



Biomass to Energy: Inventing the New Oil



Range Fuels Overview

- Formed in July 2006 by Khosla Ventures to commercialize cellulosic ethanol
- Design, build, own and operate business model
- Access to \$82MM in federal and state funds
- Broke ground in Soperton, GA last November for first U.S. commercial cellulosic ethanol plant utilizing woody biomass
- On April 1 announced the completion of an oversubscribed Series B round of private financing greater than \$100 million.



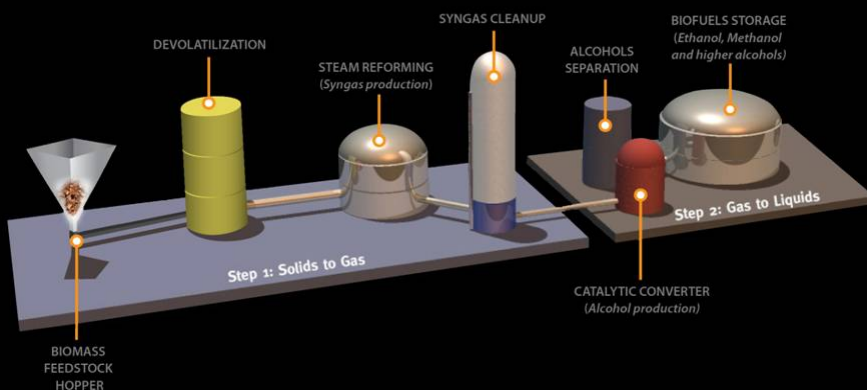
Advanced Biofuels – The Path to Success

1. A Proven Conversion Process
2. Low Cost, Abundant, and Sustainable Biomass Supply
3. Accessible Biofuels Markets
4. Legislative and Regulatory Support & Clarity
5. A Sustainable System

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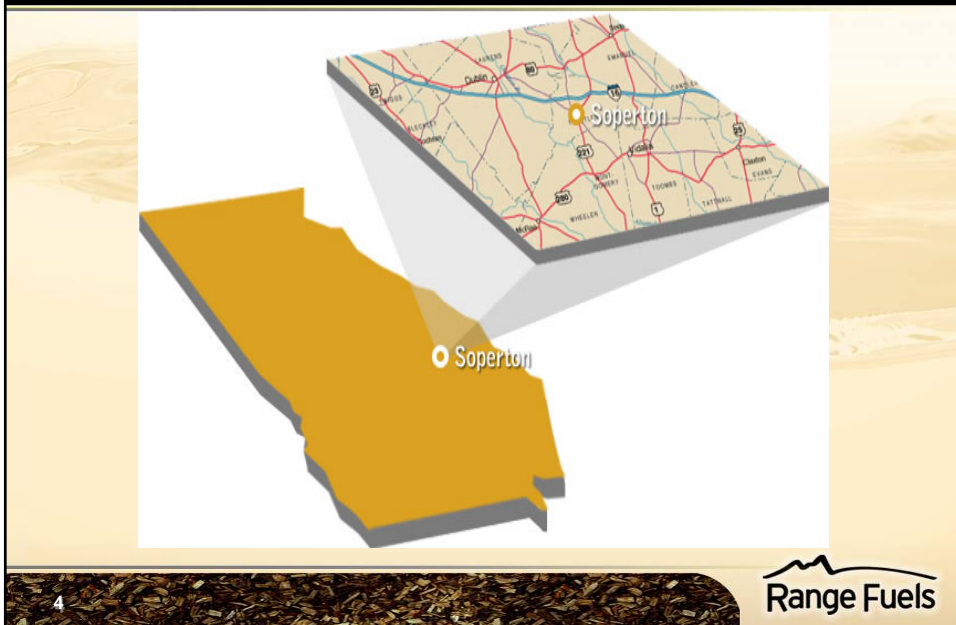
A Proven Conversion Process >>> FLEXIBILITY



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LOCATION – LOCATION - LOCATION



UNDER CONSTRUCTION



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Feedstock >>> OPTIONS ARE IMPORTANT

Wood & wood waste from
timber harvesting operations



Corn stover



Fast growing
pine and
hardwoods



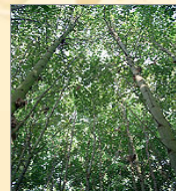
Switchgrass



Eucalyptus



Hybrid poplar



Miscanthus



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Feedstock >>> The Evolution of Renewable Biomass

- **Today** – Existing Forestry Resources
 - Pulpwood
 - Fuel chips
 - Mill residuals
- **Phase II** – increase yields by:
 - In forest residue and un-merchantable timber
 - Pre-commercial thinnings
- **Phase III** – increase yields further by:
 - Purpose grown trees and energy crops
 - In-woods moisture management

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Feedstock >>> Why Georgia and the Southeast?

