2010

A Vision for Sustainability

University of Minnesota, Morris

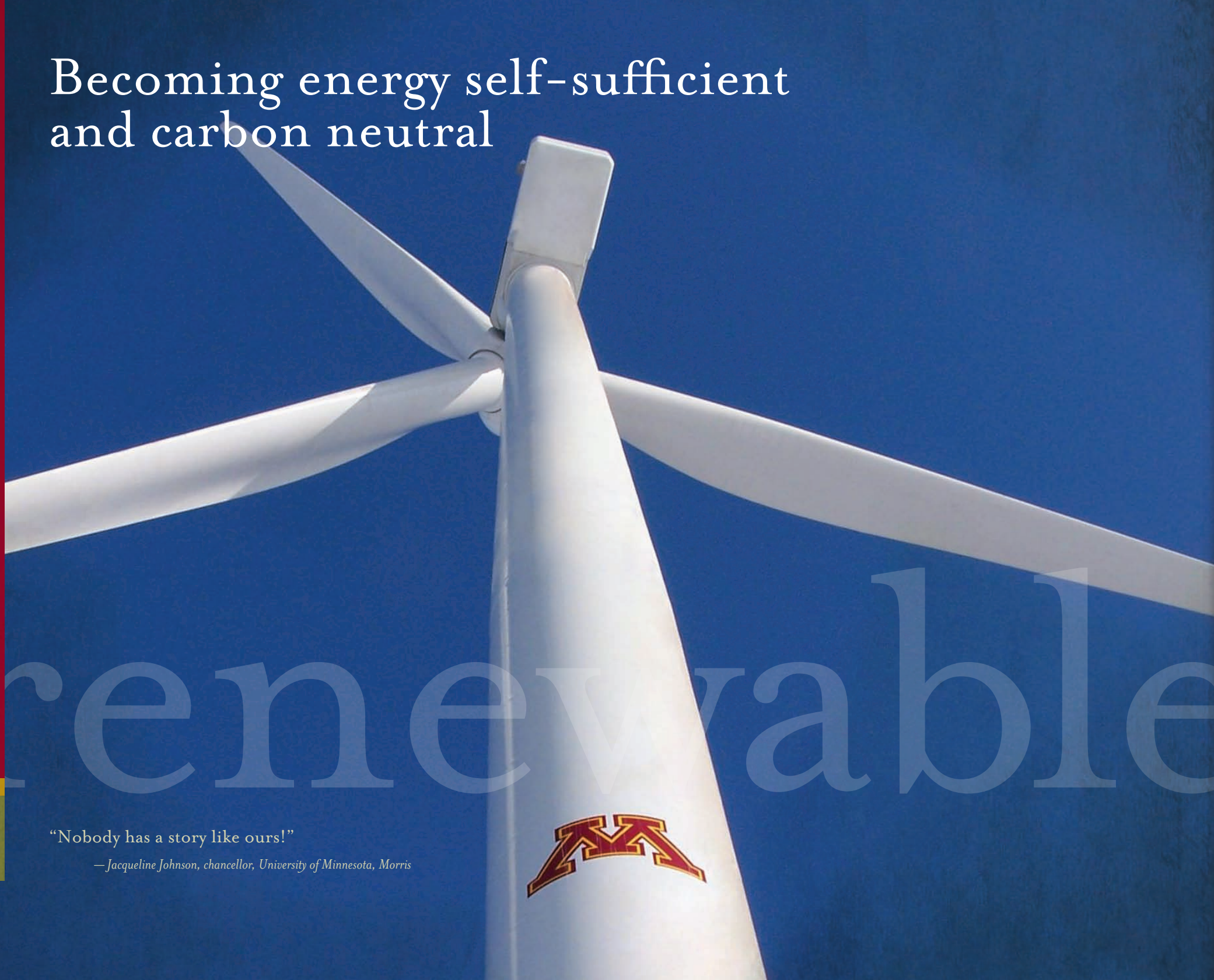
UNIVERSITY OF MINNESOTA

MORRIS

A renewable, sustainable education.

A Vision for Sustainability

Becoming energy self-sufficient and carbon neutral



"Nobody has a story like ours!"

—Jacqueline Johnson, chancellor, University of Minnesota, Morris

A comprehensive approach to sustainability

Renewable energy, conservation, research, education, and outreach are the elements of Morris's comprehensive approach to sustainability.

Morris is one of the first public colleges to generate on-site renewable power from local resources, such as corn stover.

At the south edge of campus, a biomass gasification plant—fueled by crop residues from nearby farms—generates steam. The biomass gasifier is part of an integrated system for heating and cooling campus buildings. The combined heat and power system includes a steam turbine, which generates renewable electricity from gasifier steam, and a steam-powered absorption chiller.

