



The Potential for Energy Production in MN Ag Sector

Renewable Hydrogen Initiative Forum

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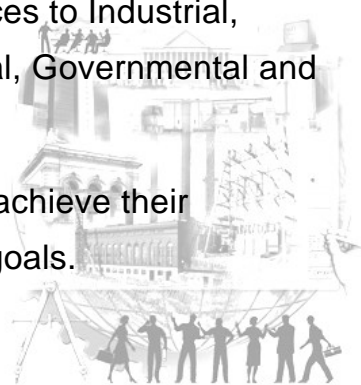
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Firm Introduction

Founded in 1994, Sebesta Blomberg provides Facility Management, Consulting, Engineering and Design/Build Services to Industrial, Institutional, Educational, Governmental and Healthcare customers.

Helping our customers achieve their technical and financial goals.





- Gross State Product \$188 billion (2001)
- Energy Costs \$12.2 billion (2000)
 - Almost all energy is imported
- Statewide energy consumption 1,668 trillion Btu (2000)
 - Bureau of Economic Analysis
 - Energy Information Administration



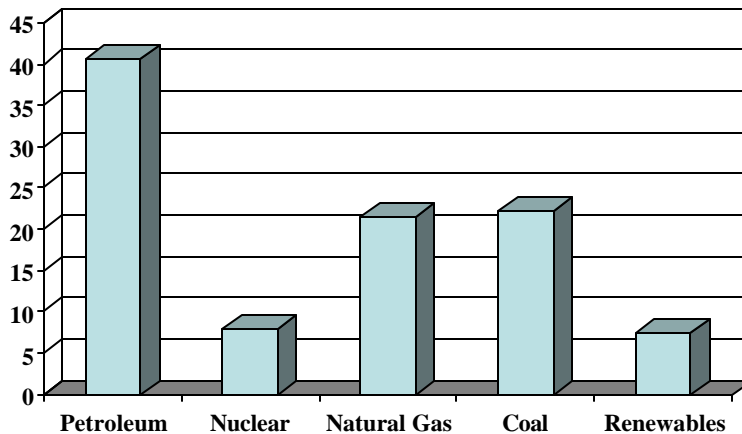
- Durable economic development requires:
 - local raw materials/energy
 - significant capital investment
 - local ownership
- Jobs go where the energy is



- All significant economic development is going to be built around processing
- Energy typically ranks behind only raw material in full plant cost
- Energy stability can offset other differentials in labor, transportation and taxes.

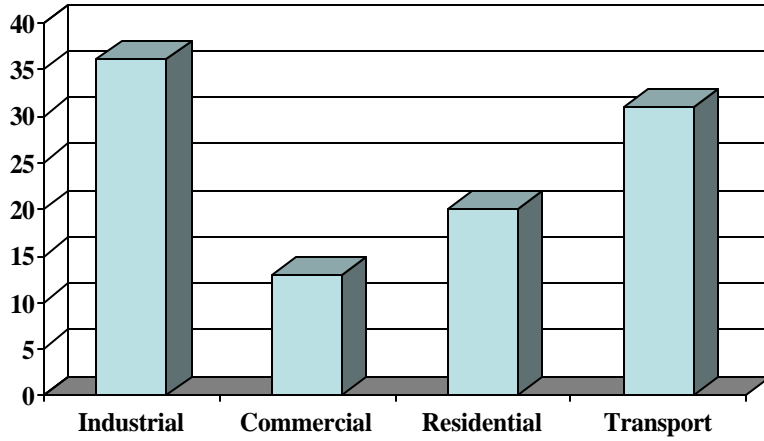


- No need to solve the whole problem
 - Meet local energy needs from local supply
 - Unhook local business from world markets
- Stimulate local economy by increased economic activity
- Biomass energy projects meets the criteria for stable economic development

