Volume 6. Number 5. Fall I, 2003

# THE STREAM

(**T**echnical tools and **H**ands-on help for **E**ducation re a **S**olar **T**heme to **R**enew the **E**nvironment **A**cross **M**innesota)

www.creedproject.org

www.mres-solar.org

**Combined Newsletter of the Communities for Responsible Energy/Environment Demonstration (CREED) Project & the Minnesota Renewable Energy Society (MRES)**

# MINNESOTA'S EERE INDUSTRY NO.3 WHAT IS IT? WHO ARE THE PLAYERS?

## SEBESTA BLOMBERG & ASSOCIATES, INC.

Providing Business and Technical Solutions to Clients Worldwide

Lyle Olson

**A TRADITION OF EXCELLENCE:** Founded in 1994, the engineering firm of Sebesta Blomberg & Associates, Inc. has delivered business and technical solutions to clients in the Institutional, Industrial and Governmental Markets. Sebesta Blomberg has grown from the original six founding partners to

**SEBESTA BLOMBERG** Cont. on p.6.

## CENTRAL MINNESOTA ETHANOL BIOMASS ENERGY PLANT

Cecil Massie & Lyle Olson

Sebesta Blomberg & Associates, Inc. (Sebesta Blomberg), Primenergy, L.L.C. and Central Minnesota Ethanol Cooperative (CMEC) intend to design, develop and construct a biomass energy plant in a currently operating ethanol plant that will co-generate heat and

**ETHANOL BIOMASS** Cont. on p.7.

## WHOLE BUILDERS COOPERATIVE

Mary Jane Heinen & Marcia Bethke

Founded in 1979, Whole Builders was established on the principles of holism – the product/outcome of the whole or group is greater than the sum of its individual parts. The original owners came together at a discussion group of the Association for Appropriate

**WHOLE BUILDERS** Cont. on p.8.

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**Fig.1. Side view of the Crocker house designed by Whole Builders Cooperative.**

# THE STREAM

**Vol. 6. #5. FALL I, 2003**

Combined Newsletter of the Communities for Responsible Energy/Environment Demonstration (CREED) Project and the Minnesota Renewable Energy Society (MRES).

Published bimonthly.

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

The Executive Director, 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 is $15, (students $10) for six issues. Back copies of the "THE STREAM" are available from the above address for $3 a copy.**

**RECENT BACK ISSUE TOPICS:-**

| Vol./# | Date | Topic |
|---|---|---|
| 4/2 | Spring I 01 | E. Eff. Appliances Part 4. |
| 4/3 | Spring II 01 | Global Warming for Real? |
| 4/4 | Summer 01 | Xcel E's Biomass Mandate. |
| 4/5 | Fall I. 01 | Ann. Reps. CREED/MRES. |
| 4/6 | Fall II 01 | Energy Edn. in Minnesota. |
| 5/1 | Winter 02 | Laws of Thermodynamics. |
| 5/2 | Spring I 02 | Renewable Projects in MN. |
| 5/3 | Spring II 02 | Shortage of Tech. Grads. |
| 5/4 | Summer 02 | Ren. Projects in MN Part 2. |
| 5/5-6 | Fall I/II 02 | Efficient Envir Friendly Trnspn. |
| 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. |

# MEETINGS

CREED Board meetings are held on the **second Monday** of each month at **1600 hours** (4:00 p.m.). During Summer they are held at either the **East** or **West Visitor Centers** of the **Coon Rapids Dam Regional Park;** and in Winter at **Anoka Ramsey Community College.** For more information, call Chair Bob Swanson, 763-424-4945, Secretary/Treasurer, Valdi Stefanson, 651-762-4015 or Executive Director, Roger Aiken, 651-644-8318.

MRES Board Meetings are on the **second Thursday** of each month at **1900 hours** (7:00 p.m.) at **Whole Builders Cooperative,** 2928 5th Ave. S., Minneapolis, MN 55408. For more information call Chair, David Boyce, 952- 445-7270, or Treasurer, Ralph Jacobson, 612-623-3246.

