

Clean Energy Resources Teams

Clean Energy Technologies & Opportunities – We Need You!

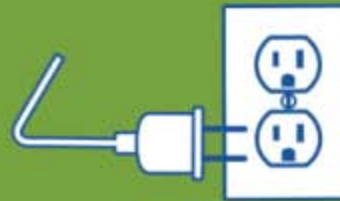
Collage of Sustainability Symposium presentation



LEARN



CONNECT



ACT



www.CleanEnergyResourceTeams.org



Our Mission

Connecting you and your community with the resources you need to identify and implement community-scale energy efficiency and renewable energy projects



What We're All About



Bringing people together to create change:

- Conservation, efficiency and renewable energy are something most folks can agree upon
- Everyone can take some action NOW
- Individual actions can scale up – to businesses, communities and beyond



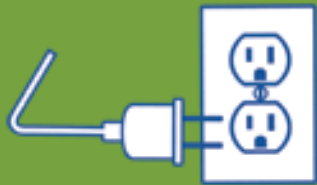
What do we do?

LEARN



- Host meetings, workshops, networking sessions
- Write case studies, project planning guides and people profiles

CONNECT

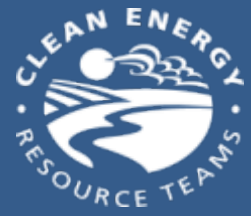


- Connect people to technical resources and assistance
- Provide seed grant funding & connections to funding opportunities

ACT



- Help organizing your community
- www.cleanenergyresourceteams.org
- Spur other statewide programs

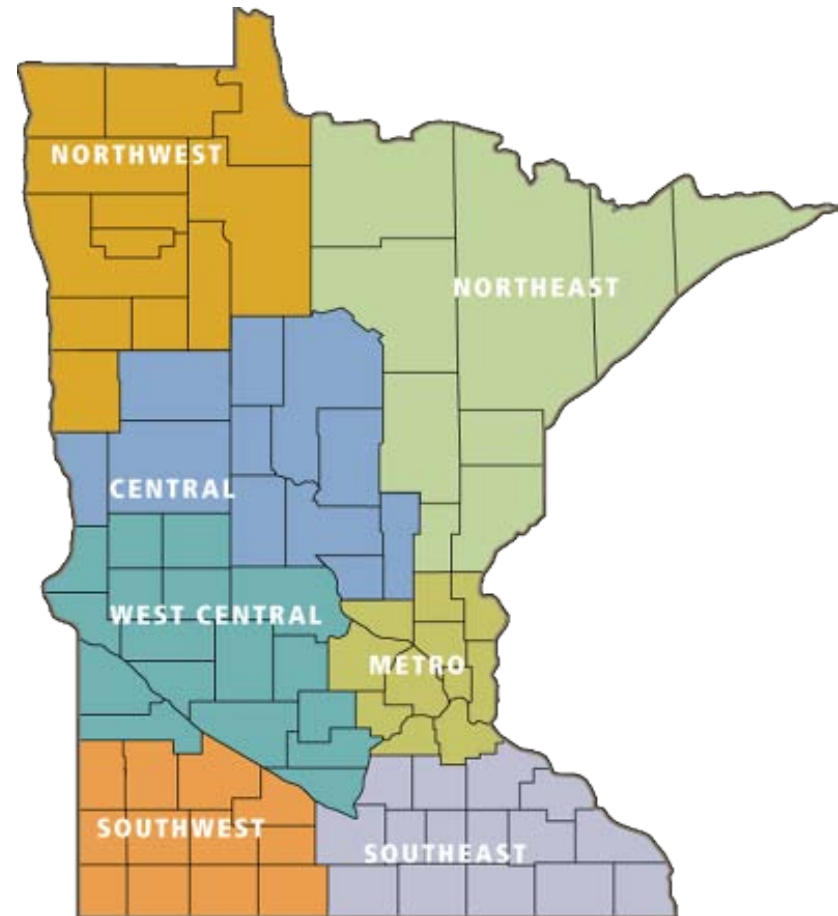


How We Work: Our Teams

Steering Committees: one per region; governing body for regional team.

Regional Teams: anyone can join, anytime they want.

- Team members have broad range of backgrounds, interests, skills
- Regions have unique interests based on the energy potential in the region.
- All conduct education and outreach around energy efficiency, renewable energy, and how people can make a difference in their own communities.





Online Resources

LEARN



Search this site >>

- Learn**
Technologies, models, blog, publications
- Connect**
Regions, events, people, groups, social media
- Act**
Campaigns, funding, volunteering
- About**
CERTs details, staff, press, contacts



- Home
- Get Answers Blog
- Technology Resources
- Project Planning Tools
- CERTs-Supported Projects
- Request For Proposals
- Publications
- CERTs Monthly Updates
- Clean Energy Superheroes
- ENERGIZED Documentary
- Glossary

Learn

Share

Learn about technologies and projects that can work for you and your community!

There are many different ways to get started and stay in the loop—whether you're looking for information about a particular technology or about planning projects for your community, we have you covered. You can also browse our publications to find case studies, reports, and presentations that delve deeper into project models and specific issues. And our blog will help you stay current on what's happening across the state in the clean energy realm.



Recent Blog Posts

Community-Based Social Marketing: What it is and what it means to me and you
 Michelle Nguyen | Wed, 10/05/2011 - 11:28am

Community-Based Social Marketing (CBSM) is an approach to achieving broad sustainable behavior in our communities. It combines the knowledge from psychology and social marketing to leverage community members'...