At the campus's Regional Fitness Center, locally manufactured solar thermal panels collect the sun's energy to heat swimming pool water. A solar photovoltaic system on the south side of the Science building converts sunlight into electricity.

On the glacial ridge overlooking the campus, a 1.65 megawatt wind turbine generates renewable electricity for the campus and the region. A second wind turbine is planned.

Shifting to renewable power is just one piece of the campus's comprehensive sustainability strategy. Other measures include historic building reuse, green building design and construction, conservation, local foods programs, hybrid vehicles, innovative curriculum, and community outreach.

The Morris campus is a nationally recognized sustainability leader and serves as a model community.

The wind turbine…

- is the first commercial-scale research wind turbine at a U.S. public university;
- is operated by the West Central Research and Outreach Center (WCROC);
- generates 5.6 million kW hours of electricity per year;
- sits atop a 230-foot tower and has three 135-foot blades;
- produces electricity at wind speeds as low as 7.8 mph and maximum electricity at wind speeds of 29 mph;
- powers WCROC's wind-to-hydrogen-to-ammonia pilot plant.

The biomass gasifier…

- consumes about 9,000 tons of corn residue and prairie grass pellets per year, harvested from farms within a 20-mile radius of Morris;
- is designed to gasify a variety of agricultural fuels;
- avoids 8,000 tons of CO_2 emissions per year;
- generates 19 million BTUs of heat energy per hour at peak capacity;
- will create up to 10 new jobs;
- injects about $500,000 per year back into the local economy through the purchase of crop residues.

The solar thermal array…

- consists of 32 flat panel solar energy collectors;
- heats water for the recreational swimming pool;
- avoids about 30,000 lbs. of CO_2 emissions per year.

More than energy

These local wind, biomass, and solar energy facilities do more than generate power. They double as sophisticated research and teaching tools. And they give other communities and institutions a chance to see how these new technologies work.

Spearheading change

Students initiated the campus quest for sustainability.

In 2001, student leaders asked Morris campus officials to subscribe to Otter Tail Power Company's wind power program. The campus agreed to buy wind energy for the Student Center. But to offset the extra expense for alternative power, officials challenged students to save an equal amount of money through conservation.

Students embraced the challenge. Water and power usage in residence halls fell and recycling jumped, saving thousands of dollars.

The students also prompted some soul searching, says Lowell Rasmussen, vice chancellor for finance and facilities. "We asked ourselves if we were good stewards of all our resources. That started us on the path to sustainability."

Students leading sustainability outreach

At Morris, students lead a wide variety of sustainability efforts, from cafeteria waste composting to organic gardening. Two new initiatives that involve students in community action are GreenCorps and Morris Healthy Eating.

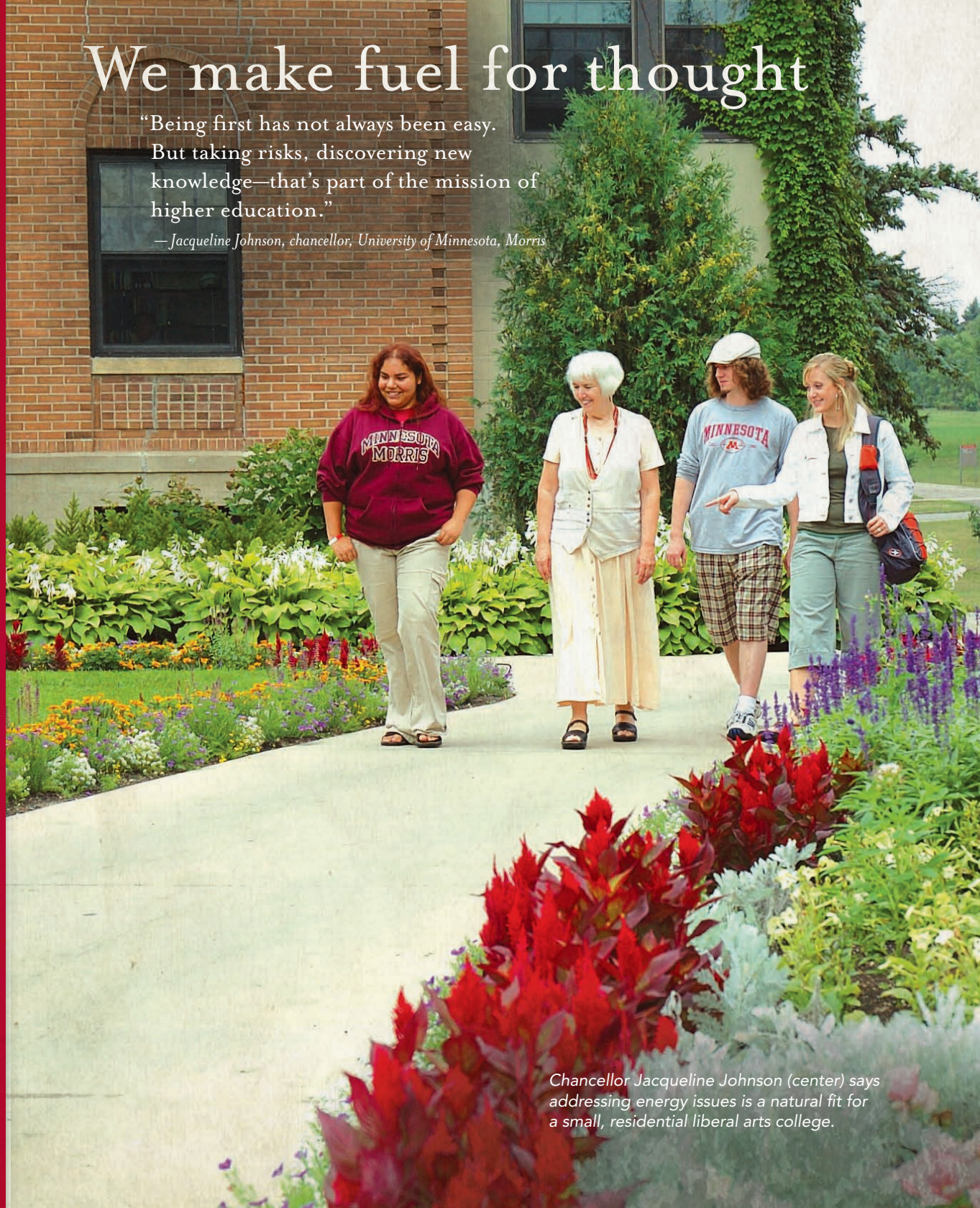
GreenCorps, launched by the Morris campus, the Minnesota Pollution Control Agency, and ServeMinnesota, is developing the next generation of environmental professionals. Morris juniors and seniors work in fields such as community outreach, waste prevention, and local government energy conservation.

