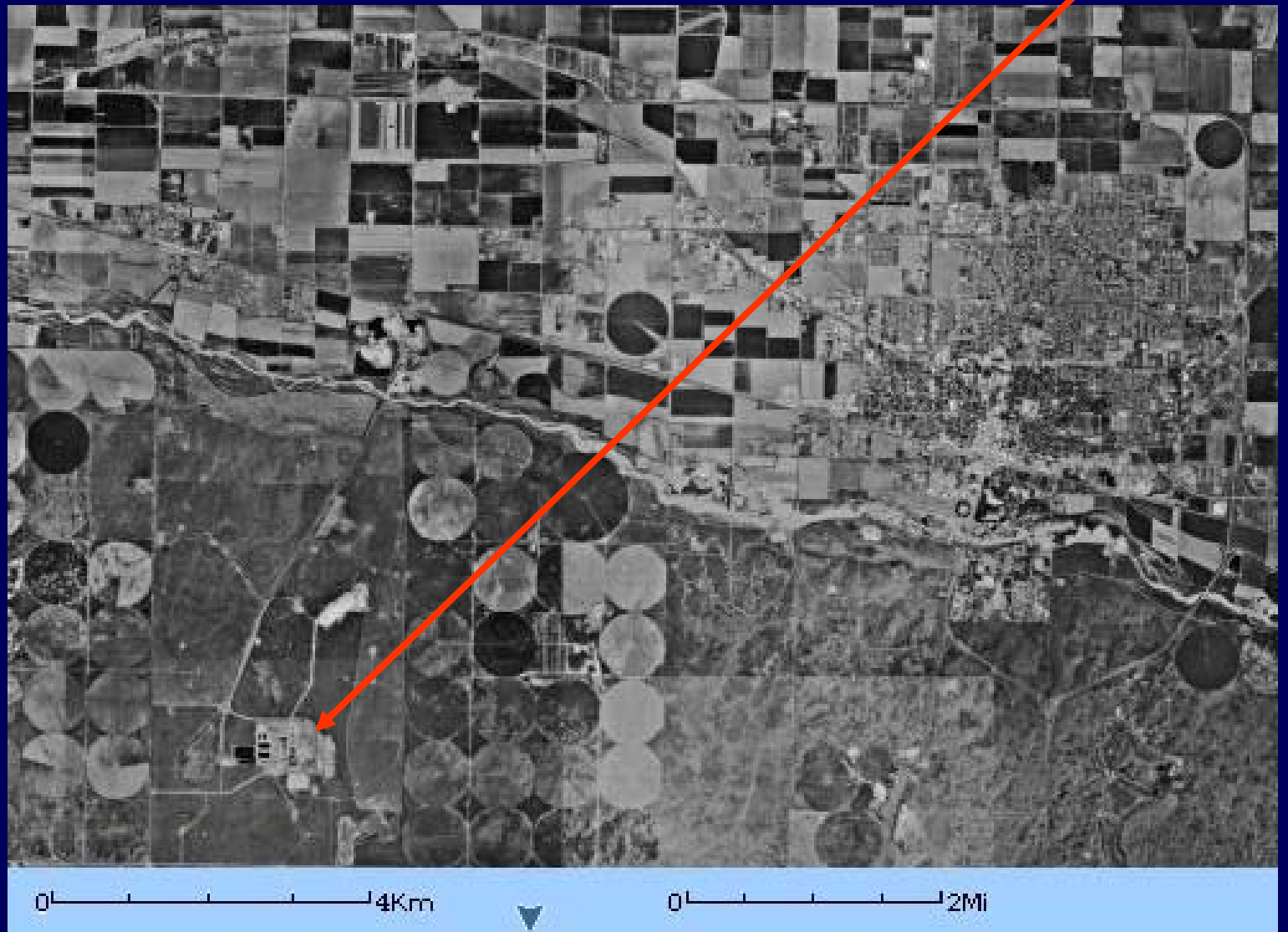
Holcomb Expansion Project

Holcomb Station - 1983

Holcomb Project Site



Alternative Design Considerations

- Renewable energy sources are not suitable for base-load applications
- Natural-gas based fuel costs too high for base-load energy
- Circulating fluidized bed units typically 250 MW or smaller
- Integrated gasification combined-cycle (IGCC) generation not quite ready for base-load requirements:

Design Selection

Decision made to use super-critical pulverized coal-based generating units using low-sulfur coal

- Supercritical steam cycle is the most energy efficient design
- PRB coal is by far the most available and economical coal source
- Pulverized coal is the only demonstrated technology available