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

# SPONSOR/MEMBERSHIPS

CREED and MRES are two independent organizations with their own separate Boards of Directors. They pool their resources and expertise to publish this bimonthly newsletter. For people who wish to support either of our organizations beyond just merely a newsletter subscription, CREED has several levels of sponsorship and MRES several levels of membership.

## CREED SPONSORSHIP:

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. We gratefully acknowledge the support of the following who have sponsored us during the past two years:-

### Global Sponsors:

Great River Energy.
Mark LaLiberte-Shelter Supply Inc.
Minnesota Power.
Xcel Energy.

### Continental Sponsors:

Bill Butler-Edge Academy.
Anders Rydaker-District Energy St Paul.

### Regional Sponsors:

Chuck Koestler, Gary Nelson, The Energy Conservatory, Michael Noble, ME3, Greg Schmidt & Nancy Hone, Ann Stewart-Stewartship, Aaron Tovo, Gina Vermilyea.

### State Sponsors:

Mike Eckhardt, Mark & Lorraine Francis, Mark Gable, Keith Harris, Jim Harrison, Bruce Odegaard, David Pogany, Curt Pratt, Mike Rivard, Steve Rhude, Ed Turner, Jeff Ylinen.

### Community Sponsors:

David Boyce & Lee Olson, Robert & Suzannah Ciernia, Sam Garst, Tom Griffin, Richard Gronning, Ann Haase, Jerry Lilyerd, Bob & Lee McLane, Carl McNally, Dr. Stephan Peter, Pat Richards, Thomas Roman, Marvin Rothfusz, Kathleen Sekhon, Wally Swentko, Joel Weisberg.

**If you would like to renew your sponsorship from a previous year, or join this special group of people who care about our environment and our economy and especially want to support our efforts to bring 3E Education to our citizens, we would love to have you do so.** Our sponsorship levels are:-

| | |
|---|---|
| Community: | $25 and above. |
| State: | $50 and above. |
| Regional: | $100 and above. |
| Continental: | $250 and above. |
| Global: | $500 and above. |

All CREED sponsors receive a free subscription to the newsletter. In addition at the State level a CREED logo button, at the Regional level a T-shirt, and at the Continental & Global levels a framed certificate of sponsorship recognition. T-shirts are also available for $10.

## MRES MEMBERSHIP:

MRES is the Minnesota chapter of the American Solar Energy Society (ASES). MRES local chapter memberships are as follows:-

| | |
|---|---|
| Individual: | $30 |
| Student & Senior: | $15 |
| Family: | $45 |
| Businesses: | $100 |
| Corporate: | $500 |

All MRES members receive a free subscription to the newsletter.

## MAILING LABEL CODES:

After your name on the mailing label or e-mail address you may find one of these codes:

| | | |
|---|---|---|
| CN | = | CREED/MRES N/L Subs. |
| CS | = | CREED Sponsor. |
| CE | = | CREED Exchange of N/Ls. |
| MI | = | MRES Individual Membership. |
| MS | = | MRES Student Membership. |
| MSe | = | MRES Senior Membership. |
| MF | = | MRES Family Membership. |
| MB | | MRES Business Membership |
| MC | = | MRES Corporate Membership. |

The two digits following the code represent the last year for which your subscription, sponsorship or membership was current. 03 represents current membership. If there is no code after your name then you are also in arrears.

# FEEDBACK

*(fëd´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**)*

Our e-mail readership continues to grow. Although we will continue to honor the requests of those of you who have asked for the hard copy paper version, we want to reduce this number to the minimum possible in order to reduce our paper and mailing costs in this era of tight economic budgets. Being able to send you the e-mail version does this and also allows you to receive the issues both in color and in a much more timely fashion.