The Morris Healthy Eating project, funded by Blue Cross and Blue Shield of Minnesota, is working to expand the consumption of fresh vegetables and fruits on campus and in the community. Students are providing support for local farmers markets, tending an organic garden, and promoting healthy food choices.

We make fuel for thought

"Being first has not always been easy. But taking risks, discovering new knowledge—that's part of the mission of higher education."

—Jacqueline Johnson, chancellor, University of Minnesota, Morris



Chancellor Jacqueline Johnson (center) says addressing energy issues is a natural fit for a small, residential liberal arts college.

Living & learning in a green community

The Morris liberal arts experience prepares students to be effective environmental stewards.

Green initiatives extend liberal learning

A liberal arts education is all about asking and answering the big questions. “Energy and related issues are the big questions of our time,” says Cheryl Contant, vice chancellor for academic affairs and dean.

The Morris campus is well suited to take the lead on these issues, says Chancellor Jacqueline Johnson. As a small residential campus of about 1,800, Morris serves as a model community, a laboratory for new ideas.

Morris’s renewable energy facilities, innovative curriculum, and close community of scientists and scholars “allow us to extend the living and learning environment,” Johnson says. Opportunities for research, leadership, and advocacy help students connect their education with real-world problems.

Sustainability issues are broad and encompassing, making them a perfect fit for the liberal arts. Resolving these issues will require the skills and qualities fostered by liberal learning: critical thinking, problem solving, communication, a broad base of knowledge from many disciplines, as well as tolerance, imagination, creativity, and openness to new ideas.

And the liberal arts experience is itself renewable and sustainable, a foundation you can build on. There’s no better preparation for active citizenship, leadership, and civic responsibility.

Sustainable living and learning at Morris

The Morris liberal arts experience offers students many ways to learn about and practice sustainability. Here are just a few examples:

- majors in environmental studies and environmental science;
- innovative courses, such as environmental political theory and creative writing about the environment;
- service-learning opportunities, such as surveying community residents on their environmental practices, prairie restoration, harvesting native prairie seeds, and interviewing and photographing local farmers;
- research opportunities in fields such as food production, biofuel crops, renewable energy economics, biomass gasification, solar energy production, prairie ecology, wind energy co-products, climate change and forest ecology, and many more;
- mentorships with prairie biologists, farmers, environmental activists, and local leaders;
- co-curricular opportunities, such as the Residential Life sustainability theme floor, local foods events, tree planting, recycling activities, organic gardening club, and renewable energy conferences;
- creative projects like costumes, sets, and props made from recycled materials in the theatre production of *As You Like It;* the annual *Fashion Trashion* show, in which students model clothing made from recycled "trash;" a student-produced video showcasing the University of Minnesota, Morris's climate change commitments. Morris was one of only five institutions nationwide chosen for the film project.

Watch climate commitment and As You Like It videos at youtube.com/UMMorris.