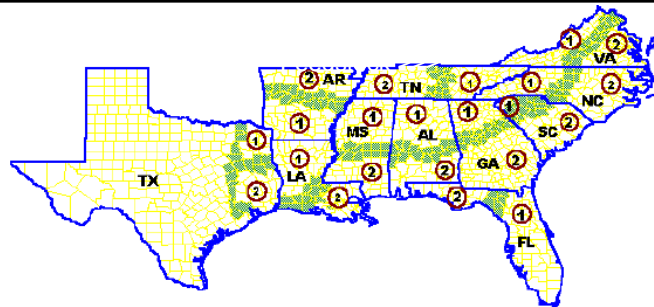


Timber Mart-South DELIVERED TIMBER

F.O.B. Mill Price Summary - Avg Prices Listed
Gate Prices/Std. Cd. F.O.B. Concentration Yard and/or Mill Yards on short hauls.
No Freight on long hauls. No yard cost. No dealer cost.

Prices U.S. \$ Per Ton

2nd Quarter 2008



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Today >>>> Pulpwood and Clean Chips

Timber Mart South 2Q08

| State | Area | Sawtimber Woods Run | | | Pine Chip-n-Saw | Pine Ply logs | Pine Poles | Pulpwood (per Ton) | | Clean Chips F.O.B./Ton | | | |
|---------------------------|------------|---------------------|--------------|--------------|-----------------|---------------|--------------|--------------------|--------------|------------------------|--------------|--------------|--------------|
| | | Pine | Oak | MixHwd | | | | Pine | Hwd | Saw Mills | | Chip Mills | |
| AL | 1 | 51.67 | 55.13 | 39.17 | 35.33 | 55.13 | 86.75 | 27.30 | 28.33 | | | | |
| | 2 | 50.52 | 51.38 | 41.75 | 37.01 | 56.88 | 79.00 | 25.69 | 29.19 | | | | |
| | Avg | 51.09 | 53.25 | 40.46 | 36.17 | 56.00 | 82.88 | 26.49 | 28.76 | 28.69 | 24.38 | 34.50 | 35.50 |
| AR | 1 | 49.09 | 54.63 | 37.63 | 31.92 | 49.46 | 74.50 | 31.20 | 31.56 | | | | |
| | 2 | 42.67 | 41.57 | 29.96 | | | | 26.96 | 23.19 | | | | |
| | Avg | 45.88 | 48.10 | 33.79 | 31.92 | 49.46 | 74.50 | 29.08 | 27.38 | 27.17 | 24.00 | 39.49 | 32.00 |
| FL | 1 | 49.86 | | 30.00 | 32.60 | 53.33 | 69.58 | 24.93 | 23.38 | | | | |
| | 2 | 50.78 | | 34.06 | 32.69 | 52.43 | 73.85 | 23.73 | 24.14 | | | | |
| | Avg | 50.32 | | 32.03 | 32.64 | 52.88 | 71.72 | 24.33 | 23.76 | 24.50 | 21.50 | 33.50 | 32.50 |
| GA | 1 | 45.38 | 45.42 | 41.62 | 33.59 | 51.00 | 69.74 | 24.60 | 27.13 | | | | |
| | 2 | 48.36 | 46.66 | 45.52 | 34.20 | 56.43 | 73.63 | 25.10 | 25.15 | | | | |
| | Avg | 46.87 | 46.04 | 43.57 | 33.90 | 53.72 | 71.68 | 24.85 | 26.14 | 24.47 | 23.70 | 28.15 | 36.25 |
| LA | 1 | 50.38 | 46.40 | 33.25 | 33.50 | 51.25 | 76.27 | 31.03 | 26.75 | | | | |
| | 2 | 53.51 | 47.25 | 45.00 | 34.30 | 52.15 | | 26.45 | 26.88 | | | | |
| | Avg | 51.94 | 46.83 | 39.12 | 33.90 | 51.70 | 76.27 | 28.74 | 26.81 | 27.84 | 26.50 | 40.48 | 37.00 |
| MS | 1 | 46.87 | 52.54 | 43.33 | 34.00 | 44.31 | 79.00 | 26.08 | 26.10 | | | | |
| | 2 | 53.44 | 52.54 | 46.72 | 33.09 | 48.19 | 76.25 | 26.78 | 24.87 | | | | |
| | Avg | 50.15 | 52.54 | 45.03 | 33.55 | 46.25 | 77.63 | 26.43 | 25.49 | 23.50 | 26.00 | 34.50 | 34.50 |
| NC | 1 | 40.11 | 49.12 | 33.22 | | 41.00 | | 20.75 | 25.17 | | | | |
| | 2 | 48.90 | 48.41 | 35.32 | 42.33 | 56.17 | | 22.56 | 23.97 | | | | |
| | Avg | 44.51 | 48.76 | 34.27 | 42.33 | 48.58 | | 21.66 | 24.57 | 27.57 | 25.75 | 30.19 | 30.75 |
| SC | 1 | 49.44 | 52.44 | 41.44 | 37.13 | 57.18 | 71.13 | 25.44 | 26.90 | | | | |
| | 2 | 47.25 | 52.02 | 41.13 | 33.19 | 57.56 | 73.19 | 26.51 | 27.63 | | | | |
| | Avg | 48.34 | 52.23 | 41.28 | 35.16 | 57.37 | 72.16 | 25.97 | 27.26 | 29.75 | 26.00 | 32.25 | 34.50 |
| TN | 1 | 32.50 | 54.59 | 40.88 | | | | 29.31 | 25.24 | | | | |
| | 2 | 42.88 | 52.97 | 36.65 | 34.28 | | | 28.32 | 28.25 | | | | |
| | Avg | 37.69 | 53.68 | 38.76 | 34.28 | | | 28.81 | 26.74 | 26.50 | 18.25 | 32.00 | 33.00 |
| TX | 1 | 48.88 | 46.56 | 39.75 | 36.38 | 55.06 | 82.13 | 29.75 | 31.00 | | | | |
| | 2 | 48.75 | | 44.13 | 33.66 | 55.00 | 71.06 | 30.27 | 25.79 | | | | |
| | Avg | 48.81 | 46.56 | 41.94 | 35.02 | 55.03 | 76.59 | 30.01 | 28.40 | 24.00 | 24.00 | 40.00 | 37.00 |
| VA | 1 | 45.84 | 49.95 | 38.25 | 34.00 | | | 25.86 | 21.46 | | | | |
| | 2 | 47.30 | 70.84 | 36.06 | 35.33 | 51.17 | | 24.06 | 25.50 | | | | |
| | Avg | 46.57 | 60.40 | 37.16 | 34.67 | 51.17 | | 24.96 | 23.48 | 21.50 | 23.50 | 31.50 | 31.75 |
| S.E. State Average | | 47.47 | 50.84 | 38.85 | 34.87 | 52.22 | 75.43 | 26.48 | 26.25 | 25.95 | 23.96 | 34.23 | 34.07 |