Unit Design Features

- 2 x 700 MW super-critical PRB coal-fired
- Lime spray dryer flue gas de-sulfurization (LSD-FGD) for SO_2
- Lo-NO_X burners (LNB), over-fire air (OFA), and Selective Catalytic Reactors (SCR) for NO_X
- Fabric filter for filterable particulate matter (PM)
- Activated Carbon (PAC) for mercury control

Proposed Emission Limits

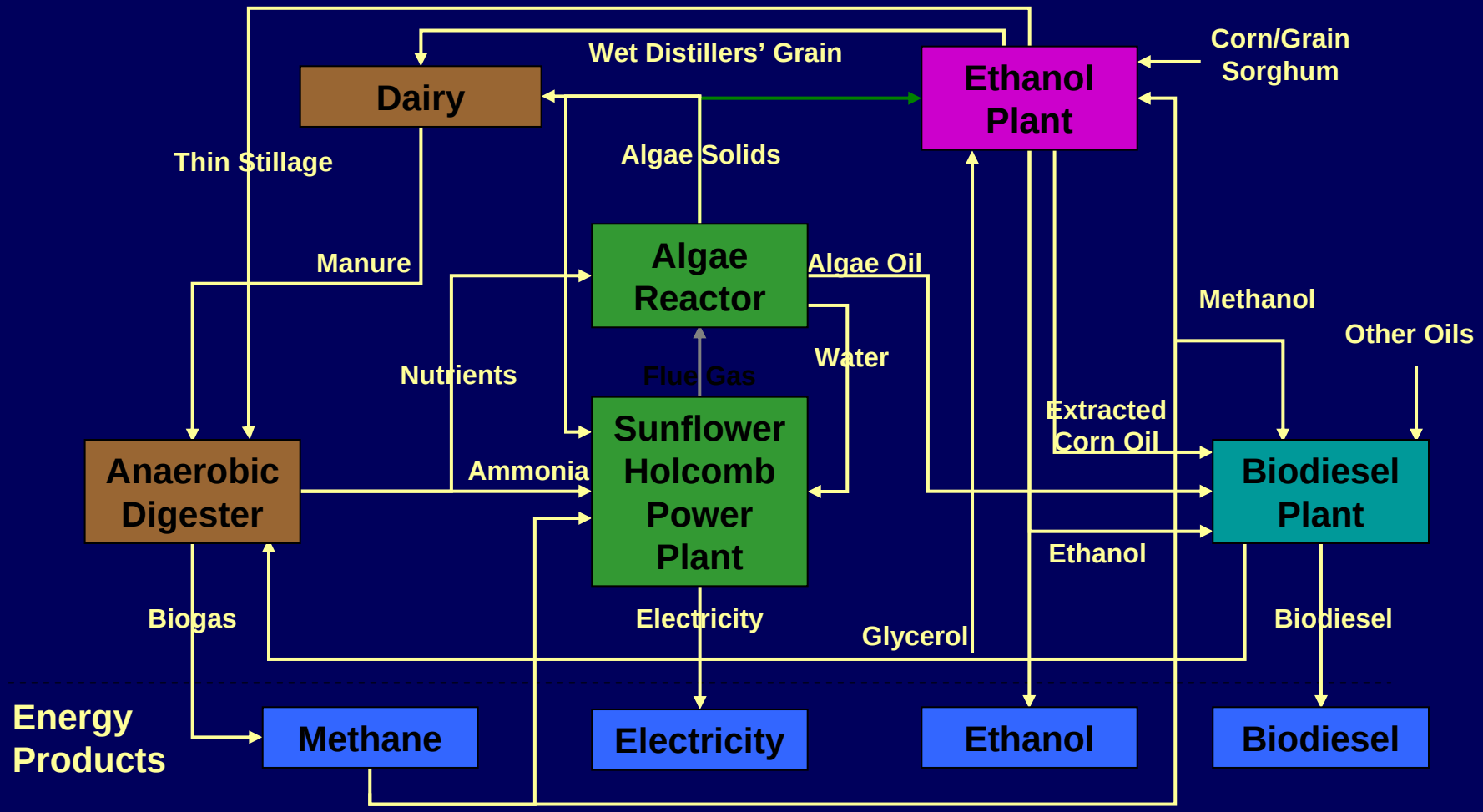
- SO_2 – 0.065 lb/mmBtu
- NO_X – 0.05 lb/mmBtu
- PM – 0.012 lb/mmBtu (filterable)
- Hg – 0.020 lb/GWh