**So if you are still receiving this through your letter box and would like to help us with our budget, please send your e-mail address to <rogeraiken@creedproject.org> and opt for the e-version.**

**Furthermore, if you are receiving the paper version and wish to continue receiving it that way, we request that you send back to us the enclosed orange colored sheet together with your check for $15 to cover the annual costs for six issues of this version. Shortly we will be purging from our mailing data base the names of all people we do not hear from.**

## FROM THE DESK OF THE EDITOR:

This issue brings the third of our series on the players which comprise the Energy Efficiency and Renewable Energy (EERE) industry in Minnesota. We had hoped to have featured as many as four different companies, but as every editor knows sometimes landing articles in your in basket is much more difficult than it may seem. However the two businesses that are featured have given us some extra material and we hope that the exposure that we are able to give them through our readership will be of benefit. Whole Builders Cooperative is an Architectural Design firm in Minneapolis which specializes in sustainable building design and solar energy collection. They therefore create the reality and put into practice both aspects of the EERE equation. Sebesta Blomberg is an engineering design firm in Roseville which not only manages standard turnkey building and other projects but has also made a commitment to assist the development of industries working toward energy independence, especially in the fields of biomass conversion. These two exemplary companies represent the very best that Minnesota has to offer in their respective fields with respect to Minnesota's indigenous energy future.

Sincerely, Roger G. Aiken.

# UPCOMING MEETINGS AND EVENTS

## 1. BOARD MEETINGS:

**JANUARY 2003:-**

**CREED:** Monday 12, 1600 hrs at Anoka Ramsey Community College's TDC Building.
**MRES:** Thursday 8, 1900 hrs at Whole Builders Cooperative.

**FEBRUARY 2003:-**

**CREED:** Monday 9, 1600 hrs. Venue to be announced.
**MRES:** Thursday 12, 1900 hrs at Whole Builders Cooperative.

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

**SPRING 2004:**

**2.1. Energy Basics: SCED 6080-32948. Two sessions Saturdays, 8:00 a.m.-5:30 p.m. February 7, 21, plus additional on line hours:** This is the first course in the EERE Series.

Energy in a Technological Society. Units, Dimensions, Nomenclature, Definitions, Energy Forms/Classifications. Energy Sources and Conversion. Electrical Energy. Energy End Use. Conservation. Site visits to the NRG, Newport Resource Recovery Facility and a coal fired electrical generating plant. Lead instructor is Roger Aiken.

**2.2. Solar Meteorological: SCED 6085-32947. Two sessions Saturdays, 8:00 a.m.-5:30 p.m. April 3, and May 1, plus additional on line hours:** Weather processes. Minnesota's meteorological solar potential. Elementary fluid mechanics. Water power basics and turbines for hydroelectric generation. Wind energy, history and potential. Wind Energy Conversion Systems (WECS). Utility factors, distribution and green pricing. Design/manufacture of wind turbines. Environmental effects of hydro and wind and prognosis the future. Site visits to hydro and wind energy generating facilities.

**SUMMER 2004:**
**2.3. Solar Direct: SCED 6078. Four Days June 21-24, 9:00 a.m.-5:00 plus additional on line hours:** Solar radiation, the solar constant, the sun-earth system, solar time, sun angles and the effect of the earth's atmosphere. Solar radiation measurement. Photovoltaics. The physics, design, construction and economics of solar cell arrays. Solar thermal applications. Heat transfer. Passive and active collection. Building design, heat loss/gain, landscaping. Energy balance of the sun-earth-atmosphere system. Pollution of the atmosphere, Global Warming. Site visits to homes and buildings utilizing solar collectors and energy efficient building design.

**2.4. Solar Photosynthetic: SCED 6086. Four Days July 26-30, 9:00 a.m.-5:00 plus additional on line hours:** Solar Radiant Energy and Photosynthesis. Biomass: Definition and Forms. Biomass production and conversion processes. Ethanol and biodiesel production from corn and soy beans. Electrical Energy and fuels (transportation and heating) from Biomass. Site visits to an oil refinery, corn and soy bean farms and an ethanol production facility.

Each course is worth 2 C.E. Semester Graduate Credits. The Spring classes comprise two Saturdays of contact time 8:00 a.m. to 5:30 p.m., preceded by course lecture and homework assignments to be posted on Hamline's "blackboard" web site one week before each class. The Summer classes are somewhat slower paced and comprise four days of contact time 9:00 a.m. to 5:00 p.m. Again lecture notes will be placed on Hamline's "blackboard" one week before the classes begin.

