

2014 ESC Market Transformation Conference

*What does ESPC
success look like at
UMM?*



UNIVERSITY OF MINNESOTA MORRIS

Troy Goodnough

Sustainability Director

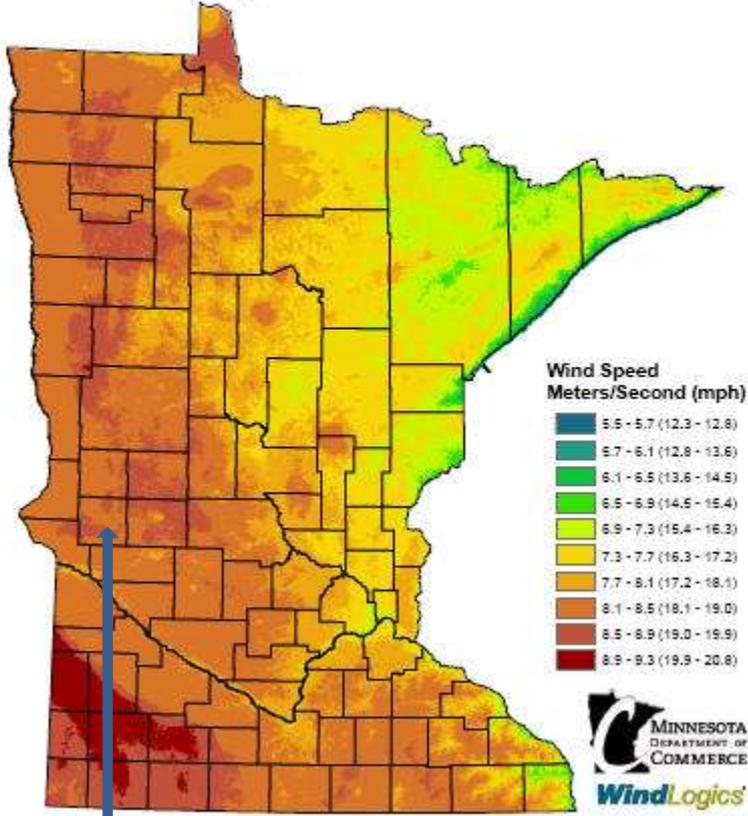
320-589-6303

good0044@morris.umn.edu

Green Prairie Community Residence hall- opened fall 2013

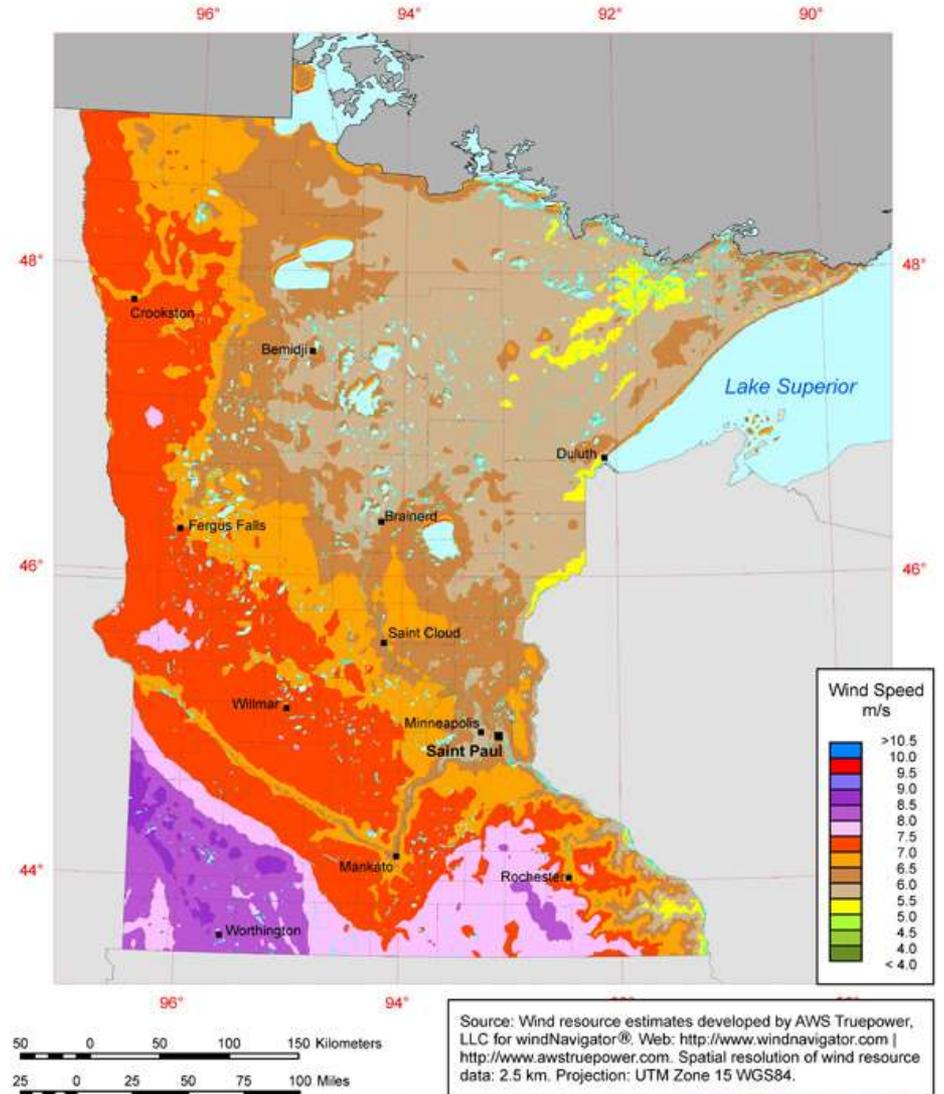


Minnesota's Wind Resource by Wind Speed at 100 Meters



STEVENS CO.

Minnesota - Annual Average Wind Speed at 80 m