Duluthian Recognized for Exceptional Contributions to Green Building movement
 Dan Thiede | Tue, 10/04/2011 - 11:41am

Duluthian Rick Carter has been named one of 34 of the world's most distinguished green building professionals in September by the U.S. Green Building Certification Institute (USGBCI). Carter, an employee of LHB, an...

Take the Minnesota Energy Challenge to Win Cool Prizes & Compete with CERT Regions
 Joel Hekard | Fri, 09/09/2011 - 1:27pm

CERTs Seed Grants

CERTs is currently accepting proposals for community-based renewable energy and energy efficiency projects. [Apply now](#)

Featured Case Study

Wind Moving Forward in West Central: Damstrom...



helping Minnesota communities determine their energy future

CERTs PARTNERS

- University of Minnesota's Regional Sustainable Development Partnerships
- Funkia Recycling
- Southwest Regional Development Consortium
- The Minnesota Project
- Minnesota Department of Commerce, Division of Energy Resources

CERTs FUNDERS

- Xcel Energy's Renewable Development Fund via Division of Energy Resources
- Bush Foundation
- Environment & Natural Resource Trust Fund



CASE STUDY: EDUCATION - NORTHEAST REGION

Hartley's Energy Explosion: A "Moving" Energy Education

By Christina Eschbach • June 2011

Part of the challenge of teaching is getting students involved and excited about the material they are learning. As science, and especially learning about alternative energy sources becomes more important in today's world, it is more vital than ever that students are learning about renewable energy sources. That's where Energy Explosion comes in.

Energy Explosion began in the 2008-2009 school year as a pilot program at Hartley Nature Center in Duluth to effectively address state educational standards for late elementary, middle school, and high school-aged students through an assessment of renewable energy demonstrations. Hartley Nature Center offers a variety of field trip opportunities for surrounding schools. The Energy Explosion is a special hands-on and exciting presentation about energy.

Energy Explosion demonstrations are also made mobile by an energy education trailer named "Electron." Demonstrations include students volunteers playing musical instruments such as an electric guitar with an amp and an electric keyboard powered by a photovoltaic (PV) solar array, a diesel generator, a small 400 Watt wind turbine, and an energy bike powered by one of their peers.

The mobile unit was the project's oversight leader, Pete Graven's, idea. "The mobility piece was a solution to address the fragmented daily rotation of subjects in middle schools that makes field trips to Hartley logistically difficult," says Pete. "It's an effective way to overcome a common problem with these unique educational opportunities."

After their first successful run, Pete wanted to create an operation manual for outside contractors for the contractors to learn the setup and take down procedures; update the lesson plans; and compile a handy FAQ for when common questions arise. The redesign also incorporated more graphic elements to accompany the demos to literally illustrate the concepts better.



The Energy Explosion "Electron" Trailer with students at Two Harbors High School

As an Energy Explosion demonstration, the instructor talks about how renewable energy sources power the instruments, how much energy is generated by the sources, and the importance of alternative sources of energy in our environment and in communities. The Hartley Nature Center's goal is not only teaching the current (and future) energy consumers about renewable energy sources but teaching about conservation.

Project Snapshot

- Purpose:** Energy Explosion on the Move, a traveling interactive curriculum on alternative energy generation, geared towards 5th and 6th graders
- Community Impacted:** Over 2,000 participants (Lake Harbors High School and Harvestfest Energy Fair) between 2010-11.
- Grant:** \$1,265 NE CERT grant
- Benefits:** Greater access to energy education, an engaging and thoughtful way to demonstrate the value of alternative energy systems



WWW.CLEANENERGYRESOURCETEAMS.ORG



Connect... with people!



CERTs 2011 Clean Energy Convergence





Renewable Energy

- Derived from natural resources that are continually replenished by the earth's systems
- Most come either directly or indirectly from the sun
- Geothermal energy taps the earth's internal heat





Renewables

- **Wind**
- **Solar**
 - Photovoltaic (electricity)
 - Solar Thermal (heat)
- **Biomass**
 - Biogas
 - Biofuels
 - Cogeneration
- **Geothermal**



But Remember: Efficiency First!

- Efficiency improvements **MUST** be the first step in any renewable energy project.
- Estimated \$1 : \$3 savings ratio
- Get an energy audit from your utility's Conservation Improvement Program (CIP) if possible
- Then actually do stuff!





Why Renewable Energy?



- Benefits local communities
- Economic development opportunities
- Local ownership
- Environmental benefits
- System reliability
- Resource diversity



