



(Technical tools and Hands-on help for Education re a

www.creedproject.org

Solar Theme to Renew the Environment Across Minnesota)

Newsletter of the Communities for Responsible Energy/Environment



THE CLIPPER LIBERTY® WIND TURBINE

by Kevin Cousineau

Clipper Windpower is a rapidly growing company engaged in wind energy technology, turbine manufacturing, and wind project development. Starting in 2002 with just a handful of people, the company has grown to include offices in the USA, Mexico, Denmark and the United Kingdom, including an ISO9001:2000 QMS Certified, 330,000 square foot manufacturing and assembly facility located in Cedar Rapids, Iowa. Clipper designs and develops advanced wind turbines, manufactures the Liberty wind turbine, and actively develops ..**CLIPPER** Continued on p.13.



Fig.1. The Clipper Liberty 2.5 MW Wind Turbine.

CONTENTS

1. THE CLIPPER LIBERTY® WIND TURBINE: [Kevin Cousineau](#), p.1.
2. FEEDBACK: p.3.
3. EDITORIAL: p.5.
4. UPCOMING MEETINGS & EVENTS: p.6.
5. NEWS ITEMS: p.10.
 1. New Board Member Tim Gerlach: p.10.
 2. Hydrokinetics on the Mississippi: p.11.
 3. Batteries for GM's Volt: p.11.
 4. Reshaping Solar: Growth Expected Despite Econ.: p.11.
 5. New Minnesota Tax Incentives: p.12.
 6. More State Vehicles Filling Up With E85: p.12.
 7. New Anti-Ethanol Studies Reach Wrong Conclusion: p.12.
6. NREL FEATURE STORY – Bigger and Better Lab Aims to Improve Giant Wind Turbines: [Joseph B. Verrengia](#) p.15.
7. THE E.U.A. COLUMN by [Bill Butler](#). Illustrated History of Wind Power Development: [Darrell M. Dodge](#).

THE STREAM

Vol. 12. No. 1. WINTER 2009

Newsletter of the Communities for Responsible Energy/Environment Demonstration (CREED) Project

Published bimonthly.

The views expressed in articles and letters in this publication are not necessarily those of the editor or of the Board of Directors of the CREED Project. All correspondence, letters to the editor, requests for copies and other matters should be addressed to: -

The Newsletter Ed., CREED Project
1589 Hollywood Court
Falcon Heights, MN 55108-2130
Tel. 651-644-8318
e-mail: <rogeraiken@creedproject.org>.

Comments, letters and contributory articles are encouraged. **The annual subscription for mailed hard copy is \$15, (students \$10) for six issues. Back copies of the "THE STREAM" are available from the above address for \$3 a copy. The e-mail version is FREE.**

RECENT BACK ISSUE TOPICS: -

Vol./#	Date	Topic
6/1	Winter 03	Ren. Projects in MN Part 3.
6/2	Spring I 03	Teacher Assocns. on E. Edn.
6/3	Spring II 03	Minn. EERE Industry #1.
6/4	Summer 03	Minn. EERE Industry #2.
6/5	Fall I 03	Minn. EERE Industry #3.
6/6	Fall II 03	Minn. EERE Industry #4.
7/1	Winter 04	Minn. EERE Industry #5.
7/2	Spring I 04	CREED's New Programs.
7/3	Spring II 04	Minn. EERE Industry #6.
7/4	Summer 04	U of M's IREE.
7/5	Fall I 04	MEA Flashbacks to Early Yrs.
8/1	Winter 05	Minnesota Snowmobiling
8/2	Spring I. 05	Fuels from Crop Residues.
8/3	Summer 05	MRES 10th Annual Solar Tour.
9/1	Winter 06	Biodiesel & Green Range Engy.
9/2	Fall 06	U of M's IREE Solar Engy. Res.
10/1	Spring 07	e-ride Industries & Elec Vehs.
10/2	Summer 07	Biomass Fuels - C. Neutral?
11/1	Winter 08	Osmotic Power - An. A.E.Srce.

MISSION

CREED is a Minnesota based 501(c)(3) nonprofit organization whose mission is to: -

"Educate Minnesotans about the impact of energy supply, conversion and use on our

environment/economic prosperity through 3E (Energy, Environment, Economy) materials and demonstration of sustainable technologies and life-styles."

MEETINGS

CREED's Board meetings are now held quarterly in March, June, September and December. The detailed work of the organization is managed by Finance, Education, Newsletter, Tours, and E85 Hybrid Subcommittees. The date for our next regular full Board meeting is **Monday March 9, 2009 at 1600 hrs** at the offices of **the Solar Oven Society**, 3225 Hennepin Ave. East, Mpls. For more information, call Board Chair, **Mike Eckhardt** at **612-709-9751**, Executive Director, **Rich Huelskamp** at **1-651-301-3271**, or Newsletter Editor, **Roger Aiken**, at **651-644-8318**.

Board meetings are open to the general public and visitors are welcome.

MEMBERSHIP

CREED has two types of membership, individual and corporate, with several levels within each type to cater to the comfort levels of different people and businesses. These are: -

INDIVIDUAL MEMBERSHIP: -

Community: \$25 to \$49.
State: \$50 to \$99.
Regional: \$100 to \$249.
Continental: \$250 to \$499.
Global: \$500 and above.

CORPORATE MEMBERSHIP: -

Bronze: \$500 to \$999.
Silver: \$1000 to \$2499.
Gold: \$2500 to \$4999.
Platinum: \$5000 and above.

These memberships have been instituted to enable people interested in and dedicated to **Energy Education** to find an organizational home and volunteer their time and expertise

to one or more of our programs. People and Organizations contributing to CREED's membership are acknowledged in issues of "THE STREAM".

Those who are now in arrears in their memberships have been removed from the list below. We gratefully acknowledge the support of the following who are current with their memberships: -

CORPORATE:

Platinum Level:

Blandin Foundation, Minnesota Power, Ottertail Power Company.

Gold Level:

Andersen Windows Corp., Clipper Windpower Inc., Cummins Power, East Central Energy, Minnesota Corn Growers' Assn., Minnesota Soybean Assn.

Silver Level:

Great River Energy.

Bronze Level:

Chippewa Valley Ethanol Coop., Lake Country Power, Windlogics.

INDIVIDUAL:

Global Level:

Mark LaLiberte.

Continental Level:

George Anderson, Michael Eckhardt.

Regional Level:

Roger Aiken, Jason Brazzale, Bill Butler, Brent Fadum, Tim Gerlach, Don & Germaine Grant, Ross Harvey, Rich Huelskamp, Derek Johnson, Chuck Koestler, Ryan Rettke, Alice Rivard, John Wilke

State Level:

Beverly Cackoski, Mark & Lorraine Francis, Dale Gregorich, Sue Hankner, Jim Harrison, Pam Nichols, Richard Pierce, Carl Sandness, Cathy Scobie, Lisa Stalker, Valdi Stefanson, Marie Today.

Community Level:

Mary Beck, Kristen Busch, Chad Carls, Chris Evavold, Kris Grangaard & Tom Prather, Dale Gregorich. Stephanie Harris, Sherry Johnson, Pam Nichols, Dave Olson, Melissa Olson, Carl Pedersen, Stephan Peter, Greg Pusch, Aaron Spicer, Steve Swanson, Joel Weisberg & Janet Watchman, Matt Winbigler.



FEEDBACK

(fĕd´bak´), the process of returning part of the output of a system to the input, either to oppose the input (**negative feedback**) or to aid the input (**positive feedback**)

Letters to the Editor are welcomed. This is an open forum for your views and/or disagreements. However neither the Editors nor the Board of Directors of CREED will necessarily endorse your statements.