For further information contact:-
**Content-** Roger Aiken, 651-644-8318 or <rogeraiken@creedproject.org>
**Registration-** Renee Wonser, CGEE @ 651-523-2419 or <rwonser@gw.hamline. edu> **or** Pam Jessup, CGEE @ 651-523-2591 or <pjessup@gw.hamline.edu>.

## 3. MINNESOTA SCIENCE TEACHERS ASSOCIATION SPRING CONVENTION:

**Friday/Saturday April 16/17, 2004.** at Mankato.

For more information go to the MnSTA Web site at <http://www.mnsta.org>.

## 4. MnSTA TEACHERS OF PHYSICAL SCIENCE (MNTOPS) CONFERENCE:

**Friday April 23, 2004.** at the Science Museum of Minnesota.

For more information contact Dawn Cameron at <dcameron@smm.org>.

## 5. UPCOMING ASES AND ISES CONFERENCES:

**ASES:**
**SOLAR 2004:**
July 11-14, Portland, Oregon.

**ISES:**
**SOLAR WORLD CONGRESS 2005:**
August 8-12, Orlando, Florida.

# NEWS ITEMS

## 1. CREED BOARD NEWS.

**Roger Aiken**, steps down as Executive Director of CREED on Jan. 1, 2004. He will continue volunteering for CREED in the areas of newsletter editing/publishing and energy course writer/instructor. A new Executive Director has now been selected by CREED's Board. The formal announcement of his appointment will be given in the next issue of "THE STREAM".

CREED is still looking for qualified people from the teaching professions, EERE industry and the public sector to fill the five vacancies remaining on the Board. Candidates must have a passion and concern for Energy Education, both in helping our teachers, and in the initiation of energy demonstrations for the general public

If you know of a person(s) who fits this description and would like to suggest or nominate him or her, please inform CREED's Executive Director, Roger Aiken, 651-644-8318, or Board Chair, Bob Swanson, 763-424-4945.

## 2. MRES BOARD NEWS.

**David Pogany,** long serving member of the Minnesota renewable energy community and recently retired chair of MRES, passed away on Tuesday morning, Dec 16, after a valiant struggle with lung cancer. He is survived by his wife Gillian and children, one of which Sara has severe diabetes.

In celebration of his life, his friends and family gathered on Sunday 21st December at the Lakeville home of his brother-in-law John Pollock. The family has set up a memorial fund to support David's young daughter Sara's diabetes treatments.

A longer tribute to his passing will appear in the next issue of "THE STREAM".

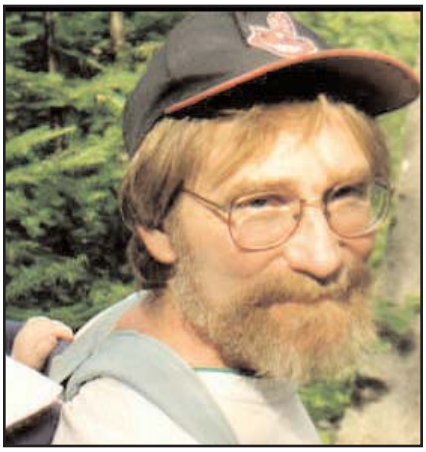

**Fig. 2. David Pogany**

## 3. FALL 2003 "ENERGY BASICS" CLASS AT HAMLINE:

A very successful "Energy Basics" class was held over two Saturdays in November, 2003 at Hamline University. This was the first class held following the new Hamline format requiring in class contact time to be supplemented with on-line material posted to their "blackboard 5" web site. This enabled us to achieve two improvements which were welcomed by the teachers who attended. First, travel was limited to just the two Saturdays, an adjustment much appreciated by the teachers during their busy school year. Secondly, the pre-posting of on-line materials enabled registrants to read and absorb the lecture materials prior to the Saturday classes, enabling more time to be allotted to profitable in-class discussion.