Minnesota Energy Policy 2007

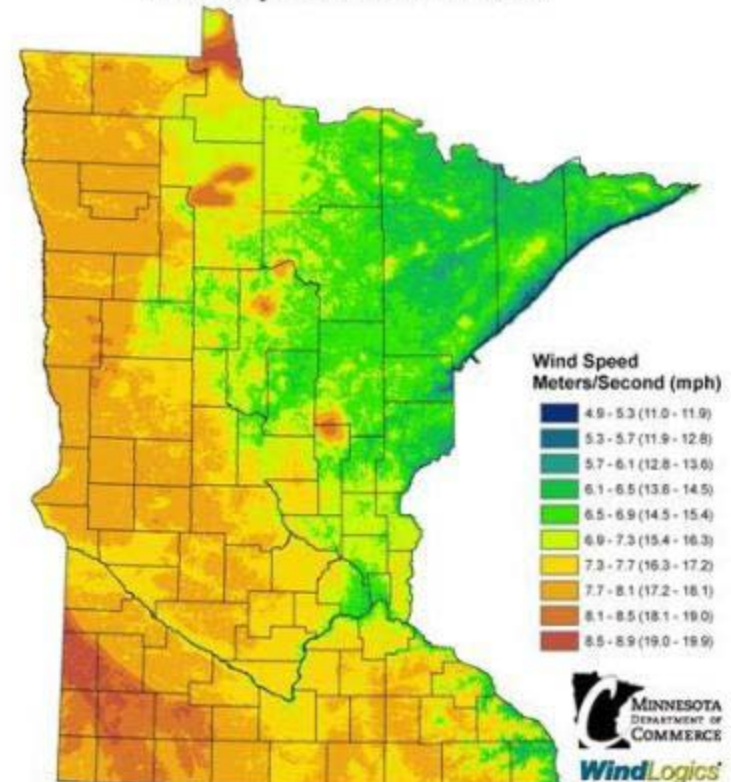
- **Renewable Energy Standard of 25% by 2025**
 - 7% by 2010; 12% by 2012; 17% by 2016
 - 30% by 2020 for Xcel
- **Next Generation Energy Act**
 - Reduce greenhouse gas emissions 80% by 2050
 - Aggressive energy savings goal—1.5% of revenues
 - Community-Based Energy Development Tariff
 - Economy-wide climate change action plan
 - Required reductions in CO₂ from power sector

Wind Energy

Minnesota has tremendous wind potential.

You will need site specific monitoring to determine the best location.

Minnesota's Wind Resource by Wind Speed at 80 Meters



This map has been prepared under contract by WindLogics for the Department of Commerce using the best available weather data sources and the latest physics-based weather modeling technology and statistical techniques. The data that were used to develop the map have been statistically adjusted to accurately represent long-term (40 year) wind speeds over the state, thereby incorporating important decadal weather trends and cycles. Data has been averaged over a cell area 500 meters square, and within any one cell there could be features that increase or decrease the values shown on this map. This map shows the general variation of Minnesota's wind resource and should not be used to determine the performance of specific projects.

January 2006



Large Wind

- Often termed “Utility-scale” electrical production
- Greater than 100 kW – current generation is 2 MW per turbine
- Average cost \$2,000,000 per megawatt





Did you know...

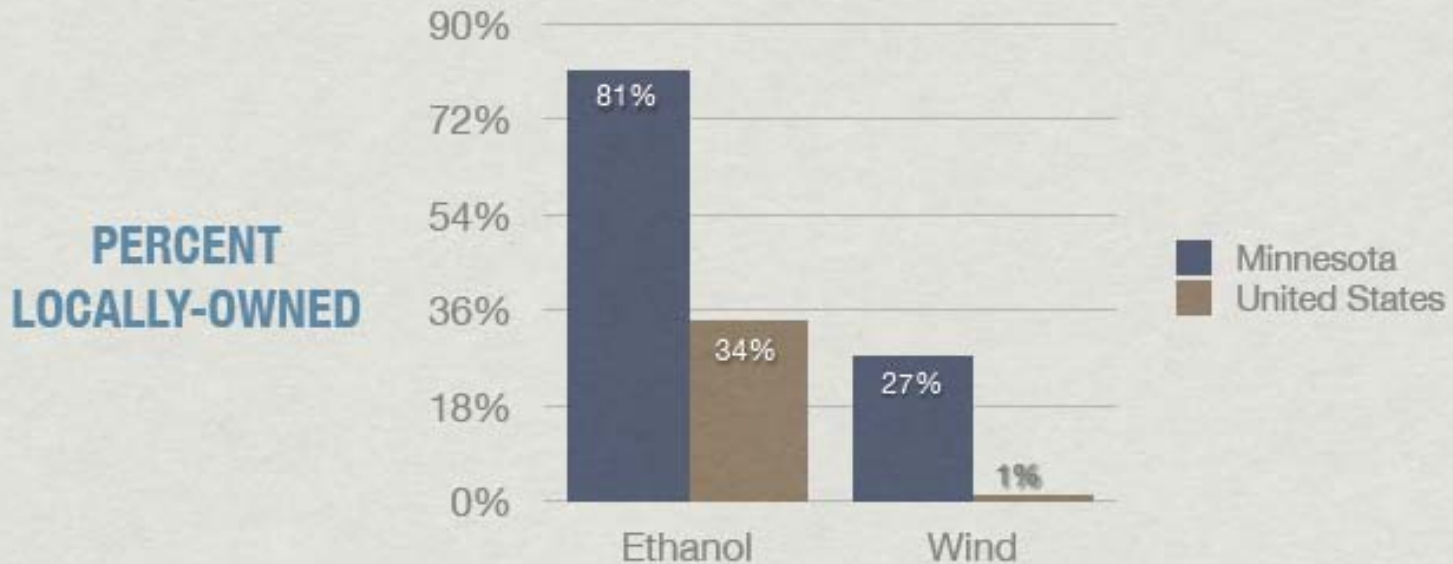
...In the United States during 2007, only 1% of large scale wind projects were locally owned.

In Minnesota, 27% of large scale wind projects were locally owned!