Derek Johnson, one of last year's DSRFE 4.ers, who teaches math at Mora High School, wrote on Tuesday, November 4, 2008:

I'm meeting today with our county U of M extension office today about collaborating with energy education. I'll let you know how this turns out.
dj.

Ed Anderson, President, PRT International, LLC, wrote on Sunday, November 9, 2008:

Roger, I read over all of the material you gave me on your summer energy course. It is quite a difference from teaching a university course where someone else does all of the fund raising and scheduling and all the instructor needs to do is prepare lectures and show up. Even under difficult restraints like having to raise the money, recruit the students and other instructors, find a suitable location, and then prepare lectures and handouts I see from the letters of thanks that even with some expected gripes you are to be commended for a great job on a much needed topic and with science teachers of diverse interests and levels of understanding of the topic.
My very best wishes, Ed.

Linda Gibeau, of the Blandin Foundation, sponsor of two of the 2008 DSRFE 4. teachers, wrote on Friday, November 24, 2008:

Dear Mr. Aiken,

I just wanted to thank you for the final report on G2008-0203. We appreciate the update and thoroughness of your reporting. If you have additional questions, please let me know.

Best regards, Linda

[Blandin Foundation sponsored two teachers from Northern Minnesota last year. Ed.]

Rod Elmstrand, Regional Director, University of Minnesota Extension, Regional Office - Mora, wrote on Tuesday, December 2, 2008:

Hi Roger,

Thank you for taking time to discuss and brainstorm some thoughts and ideas around this topic of renewable energy and related topics. My purpose again was to explore with you ways to reach youth in after school programs, 4-H youth clubs, and through County fair exhibits around the theme of energy conservation. The contacts you provided me will be helpful as I further develop our curriculum, projects and resource base.

Thank you once again for being so helpful, Rod.

Cob Burandt, <cleverlever99@hotmail.com>, wrote on Saturday, December 20, 2008:

Roger

Got your newsletter update. Just thought I would update you on progress with the engine patent.

We have it presented to The Supreme Court USA and now we wait to see if they will hear the case. The average guy on the street has absolutely no idea what it takes to actually invent something, patent it and then go through the effort to protect that patent.

Current crude price is unbelievable to me. Current state of world economy is even more unbelievable.

Hope all is well with you and all I can say is brace yourself for 2009 cause I suspect we are going to see things that will make 2008 look like the good ole days.

Cob.

Richard Weil, wrote on Monday, December 22, 2008:

Roger,

Hi, I'm Richard Weil. For years I've been getting the CREED newsletter, but unfortunately because of my year-round teaching schedule have never been able to attend any classes. I'm glad to follow what your

group is done. It is very good work. Got a funny question for you. Given the demand for STEM-oriented people, have you ever heard of someone going into these fields far beyond the usual age?

I won't bore you with my entire checkered background unless you want to continue this conversation, but I'm 58, already have four degrees (a good grounding in natural/environmental sciences through a PhD in human geography) but got completely off track from where I wanted to be in the earth sciences. I have a lot of academic experience but would much rather be doing hands on research work mixed with some teaching. I am a very good writer and decent lecturer, permanently settled in the Twin Cities, but in a dead end position that doesn't even pay the bills.

With the need for people in the areas you are working with it would seem that somebody with these skills would be useful. On the other hand, even when the economy was good I found no interest in a cross-disciplinary generalist. Regretfully, science/engineering as a profession also does not seem open to newcomers past the usual school age...although maybe I'm missing something here. I've certainly looked hard to try and find a way in.

If you want I'll send more detailed information. Anyway, thanks for your time and any thoughts on this matter, and good luck with your work.

Richard.

Penny Juenemann, a teacher at Two Harbors, wrote on Friday, January 2, 2009:

Hi Roger,

Thank you so much for the invitation (i.e. to DSRFE 5.). I'm sorry that I'll have to decline, I have two young girls and giving up two weeks with them is just unbearable. I wanted you to know, however, that I am a huge advocate for renewable energies and teaching young people about them. My husband and I have PV solar, passive solar, solar hot water, geothermal and a wind generator at our home. My husband installed all of the systems except the geothermal. So, through his work I'm well educated in the field of renewables. With all of our systems many days we make more electricity than we use and that extra electricity goes back on the grid. I bring my 10th grade biology classes to my house every spring to show and teach them how these systems work and why they're needed. In addition to this my husband found grants and rebates and installed a 2.88 KW system on a tracker at our high school, now kids are exposed to it everyday at THHS. [Use of the term **geothermal** here is confusing, correct term is **groundsource**. Ed.]

If you ever consider another format for your course or need people with considerable experience in the field of renewable energies please contact me or my husband (Jamie Juenemann at <jamie.juenemann@silvercreekinstitute.org>

Thank you, Penny Juenemann.

Don Grant, ex CREED Board Member and Treasurer, wrote on Saturday, January 3, 2009:

Hi Roger,

Hope things are going well. It's been awhile since we communicated.

I might be interested in taking the New Energy Technologies course. Would you please send me a description? Also, my life is settling down and, hopefully, I will be able to start attending the CREED BOD meetings again.

Also, please change my email address in the STREAM list to dcgrant@boreal.org.

Best regards, Don.

Kristian Jankofsky, Sen. Naturalist/Prog. Planning Coord. at LEC, wrote on Wednesday, January 7, 2009:

Happy New Year Roger,

Glad to see that you have a full crew again. I have you on our calendar June 21 to July 3, and July 19 - 24. There will be groups here again during those times. I know that last year there was some concern about other groups being here and lack of space for teachers to work with high speed internet. Please give me a call so we can discuss these concerns when you get a chance.

Thanks, Kristian.

John Engelking, Middle and High School Principal, Cook County Public Schools - ISD 166, wrote on Monday, January 12, 2009:

Roger,

I have a math teacher who would like to be enrolled in the CREED Project. Her name is Marie Lindgren. She is a top-notch teacher. I know she will be an asset to the workshop.
John.

Gwen Thomas, Senior VP, East Central Energy, wrote on Tuesday, January 13, 2009:

Thanks for the good news, Roger. I am pleased to learn that another teacher in the ECE service area will be participating.
Gwen.

John Joosten, Assistant Dean of Career and Technical Education, MN West Community & Technical College, Granite Falls, wrote on Thursday, January 15, 2009:

We received the grant, but they cut \$31,500 out of the budget. The only place I can get that from is the scholarships for graduate credit. I will still have some money left for the scholarships, but it will be more of a token.

John.

[Notification that the Federally funded WIRED grant for our joint project with MN West had been received. Ed.]

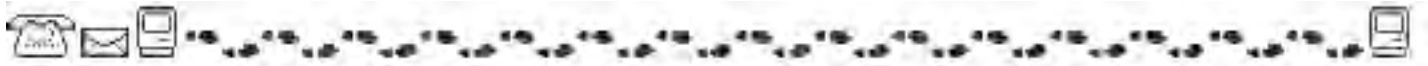
Mary Kosak, Program Officer, Blandin Foundation, wrote on Tuesday, January 27, 2009:

Dear Roger,

I hate to be the bearer of bad news, but when I checked in with the Grants Team the response was no to continued funding of teachers and the training. Your reports were excellent, and the letters of appreciation from the teachers made it a very difficult decision.

We have had to cut back on many of our funding opportunities, and it is painful to have to say no to worthwhile projects. Let's hope this economy gets some good news, and the assets of foundations and corporations can start climbing again. Thank you for your understanding.

Sincerely, Mary



FROM THE DESK OF THE EDITOR:

I guess most of my readers watched or heard President Barack Obama's speech to the joint session of the U.S. Congress on the evening of Tuesday, February 24. I am sure there were as many different reactions as there were viewers and listeners, but what came through loud and clear to me is that never was there a time that the work of the CREED Project was more important than it is now. Of the three main issues at the very top of the President's action list, two are at the very center of CREED's work, **ENERGY** and **EDUCATION**. And these two issues are all about getting people ready for the new **GREEN JOBS** that everybody is talking about.