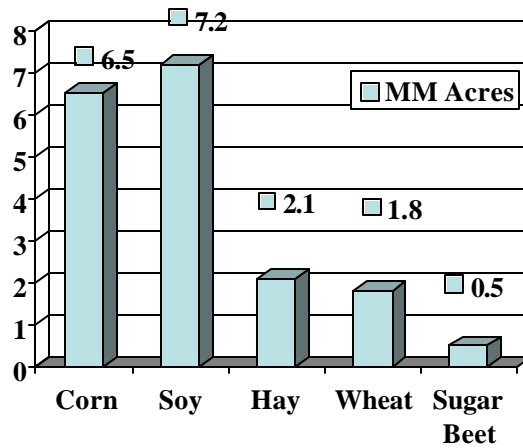




MN Energy Use in %

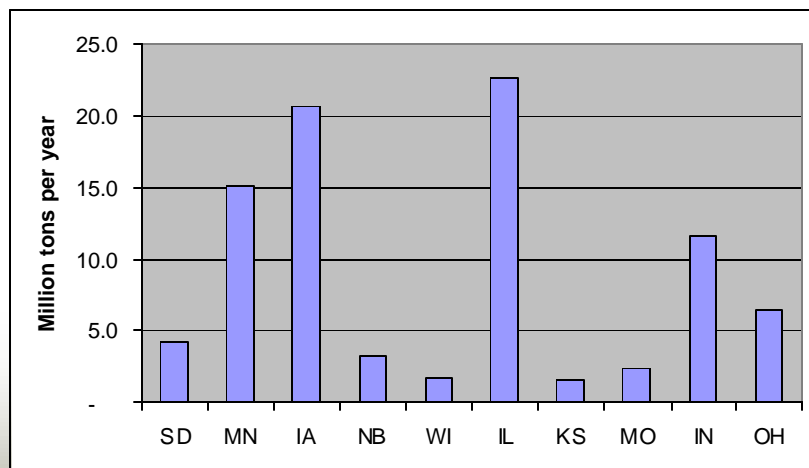


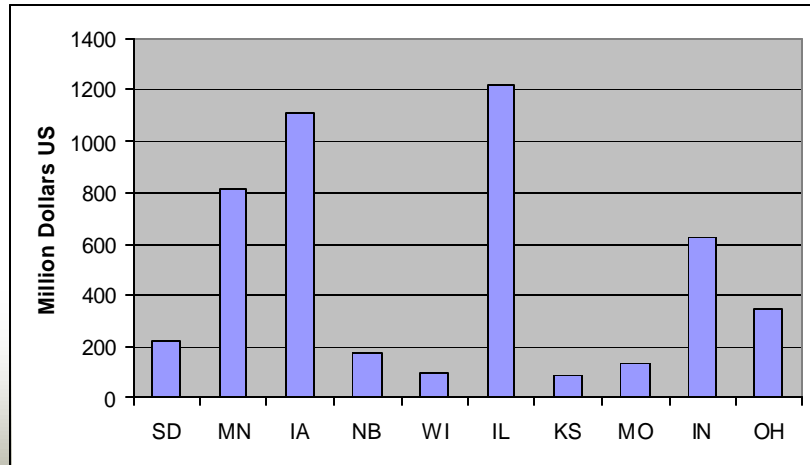
Minnesota Cropland Use





- Approximately 14 million acres with 6½ tons per acre potential yield
- Approximately 97.5 million Btu per acre
- Total energy potential 1,365 trillion Btu
 - Roughly ½ as grain and ½ as stalks
- Vs current statewide use of 1,668 trillion Btu in 2000





- Geographically remote from the energy users
- Low energy density makes it uneconomical to transport
- Users are not equipped to burn the fuel
- Pollution control and high fixed investment



- Converting energy users to biomass will be a long road
 - Capital investment requirements
 - Permitting limits
 - Infrastructure
 - Costs



- Co-firing
 - Switch grass and coal
- Convert to electricity
 - Anaerobic digesters/generation
- On-site gasification/co-generation
 - Rice hulls gasification



- Located at Central MN Ethanol Co-op in Little Falls, Minnesota (CMEC)
- Uses waste wood (sawdust) for fuel
- Uses gasification and thermal oxidation to supply all the thermal energy needs of the plant for both steam and drying
- On-line first quarter 2005



- NETL supported study of gasification of barley hulls at Rahr Malting
- Xcel RDF supported preliminary engineering and test work
- \$2 million grant from DOE/USDA for the project



- Expand use of biomass energy from co-products already on site
 - Barley malting
 - Ethanol production
 - Soy crushing plants



- For cost effective co-generation avoid electrical generation completely
 - Reduced capital investment
 - Improved efficiency
- Small scale steam engines
- Hydraulic motor systems





Convert biomass to fuels identical to or direct substitutes for current fuels

- Supply “green gas” from rural areas via existing pipelines
- For liquid fuels, SBA focus is on combined gasification/gas to liquid technologies



- Wind power has gained substantially as costs have declined
- SBA has recently begun evaluation of technology to store and dispatch wind power
- “Flow battery” technology as a possible solution



- Pyrolysis for hydrogen production
 - NREL project at Albany, Georgia
- Improved fermentation technologies
 - Syn gas to ethanol via fermentation
 - Direct aerobic fermentation of biomass



- Variable cost of harvest and transport around \$2 per million Btu
- Fixed capital costs discourage conversion
- Financing structure is critical to success
 - Long term contracts
 - Long term financing
 - Biomass supplier ownership



- As energy grows more expensive, Minnesota has the opportunity to focus more cropland on energy production and less on feed/food
- Minnesota has the biomass available to be a leader in this area
- A stable, predictable energy cost has the potential to contribute to the local economy while supporting current industries and growing new ones



Thank You!

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