Welcome Center – historic renovation





U.S. GREEN BUILDING COUNCIL

LEED GOLD

2012

Good Employees ...



**Use
Energy Wisely**

Tomorrow's energy is everybody's job

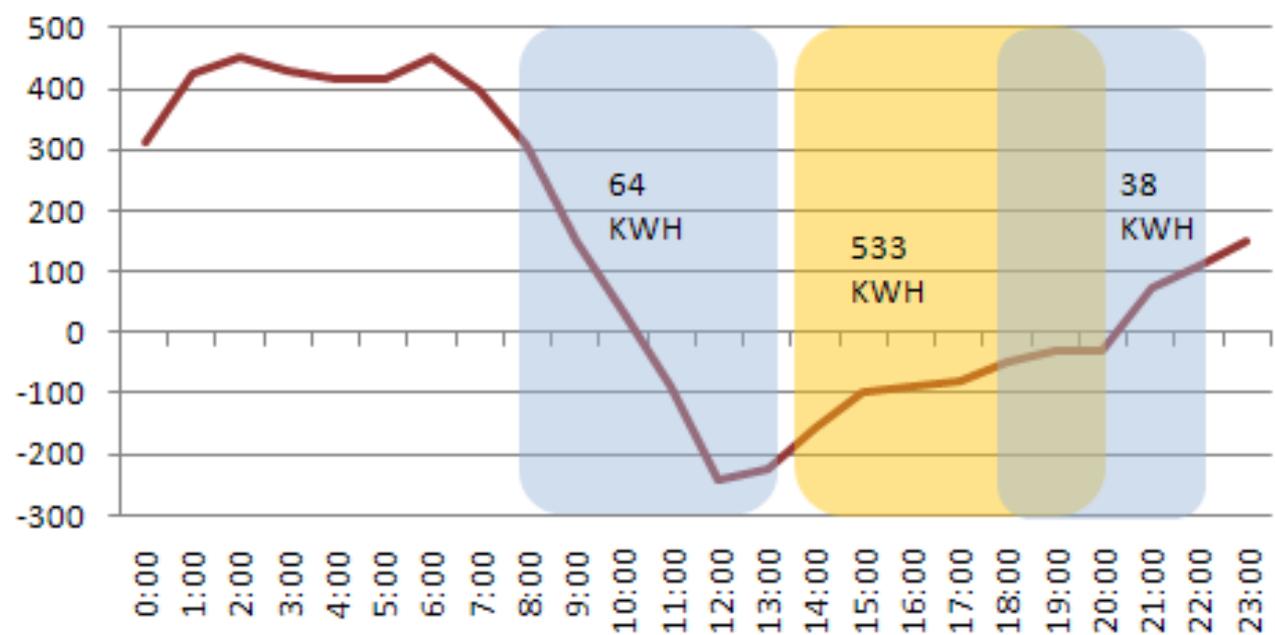
**Hit the
Lights**



*It all
+ adds up.*

www.umn.edu/italloddsup

Average Difference Supply V Demand



- Peak Hours Winter
- Peak Hours Summer

Morris worked with vendor to develop a

CARBON MASTER PLAN

Modeled collective impact of adding:

