Home-Grown Energy:

An analysis of renewable energy opportunities in Southwestern Wisconsin

Presented by
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University of Wisconsin - Madison
Department of Urban & Regional Planning
Fall 2011 Workshop
What is the plan?

Local renewable energy production

- Investment and innovation
- Economic competitiveness and independence
- Job creation
What is the plan?

**PHASE 1**
- Community Identification

**PHASE 2**
- Site Identification

**PHASE 3**
- Project Implementation
Identify communities ready for renewable energy

- 9 counties
- 274 towns, cities and villages
What is the plan?

Solar
- Photovoltaic
- Thermal

Wind

Biological
- Biomass
- Biogas
Who is involved?

Southwest Badger Resource Conservation & Development Council

Southwestern Wisconsin Regional Planning Commission

Wisconsin Extension

Multiple other stakeholders
## Why is the plan important to the region?

<table>
<thead>
<tr>
<th>Demographic Category (2010)</th>
<th>Southwest Wisconsin</th>
<th>State of Wisconsin</th>
</tr>
</thead>
<tbody>
<tr>
<td>% population over 65</td>
<td>14.9%</td>
<td>13.7%</td>
</tr>
<tr>
<td>Median income</td>
<td>$46,384</td>
<td>$49,994</td>
</tr>
<tr>
<td>% increase in population since 2000</td>
<td>6.3%</td>
<td>6.0%</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>7.3%</td>
<td>8.3%</td>
</tr>
</tbody>
</table>

## Why is the plan important to the region?

<table>
<thead>
<tr>
<th>Agricultural Measure</th>
<th>Southwest Wisconsin</th>
<th>State of Wisconsin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of farms (2007)</td>
<td>15,707</td>
<td>78,463</td>
</tr>
<tr>
<td>Number of farms (% change 2002 to 2007)</td>
<td>+10%</td>
<td>+2%</td>
</tr>
<tr>
<td>Acres of farmland (2007)</td>
<td>~3 million</td>
<td>~15 million</td>
</tr>
<tr>
<td>Acres of farmland (% change 2002 to 2007)</td>
<td>-1%</td>
<td>-3%</td>
</tr>
</tbody>
</table>

*Source: USDA 2007 Census of Agriculture*
Why is the plan important to the region?

Resources

Kickapoo River Valley

Photo Credit: Emily Mills
http://www.flickr.com/photos/emilymills/1465314307/

Farmland

Adding Value
Why is the plan important to the region?

Innovation

http://www.soldiersgrove.com/

Organic Valley and Gundersen Health System Break Ground on Cashton Greens Wind Farm, Wisconsin’s First Community Wind Project

La Farge and La Crosse, Wis. - November 14, 2011

Why is the plan important to the region?

Money Leaving Wisconsin to Pay for Imported Coal

INDEPENDENCE

TOP TEN REASONS To Buy Local.

1. Strengthen your local economy.
2. Reduce climate change impacts.
3. Support community groups.
4. Keep our community unique.
5. Create more good jobs.
6. Get better service.
7. Invest in your community.
8. Buy what you need. Don’t buy the hype.
9. Put your taxes to good use.
10. Encourage local prosperity.

Photo Credit: Jason Taellious
http://www.flickr.com/photos/dreamsung/2776853983/
Economic Impact – Current Biogas

<table>
<thead>
<tr>
<th>State (# of projects)</th>
<th>Increase in State Economic Impact</th>
<th>Increase in Personal Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wisconsin (26)</td>
<td>$2.6 Million</td>
<td>$2 Million</td>
</tr>
<tr>
<td>Minnesota (6)</td>
<td>$600,000</td>
<td>$468,000</td>
</tr>
<tr>
<td>Pennsylvania (22)</td>
<td>$2.2 Million</td>
<td>$1.71 Million</td>
</tr>
<tr>
<td>California (11)</td>
<td>$1.1 Million</td>
<td>$858,000</td>
</tr>
<tr>
<td>Illinois (3)</td>
<td>$300,000</td>
<td>$234,000</td>
</tr>
</tbody>
</table>

Montfort Wind Farm

- 6 People
- 15 Acres
- 20 Turbines
- 30 Mega Watts
### Economic Impact – Montfort Wind Farm