Unifying Message: Economics



- * Wind: owner's net income
 - * 20-year land lease: \$100,000
 - * 20-year ownership: \$1.2 million
- * Ethanol: owner's benefits
 - * 30-40 cents/bushel dividend = \$10,000 per year



Focus on: Wind Ownership Models

- Arne Kildegard of UM Morris examined the comparative costs and benefits between community-owned wind projects and corporate wind projects.
 - *Results indicated a 3 times greater economic benefit from local ownership.*



Small Wind

Small wind = <100 kW

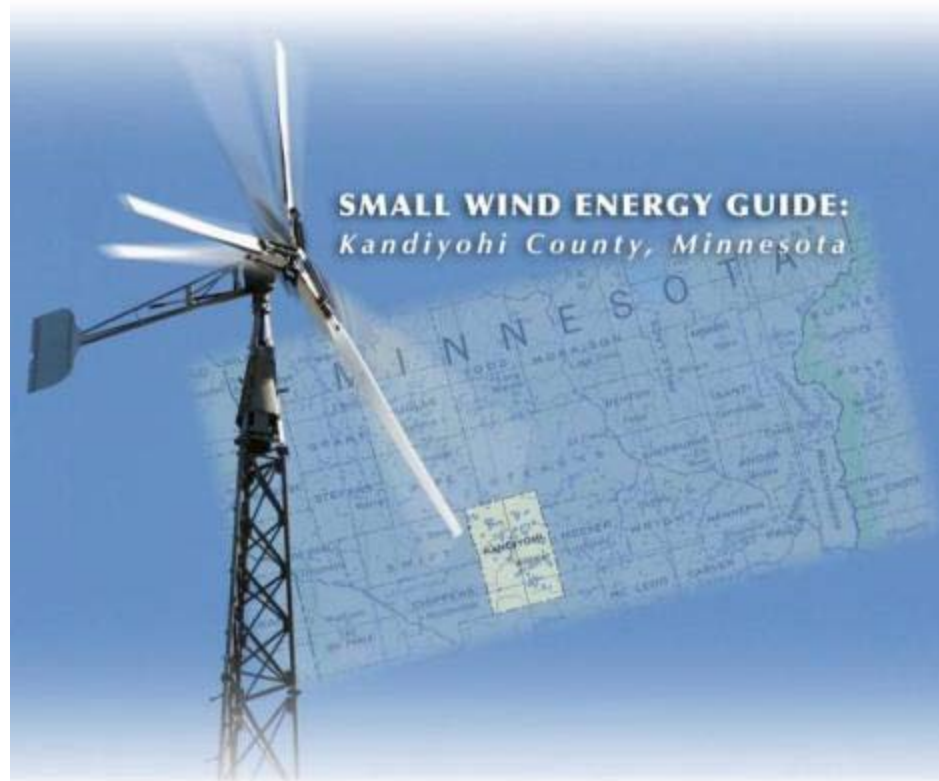
Residential, farm or small business application

- It costs roughly \$3,000-\$5,000 for every kilowatt hour of generating capacity
- Roughly 15-year payback for well-sited systems
- Net metering available for systems <40 kw





Focus on: Kandiyohi County Guide



In 2005 CERTs also worked with partners to create the Model Wind Ordinance



Solar Photovoltaic



- Photovoltaic systems (PV) produce electricity from sunlight
- Benefits? PV system output (sunny summer days) correlates with periods of peak electric demand
- Hurdles? Cost (29 cents residential 19 cents/kWh commercial after federal incentives)...But costs are dropping!
- Return on Investment is determined by net metering prices and incentives available



Focus on: Prairie Woods ELC

The Environmental Learning Center recently installed a two panel solar PV system on their property (in part with funding from the West Central CERT)

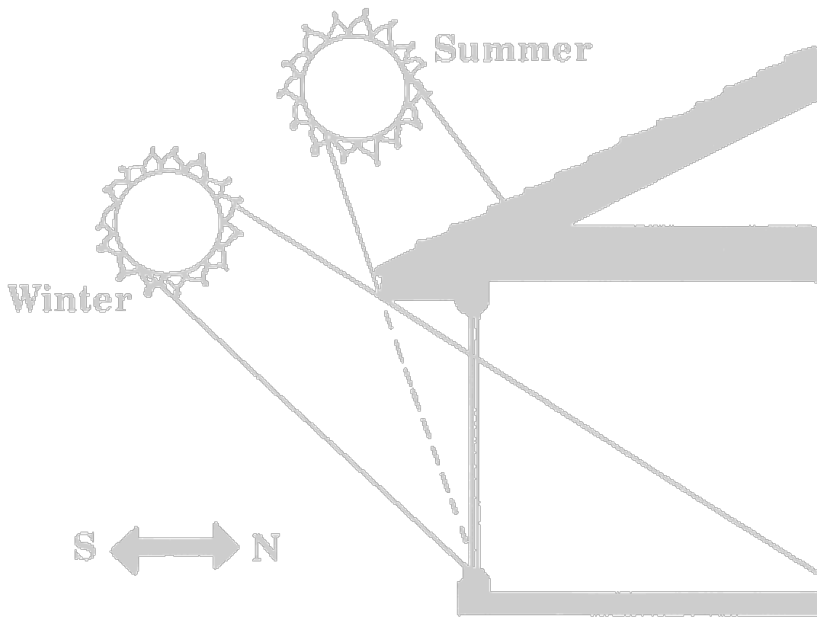
www.prairiewoodselc.org





Solar Thermal & Passive Solar

- Solar thermal – using the sun’s energy to heat water or air.
- Passive solar design integrates a combinations of building features to reduce the need for heating, cooling, and daytime lighting.





