



# **Growing Demand for Renewable Energy**

Alan Doering

Agricultural Utilization Research Institute

Waseca, Minnesota



# **Growing Demand for Renewable Energy**

- AURI is nonprofit, develops new uses for agricultural products
- Largely Minnesota state funded
- Center for Producer-Owned Energy
- Funded by USDA



# **AURI and Renewable Energy**

- Working with biodiesel since 1989
- Multiple projects with renewable fuels
- Fuels Initiative



# Alternative Energy in Minnesota

- Projects utilizing corn, soybeans, biomass, crop residue, poultry litter, woody crops, coproducts
- Minnesota activities
  - Ethanol
  - Biomass
  - Wind
  - Digesters
  - Biodiesel



# Biomass

- Crop residue
- Ag processing coproducts
  - Industrial/consumer
- Garbage burners
  - Several municipal or utility-owned facilities



# Biomass

- Litter
  - FibroMin
- Co-firing



# Digesters

- On farm
  - Haubenschild Dairy
- Industrial
  - Seneca Foods
- Community involvement
  - Perham
  - Morris
- Biomass utilization



# Biodiesel

- Made from vegetable oil or greases
- MN Mandate calls for 2% blend in every gallon sold in the state by 2005
- Several plants in process
  - Brewster
  - FUMPA



# Hybrid

- AURI working on hybrid systems utilizing vegetable oil and greases to power wind turbines
- Back up systems for non-windy days



# Factors Impacting Demand

- Fossil fuel prices
- International events
- Technological advances
- Renewables have become economically comparable



# Comparative Costs

<b>Product</b>	<b>Avg. Btu/unit</b>	<b>Units</b>	<b>Approx. Cost per million Btu</b>
Electricity	3,413	kWh	\$18.12
Natural gas	1,028,000	1,000/ft cu.	\$ 10.94
#2 fuel oil	140,000	Gallon	\$ 9.82
Propane	91,333	Gallon	\$13.69
Corn – shell	6.924	lb.	\$ 8.83
Straw	7,153	lb.	\$ 7.58
Soybean hulls	6,777	lb.	\$ 6.85
Aspen	7,589	lb.	\$ 8.47




# Methods for Growing Demand

- Governmental action
  - Mandates
    - Biodiesel
  - Compromises (nuclear storage)
    - Prairie Island
  - Credits



# Methods for Growing Demand

- Recognizing opportunities
  - Must show benefit, just “green” not enough
  - Economically viable
  - Available feedstocks
  - Meets an identified need
  - Utilize or have purchaser



# **The Future for Renewable Energy**

- Renewable fuels will have a place
- Technological advances
- Economical feasibility
- Reliability