Environmental majors tap students' idealism

When Katie Laughlin '10 went to work for a Minnesota environmental group during college, she thought it would be "just a summer job." But instead, "I ended up really, really caring about the work we were doing."

Laughlin delved into water quality and wind energy projects for Clean Up the River Environment, a group that is working to restore the Upper Minnesota River Watershed. That summer experience prompted her to switch her major. She became the first Morris student to major in environmental studies. She was also a member of Morris's first GreenCorps team, which worked on environmental education, energy conservation, and waste reduction in Stevens County.

Morris's environmental studies and environmental science programs expose students to a broad range of coursework in the sciences, social sciences, and humanities. "Environmental problems are interdisciplinary by nature," says Margaret Kuchenreuther, associate professor of biology and coordinator of the environmental studies program. "We want our students to have an understanding of the social, political, and economic dimensions of environmental issues, as well as a good grounding in science." In addition to the two environmental majors, Morris offers innovative courses such as the chemistry of sustainable energy.

Arne Kildegaard, professor of economics, says Katie Lauglin's passion for the environment is something you see a lot of on the Morris campus, where so many students "are motivated by a deep idealism."

Big Ideas

"Morris students are trying to live more sustainably, and I think that's pretty evident on our campus."

—Katie Laughlin '10

Katie Laughlin '10 was Morris's first environmental studies major and a member of Morris's first GreenCorps team. She is holding a Stirling engine, which runs on heat from a human hand.

Building on a tradition of stewardship

Green initiatives spring from the campus's rural heritage.

"Morris's commitment to sustainability is a product of our culture and values. It is rooted in the campus's history and its relationship to the land."

— Maddy Maxeiner, associate vice chancellor for external relations

Renewable energy brings the Morris campus back to its roots

Since its founding in 1887, the Morris campus has been home to three public educational institutions. As the needs of the region and state changed, the campus changed, too.

The Morris campus began as a working farm and boarding school for American Indian children. In 1910, the campus became the West Central School of Agriculture (WCSA), a residential agricultural high school. The "Ag School" gave Minnesota farm kids the chance to receive a high school education and specialized vocational training.

By the late 1950s, western Minnesota needed higher education facilities. In 1960, after intense lobbying by the region's leaders, the Minnesota Legislature established the University of Minnesota, Morris on the WCSA campus. The four-year, residential college offered students a high-quality, affordable liberal arts education.

Now, as energy and environmental issues grow more pressing, the Morris campus is responding to a new need—one that brings the liberal arts college back to its roots in agriculture and land stewardship.

"Energy initiatives really bring us back to the region, reconnecting us in a way that's part of our legacy and heritage," says Chancellor Jacqueline Johnson. "It's a natural outgrowth of the things we were."

Local food programs strengthen regional ties

A couple of years ago, Matt Johnson ‘10 rode his bicycle from Wisconsin to Georgia and spent several months working on a small farm that supplied fruit and vegetables to local consumers.

“That spawned my interest in community-supported agriculture,” says Johnson, who majored in sociology and gender, women and sexuality studies.

As a student, Johnson got involved in the local foods movement at Morris—one of many sustainability initiatives on campus. He helped organize farmers’ markets, special campus meals featuring locally grown food, and regular campus-community dinners.

The Morris campus is a founding member of Pride of the Prairie, which promotes local use of foods grown in west central Minnesota. Campus food service provider Sodexo buys direct from area farmers whenever possible, a pledge that is written into their contract.

Buying local pumps dollars into the area economy and builds a robust market for the region’s farm products, says Sandy Olson Loy, vice chancellor for student affairs, who leads local food initiatives on campus. Pride of the Prairie has relationships with more than 50 area growers.

In an era when few people have a direct connection to the farm, these initiatives raise awareness of how our food is grown and distributed, Johnson says. Just as important, they “celebrate the richness of our local agricultural community and strengthen the connections between local farmers and the campus.”

Building reuse a cornerstone of sustainability

"We shape our buildings," Winston Churchill said in 1943, "and afterwards our buildings shape us."

That's certainly true on the Morris campus. The college's historic brick-and-limestone buildings might have met the wrecking ball. But a change in philosophy set the campus on the path of preservation. Reusing the buildings constructed for the West Central School of Agriculture (WCSA) was the first step in the campus's commitment to sustainability.

The WCSA buildings had been informally slated for replacement some day, says Lowell Rasmussen, vice chancellor for finance and facilities. But in 1994, during a yearlong planning process, the campus came to see its architectural heritage in a new light. The college decided to retain the original 1911 landscape plan and renovate the historic structures for modern educational needs.

These buildings tell the campus's unique story, says Chancellor Jacqueline Johnson. That's one reason the WCSA Alumni Association urged the college to nominate the campus to the National Register of Historic Places. The campus was named an historic district in 2003. In 2010, the Alumni Association installed commemorative plaques on all the former Ag School buildings.