Solar Manufacturer – Alexandria

- Manufactures solar thermal collectors, domestic hot water heaters, and space heating systems.

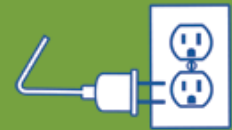


- Two 4'x8' collectors can produce 50% to 70% of the annual hot water needed for a family of four in MN.
- Return on Investment differs for what kind of water heating system you currently use



Solar in Central MN... wow!

CONNECT



Energy when you need it.



RREAL
Rural Renewable Energy Alliance

ZENERGY IS A SERVICE BROUGHT TO YOU BY:

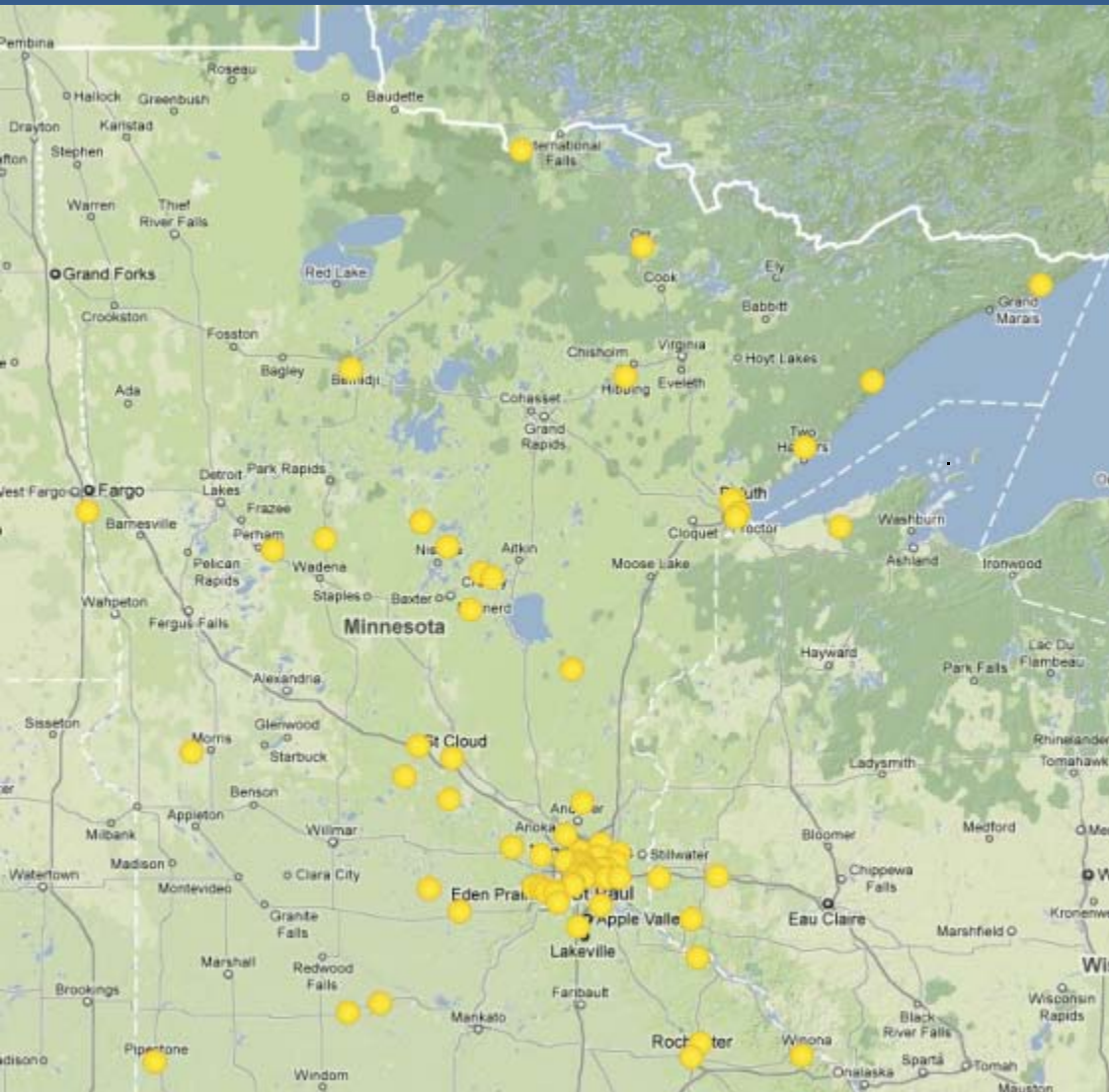
West Central
Telephone Association

Entrepreneurship abounds: RREAL, SolarSkies, Hunt Utilities Group, West Central Telephone, Silent Power



Solar & Small Wind Installers

CONNECT





Focus On: Clean Energy Project Builder

A new online directory to find companies that can help you plan, implement and manage solar and wind energy projects.



CLEAN ENERGY PROJECT BUILDER



Biomass

- Biomass is any organic material not derived from fossil fuels that can be converted to a fuel useful for generating electricity.
- Dedicated crops: woody hybrid poplars, switchgrass, etc.
- Waste products: wood residues, agricultural residues, animal waste Co-firing biomass with coal
- Gasification – community digesters



Focus on: Brooten, MN Digester

In Brooten, MN (Stearns County) a couple has installed a methane digester on their 160 cow dairy farm to turn manure into electricity.