In the last issue of "THE STREAM" I mentioned that part of Minnesota's response has been the creation of a Green Jobs Task Force co-chaired by Sen. Ellen Anderson (Saint Paul) and Rep. Jeremy Kalin (Lindstrom). I have had the opportunity and privilege of attending a couple of their meetings. However I came away from these meetings disappointed and frustrated. Training for green jobs does not start at the college level, any college administrator will tell you that. It has to start with information and awareness generation at the K-12 levels, otherwise kids will not be choosing the green job careers for which the colleges will round out their training. Yet the Green Jobs Task Force appears to have relegated this critical first step to the back burner. Will somebody stand up please and let it be known that Minnesota is way behind the curve as compared to many other states where vigorous energy education programs are already in place at the K-12 level.

We have chosen Wind and Wind Turbine Development as the theme of this issue. Kevin Cousineau's lead article on Clipper Wind Power's Liberty[®] turbine is of particular interest to Iron Rangers since these are the turbines which Minnesota Power now operates at their Taconite Ridge wind farm just north of Virginia. Furthermore the Liberty[®] turbine at 2.5 MW capacity is the largest machine currently manufactured in the United States.

We have also reproduced an NREL article on the expansion of their wind laboratory facilities to test large wind turbines, specifically the 1.5 MW General Electric and 2.3 MW Siemens Power Generation machines. My colleague Bill Butler has also responded on the wind theme in his Energy User's Association column by finding Darrell Dodge's article on the history of wind power development. So if you are interested in Wind Energy, which is now contributing about 3 percent of the power to our national grid, you will find, with the embedded links, much material to bring you up-to-date.

Be sure to check out all the upcoming meetings and events and the news items. We continue introductions to our new Board members. In this issue it is Tim Gerlach's turn. Besides being one of our new directors, he has also just recently been appointed Executive Director of the Minnesota Corn Grower's Association. Tim thus gives us a very useful link to the Biomass side of Renewable Energy in Minnesota.

Sincerely, Roger G. Aiken.

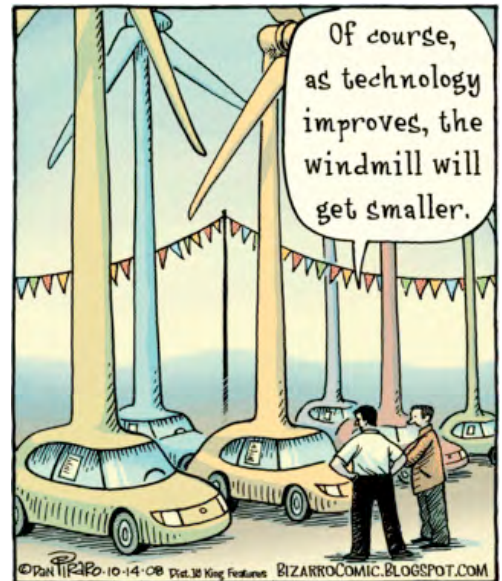
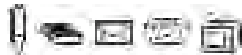


Fig. 2. Making the most of wind.

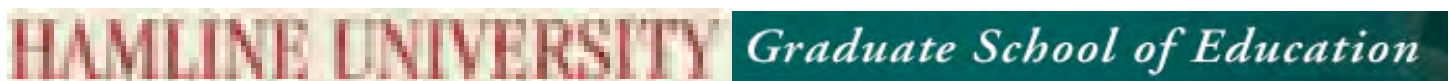
UPCOMING MEETINGS AND EVENTS

1. BOARD MEETING:

The date for CREED's next Board meeting is set for **Monday March 9, 2009** at **1600-1800** at the offices of the **Solar Oven Society, 3225 Hennepin Avenue East, Minneapolis**. Items on the Agenda will include fund raising and teacher recruitment for DSRFE 5., our joint two year WIRED grant project (EREPT) with the Granite Falls campus of MN West, work on our website, course/workshops at Hamline, and program development at Century College.

Future Board meetings are scheduled for June 8, September 14 and December 14, 2009. **Board meetings are open to the general public and visitors are welcome.**

2. C.E. COURSES IN THE RENEWABLE ENERGY CERTIFICATE SERIES AT HAMLINE UNIVERSITY FOR TEACHERS AND OTHERS INTERESTED IN ENERGY:



SPRING 2009:

1. SOLAR DIRECT (SOLAR PHOTOVOLTAIC AND SOLAR THERMAL). SCED-6078-37793. Saturdays, May 2 and 16, 2009. 0800-1730 hrs., plus online lectures and assignments posted on Hamline's Blackboard (Bb).

Hamline courses are worth 2 C.E. Semester Graduate Credits and can be applied towards Hamline's new 12 credit "Energy Education Certificate." Course requirements for the Certificate are: -



1. Mathematics for Energy Problem Solving. SCED-6134.
2. Energy Basics (Definitions, Sources, Conversion, End-use and Conservation) SCED-6080.
3. Solar Direct (Photovoltaic and thermal applications) SCED-6078.
4. Solar Meteorological (Hydro and Wind applications) SCED-6085
5. Solar Photosynthetic (Biomass Production, Conversion and Use.) SCED-6086
6. *Energy Policy. SCED-6087
 - *Energy Entrepreneurship. SCED-6088
 - *New Energy Technologies. SCED-6089

*Electives.

For further information contact: -

Content- Roger Aiken, CREED, 651-644-8318 or <rogeraiken@creedproject.org>.

Registration- Go to Hamline University's "Piperline at: -

<http://www.hamline.edu/gse/curr_new_stud/reg_info/registration_information.html> or contact Lee Schmitt, CGEE 651-523-2562 or <lschmitt@hamline.edu> or Shawn Hubert, CGEE 651-523-2846 or <shubert01@hamline.edu>.

3. DISCOVERING SCIENCE ON THE RANGE IN THE FIELD OF ENERGY PART 1.:



HAMLIN UNIVERSITY
Graduate School of Education



**CENTER FOR GLOBAL
ENVIRONMENTAL EDUCATION**

Laurentian
ENVIRONMENTAL CENTER
Learning in the Outdoors

DSRFE 5. (Part 1.) will be held at LEC, Britt, Minnesota approximately 12 miles north of Virginia.

The dates are: - Week 1. Sunday evening June 28 through Friday July 3.

Week 2. Sunday evening July 19 through Friday July 24.

DSRFE PART 1. is the first of two, 2-week live-in, course workshops worth 6 graduate semester credits. Part 1. covers the "Energy Basics", "Mathematics for Energy Problem Solving" and "Solar Direct" (solar thermal and solar PV) areas of instruction. Together with Part 2., which is offered in alternate years, it provides teachers and others with the opportunity to earn and qualify for Hamline University's 12 credit "Energy Education Certificate."

DSRFE is a cooperative effort involving the CREED Project, Hamline University's Center for Global Environmental Education (CGEE) and the Laurentian Environmental Center (LEC), designed specifically for high and middle school teachers who wish to bring their knowledge about the Energy Efficiency and Renewable Energy (EERE) industry in Minnesota up-to-date and thereby be able to encourage their students to choose a future career in this field.

RATIONALE: The EERE Industry, which comprises utilities and other energy companies, is facing a shortage of new hires for their engineering, managerial and technician positions. CREED's Energy Education initiative which is part of the STEM effort to reverse the decline in Minnesota's graduating rates from our colleges in these disciplines, is focused on helping science, tech. edn., mathematics and other teachers improve their knowledge and ability to address this issue in their classrooms.