Average Prices

Pulpwood

26.36

Saw Mills

24.95

Chip Mills

34.05

 Range Fuels

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Phase II >>>> Fuel Chips, Slash, Pre-commercial thinnings

Timber Mart South 2Q08

| Item | \$/Green Ton | | | |
|---------------------|----------------|------|----------|-------|
| | State | Area | Region | Avg |
| Fuel Chips Hardwood | Alabama | 1 | Northern | 15.50 |
| | Florida | 1 | Eastern | 21.21 |
| | Florida | 2 | Western | 21.92 |
| | Louisiana | 1 | Northern | 25.20 |
| | Louisiana | 2 | Southern | 18.00 |
| | North Carolina | 1 | Western | 17.00 |
| | North Carolina | 2 | Eastern | 14.00 |
| | Texas | 1 | Northern | 22.25 |
| | Virginia | 2 | Eastern | 29.00 |
| Fuel Chips Pine | Alabama | 1 | Northern | 15.50 |
| | Florida | 1 | Eastern | 21.21 |
| | Florida | 2 | Western | 21.92 |
| | Georgia | 1 | Northern | 17.75 |
| | Louisiana | 1 | Northern | 24.75 |
| | Louisiana | 2 | Southern | 21.55 |
| | North Carolina | 2 | Eastern | 14.00 |
| | South Carolina | 2 | Eastern | 8.25 |
| | Texas | 1 | Northern | 22.25 |
| | Virginia | 2 | Eastern | 29.00 |

Average Prices

20.03

 Range Fuels

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Phase III – Herbaceous Energy Crops A collaborative with Ceres



Soperton Field Trials of Herbaceous Energy Crops

- C4 grasses are the plant world's most efficient photosynthetic engines
- High yields & widely adapted; relatively fast breeding cycles
- Numerous environmental benefits
- Blade Energy Crops™ brand seed and agronomic guidance from Ceres
 - **Switchgrass**
 - **High Biomass Sorghum**
- PROJECT GOALS: Understand yields, best management practices and conversion efficiency of Ceres crops



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Accessible Biofuels Markets >>> What Do We Need?