The digester will produce 400 to 460 kWh of electricity per day. 95 kWh will be used per day to operate the system



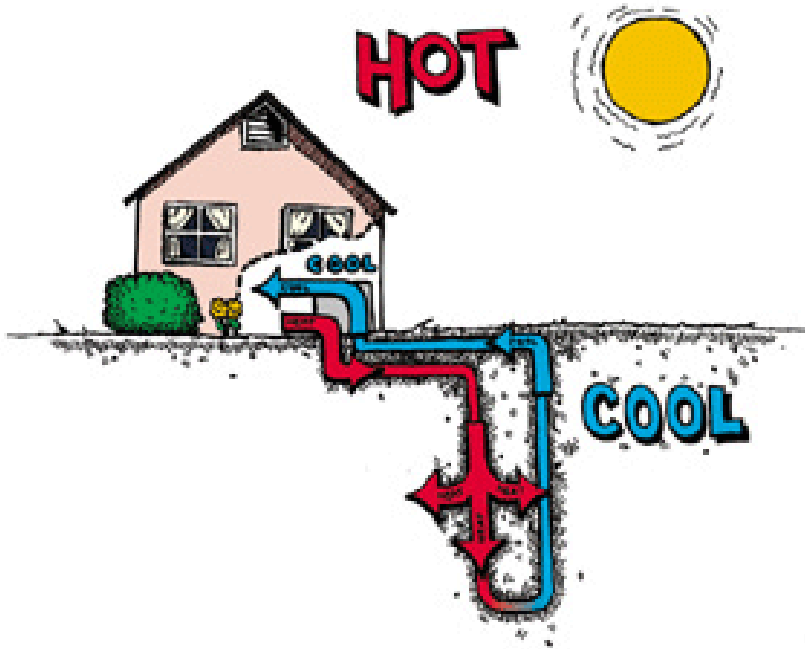


Biofuels

- Generally refers to ethanol and biodiesel that are primarily used in transportation, but can be burned to produce electricity
- Ethanol is generally derived from corn
 - E85 is a blend of 85% ethanol and 15% gasoline
- Biodiesel is generally from soybean oil



Geothermal



This technology uses the earth's constant temperature below the surface to heat or cool a home and to provide hot water.

- A typical 2400 square foot house will need a five ton system;
- Installation cost of the conventional system = \$ 6,500 (LP gas furnace)
- installation cost of the Geothermal system = \$21,000
- Reduction of operating cost per year = \$1,800
- Payback $(21,000-6,500)/ 1,800 = 8.1$ year or 12% Return on Investment



Focus on: ECONAR Heat Pumps

- Located in Appleton and Elk River, MN
- Manufacture ground-source heat pumps designed for MN's cold weather climate.
- ECONAR Geothermal Heat Pumps may qualify for a Federal Energy Tax Credit of up to \$300.



Renewable Energy Resources

- www.eere.energy.gov – Office of Energy Efficiency and Renewable Energy (DOE)
- www.nrel.gov – National Renewable Energy Laboratory



Renewable Energy Resources

- www.cleanenergyresourceteams.org – CERTs
- www.commerce.state.mn.us – Minnesota Division of Energy Resources
- www.mnrenewables.org - Minnesota Renewable Energy Society (MRES)
- www.windustry.org – Windustry
- <http://www.dsireusa.org/> Database for State Incentives for Renewables & Efficiency

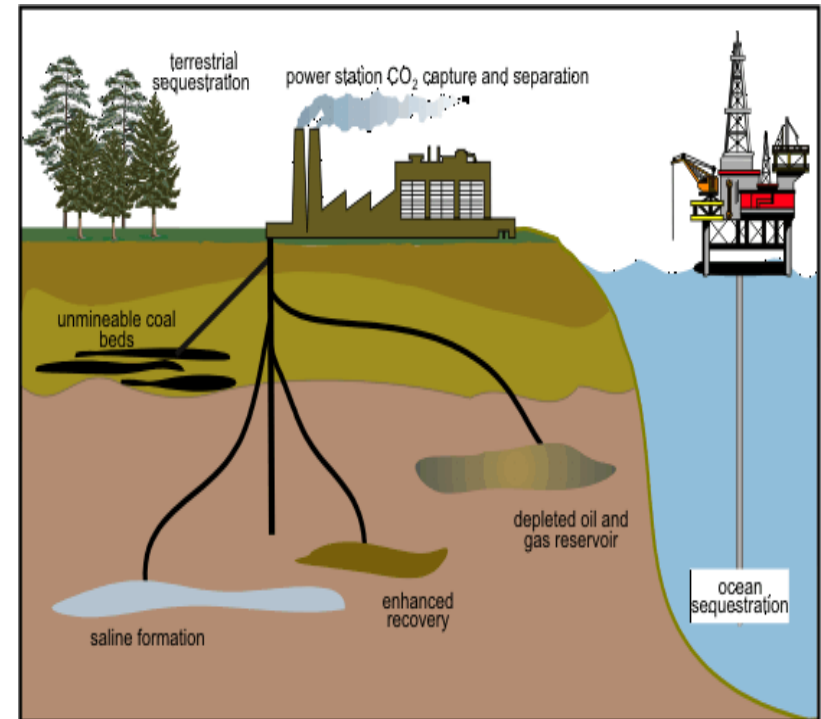


Carbon Sequestration

- Carbon sequestration can be defined as the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere.
- Growing plants sequester carbon from the atmosphere and release it when they decompose unless converted