STATUS: Registration for this course/workshop is now full with 21 teachers and several more on the waiting list. We will be offering Part 2. again in 2010. If you are interested please contact **Roger Aiken** at **651-644-8318** or <rogeraiken@creedproject.org>

4. CREED'S COOPERATIVE PROJECT WITH MN WEST: EMERGING RENEWABLE ENERGY PROGRAM TRAINING (EREPT):



We received word about a month ago that our joint proposal with MN West Granite Falls campus for a federally funded WIRED grant had been granted, so the first of two summers of instruction for high school teachers from the south west part of the Minnesota will take place this year, 2009.



Dates for the two-week live in course/workshop, which will be held in Granite Falls, are: -

Week 1. Sunday evening June 7 through Friday June 12.

Week 2. Sunday evening June 14 through Friday June 19.

EREPT will be modeled after our DSRFE course/workshops held at the Laurentian Environmental Center. EREPT 1. however will differ from DSRFE 1, in that the second week will cover the materials of "Solar Photosynthetic" rather than "Solar Direct". The former will cover all aspects of biomass – production, conversion to fuels and its end use.

Science, Math, Ag and Tech. Ed. teachers interested in participating in this FREE offering should register with **John Joosten**, Assistant Dean of Career and Technical Education, at **320-564-5018**, **800-657-3247**, **507-828-0495 (cell)**, or <jjjoosten@gf.mnwest.mnscu.edu>.

5. 19TH ANNUAL ENERGY DESIGN CONFERENCE AND EXPO:

Tuesday and Wednesday March 10 and 11 (pre-conference March 9), Duluth, MN.

Learn from experts and professionals about the latest innovations in high performance buildings, sustainable design and development, and current energy and environmental topics. This ever-growing event offers over 55 informative workshops and over 80 exhibitors, plus the opportunity to network with the best in the business.



Conference session topics include:

BUILDING SCIENCE:

- *Designing and Building a High Performance.
- *LEED for Homes and MN GreenStar (full day).
- *HVAC and Combustion Safety.
- *The Next Frontier for High Performance Housing High Performance Case Studies.
- *Commercial track focused on the commissioning process, energy management, and lighting.
- *Home Houses That Work, 1 & 2 (EEBA).
- *Advanced Retrofitting for Energy Efficiency.
- *The Human Health & Housing Connection.

SUSTAINABILITY, RENEWABLES, ENVIRONMENTAL, ETC:

- *Sustainable Design and Construction.
- *Solar Energy Options – Residential & Commercial.
- *Comparing Fuel Costs and HVAC Alternatives.
- *Affordable Housing – Incorporating Green & Energy Efficiency.
- *Avoiding Dubious Energy Investments.
- *Green Building Design & Products.
- *Small and Large Scale Wind Systems.
- * Green or Greenwashing?

And much more!

To learn more visit us at <www.duluthenergydesign.com>.

6. RENEWABLE ENERGY WORLD CONFERENCE AND EXPO NORTH AMERICA:

Tuesday-Thursday, March 10 – 12, 2009, Rio All-Suite Hotel & Casino, Las Vegas, Nevada.

The Renewable Energy World Conference & Expo North America (formerly POWER-GEN Renewable Energy & Fuels) has a proven track record– now in its 6th year– as renewable energy's leading conference. It offers a worldwide audience who will hear papers, panel discussions and presentations during technical sessions related to technology, markets, business strategies and policy covering the wind, solar, biomass, hydro, geothermal, ocean/tidal/wave, bio-power, bio-fuels hydrogen and energy sectors. There has never been a better time to be a part of the exciting, ever-growing world of renewable energy!



Connecting 5,000 renewable energy power professionals with 300 exhibitors for three days of networking, new business negotiation and the exchange of important ideas and information impacting the renewable energy industry today.

To register go to <www.pennwellregistration.com/online/LoginServlet?confId=281>.

7. MnSTA SPRING CONFERENCE - CELEBRATING SCIENTIFIC REVOLUTIONS: EDUCATING STUDENTS FOR THE FUTURE:

Thursday-Saturday, March 26 - 28, 2009, Mayo Civic Center, Rochester, MN.

Join us for our largest annual conference, the MnSTA Spring Conference. This two-day event is your key to learning and sharing together with teachers of science from all around Minnesota! Make your hotel reservations early!

For further information and details go to MnSTA's web site at <www.mnsta.org/spring>.



8. MnSTA MnTOPS: MN TEACHERS OF PHYSICAL SCIENCE CONFERENCE:

Friday, April 24, 2009, Science Museum of Minnesota

Join Minnesota Physical Science Teachers for an exciting day of sharing about great ways to teach physical science! For further information contact conference chair Jodi Hansen <jodi.hansen@isd518.net>.

9. WINDPOWER 2009 CONFERENCE & EXHIBITION:

Monday-Thursday, May 4 - 7, 2009, McCormick Place Convention Center, 2301 S. Lake Shore Drive, Chicago, Illinois.

WINDPOWER 2009 Conference and Exhibition is the largest annual wind conference and exhibition in the world featuring over 13,000 attendees and over 776 exhibitors. Each year, wind energy professionals gather at this event to learn about the latest industry developments and technologies, review new products and services in the expansive exhibit hall, and network with leading industry decision makers.

For further information go to <www.windpowerexpo.org/>.

10. SOLAR 2009:

Monday-Saturday, May 11-16, 2009, Buffalo Niagara Convention Center, Convention Center Plaza (153 Franklin Street), Buffalo, NY 14202

ASES National Solar Conference



SOLAR 2009 is America's leading conference on the emerging trends, technology, and opportunities shaping the new energy economy. Now in its 38th year, SOLAR 2009, May 12-16, 2009, introduces you to the leaders, innovators, and entrepreneurs moving the industry forward. With the solar energy and energy efficiency sectors changing at an unprecedented pace, this conference helps you understand the changes and uncover the billion-dollar opportunities. Gain the insight and build the connections you need to stay ahead.

Who should attend?

* Solar equipment dealers and installers, * Entrepreneurs, * Researchers, scientists and engineers, * Green builders, architects and facilities managers, * Investors and analysts, * Academics and educators, * Students and career changers.

For further information go to: -

<www.ases.org/index.php?option=com_content&view=article&id=156&Itemid=53>.

11. MINNESOTA TECHNOLOGY ASSOCIATION FALL CONFERENCE

Friday - Saturday September 25 & 26, 2009 at the Saint Cloud Holiday Inn and Suites.

For further information go to: -

<www.mtea.net/Events.html#meetings>



MTEA Minnesota Technology Education Association
An affiliate of the International Technology Education Association



1. NEW BOARD MEMBER TIM GERLACH:

It is our aim to present to you in each issue of "THE STREAM" something about one of our Board members. Since four new members have joined us recently we are providing bios on each of them. In Vol. 11. No. 1. Winter 2008 we introduced Darryl Thayer who is now our Vice-Chair. He is also on our staff as Certification Instructor. In Vol. 11. No. 2. Fall 2008 we introduced Carl Sandness. Carl teaches physics at Hibbing High School and in addition has become CREED's newest instructor helping out at our summer course/workshops. In this issue it is Tim Gerlach's turn to be placed in the hot seat. We have known Tim for a long time, particularly in his role as one of Minnesota's foremost E85 advocates, when he worked for the American Lung Association of Minnesota's clean fuels program. He now works for the MN Corn Growers as their new Executive Director. We are very excited to have him as one of our new Board members. The following press release provides more information about Tim.

MINNESOTA'S CORN ORGANIZATIONS NAME TIM GERLACH EXECUTIVE DIRECTOR

Shakopee, Minn., December 23, 2008 – The Minnesota Corn Growers Association (MCGA) and the Minnesota Corn Research & Promotion Council (MCR&PC) recently named Tim Gerlach executive director of both organizations. Gerlach had most recently served the organizations as assistant executive director, and had stepped in as the organizations' interim leader following the departure of former exec Bruce Stockman in September.