Two site visits were scheduled. On Saturday 8th we visited NRG's Resource Recovery Facility at Newport, where garbage from across the counties of Ramsey and Washington is dumped and processed into RDF (Refuse Derived Fuel). On Saturday 22nd we visited Xcel Energy's High Bridge generating plant in Saint Paul. This is one of the coal burning plants scheduled to be replaced with combined cycle gas turbine/Rankine cycle, natural gas fueled technology in the next few years.

Six students were registered in this class. Interestingly only three of these were teachers, one of whom is a fourth grade elementary school teacher. Of the remaining three, one works for the Defense Department, a second for a biomedical company and the third is a student at Metropolitan State University. Apparently our EERE classes have value to more than just high school teachers. See photos of Fig. 8., p.10..

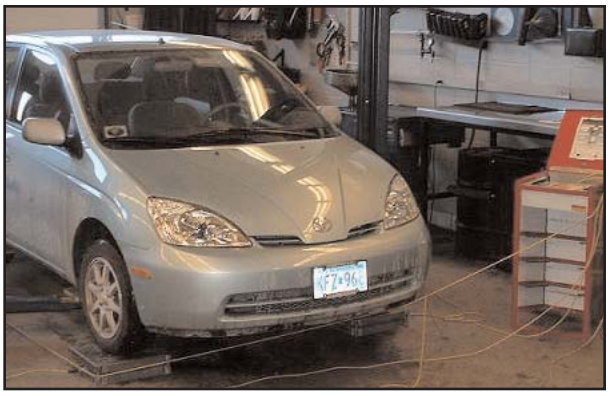

**Fig. 3. Toyota Prius on the Scale.**

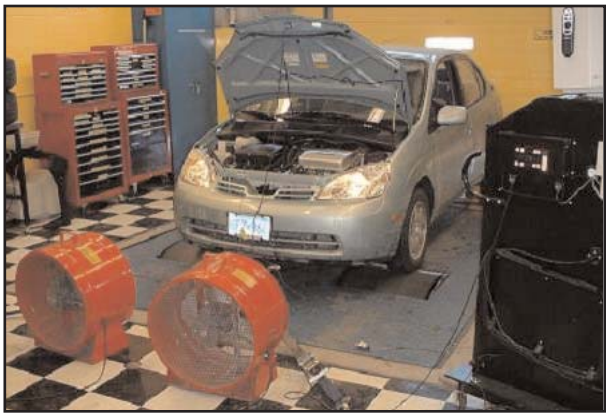

**Fig. 4. Prius on the Dynamometer.**

## 4. TOYOTA PRIUS CONVERSION UPDATE:

Roger Aiken's Toyota Prius hybrid vehicle, underwent its first performance test runs at the Minnesota Center for Automotive Research (MnCAR) at Minnesota State University, Mankato during November/December. During this period initial baseline test runs using E10 (standard grade gasoline or gasohol as used in Minnesota) were car-

ried out by a team of five final year automotive engineering students under the direction of Drs. Paul Sullivan and Bruce Jones. The vehicle will be returned to MnCAR in January for further performance testing with increasing proportions of ethanol in the fuel up to 85% (i.e. E85). The goal of these tests will be to ascertain whether, with a few minor changes to the fuel injection, and timing, the vehicle will be able to run successfully on E85 fuel both for everyday use and as a demonstrator vehicle.

## 5. BOOK REVIEW:

**Sleeping With the Devil: How Washington Sold Our Soul for Saudi Crude,**
by Robert Baer - New York Crown Publishers, 2003

Are we in jeopardy of seeing gasoline prices rise to $5 a gallon in the next two years? What would $5 gasoline do to the U.S. economy? These are questions addressed by Robert Baer in his recently published book, which brings into focus the great dangers we face in relying on Saudi Arabian oil, and highlights our need to change our energy habits from fossil fuels to renewable fuels. As a CIA agent, Baer spent 23 years probing the volatile mix of poverty, oil money, weapons, and militant Islamic fundamentalism which simmers in the Middle East. For him, the only question is WHEN (not whether) explosive events in the Saudi kingdom will double or quadruple the price of crude oil IF we continue to do nothing to prevent it.