Mechanisms for Sequestration & Storage

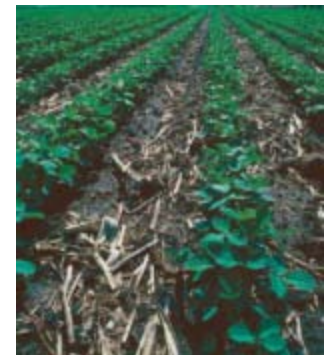
- **Terrestrial Carbon Sequestration**
 - Trees
 - Perennial Grasses
 - Conservation Tillage
 - Methane Capture (Digesters)
- **Geologic Carbon Storage**
 - Secure capture and storage





Terrestrial Carbon Sequestration

- **Trees**
 - Afforestation, Reforestation or Agroforestry
 - Species and age dependent
 - 5.5 mT/acre
- **Perennial Grasses**
 - Deep root systems
 - Mix of species
 - 1.6 mT/acre
- **Conservation Tillage**
 - Low-Till / No-Till
 - .3-1 mT/Acre
 - Controversial
- **Methane Digester**
 - 18.25 mT of CO₂ per ton of methane per year





What are Carbon Credits?

Carbon credits encompass two ideas:

- Prevention/reduction of carbon emissions produced by human activities from reaching the atmosphere by capturing and diverting them to secure storage.
- Removal of carbon from the atmosphere by various means and securely storing it.



Credits

- For carbon sequestered and stored for a defined period of time (15-100 years)
- Forestry credits – net sequestration
 - Carbon sequestered (tree growth, soil storage)
 - Carbon emitted (mortality, harvest, etc.)
 - = Net carbon sequestration above base “business as usual” case (basis for payment)
- Payments based on no. of tons of CO₂ equivalent per year



In Conclusion...

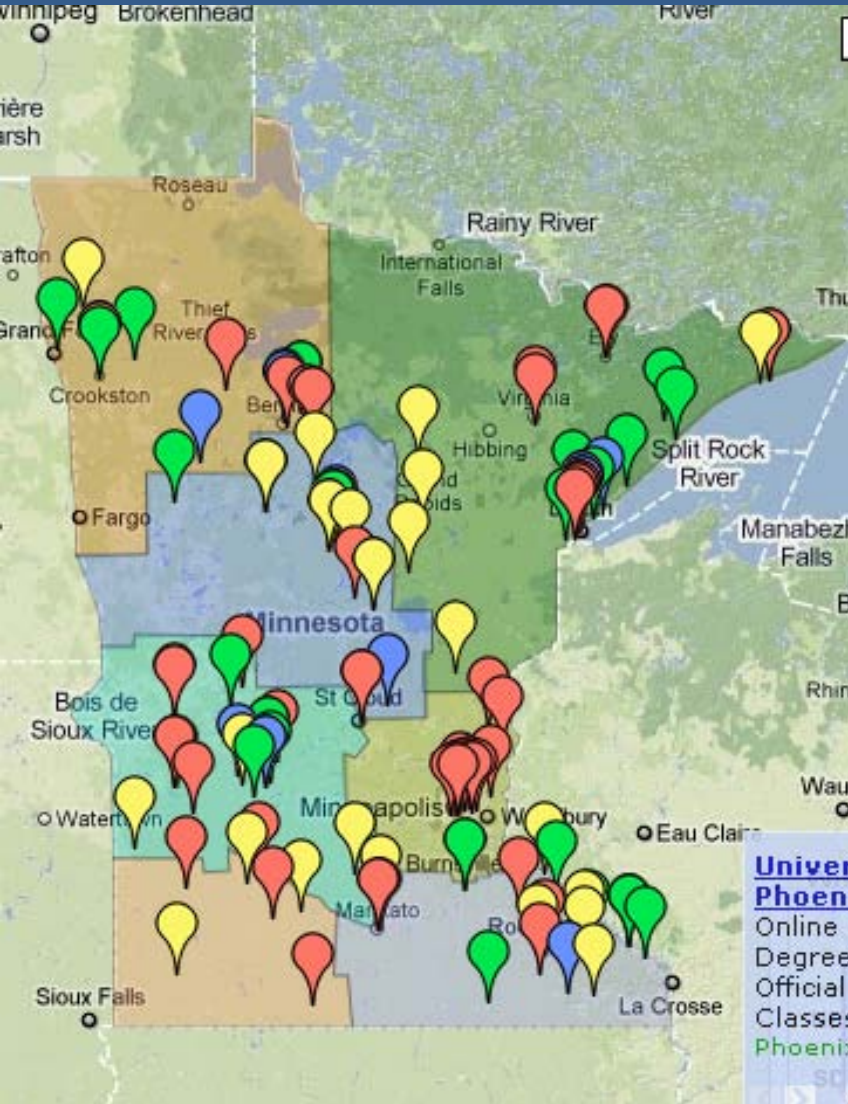
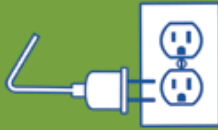
- Energy Efficiency first
- Research the renewable energy system best for you
- Celebrate (and support) the clean energy entrepreneurs in Central Minnesota
- Please join us



Closing Updates from CERTs

- Seed Grants
- GreenStep Cities
- Find local locations for Holiday Light Recycling
- Connect with CERTs!

Seed Grants Available Now!