Fig. 3. New Board Member Tim Gerlach.

"We conducted a search to fill this position and ultimately concluded that we were already employing the most qualified person for the job," said MCGA President Doug Albin of Clarkfield. "Tim has the skills and knowledge needed to help guide us into the future and Minnesota's corn producers will benefit from his leadership."

Gerlach comes to the corn organizations with more than 15 years of experience in biofuels and environmental work. Prior to his stint at MCGA/MCR&PC, he served as vice president for clean fuels and vehicle technologies at the American Lung Association of the Upper Midwest and has worked for a decade as the director of the Minnesota E85 Coalition. Gerlach has also recently served on the Biodiesel Task Force and NextGen Energy Board. Between 1995 and 1998, he managed the U.S. Department of Agriculture-supported National Alternative Fuels Laboratory Program at the University of North Dakota Energy & Environmental Research Center.

"With Tim, we have the benefit of building on a previous productive relationship, as he has worked closely with our organizations in his capacity as director of the Minnesota E85 Coalition for the past ten years," said Jerry Demmer, a farmer from Clarks Grove and chair of MCR&PC. "He has an excellent understanding of what it will take to move our organizations forward and he has the proven ability to get people to work together for the common good – something that has become increasingly important in the agricultural community."

The Minnesota Corn Growers Association (MCGA) is a membership organization made up of 6,200 Minnesota corn farmers, their associates and supporters. The Minnesota Corn Research & Promotion Council is an 11-person board charged with the oversight of Minnesota's corn check-off. Both organizations share the same mission of promoting and creating opportunities for the profitability of corn farmers, while enhancing quality of life.

2. HYDROKINETICS ON THE MISSISSIPPI:

FERC Bulletin No. 1788 -9- January 9, 2009

Old Man River received a renewable energy twist recently when the Federal Energy Regulatory Commission (FERC) approved installation of the nation's first hydrokinetic electric device below Lock & Dam No. 2 in Hastings. FERC's approval means that a 12-foot diameter, 18-foot long turbine can be mounted on a barge in the tailrace of an existing hydro plant, generating electricity from Mississippi River water flowing through a turbine south of the dam.

Minneapolis-based Xcel Energy Inc. has signed a power-purchase agreement for electricity generated by the generator, which is the first of several such projects planned by Houston-based Hydro Green Energy LLC.

FERC members voted 5-0 in favor of the Hastings project, which is one of seven possible dam tailrace renewable-energy developments between Hastings and the Iowa border on the Mississippi. Hydro Green Energy is financing the project with \$2.6 million in Series A funding obtained in April from Quercus Trust, an investor in alternative energy and intellectual property. The company now is seeking Series B funding to support further expansion of hydrokinetic projects.

FERC approved two 35-kilowatt turbines to be installed below the barge, or a total of 70 kilowatts of power. Mark Stover, vice president of governmental and external affairs for Hydro Green, said each jet engine-shaped turbine could generate up to 100 kilowatts.

Gloucester, Mass.-based Free Flow Power (FFP) filed applications to install groupings of in-river turbines south of Lock & Dam No. 3 near Red Wing; Lock & Dam No. 4 near Kellogg; Lock & Dam No. 6 near LaCrescent; and Lock & Dam No. 8 near Genoa, Wisconsin. That company has grand plans to install groupings of six two-foot turbines in the Ohio and Mississippi Rivers—mostly from St. Louis, Mo. to the Gulf of Mexico, generating a total of 1,600 megawatts of energy by harnessing the power of major rivers.

That's more electricity than the 1,377 megawatts that Minnesota currently generates from wind farms, according to the American Wind Energy Association.

3. BATTERIES FOR GM'S VOLT:

DETROIT AF News 01-21-2009--- General Motors Corp. said it will invest \$30 million in a U.S. plant that will build next-generation batteries for its all-electric Chevrolet Volt, Reuters reported.

The facility is set to open in Michigan in 2010. The plant will assemble lithium-ion battery cells manufactured by South Korea's LG Chem Ltd. into 400-pound packs. These packs will power the Volt plug-in car.

"We chose Chevy because we can't be niche with the Volt. We have to make it a mass-production vehicle," Ed Peper, North American vice president of GM's Chevrolet brand, said at the Automotive News World Congress in Detroit.

The Volt is being designed to run 40 miles on a single battery charge.

4. RESHAPING SOLAR: GROWTH EXPECTED DESPITE ECONOMY:

by Elisa Wood

Tax credits, new trends and independent companies are spurring a solar surge. Elisa Wood reports from San Diego, USA on the growing consumer interest in solar energy despite the financial crisis. Outside the doors of the San Diego Convention Hall the world economy was falling apart, inside Aaron Hall, chief executive of California's Borrego Solar Systems, was describing the rapid growth of his solar electric contracting firm. Revenue was US \$7 million in 2005, \$12 million in 2006, and \$30 million in 2007. For 2008, Hall projected revenue of \$60 million, and possibly \$80 million. 'With the government passing the extension of the solar investment tax credits, we anticipate that 2009 will be another phenomenal year for Borrego and the entire solar industry', he said. Hall's words - coming in October just after the stock market's record crash and the tumbling of major merchant banks - underscored the rarified business climate renewable energy currently enjoys in the US.

5. NEW MINNESOTA STATE TAX INCENTIVES:

*New tax-free incentives through a "GreenJOBZ" program that will provide the same tax exemptions found in the state's JOBZ program to qualifying green job projects.

*A new Job Growth Investment Tax Credit, 50% of which will be targeted to green job projects that will promote the state's renewable energy goals (\$20 million).

*A new Small Business Investment Tax Credit for investments in qualified Minnesota businesses, 50% of which will be targeted to green job projects (\$60 million).

*Incentives to expand the production and infrastructure for biomethane, solar, and other renewable energy projects.

*Creation of a clean and green technology category as part of the Minnesota Cup competition to reward innovation and spark invention.

6. MORE STATE VEHICLES FILLING UP WITH E85:

Saint Paul, Minn.-(October 20, 2008) – More Minnesota state employees are heeding Governor Pawlenty's call to reduce petroleum fuel consumption and use cleaner-burning alternative fuels like E85 in state vehicles whenever possible. According to a new report from the Minnesota SmartFleet Committee, E85 use in the state fleet during the first three quarters of 2008 is **79 percent greater** than during the same period in 2007. In the first nine months of 2008, 529,000 gallons of E85 were used to fuel the state's roughly 1,700 flexible fuel vehicles. Last year at this point, only 295,000 gallons of the locally produced, largely renewable fuel had been used.

"We have increased our E85 use to approximately 12 percent of our total fuel purchases," said Tim Morse, Chair of the SmartFleet Committee and director of Fleet and Surplus Services, Minnesota Department of Administration. "That's very good progress toward our goal, but with E85 available at more than 360 locations statewide, we can do even better."

The report was hailed by the American Lung Association of Minnesota, which supports the use of E85. "A flexible fuel vehicle running on E85 instead of gasoline produces significantly less tailpipe emissions than the same vehicle using gasoline," said Kelly Marczak, director of the American Lung Association of Minnesota's clean fuels program. "To-date, the state fleet's use of E85 in 2008 has prevented more than **2100 tons** of lifecycle carbon dioxide emissions and other harmful pollutants from entering our air simply by using E85 instead of gasoline."

There are an estimated 200,000 vehicles that can use E85 as well as gasoline on the road today in Minnesota. As with the state fleet, the Minnesota Department of Commerce has noted an increase in overall E85 sales throughout 2008, even as gasoline sales have declined for four consecutive months. While vehicles using E85 instead of gasoline get fewer miles per gallon, the price of the ethanol-based fuel in Minnesota is currently averaging from 40 to 60 cents less than regular unleaded, according to the American Lung Association of the Upper Midwest, which tracks E85 prices on its <www.CleanAirChoice.org> website.