**SEBESTA BLOMBERG** Cont. from p.1.
over two hundred employees. Sebesta Blomberg ranks as an ENR Top 500 design and engineering firm in the USA and one of the top 50 fastest growing companies in Minnesota.

The firm's client list contains many marquee clients including the University of Minnesota, Harvard Medical School, Yale University, Stanford, 3M, Medtronic, Imation, Honeywell, Harrods of Knightsbridge - London, General Mills, Art Institute of Chicago, US Capital, Smithsonian Institution, The Pentagon, Dallas/Fort Worth Airport, Minute Maid Foods, Starbucks Coffee and Kraft Foods.

**A WORLD OF HIGH-QUALITY SOLUTIONS:**
Design innovation and value-added solutions have helped Sebesta Blomberg grow from it's headquarters office in Roseville to also include regional offices in Minnesota, Illinois, Massachusetts, Texas, Colorado, Washington D.C. and California. An international office in China also has been established to provide clients with solution capabilities for their Asian operations.

**EXPERTISE CUSTOMIZED TO EACH PROJECT:**
Sebesta Blomberg manages projects of every size, scope and level of complexity, from minor upgrades to major system redesigns.

The firm completes projects for higher education facilities, healthcare centers, convention centers, museums, airports, medical manufacturers, food and beverage manufacturers, specialty chemical firms, agricultural processing, government facilities and laboratories, utility generators and industrial product manufacturers.

Sebesta Blomberg's vertically integrated suite of services begins with operational and needs assessments and feasibility studies, development of business analysis to aid capital investment decisions, design and implementation of systems and facilities, through system commissioning, training and operational optimization and assistance.

**A BRIGHT FUTURE:**
Sebesta Blomberg continues to grow to meet client demand for additional value added services. Expansion of services is planned to serve the facility management market, renewable energy production and value-added agriculture markets. We are committed to providing services dedicated to assure our client's success.

## SUPPORTING GROWING ENERGY INDEPENDENCE:
Sebesta Blomberg has made a commitment to assist the development of industries working toward energy independence. Joint venture projects involving the Sebesta Blomberg office in China to develop two wind energy farms are underway. The company has also moved into the biowaste-to-energy market with

leadership in new drying technologies to convert typical waste streams into value-added products or to be used as a fuel source. Last year the firm presented a technical presentation on dryer technologies at the American Gas Association National Conference in Washington DC. In previous years, the firm applied for and received grants from the DOE (approximately $250,000 for biomass fuel use at Rahr Malting) and Xcel Energy (approximately $740,000) for power and thermal energy from distillers dried grains with solubles (DDGS) and corn stover.

This year, the firm applied for and received a two million dollar grant from a joint USDA/DOE renewable energy fund. This grant will be used in conjunction with the Central Minnesota Ethanol Coop to eliminate natural gas purchases and to reduce power purchases and use locally available biomass in a gasification process.

Lyle Olson is an engineer with Sebesta/ Blomberg & Associates Inc. in Roseville. He may be reached at 651-634-7254 or e-mail at <lolson@sebesta.com>.

