
Minnesotan’s Past

A. Peat
B. Fiber
C. District Steam Heat
D. Solar
E. Prairie Island Mandate

Peat

- The state has taken an interest in peat development going back decades
- The DNR initiated the Minnesota Peat Program and Peat Inventory Project.
- Minnesota has 7.5 million acres of peat lands that comprise 14% of the land base of the state.
- Minnesota possesses 4% of the world peat resources in an amount comparable to Sweden, Poland, and Ireland

Peat (Continued)

- Minnesota has the 5th largest peat resource in the world (Russia is first, Canada 2nd, Finland is 3rd and Sweden is 4th)
- The world peat resource equals 70 billion tons of oil
- US reserves of peat equal 1/3rd the combined national oil and gas reserves, and half this reserve is located in Minnesota.
- Large power plants consume more than 70% of the fuel peat produced in the world.
- Peat is not considered renewable
- However, it has a low sulfur content.
Renewable Energy and State Government:
Past, Present and Future

Fiber/Wood

• Prior to 1970, wood for residential heating was nearly 200,000 cords.

• From 1970 to 1975, fuel wood consumption increased rapidly.

• The DNR in the first half of the 1980's installed wood burning systems at eight sites.

• Over 200 commercial and industrial scale facilities used fiber fuel energy by the mid-1980's.

District Heating

• Generally district heating systems were installed during the first 30 years of the 1900s
• Termination of the systems occurred during the latter half of the 1970's.
• Lower natural gas and home heating oil prices reduced interest in these systems.
• In 1980, Minnesota had 15 municipal district heating systems.
• This is roughly half the number that once operated.
• Studies of these systems found cities generally keeping the boiler and electric generating systems working well.
District Heating (Continued)

- Maintaining distribution systems was the main problem for municipal utilities.
- In 1985, Legislation created state loans for the design costs

Solar, Wind, Ethanol and Other Alternative Energy

- In 1978, the legislature enacted residential energy efficiency standards.
- Property tax exemptions were provided for alternative energy systems.
- The Metropolitan Council was required to consider access to sunlight in its land use plans.
- In 1979, a state income tax credit for renewable energy systems (solar, wind, and biomass conversion) and earth sheltered housing during taxable years 1979 through 1982.

Solar, Wind, Ethanol and Other Alternative Energy

- The market value of solar, wind, or agriculturally derived methane gas systems excluded from property tax.
- Solar easement's could be negotiated
- Renewable energy systems in plans for all new state buildings or renovations, 1979 laws.
- In 1982, the Legislature established wind easements.
- In 1986, the Legislature created an ethanol development fund, and used it to make payments to producers of ethanol.
- The 20-cent ethanol producer payment began

1994 Prairie Island Renewable Energy Mandates

- The agreement allowing storage of Nuclear Waste in Dry Casks as Prairie Island imposed three renewable and alternative energy mandates on Xcel
  - Wind
  - Biomass
  - Investment in renewable development

Wind
- 425 megawatts of wind energy capacity by December 31, 2002
- Additional 400 megawatts if ordered by PUC
1994 Prairie Island Renewable Energy Mandates

• PUC ordered Xcel to obtain that additional 400 megawatts by 2012
• Xcel had 480 megawatts under contract by the end of 2002

Biomass
• 125 megawatts of biomass capacity by December 31, 1998 (reduced to 110 Mw in the 2003 Prairie Island bill)
• FibroMinn: 50 Mw – poultry litter (increased to 55 Mw in the 2003 bill)
• EPS/Beck: 50 Mw – whole tree (changed to Hibbing/Virginia municipal utility joint venture at 35 Mw in 2003 bill)
• St. Paul Cogeneration: 25 megawatts – waste wood

1994 Prairie Island Renewable Energy Mandates

- Investment in renewable development
- “Renewable Development Fund”
- Not state money – internal Xcel fund
- Projects approved by PUC
- $500,000 per cask per year
- $8.5 million annually
- PUC approved first round of projects in 2002

Minnesota’s Present

Minnesota Is National Leader in Renewable Fuels

- A. Renewable Fuel Standard
- B. Wind
- C. Ethanol
- D. Biodiesel
Renewable Energy and State Government:
Past, Present and Future
Renewable Fuel Standard