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

Sunflower Integrated Bioenergy Center



Reduced Waste Streams = CO_2, NOx, SOx, Nutrient Load (Nitrogen & Phosphorus), Heat, & Waste Water

Anaerobic Digester Sub-System

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

Algae Sub-System

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

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, CO_2, and nutrients into oil (for biodiesel) and starch (for ethanol).
- CO_2 and NOx 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

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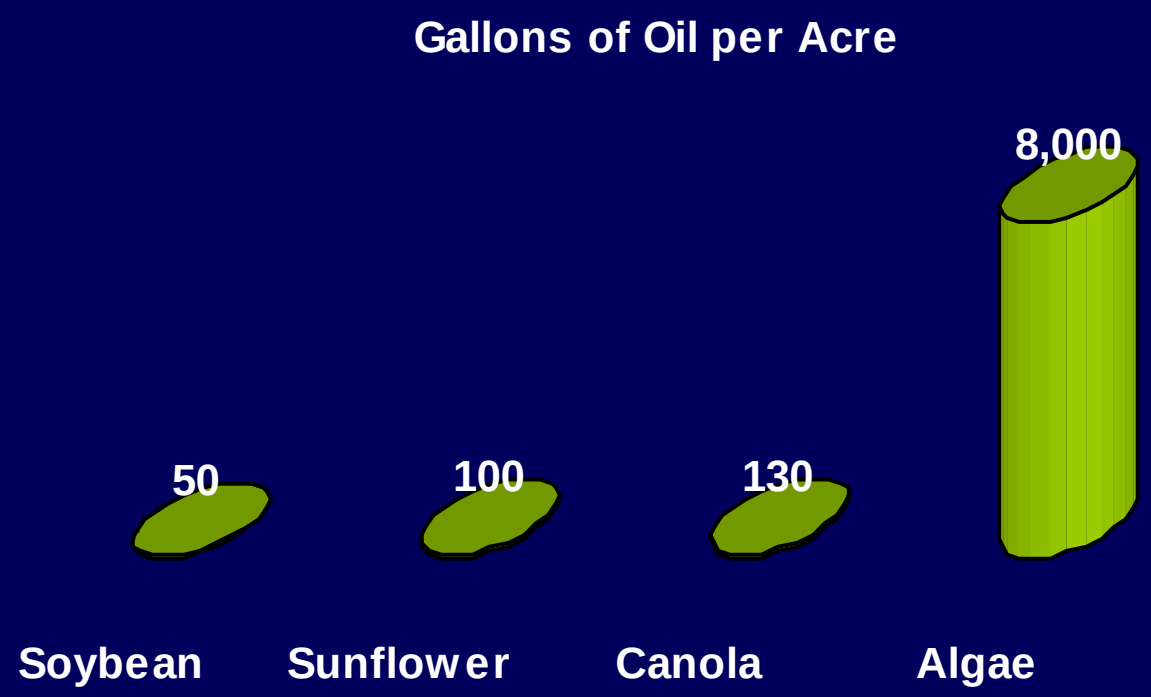
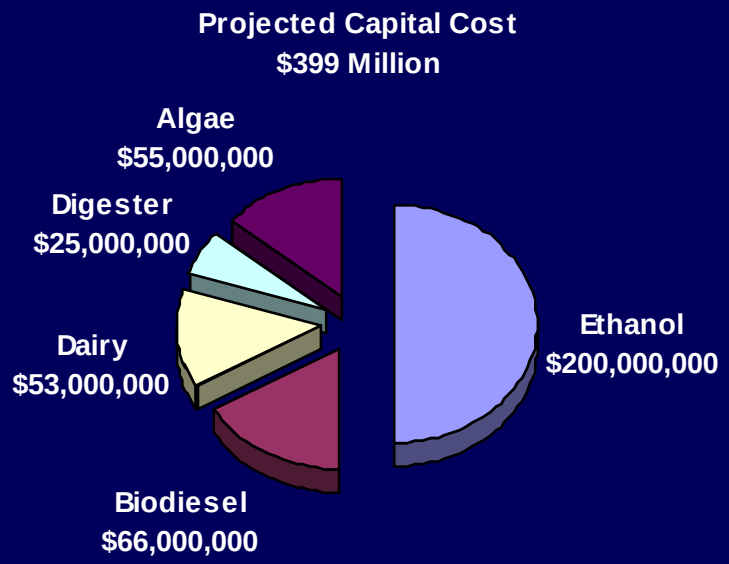


Greater Profitability

- 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

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www.sunflowerbioenergy.com