**ETHANOL BIOMASS** Cont. from p.1.

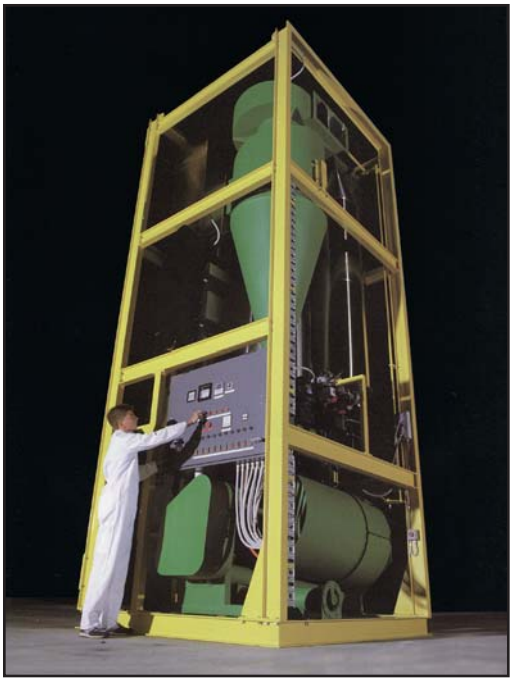

**Fig. 6. Experimental Drier.**

electricity using a steam turbine based on gasification of forest residues. This project will be executed under the USDA/DOE's Biomass Research and Development Initiative opportunity.

**Fig. 5. Drier for Distillers Dried Grains.**

Based on preliminary studies conducted by the team, and a previously funded DOE project, the team has collected and analyzed operating and economic data that suggest a new approach to gasification that would significantly reduce CMEC's dependence on fossil fuels, thus reducing its operating costs. The CMEC plant was selected for its unique characteristics and its close proximity to a large and continuous supply of biomass produced by its ethanol operations and access to forest and agricultural biomass sources.

The overall goal of the project is to commercialize an innovative biorefinery that gasifies low value waste residues to generate electricity, heat, and liquid fuels in an environmentally beneficial, technically practical, and economical application. If demonstrated, this project will significantly enhance ethanol operations by reducing operations costs, lowering environmental emissions, increasing revenue by creating higher value co-product streams, and displacing fossil fuels. Furthermore, this project will create a modular design for biomass cogeneration that can be applied and replicated at other ethanol and agricultural plants across the country and abroad.

**Fig. 7. Experimental Drier" Example 2.**

The expected outcome relative to program priorities is that this project will encourage rural co-production of power and heat from locally available biomass, while

reducing animal waste issues. By basing this distributed power generation on low-value forest and agricultural wastes, this project will encourage rural economic development by expanding the industry that collects these fuels and by enhancing rural based ethanol production. By basing the production of ethanol on biomass energy, the project advances goals of greenhouse gas emission reduction and national energy independence. At present, the USDA estimates the overall energy ratio of ethanol production to be 1.34 units of energy output in the form of ethanol for every unit of energy input in the form of fossil fuels. This project is expected to increase that ratio to 2, thus making ethanol production a clearly beneficial energy source.

This project offers a unique opportunity to demonstrate the feasibility of biomass-to-energy conversion, while eliminating forest and agricultural biomass residues. The team will start the project with pre-engineering by conducting a site survey and a soil report. Detailed engineering of the gasification facility will be followed by procurement, and installation of all equipment. The team will also work on environmental permitting for the integrated energy generation facility and beneficial use of the discharged ash. The project will end with the successful demonstration and start-up of the biomass-to-energy plant.

**WHOLE BUILDERS** Cont. from p.1.

Technology, a non-profit organization that was formed around the principles espoused by E. F. Schumacher. Since that time, WBC has provided Design and Construction Services with a comprehensive approach, bringing together design and construction specialists with an emphasis on energy conservation, sustainable principles and cutting edge technologies as well as high quality construction details.

Mary Jane Heinen, AIA and Marcia Bethke are the current owners. WBC has four employees: Design Assistant, Construction Manager, Cabinetmaker and Office Support.

We are proud that in all of our past and current projects, by using our design/build approach both in new homes and in remodeling, the finished product uses less energy than similar sized structures and functions well and is pleasing and comfortable to the occupants. The strength of the company is creative design and quality construction, with a commitment to provide service and follow-up on every project.

Creative and Finely Detailed Design/Build Projects
Incorporating Sustainable Principles Since 1979
Licensed Architect w Custom Cabinetry
Complete Construction Services
612 - 824 - 6567
MN License # 3093

WHOLE BUILDERS
A DESIGN BUILD COOPERATIVE

Over the past 25 years, the company has completed over 35 new homes/large remodels and another 200 – 300 remodels/expansions/additions; all of which incorporate an energy efficient/sustainable building technology. These include: earth berming, passive and active solar, wind, photovoltaics, superinsulation, and the use of green building products.

