Madelia Model:
Project Update 4.2.2012

Linda Meschke
Rural Advantage
Madelia Model: Perennial Feedstocks to Advanced Biofuel

**Goal:**
Utilize Local Grown Renewable Energy as a Catalyst for Increasing Perennials on the Landscape to Reduce Pollution from Production Agriculture
Concept

- Uses Renewable Energy & Bio-Industrial Processing as a Catalyst for Sustainable Regional Development
- Utilize perennial feedstocks, at priority sites on the landscape, to mitigate agricultural non point source pollution
- Provides a Market
  - 1,000’s of acres of perennials
- Creates New Enterprises & Jobs
Rural Economic Development Concept

Major Ag Processor

Bio Based Industrial Park
Sustainability Theme

Renewable Energy Source
(Wind, Thermo, Solar, Methane, Bio Fuels, Hydrogen, etc.)

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Growers deliver to their local sub zone
Results in Multiple Benefits

- Water Quality
- Renewable Energy
- Habitat Enhancement
- Sustainable Agriculture
- Vibrant Rural Communities
- Retain Rural Wealth
Madelia Fuelshed
Prairie Skies Bioenergy Facility
A 25 Mile Radius of Madelia, Minnesota
75% of the Feedstock is expected to come from this Area
Prairie Skies Bio-Energy Project
Phase I

Feedstocks

- Multiple Feedstocks Grown Locally
- Perennials Targeted to Priority Sites

Torrefaction

- Produces an Advanced Biofuel
- Similar to Wyoming Coal in BTU's [8,600/lb]

Madelia Model
Renewable Energy and Sustainable Rural Communities
Torrefaction Facility

• Construction of a 300 ton/day torrefaction facility at Madelia [co-located next to Tony Downs Foods].

• Benefits of Torrified Material
  • Hygroscopic
  • Densification – 80%
  • Reduces Volume
  • Increases Energy Value 30%

Torrefaction is a thermo-chemical treatment of biomass in the 400 – 650 degree F range. In this process the biomass partly [especially the hemicellulose] decomposes, giving off various types of volatiles.
Prairie Skies Bio-Energy Project
Phase II & III

- Produces:
  - Syngas
  - Electricity
  - Heat/Steam
- Co-Located with a Major Ag Processor

Bio-Fuels Refinery
- D-4814 Gasoline
- D-975 Diesel
- Anhydrous Ammonia

High Pressure Gasifier
Madelia, MN - Watarwan County
Madelia Township, T-107N, R-30W
SW 1/4, NE 1/4 - Section 27 [Site]

Site Location
600 Benzel Ave. SW
Lat  44.024097
Long  94.2508.38W
Recent Updates:

- Prairie Skies Biomass Co-op Formed [9/2010]
- Local Grower Co-op
  - 15 Members
- Supply the Feedstock and Own the Torrefaction Facility [4/2011]
  - 300 Tons per Day
  - ~$22 Million Capital Cost
  - ~45 Jobs in Facility
  - ~75 Jobs in Feedstock Supply Chain
Recent Updates: continued

- Biomass Crop Assistance Program (BCAP) Proposal
- Similar to CRP except:
  - 5 Yr Grasses/ 15 Yr Woody
  - Pays Annual Rental Payment
  - Pays Establishment
  - Allows Harvest
- Applied for $42 Million
- Did Not Receive – Needed Feasibility Study
- Re-apply in 2012 ???
Recent Updates: continued

- Awarded an MDA Next Generation Grant
- $73,000 Grant/ $73,000 Match
- Deliverables:
  - 3rd Party Feasibility Study
  - Business Plan
  - PSBC Organizational Procedures, Share Development & Feedstock Agreements
- Partners: PSBC, SynGas Technologies, LLC, Cooperative Development Services, Black Dog Co-op Law, Minneapolis Biomass Exchange
- Completed by 6/30/2013
Current Feedstock Supply [six county area]

**Agricultural Crops**
- Corn
- Soybeans
- Wheat
- Oats
- Forage Hay
- Natural Areas

2,071,229 Acres Total

**Program Conservation Lands**
- CRP
- Continuous CRP
- CREP
- RIM
- RIM WRP
- WRP
- USFWS Acq.
- DNR WMA

91,641.99 Acres Total
**MM Feedstock Supply**

<table>
<thead>
<tr>
<th>Feedstock</th>
<th>% of Supply</th>
<th>Tons</th>
<th>Acres</th>
<th>Yield</th>
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<tr>
<td>Native Grasses</td>
<td>35 %</td>
<td>38,325</td>
<td>19,162</td>
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<tr>
<td>Corn Stover</td>
<td>25 %</td>
<td>27,375</td>
<td>13,688</td>
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<td>Alfalfa</td>
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<td>10,950</td>
<td>2,190</td>
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<td>Miscanthus</td>
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<td>10,950</td>
<td>913</td>
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<td>Small Grain Straw</td>
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<td>10,950</td>
<td>5,475</td>
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<tr>
<td>Short Rotation Willow</td>
<td>10 %</td>
<td>10,950</td>
<td>2,736</td>
<td>12 T/A [3 yr]</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>100 %</strong></td>
<td><strong>109,500</strong></td>
<td><strong>44,164</strong></td>
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# Harvest Schedule

## Prairie Skies Bio-Refinery Feedstock Supply Harvest Schedule

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<td>Wheat Straw</td>
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<td>Corn Stover</td>
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L Meschke Photo
Targeting Acres

Crop Equivalent Ratings for the Madelia Fuelshed

CER
- Not formed
- 0.1 - 20.0
- 20.1 - 40.0
- 40.1 - 60.0
- 60.1 - 80.0
- 80.1 - 100.0

Legend:
- North Arrow
- Scale (0 - 20 miles)

Locations:
- Madelia
- New Ulm
- Sleepy Eye
- Mankato
- Saint James
- Winnebago
Potential Ecological Uplifts:
- Sediment, N & P Reduction
- Water Storage Increased
- Wildlife & Pollinator Habitat
- Carbon Sequestered
- GHG Reduced

* Compare economics of corn production on *marginal lands* to dedicated energy crop economics.
What are we paying for?

- **More Pollinators**  
- **Pollinator Habitat**  
- **Land & Plants**

- **Added Ecological Value**
- **Installed Practice**
- **Natural Infrastructure**
Stacking/Bundling Credits

- Sediment Filtered
  - Added Ecological Value

- Phosphorous Reduced
  - Added Ecological Value

- Carbon Sequestered
  - Added Ecological Value

- Vegetated Buffer
  - Installed Practice

- Land & Plants
  - Natural Infrastructure
Prairie Skies Bio-Energy Project

Feedstocks
- Native Grasses
- Woodies
- Alfalfa
- Miscanthus
- Corn Stover
- Straw

Torrefaction
- Universal Feedstock
- Higher Energy Density
- Hydrophobic
- Eliminates Biological Activity
- Heat/Steam Co-Product

High Pressure Gasification
- Syngas
- Electricity
- Heat/Steam

Bio-Fuels Refinery
- D-4814 Gasoline
- D-975 Diesel
- Anhydrous Ammonia

Multiple Feedstocks
- Targeted to Marginal Lands
- Co-Located Next To A Major Agricultural Processor
- Supports Rural Economies

Multiple Benefits
- Water Quality
- Wildlife Habitat
- Less GHG
- New Enterprises & Jobs
The End

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