiving in wet climates

Feedstock bulk density

- Short distance hauls for chopped biomass, but compaction can be an option, albeit at a price
- Our equipment friends have gotten really good at engineering machines that create very dense bales



Integrating Industrial Safety Standards on the Farm



- Of the 3.1 million who work on America's farms and ranches, farm accidents and other work-related health problems cause 120,000 injuries each year.
- Leading cause of death among farmworkers? Injury from livestock? Hazardous chemicals? Grain bin engulfment? Tractor overturns?
- 70% of farmworkers indicated that they could not speak English "at all", only "a little", or "somewhat".
- Noise-induced hearing loss has been found to affect ¼ of younger farmers, and at least ½ of older farmers.
- Symptoms of chronic bronchitis were observed in as many as 50% of swine confinement workers and grain handlers.

Genera's Approach to Safe Industrial Farming



Safety Programs and Training:

Personal Protective Equipment

Lock Out/Tag Out

Electrical Safety

Confined Space Entry

Fall Protection

Blood Borne Pathogens

Hazard Communication

Hearing Conservation

Fire Prevention and Hot Work Procedures

Emergency Action Plan

Equipment Procedures

Hazard Assessment

Safety Audit

Powered Industrial Truck



Hazard Assessment



- Work Planning evaluates hazards and implements controls to mitigate risk
- Use equipment for its intended purpose
 - Review Operators' Manual
 - Adhere to Safety Cautions, Warning, Signage
- Responsible for Safety of all participants <u>and</u> non-participants
- Each new process, operation or task requires a hazard assessment – must be documented
- Determines risk mitigation
 - Engineering
 - PPE

		HAZARD SEVERITY				
		Negligible (1)	Slight (2)	Moderate (3)	High (4)	Very high (5)
	Very Unlikely (A)	LOW	LOW	LOW	LOW	MEDIUM
	Unlikely (B)	LOW	LOW	LOW	MEDIUM	MEDIUM
	Possible (C)	LOW	LOW	MEDIUM	MEDIUM	HIGH
	Likely (D)	LOW	MEDIUM	MEDIUM	HIGH	нан
	Very Likely (E)	LOW	MEDIUM	HERM		HIGH

Near Miss Reporting



Clear Form NEAR MISS REPORT A near miss is a potential hazard or incident that has not resulted in any personal injury. Please complete this form as a means to report these near-miss situations. Forms may be turned into any supervisor or placed in the company drop boxes located in the process office, main office, or equipment building. This form may be completed anonymously. Time _____ a.m. \square p.m. \square Please check all appropriate conditions: Unsafe Act Unsafe equipment Unsafe Condition Unsafe use of equipment Description of incident or potential hazard: Reported By: Date: (optional) Administrative Use Only: Assigned To:__ Date Received: Reviewed by:

Safety Audit Program



- Targeted, short inspections that are performed to ensure we keep our work place, employees, and our equipment safe
- Two safety audits performed each week
- Each employee is trained to perform audits and is involved in the program
- Each team is provided with a checklist to evaluate employee and site safety
- Employees are trained on what to look for, how to constructively help one another, and how to remedy issues on the spot
- Results are tracked to evaluate safety trends
- 100% participation for the past 9 months
- Ultimate goal is to increase awareness and promote a safe work environment



How Do We Add Value?



- The only company fully integrating the entire biomass supply chain, from landowner recruitment to production and inventory management to sizing and delivery
- The only company with front-to-back experience with purpose-grown crops at commercial scale
- A focus on optimization for each unique supply chain solution to reduce cost and risk
 - Customer, process, location, feedstock
- Extensive biomass preprocessing and handling expertise and technology
- Highly developed safety program ensures worker safety







Delivering Sustainable Biomass Solutions

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