<table>
<thead>
<tr>
<th>Economic Impact</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Taxes</td>
<td>$58,170</td>
</tr>
<tr>
<td>Land Lease</td>
<td>$90,000</td>
</tr>
<tr>
<td>Estimated Jobs</td>
<td>180</td>
</tr>
<tr>
<td>Estimated Economic Impact</td>
<td>$70 million to local economies</td>
</tr>
</tbody>
</table>

RENEWABLE ENERGIES
Solar PV

Organic Valley, Vernon County

Solar Thermal

Seven Seeds Farm, Iowa County
### Solar PV

<table>
<thead>
<tr>
<th>Pro</th>
<th>Con</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can use most open areas (rooftops, fields, yards)</td>
<td>Limited by sun (weather and seasons)</td>
</tr>
<tr>
<td>Good infrastructure support</td>
<td>State-wide incentives revoked</td>
</tr>
<tr>
<td>Income stream through energy buybacks</td>
<td>Higher upfront costs</td>
</tr>
</tbody>
</table>

### Solar Thermal

<table>
<thead>
<tr>
<th>Pro</th>
<th>Con</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower upfront costs than PV</td>
<td>No direct earning</td>
</tr>
<tr>
<td>Faster economic payback period</td>
<td>Limited by sun (weather and seasons)</td>
</tr>
<tr>
<td></td>
<td>State-wide incentives revoked</td>
</tr>
</tbody>
</table>
Wisconsin solar potential: approximately 4.5 kWh/sq. m/day
# Wind

## Montfort Wind Farm, Iowa County

<table>
<thead>
<tr>
<th>Pro</th>
<th>Con</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generates significant energy, profit</td>
<td>Large upfront costs</td>
</tr>
<tr>
<td>Income to landowners as land lease</td>
<td>Wind not available in all southwestern WI</td>
</tr>
<tr>
<td></td>
<td>Uncertain political landscape</td>
</tr>
<tr>
<td></td>
<td>Property rights concerns</td>
</tr>
</tbody>
</table>
Wind Energy Potential

6.5 m/s → threshold for viability
Wind Energy Potential
Wisconsin
Bioenergy Process

- **BIOMASS**
  - MANURE
  - STOVER
  - WOOD
  - WASTEWATER
  - FOOD WASTE

- **CHEMICAL PROCESSING**
  - ANAEROBIC DIGESTION

- **DIRECT FIRING**

- **COMBUSTION**

- **ENERGY!**
  - BIOFUELS
  - BIOPOWER
  - BIOPRODUCTS

Seven Seeds Farm, Iowa County
Biological Energy

Combustion

Rockbridge Sawmill, Richland County

Biogas

Gundersen Lutheran, Lafayette County
## Biological Energy

### Combustion

<table>
<thead>
<tr>
<th>Pro</th>
<th>Con</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses waste products</td>
<td>Requires utility cooperation</td>
</tr>
<tr>
<td>Good infrastructure support</td>
<td>Need for training and maintenance labor</td>
</tr>
<tr>
<td>Can retrofit existing power plants</td>
<td>Air pollution concerns</td>
</tr>
</tbody>
</table>

### Biogas

<table>
<thead>
<tr>
<th>Pro</th>
<th>Con</th>
</tr>
</thead>
<tbody>
<tr>
<td>Added savings from waste management</td>
<td>High upfront cost, variable input value</td>
</tr>
<tr>
<td>Creation of secondary products</td>
<td>High upfront cost, variable input value</td>
</tr>
<tr>
<td>Can use variety of inputs</td>
<td>Slurry lines are expensive</td>
</tr>
<tr>
<td></td>
<td>Hauling inputs can be a nuisance and generate traffic</td>
</tr>
</tbody>
</table>
Biomass Energy Potential

Biomass Resources of the United States
Total Resources by County

This study estimates the biomass resources currently available in the United States by county. It includes the following feedstock categories: crop residues (5 year average: 2003-2007), forest and primary mill residues (2007), secondary mill and urban wood waste (2002), methane emissions from landfills (2006), domestic wastewater treatment (2007), and animal manure (2002). For more information on the data development, please refer to http://www.nrel.gov/docs/fy08osti/39181.pdf. Although, the document contains the methodology for the development of an older assessment, the information is applicable to this assessment as well. The difference is only in the data's time period.