The members of Minnesota's Clean Air Choice Team are: -

Minnesota Corn Growers Association
General Motors Corporation
Minnesota Dept of Agriculture
US Dept of Energy Clean Cities

Minnesota Soybean Growers Association
Minnesota Dept of Commerce
National Ethanol Vehicle Coalition
American Lung Association of Minnesota

7. NEW ANTI-ETHANOL STUDIES REACH WRONG CONCLUSION ON GREENHOUSE GASES:

Minneapolis, Minn. (February 15, 2008) – A new policy brief from the Minneapolis based Institute for Local Self-Reliance (ILSR) criticizes the authors of two recent studies published in *Science* for advancing a conclusion not supported by their own studies.

“The studies usefully estimate how much carbon will be released when new land is brought into crop production,” says David Morris, ILSR’s Vice-President and author of *Ethanol and Land Use Changes*. “But the authors’ declarations that ethanol increases greenhouse gas emissions, a conclusion that has made headlines around the world, is not supported, and may be contradicted, by their own data.”

The report notes that the vast majority of today’s ethanol production comes from corn cultivated on land that has been in corn production for generations. “Since little new land has come into production, either directly or indirectly, the current use of ethanol clearly reduces greenhouse gas emissions,” says Morris, who served six years on an Advisory Committee on biomass to the U.S. Departments of Energy and Agriculture.

The studies fail to recognize the very low greenhouse gas emissions from advanced ethanol plants, plants that can reduce emissions by over 50 percent as compared to gasoline. Nor do the studies factor in the higher greenhouse gases that will be emitted when crude oil is extracted from unconventional sources like tar sands.

A controversial part of these studies examines the indirect impacts of growing energy crops. For example, if corn acreage displaces soybeans in the U.S., the authors assume that an equal amount of soybeans will have to be grown in the rest of the world to make up for that loss in animal feed. But a byproduct of corn ethanol production is a high protein animal feed called distiller’s grains. Indeed, distiller’s grains produce more protein per acre of corn harvested than is produced from an acre of soybeans.

The most contentious part of the studies may be the conclusion that when countries import less food and feed from the U.S., growing more themselves, that greenhouse gases increase. “The conclusion is not only counterintuitive, but will undoubtedly stir up considerable opposition by farmers and advocates of local food around the world,” says Morris, who also has served as an advisor to the energy administrations of Presidents Ford, Carter, Clinton and George W. Bush.

ILSR’s full report, *Ethanol and Land Use Changes*, is available at <www.newrules.org/de/Ethanol-and-Land-Use.pdf>. To arrange an interview with Mr. Morris, contact **Brooke Gullikson** at **612-379-3815**. or <bgullikson@ilsr.org>.

Since 1974, ILSR has worked with citizen groups, governments and private businesses in developing practices that extract the maximum value from local resources.



CLIPPER Continued from p.1.....wind power generating projects worldwide. Clipper is a public company listed on the London Stock Exchange's Alternative Investment Market (AIM).

The Clipper Liberty wind turbine is a 2.5 Megawatt machine with rotor sizing for IEC Class I, II and III. The largest wind turbine built in the United States, Liberty utilizes a unique design and employs new and advanced technology that increases its efficiency and capabilities compared to older, more traditional designs currently on the market.

Although large, when viewed from any angle, the Liberty nacelle is about half the size of other 2.5 MW wind turbine designs. This is a benefit of its patented distributed generation drive train, or Quantum® gearbox, which employs four smaller, permanent-magnet generators versus the older, traditional machine’s much larger single induction generator. In addition, Liberty’s gearbox contains only two active stages instead of the standard three. This not only increases the efficiency of the transmission but, more importantly, enables the input torque (rotational power) to be divided into multiple sections, lowering the stress on each of the gears compared to conventional designs.

Despite its four generators, the Liberty design uses no more parts than a standard 2.5 MW single generator machine due to its decreased gearbox and generator complexity. Additionally, having four smaller generators enables simple change-out of generators when necessary via an on-board hoist that can pick up and remove any single generator down the tower – a feature that cannot be accomplished with a large induction generator. The failure of a standard single induction generator would require an enormous crane that would cost more to mobilize than the cost of the generator it was tasked to replace.

In addition to the above, the Liberty design also offers a number of advantages over more traditional wind turbine designs. For example, Liberty's four generators include powerful rare-earth magnets. These large, 660 kW, permanent magnet alternators are highly efficient, over 97% and therefore 3 to 4% more efficient than the standard induction generator used on the vast majority of commercial wind turbines today. They are also small, lightweight and do not employ slip rings or brushes that are common with the contemporary "doubly fed inductor generator" designs.

FOLLOWING THE WIND:

A variable speed wind turbine design, Liberty's rotor speeds follow the changing wind conditions. More traditional fixed speed machines have a peak efficiency that occurs at only a single wind speed. The Liberty design, however, can change its speed as the wind changes, thus high efficiency peaks at all of the operating speeds instead of just one.

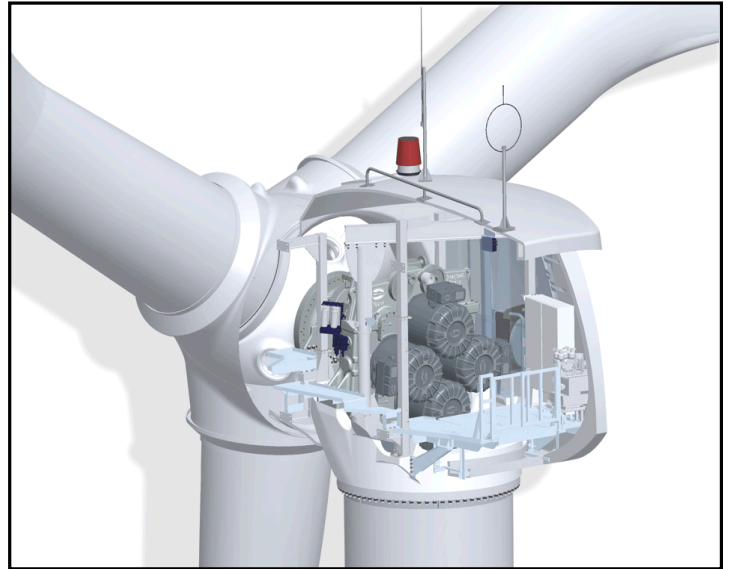


Fig.4. Cut-Away View of the Clipper Liberty's Nacelle Showing the Four Generators.

The big problem experienced with variable speed machines is due to the fact that generators only operate at a single speed, thus they must synchronize their speeds, and therefore their AC frequency output, with the utility grid itself. To get around this problem the Clipper generator is not connected directly to the grid; instead its generator output is converted to Direct Current (rectified), and then converted to a fixed frequency through a high power inverter operated by modern power transistors. The generator is allowed to produce variable speed and variable frequency while the converter connects its power to the grid at a fixed frequency.

This method of conversion is unique to the Liberty design since it employs simple passive rectifiers and power that flows only in a single direction, from the generator to the rectifier, to the converter and on into the utility grid. Most "doubly fed" variable speed wind turbines operate with dual inverters and power that flows both to and from the grid. The Liberty design offers a simple but sophisticated approach to achieving variable speed, constant frequency (VSCF) generation.

FOLLOWING THE GRID:

Today, modern wind turbines are required to "follow" the utility grid as that grid changes its voltage, frequency and phase angle. Liberty's variable speed design lends itself very well to all of these requirements due to the use of a transistor-based converter connected to the grid instead of a slow response, and somewhat uncontrollable rotating machine.

