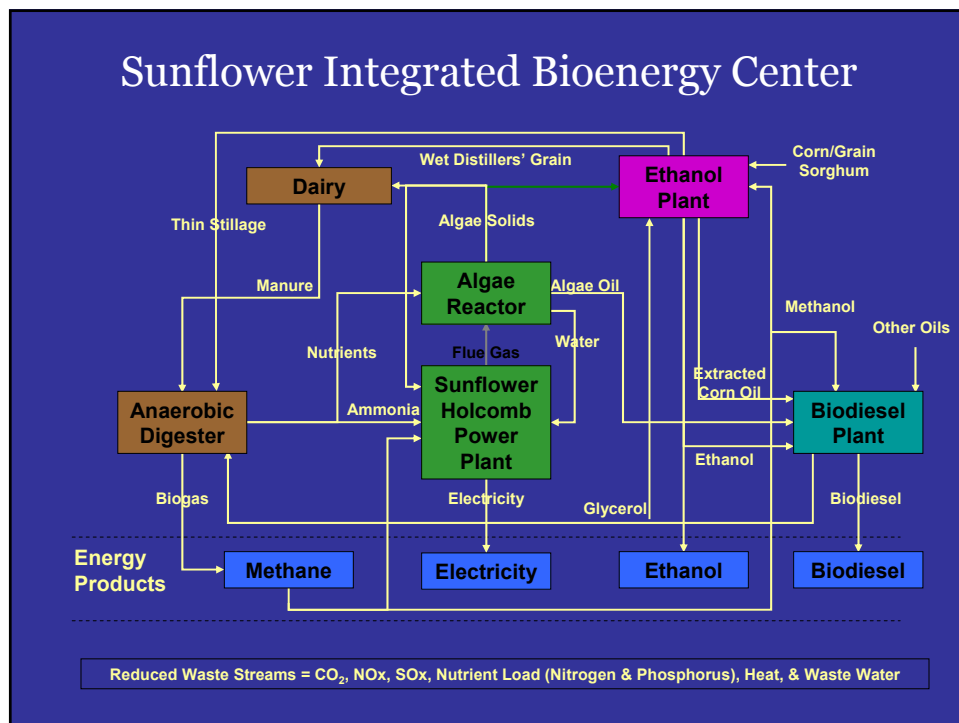

Sunflower Integrated Bioenergy Center

Sunflower Integrated Bioenergy, LLC



Goal is to develop a bioenergy facility that will integrate a number of commercial or near commercial renewable energy technologies with the coal-based power plant located at Holcomb Station



Ethanol Sub-System

- Produces Ethanol
- System Waste Streams
 - Distillers Grains
 - Water
 - Thin Stillage
- System Inputs
 - Corn
 - Starch
 - Biogas
 - Water

Anaerobic Digester Sub-System

- Produces Biogas
- Digester Waste Stream
 - Methanol
 - Solids w/ nutrients
 - Water w/ nutrients
- Digester Inputs
 - Animal Waste
 - Waste Water
 - Thin Stillage
 - Glycerol

Dairy Sub-System

- Produces Milk & Calves
- System Waste Streams
 - Animal Waste
 - Waste Water
- System Inputs
 - Distillers Grains
 - Water
 - Feed grains
 - Roughage & Protein

Bio-Diesel Sub-System

- Produces Bio-Diesel
- System Waste Streams
 - Glycerol
- Bio-Diesel Inputs
 - Oils
 - Soybean
 - Corn
 - Algae
 - Canola
 - Animal tallow
 - Methane Gas
 - Methanol

Algae Sub-System

- Produces Algae Oil, Starch, Protein
- Algae Waste Streams
 - Water
- Algae Inputs
 - Water
 - Nutrients
 - Sunlight
 - CO₂

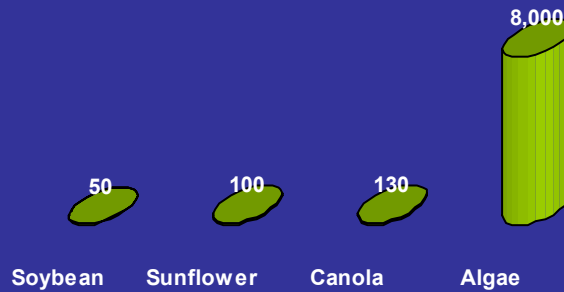
Algae Reactor

- Microalgae is the most primitive plant form - typically one or two cells.
- This simple structure allows algae to be very efficient at converting sunlight, CO₂, and nutrients into oil (for biodiesel) and starch (for ethanol).
- CO₂ and NO_x are consumed in the bioreactor by algae through photosynthesis and other biological processes. Algae are suspended in water with nutrients from the anaerobic digester.
- Phase 1 onsite algae study completed