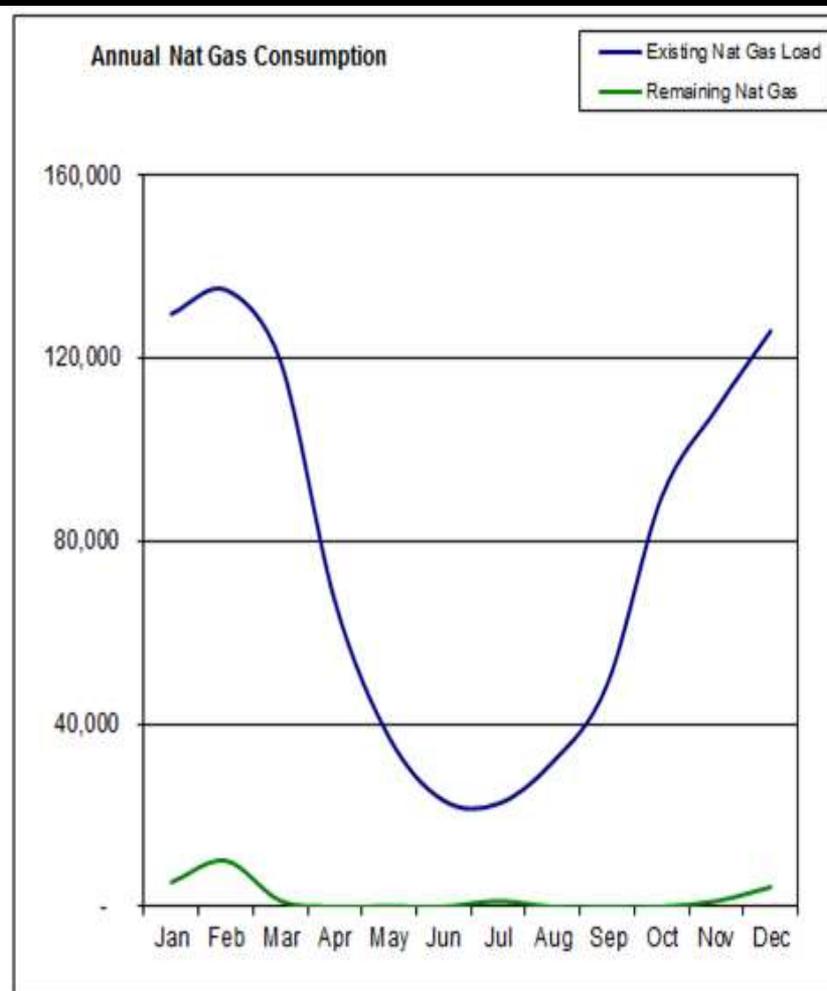
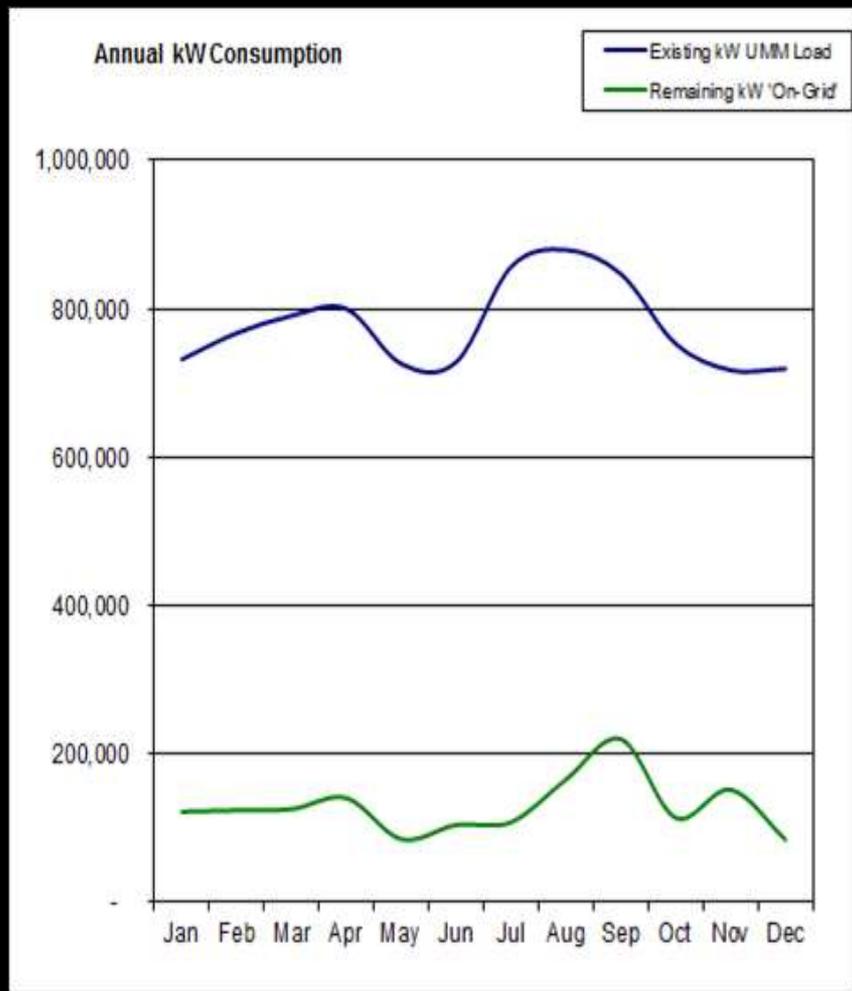
Biomass plant