Our custom cabinet shop allows us to carry sustainable principles to the selection of materials and finishes that are incorporated into kitchen cabinets and other interior built-ins that help to optimize the function and aesthetics of interior spaces.

Education is also a large part of our company's mission. Whether it is attending seminars, teaching classes or updating our product information, we are constantly evaluating what we do, how we do it, and how we can better serve others and share the knowledge we have.

Our future goals are to design and build energy efficient and sustainable new homes in the metro area. Our ultimate vision is to work with a developer to create a whole neighborhood of these types of homes with alternative energy systems.

Typically, we draw on the skills of a variety of subcontractors that share our values to produce our projects. When hiring, we look for employees with a variety of skills and the ability to work independently. Skills in Design, Carpentry, Cabinetry, Project Management, Marketing are high on our list. Creativity, communication and a commitment to environmental responsibility are a must.

# HIGH-MASS ACTIVE AND PASSIVE SOLAR RESIDENCE

Cambridge, MN 55008

Architect: Mary Jane Heinen | Contractor: Owner

## SPECIFICATIONS

### Area Data

Latitude: 45° N. Degree Days: 7,575 (62° base temp, 68° thermostat setting)
Average Radiation per ft$^2$ of vertical surface in January: 921 BTU's

### General House Data

New two story, 40' x 40' rural retirement home. First floor accessible living space with attached artisan's woodshop/garage. Second floor painter's studio, guest space, and office.

Size: 3,200 ft$^2$
Cost: <$100 per ft$^2$

### Solar Thermal

Collector: Direct Gain 169.5 ft$^2$ Rooftop
Active System 460 ft$^2$
Storage: 600 gallons water with 12kW electric water heater back up
Back Up: Woodburning catalytic stove, off-peak electricity from utility
Passive Solar Savings Fraction: 10.9%

### Heat Retention Data

Floors: In-floor radiant heat from solar energy
Lower 5" concrete slab on grade, vapor barrier, 2" rigid insulation R = 10
Upper 2" concrete slab on wood framing
Walls: Insulated concrete forms, 2.4" expanded polystyrene R = 20
Roof: Structural Insulated Panels R = 38
Glazing: H Type double pane windows with .37-.32 U value with Low E on inner pane

### Estimated Performance

SBIC Builder Guide:

| | | | |
|---|---|---|---|
| Heating Conservation | 25,500 BTU/yr-ft$^2$ | Cooling Conservation | 6,000 BTU/yr-ft$^2$ |
| Auxiliary Heat | 23,000 BTU/yr-ft$^2$ | Cooling | 2,600 BTU/hr-ft$^2$ |
| Temperature Swing | 7°F | | |

### Solar Electric

1500 watt grid inter-tied/UPS tracking PV system installed in 2001

### Sustainability

Site: 15 acres reforested with 20,000 trees providing firewood for backup heat, 6 acres restored to prairie, 3 ponds excavated
House: Locally harvested post and beam construction. Salvaged wood products (from previous projects and downed trees) were used on interior work. The solar thermal panels were also salvaged.

Mary Jane Heinen and Marcia Bethke are the owners of Whole Builders Cooperative, 2928 5th Avenue South, Minneapolis, MN 55408. They may be reached at 612--824-6567 or <wbuilders@qwest.net>.

## *BILL BUTLER'S EDGE ACADEMY COLUMN*

Bill Butler is currently on vacation in Florida. We will continue with his column in the next issue.

**COMMUNITIES FOR RESPONSIBLE ENERGY/ENVIRONMENT DEMONSTRATION (CREED) PROJECT**
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## THIS IS YOUR COPY OF "THE STREAM" - ENJOY IT!

**The Class Sweats Over a Quiz!!**

**Thermo Lab View 1.**

**Thermo Lab View 2.**

**The Group at N.R.G. Newport.**

**Fig.8. Fall 2003 "Energy Basics" Class. See News Item on p.5.**