Says the chancellor: "This place is a living example of America's educational history."

For a glimpse into the Morris campus's past, view the collection of historical campus images at: contentdm.morris.umn.edu. You can also take a historic campus walking tour. Check it out at the Welcome Center.

A legacy of serving the region

The Welcome Center is the former WCSA Engineering building, built in 1915. In 2010, UMM completed an $8 million renovation of the building, which transformed it into one of the most energy efficient buildings in Minnesota.

Discovering renewable energy solutions

In this small prairie town, creative minds are tackling tough energy problems.

"The nature of science is interdisciplinary; the Green Prairie Alliance reflects this. You can't tackle difficult problems alone. You need that collaboration."

—Ted Pappenfus, Morris associate professor of chemistry

Green Prairie Alliance doing complementary research

Morris area scientists are working on ways to make nitrogen fertilizer out of "thin air."

Today, anhydrous ammonia, an important crop fertilizer, is made primarily from nonrenewable natural gas. Ted Pappenfus, a University of Minnesota, Morris chemistry professor, is testing a chemical process to derive ammonia from wind energy and renewable ethanol. A mile away at the West Central Research and Outreach Center (WCROC), scientists are producing ammonia using wind-powered electrolysis of water.

These are just two examples of complementary research emerging from the Green Prairie Alliance—an unusual research collaborative that includes the Morris campus, WCROC, and the nearby USDA-ARS North Central Soil Conservation Research Laboratory. The Alliance is finding ways to turn rural Minnesota's abundant natural and agricultural resources into renewable energy. The knowledge gained here, in this small town, is being shared worldwide.

The Morris campus is demonstrating the use of a commercial biomass reactor for district heating and cooling. The USDA-ARS station is working on sustainable biomass harvesting guidelines, while WCROC is developing biomass handling, densification, and storage methods. The Alliance draws on the strengths of each organization to tackle complex problems, says Mike Reese, WCROC renewable energy director. "We've put together teams that can look at the complete picture."

Gasification courses serve emerging industry

The Morris campus is offering training for a new industry.

Biomass gasification courses are educating college students, entrepreneurs, policy makers, and others who want to work in the emerging biomass gasification sector. The courses cover the chemical, biological, and economic considerations of biomass power. Students get hands-on experience with small-scale biomass gasifiers.

"Gasification is going to boom in the future," says Ted Pappenfus, associate professor of chemistry. "We need to be training people and giving them the background they need" to advance the industry. Morris "is leading the way."

For more information about Morris gasification courses, visit morris.umn.edu/cerp/biomass. Watch a video about gasification courses at: mnrem.org/wiki/video-biomassgasification.

'Green' blueprints

The Morris campus and its collaborators are showing other small communities and institutions how to go green.

For instance, the Green Prairie Alliance is developing a practical gasification tool kit, which includes:

- standard operating procedures;
- environmental permitting and monitoring guidelines;
- estimated gasification revenues, expenses, and sample budgets;
- best management practices for sustainable biomass production, harvest, collection, storage, and densification;
- templates for biomass market contracts;
- markets for biomass gasification ash.

Current research from the Green Prairie Alliance

- Biomass gasification district heating and cooling
- Wind power and gasification economics
- Renewable nitrogen fertilizer production
- Biomass collection, handling, densification, storage
- Solar energy demonstrations
- Sustainable crop residue harvesting
- Use of gasification ash for fertilizer