NREL

This map was produced by the National Renewable Energy Laboratory for the U.S. Department of Energy.

Author: Billy Roberts - September 23, 2009
METHODOLOGY & RESULTS
Methodology

Quantitative

Qualitative

Identification of Potential Renewable Energy Opportunities
# Existing Plans & Other Research

## Existing Plans

<table>
<thead>
<tr>
<th></th>
<th>Title</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Burlington Municipal Development Plan</td>
<td>Burlington, VT</td>
</tr>
<tr>
<td>2</td>
<td>Climate Action Plan</td>
<td>Chicago, IL</td>
</tr>
<tr>
<td>3</td>
<td>Colorado Climate Action Plan</td>
<td>Colorado</td>
</tr>
<tr>
<td>4</td>
<td>The Lake and Peninsula Borough Regional Energy Plan</td>
<td>Alaska</td>
</tr>
<tr>
<td>5</td>
<td>Renewable Energy Assessment</td>
<td>New York</td>
</tr>
<tr>
<td>6</td>
<td>PLANYC</td>
<td>New York, NY</td>
</tr>
<tr>
<td>7</td>
<td>Pioneer Valley Clean Energy Plan</td>
<td>Massachusetts</td>
</tr>
<tr>
<td>8</td>
<td>Climate Action Plan</td>
<td>San Francisco</td>
</tr>
<tr>
<td>9</td>
<td>“Seattle, a Climate of Change”</td>
<td>Seattle, WA</td>
</tr>
<tr>
<td>10</td>
<td>Comprehensive Energy Plan, Vermont’s Energy Future</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Regional Energy Plan Report</td>
<td>San Diego, CA</td>
</tr>
<tr>
<td>12</td>
<td>Monterey Bay Regional Energy Plan</td>
<td>California</td>
</tr>
</tbody>
</table>
Existing Plans & Other Research

- Previous attempts
- BUT ...
  - Efficiency v. new projects
- New territory
Words are Great
but numbers
STRENGTHEN
SUPPORT
Getting the data

- Drove quantitative analysis
- Valuable asset
Making Sense of the Data

- Method to madness?
- Units?
- Relevance?
- Meaningful classifications
# Opportunity Assessment

<table>
<thead>
<tr>
<th>Physical</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bio</strong></td>
<td><strong>Wind</strong></td>
</tr>
<tr>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td><strong>Gotham</strong></td>
<td>X</td>
</tr>
<tr>
<td><strong>Onalaska</strong></td>
<td>X</td>
</tr>
<tr>
<td><strong>Reedsburg</strong></td>
<td>X</td>
</tr>
<tr>
<td><strong>Etc.</strong></td>
<td>X</td>
</tr>
</tbody>
</table>
Physical Indicators for Solar Energy

SOLAR POTENTIAL
The solar potential for the nine county region is uniform at 4-5 kWh/m².
Physical Wind Indicators

- **High Potential** (6.5 > m/s at 80 meters)
- **Low Potential** (6.5 < m/s at 80 meters)
Highlighted Communities
Pecatonica River Valley

Darlington, Blanchardville, Argyle, Lafayette County
Overview and Opportunities

- Social
  - Residential solar
  - Public/private local interest
- Bioenergy
  - Dairy farms
  - Corn stover
  - Sewage treatment plant
- Wind energy
  - Military Ridge
Baraboo Hills

Baraboo, Reedsburg
Sauk County
Overview and Opportunities

- History of land ethic
- Natural resource tourism and amenities
- Large-scale food processing plants
- St. Claire hospital
La Crosse,
Onalaska
La Crosse County
Overview and Opportunities

- Urban center
- Infrastructure
- Private leadership
- Biodigestion
- Biomass
Some considerations…

Our Analysis

- Data availability
- Time frame
- Survey non-response
- Privacy issues
- Scale
Some considerations...

Future Project Feasibility

- Policy
- Physical resources and barriers
- Public acceptance
- Time
- Money
Next steps

Network-building

ID potential projects in ready communities → Analyze fatal flaws → Site analysis and identification

Project implementation

PHASE 2

PHASE 3
The take away...

What’s happening now in the region?

What are opportunities for growth?

How can we make the most of these opportunities?

Montfort Wind Farm, Iowa County
Thank you!

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