CERT Seed Grant Funding

- In four funding rounds (2006-2010): over 100 projects!
- Range from community energy efficiency projects to an on-farm oil press to solar on schools
- Funds for labor only to support local jobs



GreenStep Cities



Taking action with proven best practices

GreenStep Cities is an action-oriented voluntary program offering a cost-effective, simple pathway to implementation of sustainable development best practices that focus on greenhouse gas reduction



What makes GreenStep different?

- Focused on Minnesota
- Geared toward smaller cities
- Best practices developed by experts in their fields from MN
- Action oriented
- Allows flexibility with each Best Practice
- Gives credit for actions you've already taken and helps you identify new actions
- Identified real resource people who can help you with each best practice.
- Online case studies to give you examples of how it's worked.



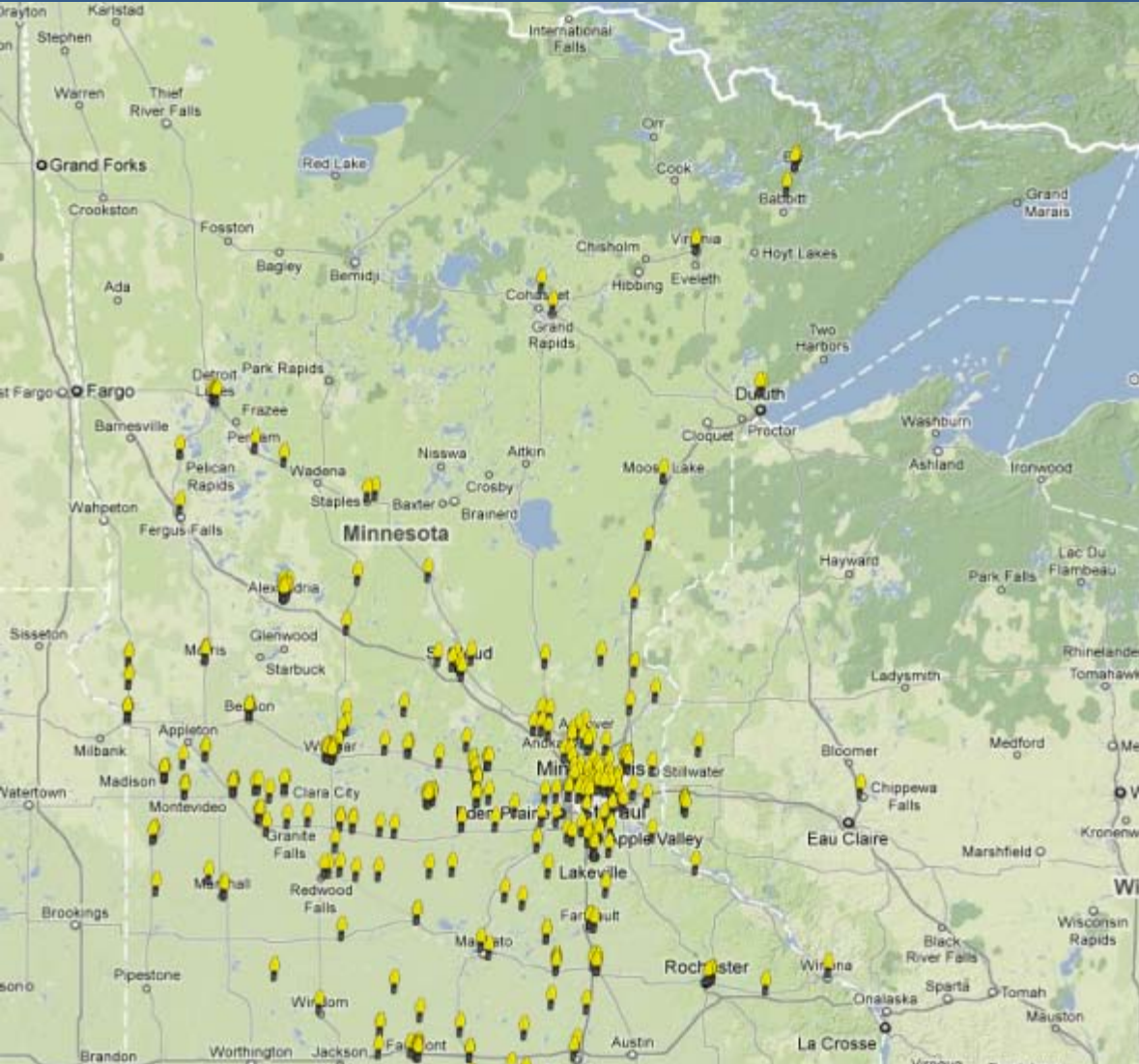
Why would my City do this?

For a healthy, resilient community:

- Cheaper-to-operate & green buildings
- Lower costs to government, business, educational institutions & citizens
- Ecological infrastructure, low-impact development
- Cleaner water, air & viable habitat
- Walkable, bikeable communities and healthier citizens & businesses
- Transportation options that connect jobs & housing
- Local food production
- Local renewable energy production
- More local, green jobs



Holiday Light Recycling



In past two years:

- 280,000 lbs of lights
- Saved 2.7 million kwh
- Saved \$200,000



Connect with CERTs!

- **Like CERTs on Facebook to stay in the loop**
<http://facebook.com/cleanenergyresourceteams>
- **Follow CERTs on Twitter to get timely updates**
<http://twitter.com/mncerts>
- **Sign up for CERTs email updates**
<http://updates.mncerts.org>



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