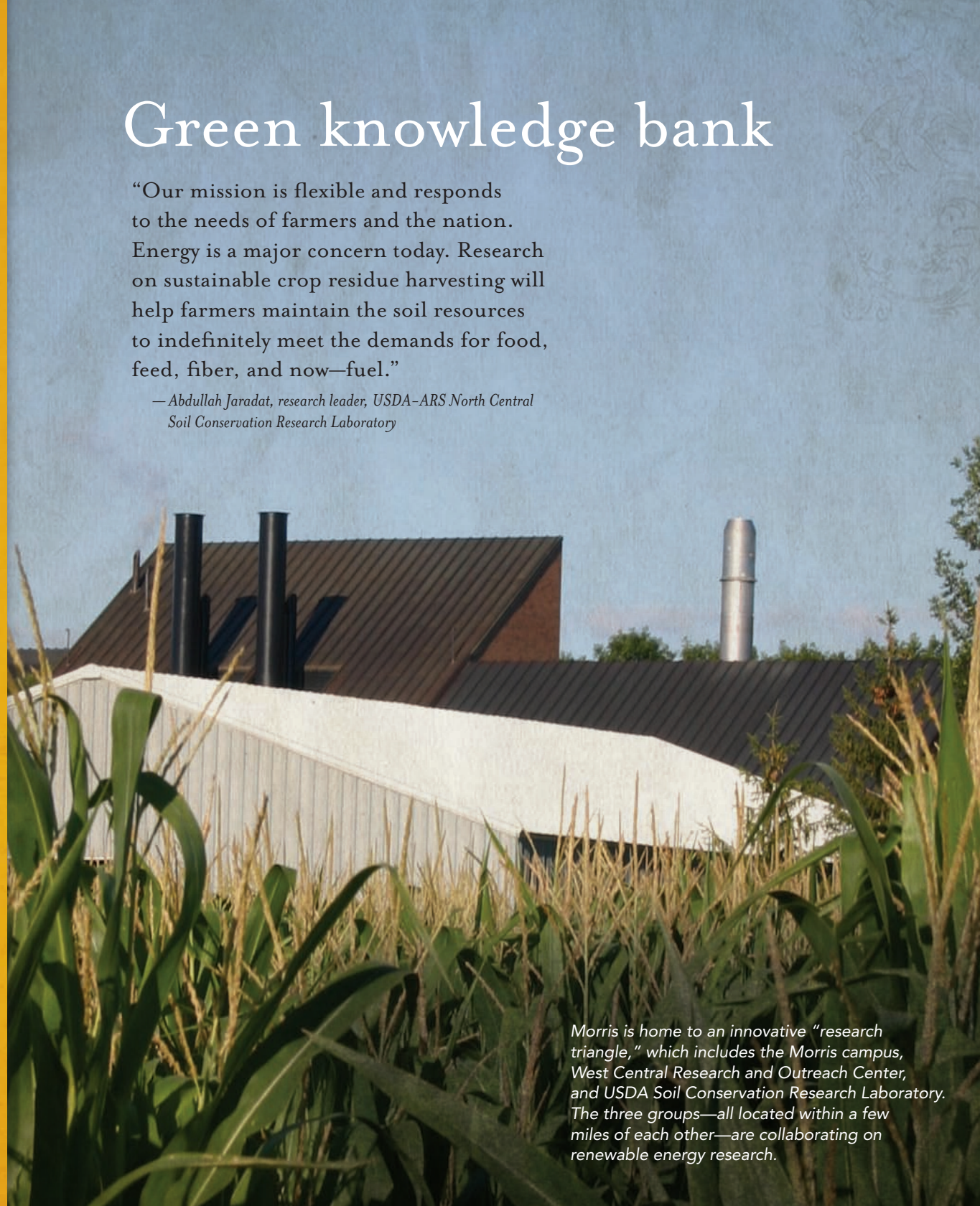
Future research from the Green Prairie Alliance

- Demonstration of a hydrogen fueling station
- "Smart" power distribution systems
- Value-added biofuel products, such as ethanol from gasification syngas
- Biofuel crops for Minnesota, such as sweet sorghum, camelina, and calendula
- Alternative polymers for photovoltaic solar collectors
- Small-scale biomass gasification
- Enzymes for cellulosic biofuel production

Green knowledge bank

"Our mission is flexible and responds to the needs of farmers and the nation. Energy is a major concern today. Research on sustainable crop residue harvesting will help farmers maintain the soil resources to indefinitely meet the demands for food, feed, fiber, and now—fuel."

—Abdullah Jaradat, research leader, USDA–ARS North Central Soil Conservation Research Laboratory



Morris is home to an innovative "research triangle," which includes the Morris campus, West Central Research and Outreach Center, and USDA Soil Conservation Research Laboratory. The three groups—all located within a few miles of each other—are collaborating on renewable energy research.

Donors and partners are helping to create a sustainable campus

Creating a green campus community is a collective effort.

"Morris students—and alumni, too—care about ideas and knowledge, but that's not enough for them. They want to take their ideas and ideals and make something happen."

—Jacqueline Johnson, chancellor, University of Minnesota, Morris

Annual Fund supports renewable initiatives

Not long after the University of Minnesota, Morris declared its commitment to sustainability, "donors started designating gifts for green projects," says Maddy Maxeiner, associate vice chancellor for external relations. "People really caught the fever."

The UMM Sustainable Green Fund, launched in 2007, gives donors a way to support renewable energy projects on campus. One of the first donors was computer science professor Marty J. Wolf of Bemidji, Minnesota.

Wolf grew up in Richmond, Minnesota, and graduated from the University of Minnesota, Morris in 1985 with degrees in chemistry and computer science. He earned a doctorate in computer sciences from the University of Wisconsin, Madison and taught for eight years at Minnesota State University, Mankato. In 1998, he joined the faculty at Bemidji State University.

Morris's work on renewable energy fits right in with Wolf's thinking. It makes sense to "produce energy where we use it. I'm very interested in initiatives that explore this." He's glad his alma mater "is really out in front" on renewable energy.