- Higher blends
 - Testing indicates +20% is achievable in existing vehicles

- Wider distribution
 - Only 1,651 E85 stations in the United States
 - More Flex Fuel vehicles in high mileage cars

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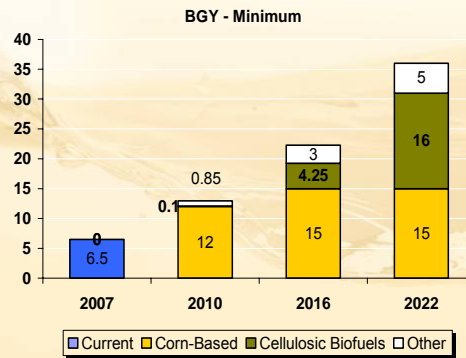
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Legislative and Regulatory Support

2007 Energy Independence and Security Act

The RFS is critical to create and support a market

The definition of Renewable Biomass needs to be inclusive, not exclusive



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Legislative and Regulatory Support

FOOD, CONSERVATION, AND ENERGY ACT OF 2008

- \$1.01 per gallon cellulosic Biofuels tax credit
 - \$0.56 for cellulosic ethanol
 - \$1.01 for methanol
- Title IX – Energy Programs (key provisions for Advanced Biofuels producers)
 - Biorefinery Assistance
 - Loan guarantees – up to \$250 million
 - Grants – up to 50% of project costs
 - Biomass Crop Assistance Program
 - Provides financial assistance to growers transitioning to renewable biomass for use by biomass conversion facilities

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Slide 18

p1 What about coverage of opportunity costs?
pwright, 7/28/2008

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Sustainability >>> What is it?

Sustainable development marries two important themes: that environmental protection does not preclude economic development and that economic development must be ecologically viable now and in the long run.

“Meeting the needs of the present without compromising the ability of future generations to meet their own needs.”¹



Improving the Energy Balance

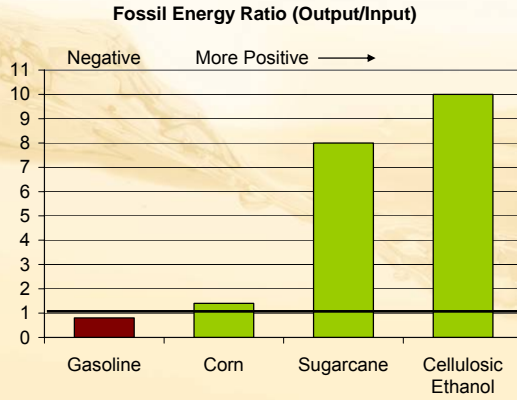
Reducing the impacts of GHG

¹ The World Commission on Environment and Development – The Brundtland Report - 1987

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Sustainability >>> Improving the Net Energy Balance

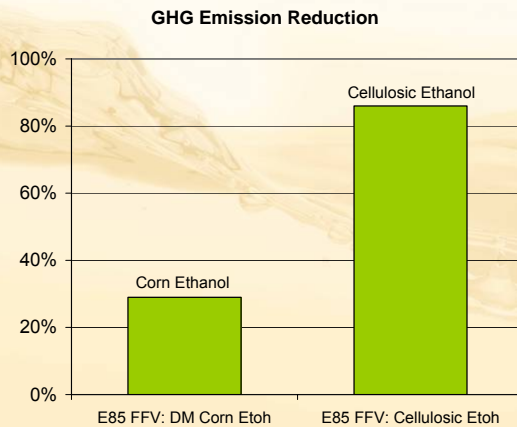


Sources: Argonne National Laboratory, "Energy and Greenhouse Gas Emissions Impacts of Fuel Ethanol" Presentation, August 23, 2005, and the Brazilian Reference Center on Biomass, "Brazilian Sugarcane Ethanol: Lessons Learned" Presentation, December 2005.

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Sustainability >>> While reducing GHG Emissions



GHG emission reductions per gallon of ethanol to displace an energy-equivalent amount of gasoline

Source: Argonne National Laboratory, "Energy and Greenhouse Gas Emissions Impacts of Fuel Ethanol" Presentation, August 23, 2005.

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It's not easy.....



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But the benefits are substantial:



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