- Current law requires Minnesota utilities make a "good faith effort" to procure from renewable sources
- Goal is 10 percent of the utility's total retail electric sales by 2015
- Xcel has to provide 1,125 MW of wind by 2010 and 110 MW of biomass by 2002
- Xcel is required to contribute to a Renewable Development Fund
- Low-interest loan programs are available to farmers developing renewable energy projects through the MN Dept of Ag Rural Finance Authority

Wind

- Minnesota has substantial wind resources

Wind

Tax exemptions:
• exempts construction costs of wind facilities from sales tax
• exempt from the property tax real and personal property of a wind facility, except land
• exempts wind facilities located in Job Opportunity Building Zones from the wind energy production tax
Wind

Renewable Energy Production Incentives:

- Payments of 1.5 cents per kilowatt-hour for ten years to small wind generators (generally, under 2 Mw), owners of qualified hydroelectric dams, and farm anaerobic digesters. (Changed in 2005 to as little as 1 cent per Kwh).
- Annually allocates $4.5 million from the renewable development account to fund wind production incentives, and
- Up to $1.5 million to fund incentives for other renewable fuels.

Wind

- Xcel Energy is mandated to construct or purchase 1,125 MW of wind by 2010
- Xcel currently has over 900 Mw under contract.
- Minnesota has net metering (retail and average retail rates) for sub 40 Kw systems

Ethanol

- The main components of the Minnesota Ethanol Program are:
  1. An oxygenated fuel statute that requires state-wide oxy-fuel (ethanol blend) use;
  2. A 13 cent per-gallon ethanol producer incentive

- By 2002:
  ♦ $550 million was spent for total corn/ethanol plant construction
  ♦ $370 million in private sector financing
  ♦ $180 million in local equity capital
  ♦ $200 million worth of corn was committed for processing annually
Ethanol

- Results from 2002 MDA report:
  - 1. 120 million bushels of corn (12 percent of Minnesota’s crop) is made into ethanol and livestock feed (2002);
  - 2. Minnesota's 14 plants produced 300 million gallons of ethanol in 2002;
  - 3. Nearly 10% of our gasoline is being replaced by ethanol each year; and
  - 4. The Twin Cities Area met EPA's carbon monoxide standard and has achieved "attainment" status

Ethanol

- Ethanol has its Detractors; The Issue is Energy Balance.
  - In 2004, Professor David Pimentel of Cornell reported a ethanol net energy loss of 29%.
  - Professor Pimentel's claims are not new. A 1998 report by Professor Pimentel also concluded that ethanol is a net energy loser.

Ethanol

• Other Credible Researchers Disagree with Professor Pimentel.
  – Argonne National Laboratory researchers concluded Pimentel’s assessment relied on old data from the 1970s and early 1980s, not the 1990s.
  – Colorado School of Mines researcher, also reports that Pimentel used old estimates (from 1979) to calculate ethanol energy usage.
  – USDA Finds Positive Energy Balance for Ethanol. The USDA Reports Ethanol has a Positive Energy Balance of 1.67 to 1.

• Compare the Energy Balance of Gasoline. A report by the Minnesota Department of Agriculture, when taking into account the energy needed to extract, transport and refine crude oil into gasoline, the final energy product of gasoline has an energy ratio of 0.805, half that of ethanol.

Ethanol

• **Ethanol’s Energy Balance Continues to Improve.** One bushel of corn now yields at least 2.8 gallons of ethanol -- up from 2.5 gallons just a few years ago.

• **Another Concern is that Ethanol Requires Too Much Agricultural Production.** Pimentel’s report calculated that fueling all automobiles with 100% ethanol would tie up about 97% of U.S. land area for corn crops.

• **But Agricultural Production Efficiency has Improved Dramatically.** Since 1980, planted corn acreage has been a nearly constant 73 million acres. The corn yield in 2000 increased from 91 bushels per acre to 137 bushels per acre.