Alumni turning in extra 'credit'

Morris alumni are buying carbon credits for the campus.

The University of Minnesota, Morris Alumni Association established the UMM Alumni Impact Fund, an endowed fund that benefits Morris by addressing versatile strategic campus needs. Earnings from the endowment currently pay for carbon credits that offset emissions from the campus fleet and grounds equipment.

"The Alumni Association is honored to be able to contribute to these green efforts," says Debra Carlson '72, of Clear Lake, Minnesota, alumni association past president. "If you care to make a difference," she tells fellow alumni, "this fund is an easy way to contribute to something that's going to have a big impact—not only on the environment, but also on students, who get hands-on experience working with faculty on alternative energy projects. Students could not have a more relevant educational experience."

Join the effort

The Morris campus's renewable energy and sustainability initiatives are supported by partnerships with the University of Minnesota, federal and state agencies, and many private organizations and friends.

You can contribute to these sustainability efforts, too. Here's how:

- Tell our story.
- Recycle this brochure by passing it on.
- Make a gift to the UMM Sustainable Green Fund or the UMM Alumni Impact Fund.

To make a gift, call Maddy Maxeiner at 320-589-6386, or visit morris.umn.edu/givetomorris.

Some of our partners

Agriculture Utilization Research Institute
Association for Advancement of Sustainability in Higher Education
Chippewa Valley Ethanol Company
City of Morris
Clean Energy Resource Teams
Diversified Energy, LLC
Environmental Protection Agency Green Power Partners
Great River Energy
Initiative for Renewable Energy and the Environment
Legislative Commission on Minnesota Resources
McKinstry
Minnesota Corn Growers
Minnesota Corn Research and Promotion Council
Minnesota Department of Commerce Energy Office
Minnesota Soybean Growers
Minnesota Soybean Research and Promotion Council
Minnesota West Community and Technical College
Minnesota's Renewable Energy Marketplace
National Renewable Energy Lab
Norsk Hydro Office of Environmental Assistance
North Central Soil Conservation Research Laboratory
Otter Tail Power Company
Pride of the Prairie Local Foods Initiative
Runestone Electric Association
South Dakota State University
Southwest Initiative Foundation
Stevens County Economic Improvement Commission
Upper Midwest Association for Campus Sustainability
Upper Midwest Hydrogen Initiative
United States Department of Agriculture-Agricultural Research Service
University of Minnesota West Central Regional Sustainable Development Partnership
University of Minnesota West Central Research and Outreach Center
University of North Dakota Energy and Environmental Research Center
Xcel Energy

You can help

"There's not going to be a single solution to our energy needs. It's going to take many people with diverse views and problem-solving skills to come together and be really creative."

—Marty Wolf '85

Marty Wolf '85 supports renewable initiatives at Morris through the UMM Sustainable Green Fund.

The Morris campus is shrinking its carbon footprint

Fleet: fewer emissions

The campus fleet of hybrid gas-electric cars consumes less gasoline and emits fewer greenhouse gases than conventional vehicles, cutting more than 21 tons of carbon dioxide emissions per year. Diesel-powered grounds equipment runs on B-20, a 20 percent blend of soy biodiesel. The Morris fleet also includes a zero emission vehicle, the ZEV, which runs on electricity. The campus also has a bus program to transport students between Morris and the Twin Cities.

Water: slowing the flow

Water flow restrictors on bathroom faucets and showers, low water flow toilets, and automated urinal flushers have cut campus water use by two million gallons a year. Process water from the campus steam plant is recycled, rather than discharged.

Light and heat: energy-saving upgrades

The campus has invested $4 million in energy-saving improvements to existing buildings. Conventional lamps have been replaced with energy efficient LED lights or compact fluorescent bulbs, and programmable temperature controls have been installed in campus buildings. These and other upgrades are being paid for with energy savings—which total several hundred thousand dollars a year—through an innovative financing arrangement with McKinstry, an engineering and energy services firm.

Less waste: more recycling

Students run the Morris recycling program. The campus recycles aluminum, tin, plastic, glass, and electronics waste as well as cardboard, glossy paper, office paper, and newsprint. The campus uses eco-friendly cleaners and recycled paper products whenever possible. Disposable plates and cutlery are made from biodegradable starch. Students are even experimenting with composting food waste from the campus café.

Renovation: energy efficient standards

The Welcome Center renovation transformed the 1915 Community Services building into one of the most energy efficient structures in Minnesota. The Welcome Center is built to meet Leadership in Energy and Environmental Design (LEED) standards, which set benchmarks for energy efficiency and sustainability. Future campus construction and renovation will also apply LEED sustainability standards. The campus policy to promote LEED building standards grew out of a student-led initiative.