The Liberty machine has demonstrated the ability to continue operating, even with a failed utility connection, and low line voltage (only 10% of the nominal) for a period of 3 seconds, exceeding the requirements of most utility interconnect agreements in the United States and Europe. This type of operation, more commonly known as "Low Voltage Ride" Through or "LVRT", prevents problems with utility grids during outages of generation systems including the "domino effect" that cause entire areas to shut down. These events have occurred multiple times over the past decade. Clipper's Liberty wind turbine, however, has the ability to help bring stability to a utility grid and or prevent such events from occurring.

FOLLOWING THE MARKET:

Today, the Liberty production line is in full swing at Clipper's plant in Cedar Rapids, with more than 300 turbines installed in the field. Clipper's California-based engineering staff continues to make

improvements to an already great product. Turbines are installed in New York, Iowa, Kansas, California, Texas and Minnesota. Development continues in other states besides.

The Liberty wind turbine is a unique and innovative American wind turbine design that achieves some of the highest efficiencies ever obtained by any commercial wind turbine. Its unique approach to gearbox and variable speed technology lowers the cost and increases the performance of these important renewable energy generation machines.

Kevin Cousineau is Director of Electrical Engineering and Controls at Clipper Windpower. Among the wind industry's recognized pioneers, prior to joining Clipper, Mr. Cousineau held leadership positions in his field of expertise at Zond Systems, Enron Wind, and GE Wind Energy. The holder of 15 patents in wind turbine and industrial controls,

Mr. Cousineau has been recognized by the American Wind Energy Association for his technical achievements. He may be reached at <kcousineau@clipperwind.com> or 805-690-3267.

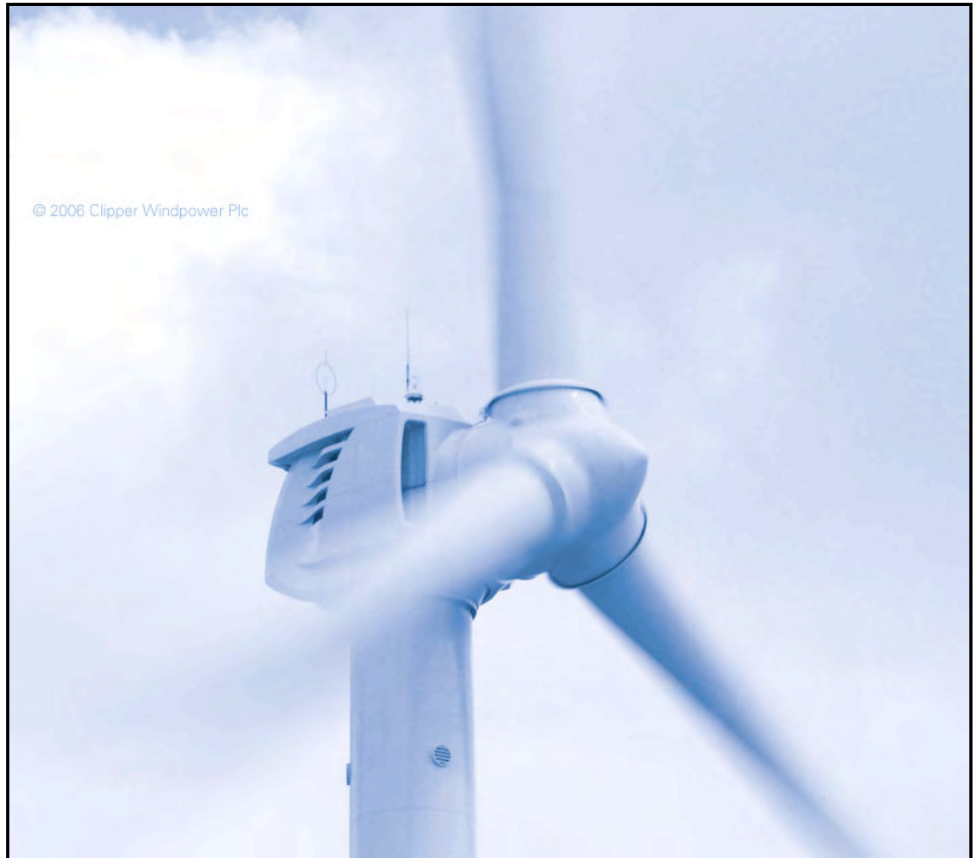


Fig. 5. Into the Wind.



NATIONAL RENEWABLE ENERGY LABORATORY FEATURE STORY BIGGER & BETTER: LAB AIMS TO IMPROVE GIANT WIND TURBINES

By Joseph B. Verrengia

January 30, 2009

If the U.S. is going to generate 20 percent of its electricity from the wind in the next 20 years, wind turbines will need to evolve in every way - larger, taller, less expensive, more reliable and more efficient.

At NREL's National Wind Technology Center, <<http://www.nrel.gov/wind/nwtc.html>> engineers are preparing to install the two largest turbines ever tested at the laboratory. Key elements of a 1.5 MW General Electric turbine <http://www.gepower.com/prod_serv/products/wind_turbines/en/15mw/index.htm> have begun arriving; instrumentation and equipment testing should begin by late summer. Installation of a 2.3 MW turbine from Siemens Power Generation <<http://www.powergeneration.siemens.com/products-solutions-services/products-packages/wind-turbines/products/Products.htm>> is scheduled for late summer, too.

Both turbines will be erected on the NWTC's eastern perimeter, where they will run for years while serving as prominent sentinels overlooking metropolitan Denver.

"We need to understand how these big turbines respond," said senior project leader Jim Green, who is leading the GE tests. "Increasing their performance, reducing their loads, creating components that last longer – we'll need to learn about all those things if we're going to make more wind power."

Supersized Wind Turbines:

The GE turbine will operate atop a 262-foot steel tower. The diameter of its rotor will reach 250 feet. Its total weight, including the tower, will approach 220 tons.

The only visible part of the foundation will be the bolt circle for the tower itself, but looks can be deceiving. Covered with dirt for extra weight, its octagonal concrete foundation pad will measure 50 feet across and weigh about 500 tons.

"The pad has to be that big," Green said, "because that's what keeps the whole thing standing upright in high winds."

Special overland trucks started arriving at the NWTC in December carrying sections of the GE system. The trucks are up to 195 feet long – three times as long as a typical 18-wheeler. They use as many as 13 axles to distribute the weight of their huge cargo.

The trucks took a designated route on major roads that are designed to handle oversized loads and traveled at times that would not disrupt traffic. Two of the trucks were followed by a separate escort vehicle that remotely steered the trailer's rear wheels by radio signals to help the long trucks negotiate tight corners.



Fig. 6. Blades of the General Electric 1.5 MW turbine are being stored outside on cradles this winter at the National Wind Technology Center. They are secured with large concrete blocks to prevent them from being damaged during high winds and storms. Credit: Jim Green



Fig. 7. Photo of a long truck parked on a road with a yellow cab and red trailer carrying a white wind turbine blade. Trucks capable of transporting wind turbine blades are some of the largest and heaviest vehicles driving on the nation's roadways. Delivery routes must be carefully planned and approved to avoid urban rush hours, narrow lanes, sharp curves and weak bridges. Credit: Jim Green

In mid-December, the tower sections arrived from Tulsa, Okla.; the blades from Aberdeen, S.D.; and the generator housing and rotor hub from Pensacola, Fla.

During the spring, NREL will build new access roads to the planned turbine pads and provide other site preparation. NREL is purchasing the turbine for the U.S. Department of Energy under a subcontract with GE.

The GE turbine is already a workhorse commercial model, accounting for nearly half of all turbine sales in the U.S. The NREL tests are intended to discover ways to squeeze more power out of existing wind farms and improve the durability of the turbine's components.