BioMass/Solar/Biodiesel

- Minnesota is the first state with a biodiesel mandate. A 2% mandate went into effect in September 2005.
- **Biomass and Other Agricultural Resources Tax Exemptions:**
  - Exempts from the property tax attached machinery and other personal property of specific facilities, including the Fibro Minn poultry litter project in Benson and projects proposed by Itasca Power and Rahr Malting.
  - Similar exemption, limited to five years, to any waste wood facility and any facility fulfilling Xcel’s biomass mandate
  - Photovoltaic devices exempt from property and sales taxes

**Minnesota’s Future**

A. 20% Ethanol Content Mandate
B. 20% Renewable Energy by 2020
C. Biodiesel
D. Hydrogen

Ethanol

- 20% Ethanol Mandate enacted in 2005.
- Builds on current law that requires 10% ethanol blend in gasoline
- New mandate can be met through increased use of E-85 in Flexible Fuel Vehicles.
- But real future may be in new ways of producing Ethanol. Current plants use corn, produces ethanol from corn starches. But corn is food. Has many uses. Many competing products.
- There is competition from sugarcane and other plants that produce more ethanol per acre.
- New technology is being developed to convert cellulosic fibers to ethanol.
- Cellulosic ethanol means plants like switchgrass, native plants, brush, crop residues, wood can be used increasing the feedstock and potentially reducing the cost of ethanol production.
Senator Dayton & Representative Welti Promote E85

20% Renewable Energy

- Minnesota has a huge renewable energy potential.
- Minnesota has the technical potential to generate more than 13 times its current electricity needs from renewable energy.
- Under a national 20 percent RES, Minnesota would increase its total home-grown renewable power to more than 4,750 megawatts (MW) by 2020.
- There is a proposal now, House File 2532 to establish a higher state standard---20 percent by 2020—and makes it mandatory for all utilities
- The bill authorizes the PUC to impose financial penalties on utilities
- One study has already found that 20 percent penetration of wind power on the electricity grid is competitive with new coal.
- Wind power displaces the use of expensive, imported natural gas.
- One big wind turbine operating at the University of Minnesota at Morris provides 60 percent of the school's power needs.
Renewable Electricity Standards

- Nevada: 20% by 2015, solar 5% of annual
- Minnesota: 19% by 2015*
- Iowa: 2% by 1999
- Wisconsin: 2.2% by 2011
- Montana: 15% by 2015
- Illinois: 8% by 2013**
- New York: 24% by 2013
- Maine: 30% by 2000
- MA: 4% by 2009
- RI: 16% by 2009
- CT: 10% by 2010
- NJ: 6.5% by 2008
- DE: 10% by 2019
- Maryland: 7.5% by 2019
- Washington D.C.: 11% by 2022
- Pennsylvania: 8% by 2020

*Includes requirements adopted in 1994 and 2003 for one utility, Xcel Energy.
**No specific enforcement measures, but utility regulatory intent and authority appears sufficient.

- California: 20% by 2017
- Arizona: 1.1% by 2007, 60% solar
- Texas: 5,880 MW (~4.2%) by 2015
- New Mexico: 10% by 2011
- Colorado: 10% by 2015
- Hawaii: 20% by 2020

**Biodiesel**

- The state biodiesel production will continue to expand.
- No certainty additional legislative action will be needed to create a market for it.
- High diesel prices may be adequate to create demand for soy-based diesel, and diesel from other vegetable and fat sources.

Hydrogen and Beyond

- On Nov 29, the second annual research symposium of the Initiative for Renewable Energy and the Environment at the University of Minnesota presentations related to research projects that may give a hint to the future. IREE has received funding for the legislature, and particularly from the Renewable Development fund as part of the 2003 legislation giving Xcel additional storage capacity for nuclear waste at its nuclear power plants along the Mississippi River.

Hydrogen and Beyond

- IREE projects include:
- Solar Energy and Advanced Energy Efficient Roof Systems
- Transition Roadmap Toward a Carbon-Neutral Energy System for the Upper-Midwest Region
- Development of Commercially Transferable Thermochemical Conversion Technologies
- Renewable Hydrogen Energy for the Farm
- Biocatalysis for Detoxifying Nitrogenous Waste and Producing Gasoline-type Fuels
I've traded in my gas guzzler for a Mustang.

Why?

Hay is cheaper than gas.