Housing: green residence

A planned green residence hall for 80 students will demonstrate sustainable living. The Green Prairie Living and Learning Community will feature a real-time energy monitoring system, which will tell residents exactly how much power they're using, so they can adjust their behavior to save energy—and money!

Landscape: showcasing green practices

Storm water gardens, wetlands, jewel box greenhouses, low-maintenance native plants, pedestrian friendly roadways. These are some of the ways that the Morris campus's landscaping plans promote sustainability, highlight the campus's green commitment, and demonstrate environmentally sound water management practices. There's even an organic vegetable garden on campus.

Green champions: raising awareness

Every February, campus residence halls compete to reduce their heat and electricity consumption, use less water, and recycle more. Special events during the "dorm energy wars" include a film series and weekly conservation themes.

Power down: energy-saving vending

Morris students led the effort to install VendingMisers® on refrigerated vending machines. The devices automatically power down the machines when they are not in active use, cutting energy consumption by more than 40 percent.

Thank you

Thank you to those who helped bring the Morris campus sustainability story to life through this publication. A special thanks to the team of University of Minnesota, Morris alumni who contributed their time and talents:

Rick Hansen '83, president and partner at Visions, Inc., Brooklyn Park, Minnesota, earned a bachelor of arts in management and economics from the University of Minnesota, Morris. Rick is married to Peggy Huot Hansen '82, also a Morris graduate, and has two children. He lives in Shoreview, Minnesota.

David A. Hull '83, vice president of business development at Visions, Inc., earned a bachelor of arts in management and economics from the University of Minnesota, Morris and a master of business administration in marketing from the University of St. Thomas in 1995. David is a career sales and marketing strategist with more than 25 years experience.

James Kleinke '83 graduated from the University of Minnesota, Morris with a bachelor of arts in business economics and speech communications. James is a marketing entrepreneur. He resides in St. Cloud with his wife Mary, who attended the University of Minnesota, Morris in 1983, and their two children.

Liz Morrison '75 is a freelance agriculture reporter. She graduated from the University of Minnesota, Morris with a degree in English. She lives in Morris.

If you're an alumnus who would like to tell the Morris campus story, contact the Office of Alumni Relations and Annual Giving at 320-589-6066 or alumni@morris.umn.edu.

Photo Credits

Mike Cihak, Geoffrey George, Crystal Mohr, Liz Morrison '75, Lara Swimmer, Joel Tallaksen

Green glossary

Absorption chiller: A thermodynamic technology that uses a heat-absorbing material—the Morris chiller uses lithium bromide solution—to remove heat from steam or hot water. Morris's absorption chiller cools campus buildings in the summer.

Biomass: Renewable organic matter such as crops and crop residues, perennial grasses, wood, algae, animal manure, and the organic parts of municipal and industrial waste.

Carbon credits: A financial instrument aimed at reducing greenhouse gas emissions. One carbon credit represents the reduction of one ton of carbon dioxide. Carbon credits are awarded to countries or groups that have reduced their greenhouse gases below their emission quota. Carbon credits can be bought and sold in the international market. The Morris campus buys carbon credits to offset its fleet emissions.

Carbon footprint: The total amount of greenhouse gases produced to support human activities, usually expressed in tons of carbon dioxide (CO_2).

Carbon neutral: Emitting no net carbon dioxide. The Morris campus is working to become carbon neutral by cutting fossil fuel use, conserving resources, and generating renewable power.

Chilled beam cooling: Chilled beams use cold water, rather than air, to remove heat from a room. Cold water is pumped through coiled pipes in the ceiling, cooling the air through convection, a little like a car radiator. Chilled beam cooling can cut energy use by 20 to 50 percent. Morris's Welcome Center uses chilled beam cooling instead of traditional air conditioning.

Combined heat and power (CHP): Sometimes called cogeneration, CHP systems produce heat and electricity simultaneously. The Morris campus's CHP system captures heat from the biomass gasifier to power a turbine that generates electricity. CHP systems are extremely efficient, supplying heat and electricity at about 90 percent efficiency.

Corn stover: The cobs, leaves, and stalks left after corn grain is harvested.

Gasification: A thermal process that burns organic materials in a low-oxygen environment, producing low-BTU producer gas, or syngas. Syngas can be substituted for natural gas in a furnace, turbine, or engine.

Green Prairie Alliance: An informal Morris research consortium that includes the University of Minnesota, Morris, the West Central Research and Outreach Center, and the USDA-ARS North Central Soil Conversation Laboratory.

Photovoltaic collector: Solar energy collector that converts sunlight into electricity. Morris's photovoltaic array is used for solar polymer research and instruction.

Solar thermal collector: Solar energy device that heats water. Morris's solar thermal array heats swimming pool water.

Steam turbine: A turbine that rotates when pressurized steam strikes the vanes on a rotor, providing mechanical energy to generate electricity.

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A renewable, sustainable, education.