Focus on Renewable Energy

Thermal Conversion of Biomass.

Lowell Rasmussen
Associate Vice Chancellor
University of Minnesota, Morris
U of MN Renewable Energy Initiatives

- U of MN Morris - Rural sustainable energy platforms
- NRRI Duluth – Northern Sustainable energy platforms.
- U of MN U More Park – Urban sustainable communities
- U of MN IREE and Environmental Institute – Research platforms
Community-Scale Renewable Energy Systems

- Hybrid Wind System
- Biomass Gasification System
- Community Biogas System
- Green Office / Living-Learning Buildings

Practical production systems with research and demonstration platforms

“Destination Renewable Energy Research & Demonstration Systems”
Vision for the Future

- “the failure of the market, which left rural areas literally and figuratively in the dark, required an aggressive federal initiative to insure that residents of sparsely populated areas were no longer comparatively disadvantaged in the twentieth century American Economy”

Laurence J Malone, Hartwick College
REA of 1936 and Renewable Energy

• REA brought a new form of energy to rural America that revolutionized agricultural practices and brought gains in productivity and economic development.

• The legislation passed by the 2007 Minnesota Legislature and signed by the Governor will bring new forms of energy to rural Minnesota and will significantly impact agricultural practices, increase productivity and promote economic development.
University of Minnesota, Morris

- Green Prairie Alliance
  - West Central Research and Outreach Center
  - USDA
  - University of Minnesota, Morris

- Carbon neutral by 2010
- President’s Climate Challenge
UMM Living learning Community

- Liberal arts mission
  - Civic engagement
  - Critical thinking
  - Big picture thinking
- Green living, green learning
  - Academic rigor and integration of modern day issues
  - Commitment to carbon neutral community
- Sense of place and traditions
  - Understanding our resources
  - Practicing stewardship
Pride of the Prairie

• Founding member of local foods organization
• Eat great food grown by people we know – fall and spring local foods feasts, farmers markets, a local foods directory for individual sales.
• Spend our food dollars locally - investing in family farms and our prairie home.
• Strengthen a sustainable local food system, with regional and national impact – our work with Sodexho Campus Services brings local foods to MN universities and $500,000 to MN and WI sustainable farmers this year.
• Reduce the miles our food travels – from 1700 national average to 100 mile average for fresh nutritious food and energy savings.
• Study, work, and learn in partnerships that build community – service learning, internships, directed studies, and volunteer opportunities connect students with farmers and local foods work.
The Green Prairie Alliance: Bio-mass/Bio-energy Research Triangle
Strategic Resources

Soil, Moisture, & Sun

Excellent Wind Resource
Biomass Gasification

Small Modular Applications

**Biomass Gasification via Partial Oxidation**
(Auto Thermal)

- **Biomass**
- **Air**

**GASIFICATION**
850°C
About 1/3 amount of air/oxygen needed for combustion

- **Producer Gas**
  (50% N₂, H₂, CO, CO₂)

- **Char & Ash**
- **Power Generation**
Atmospheric Close Coupled Gasifier

- Biofuel Infeed
- Underfed Air
- Producer Gas Output
Biomass Tool Box

- Standard Operating Procedures (SOPs) for biomass gasification systems
- Best Management Practices (BMPs) for biomass cropping systems
- Templates for Market Contracts and Pricing Structures based on biomass feedstocks
- Measurement of Financial and Economic Impacts
Biomass Tool Box

- Development of State and Federal Environmental Permitting Procedures for biomass gasification systems
- Guidelines to Initiate the Sustainable Harvest, Storage, Processing, and Delivery of a portfolio of feed stocks
- Worldwide Information Transfer via Web Monitoring of energy production, efficiencies and emissions. The information transfer will be enhanced with Web SCADA systems, Web cameras, Capstone Classes, workshops, and published reports
Thermal Conversion of Biofuels

- Morris Biomass Plant:
  - Use up to 8,000 tons of biomass
  - At $50/ton adds $400,000 to local economy.
  - Avoids 8,000 tons of CO2 discharges
  - RGGI carbon markets as high as $8/ton CO2. $64,000
Gasification Challenges

- Low density source of carbon
- Lack of uniformity
- Producer gas is low BTU value 125-300 btu/ccf
- High mineral content
- Emissions and ash streams quite different than fossil fuels.
Opportunities

- Economic development
- Environmental impact (GHG)
- Carbon Science
- Agricultural diversification
- Public engagement and understanding
Thank You

- 1936 to 2007
- We hope you leave today's conf with an feeling of a promising renewable energy future.