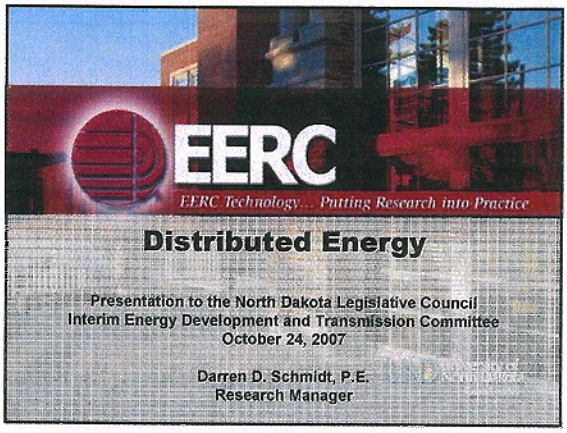


Distributed Energy

- Distributed energy
- Cogeneration
- Combined heat and power
- Trigeneration

- These are all terms to describe opportunities to utilize local fuels and create value for the energy customer, while simultaneously enhancing the domestic ability to create energy in a market with a growing demand.

- The solutions include a multitude of technologies that have specific market niche and are normally tailored to meet the customer's needs.

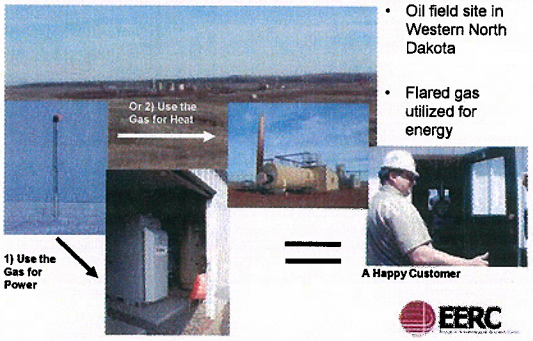
EERC

North Dakota's Potential for Distributed Energy

- Associated gas in North Dakota oil fields
- Solid fuel-fired heating opportunities (schools)
- Biomass – landfill/sewage gas
- Biomass – agricultural processing residues
- Biomass – wood and other by-products from manufacturing.
- Biomass – wood forest management initiatives
- Biomass – Crop residue/CRP management
- Centralized steam plant – absorption chilling opportunities
- Wind

EERC

Associated Gas



- Oil field site in Western North Dakota
- Flared gas utilized for energy

EERC

How the EERC Creates Value

- Oil production is the primary concern; associated gas is a by-product.
- Associated gas ranges in composition, Btu, sulfur content – (nonstandard) – not easy to implement.

- The EERC finds solutions to improve implementation:
  - Microturbine power generators
  - Low-Btu gas burners
  - Cost-effective gas handling and cleanup
  - Improved environmental performance
- The EERC provides the service that the vendors cannot currently provide, which through spin-off/ commercialization enables creation of new North Dakota-based businesses and services.

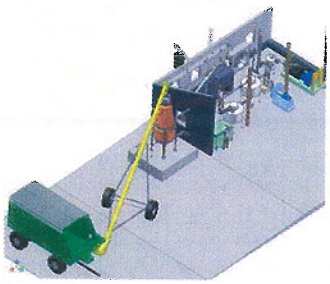
EERC

Biomass – Gasification

- Grand Forks Truss.
- Generate cut 2×4 ends and sawdust – requires disposal.
- Primary energy use is electricity.
- The EERC creates a small power plant that will operate within economically attractive restraints.
- The technology "microgasification" uses a gasifier to convert wood to a gas that can be fired in a generator.
- The technology can be manufactured locally and marketed nationally.

EERC

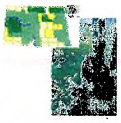
How the EERC Creates Value

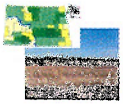


- Provides the customer with the solution.
- Utilizes expertise in energy to seek out the best-fit technologies and innovates.
- Understands why and how the customer would purchase – enables investments in new approaches.

EERC

Opportunities





- Developments in oil and gas.
- Forest management. Example: Turtle Mt. area – biomass to energy and/or biomass to products.
- Municipal landfill opportunities. Example: landfill gas utilization in Fargo, 32 LFG wells in place, power generation and gas provided to Cargill.
- Agricultural processing residue opportunities – beet pulp/tailings, potato residue, sunflower hulls, etc., "concentrated sources"
- "The majority of licensed boilers in North Dakota are at stated-owned facilities."
- CRP lands/energy crops – difficult challenge, however, securing a consistent, reliably priced feedstock for a cellulosic technology developer could provide the appropriate financial incentive.
- Distributed production of alcohols, ammonia, or other value chemicals.

EERC

Contact Information

Energy & Environmental Research Center
University of North Dakota
15 North 23rd Street, Stop 9018
Grand Forks, North Dakota 58202-9018

World Wide Web: www.undeerc.org
E-Mail: dschmidt@undeerc.org
Telephone No. (701) 777-5120
Fax No. (701) 777-5181

Darren D. Schmidt P.E., Research Manager

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