"Any improvements we can make will have a lot of leverage in the wind industry," Green said.

Bigger than a Football Field:

The Siemens 2.3 MW turbine will be noticeably larger than the GE. It will use a similar tower, but its rotor diameter is a whopping 331 feet – more than the length of a football field!

Unlike the GE, the Siemens model is a late-stage prototype. It features a novel blade design that captures more of the wind's energy, but is not supposed to force any more load onto the turbine's moving parts and control systems. It will be heavily instrumented to produce a constant stream of data on aerodynamics, power characteristics, vibrations, system fatigue, acoustics and other key measurements.

The tests will be conducted in three phases through late 2011.

"These tests will verify the performance of the new blades under real and challenging conditions," said NREL senior engineer, Lee Jay Fingersh, who is project lead for the Siemens turbine.

"It looks very graceful and simple, but the aerodynamics of a wind turbine are harder to understand than an airplane or a helicopter," he said.

Siemens is providing the turbine, engineering support and maintenance from its new R&D office in nearby Boulder. NREL is providing the site, installation services and expertise in field aerodynamics testing, structure and reliability testing and meteorological analysis.



Fig. 8. A truck carrying a wind blade negotiates a sharp curve at the National Wind Technology Center. The logistics of delivering and installing increasingly large wind turbine components is just one issue that requires attention if the U.S. is to meet 20 percent of its electricity needs with wind power by 2030. Credit: Jim Green.



Fig. 9. A truck carrying a section of steel tower for a GE 1.5 MW wind turbine approaches the National Wind Technology Center. The truck has 13 axles to distribute the weight of its cargo. The escort vehicles behind have radio-controlled equipment to help steer the trailer from behind. Credit: Jim Johnson

The NWTC would make a poor commercial wind farm, but the location downwind from Eldorado Canyon and the Continental Divide <<http://www.nrel.gov/wind/facilities.html>> provides gusty conditions that

challenge turbine and blade designs and generate data at the equipment's limits. Motorists on Highways 93 and 128 can expect to see the giant turbines operating regularly.

"The turbines generate more power than we can use at the NWTC," Fingersh said. "We'll become an exporter of electricity and be able to offset some of the program's costs."

Learn more about NREL's wind turbine research at <<http://www.nrel.gov/wind/>>.



BILL BUTLER'S ENERGY USER'S ASSOCIATION COLUMN

In keeping with the theme of this newsletter Bill decided to reproduce part of this paper. The rest of the paper can be found at: <<http://www.telosnet.com/wind/#The%20Case%20for%20Wind%20Power>>.

Illustrated History of Wind Power Development

by Darrell M. Dodge



Fig. 10. Wind turbines through history, from a Mediterranean mill to advanced designs.

The historical and technical information in this paper is derived from many sources. Information on developments since 1975 is based primarily on my personal experience with the U.S. Federal Wind Energy Program, my extensive reading (and editing) of wind energy journals and research reports over the last 25 years, my conversations with wind energy researchers, interactions with members of the wind energy community, and my personal view of wind power developments and of the wind industry. Opinions expressed here are my own, of course. --DMD

CONTENTS:

- * The Case for Wind Power
- * Early History Through 1875
- * 20th Century Developments
- * Government Programs
- * Recent Market Developments
- * The Future of Wind Power

The first section is reproduced below.

THE CASE FOR WIND POWER:

For human development to continue, we will ultimately need to find sources of renewable or virtually inexhaustible energy. It's difficult to imagine this, but even if we find several hundred or even thousand years of coal and natural gas supplies, what will humans do for the next 250,000 years or so after they are depleted? Even the most apparently "inexhaustible" sources like fusion involve the generation of large amounts of waste heat -- enough to place damaging stress on even a robust ecosystem like Earth's, at least for the organisms that depend upon stability of the system to survive.

We are engaged in a sort of worldwide biological experiment, with our descendents as the subjects. Our present habits of energy use are shaping an entirely different earth than the one with which we are familiar. When these changes begin to be expressed, there will be no one to preserve the familiar and there's no guarantee that things will turn out the best for our particular species. Some have looked ahead and seen this. But they usually don't get much support from societies that are too busy trying to "make do" and that are rushing backwards into the future -- in other words, every society on earth.

One of the areas that suffers because of this backward thinking is the development of renewable energy sources -- and the topic of this section: Wind Energy Conversion.

There's a lot of underlying popular support for wind energy and the other renewables in the United States. But there's also a lot of apathy as well. We are blissfully sedated by low conventional energy prices and are gulping down the few remaining years of cheap natural gas and Mid East oil. As we do this, the inertia of global warming is inexorably building.

What drives the continued development of mechanical devices like wind turbines in the face of this widespread lack of support? In the case of wind turbine technology, I suspect that part of the reason for persistence of this vision is how accessible wind turbines are to the understanding. They are personal in a way that almost no other form of power generation is.

This "personal" scale has been both the blessing and the curse of wind power development. The field tends to attract people who are committed, creative, and passionate. It also attracts a few people who are a little too much of all of those things, to the point that sometimes the grounding of reality is lost. Both of these tendencies will be evident in this brief history of wind power development. Wind power will probably succeed or fail based on the ability or inability of its proponents to bank the fires of "Romance" and focus on defining wind generation's role as a practical alternative to conventional generation sources.

Wind energy conversion is a fascinating field to study, if only because its past has been so checkered and its exact future is so uncertain. Unlike the aerospace industry, the computer industry, and almost any other successful industry you can name, wind energy -- the leading mechanically based renewable energy for much of man's history -- has never made anyone rich for long. But unlike many of these other industries, it has been around for thousands of years. It's a technology that has been reinvented numerous times. We are left with the promise and the drive to succeed despite daunting (and sometimes puzzling) obstacles.

Darrell Dodge lives in Littleton, Colorado and may be reached at <dmdodge@aol.com>.

Bill Butler, Director, Energy User's Association & CREED Newsletter Co-Editor, may be reached at **651-426-3356** or <bandco2@comcast.net>.

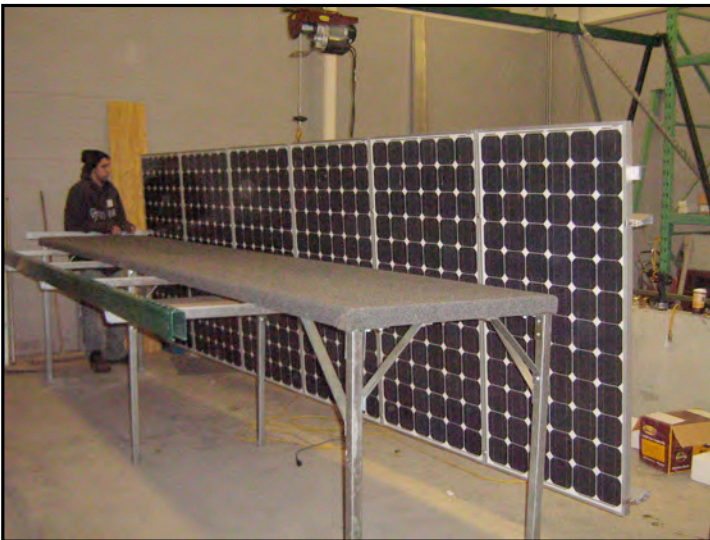


COMMUNITIES FOR RESPONSIBLE ENERGY/ENVIRONMENT DEMONSTRATION (CREED) PROJECT

1589 Hollywood Court,
Falcon Heights, MN 55108-2130

www.creedproject.org

**THIS IS YOUR COPY OF
"THE STREAM" - ENJOY IT!**



Figs. 11.-15. The Newly Installed PV Array on the Hennepin County Maintenance Center Roof in Medina is, at 98 kW capacity, now the largest PV system in Minnesota. The Wanxang cells were made in China.