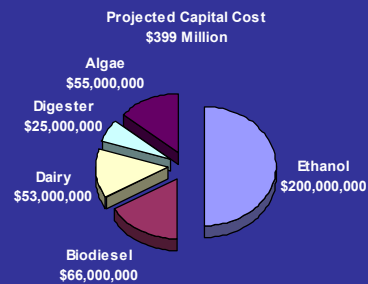


Gallons of Oil per Acre



Greater Profitability

- Utilization of co-products from one facility as a feedstock for another facility
- Shared infrastructure resources such as rail, road, and gas line access
- Shared management, back office, and maintenance resources
- Transportation benefits
- Power plant co-location advantages
- Over 160 new jobs



Environmental Benefits

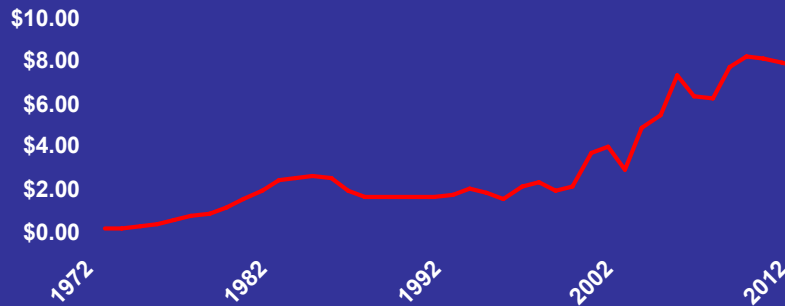
- Carbon utilization technologies and associated carbon credits
- Utilization of waste streams as feedstocks
- Comprehensive approach to water reuse and reducing natural gas use
- Reduction in green house gas emissions (CO₂ and methane)
- Other emission reductions
- Water treatment and possible zero waste water discharge

Market Resilience

- Use of co-product feedstocks to hedge against market fluctuations
- Development of new oil and starch sources for biodiesel and ethanol
- Processes to reduce operating cost such as local delivery of wet distillers grain
- Portfolio approach to bioenergy technology & agricultural products
- Single owner model allows ability to flex with the market

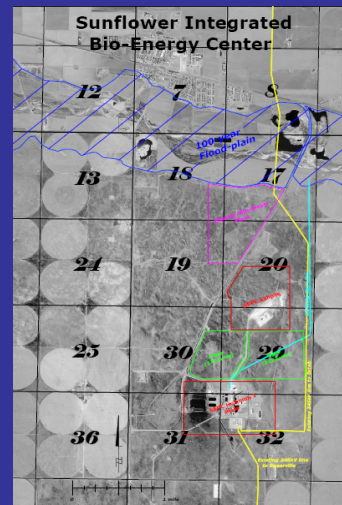
Anaerobic Digestion

Historical and Projected Natural Gas Prices



Location Advantages

- 10,000 acre site (access to additional 30,000 acres)
- Ample water supply
- 3.6 million head of cattle in the region
- 302 million bushels of corn grown in the region
- 135 million bushels of sorghum grown in the region
- 70,000 new dairy cows in western Kansas since 1995
- BNSF mainline rail access
- Natural gas pipeline onsite
- Land zoned for heavy industrial use
- Community support for power plant and bioenergy center development



Engineering Status

- Black and Veatch has completed a model validation project

Integrated Model Status

- Full patent application on file with USPTO for integrated model

Funding Status

- KBA grant for engineering with milestones for additional funding
- Cash and in-kind contributions made by SIB, LLC partners
- In conversations with multiple capital advisory firms interested in raising debt and equity

Legislative Status

- Assisted in passing Kansas legislative Bioenergy incentives

Sunflower Integrated Bioenergy, LLC

Chad Jackson

785.532.3907

cjackson@ksu.edu

Trevor McKeeman

785.532.3904

mckeeman@ksu.edu

Clare Gustin

785.623.3321

cgustin@sunflower.net