Absorption chilling

Backpressure steam turbine

Wind turbines

McKinstry energy modeling



\$4M invested in ESCO

Interior lighting upgrades

Exterior lighting upgrades

Controls upgrades

Completed solar thermal for pool

Boiler plant upgrades

Table 4.2: FIM Matrix

FIM #	FIM Name	Description (Existing Conditions)	Description (Proposed Conditions)	Budget
9.01-UMM	Interior Lighting Upgrades	Many of the interior lighting fixtures on the UMM Campus are fluorescent with T12 lamps and magnetic ballasts.	Upgrade existing fluorescent lighting fixtures with T8 lamps and electronic ballasts.	\$323,767
9.24-UMM	Exterior Lighting Upgrades	Parking lot, pathway and building wall packs are predominately high pressure sodium lights	Upgrade HPS fixtures to LED technology that is dark sky compliant.	\$212,711
17.09a-RSP	Controls Upgrade - Recreation Swimming Pool Ventilation	The Dumont Air Handling Unit is not maintaining proper control of the recreation natatorium environment	Upgrade the controls on the Dumont unit for better control of the environment within the recreation pool environment	\$13,814
24.01-SPO	Thermal Solar for Sports Complex	Domestic hot water is heated with a steam powered instantaneous water heater in the Sports Complex. Presently both the Recreation swimming pool and the competition swimming pool area heated via two independent steam to hot water heat exchangers with steam	Implement a thermal solar heating system to heat the swimming pool water of both pools with any remaining excess capacity providing preheat to domestic water and significantly reduce the use of fossil fuel generated steam.	\$250,446
18.16-HPF	Ground Water Modifications	There is a sump pump located in the basement of the heating plant which extracts water from the relatively high water table and ejects it directly to the sanitary sewer system.	Rather than ejecting this water directly down the sewer, pretreat this water and utilize for boiler make-up throughout the year and cooling tower make-up in the summer time. Any remaining water not used for make-up can be used for irrigating the varsity	\$170,816
10.07-HPF	Steam Turbine/Absorption Chiller	Excess unused energy capacity exists in the biomass boiler while electrical power is purchased.	Use a steam turbine to harvest the available energy to produce electricity and provide the desired heat energy for distribution. Use an absorption chiller for condensing steam and added chilled water capacity.	\$2,939,232
4.16-UMM	Direct Digital Control (DDC) Enhancements	An existing Invensys Direct Digital Control (DDC) system is used to control most of the larger pieces of heating, ventilating and air conditioning (HVAC) equipment on the Campus. However, there remains an opportunity to enhance the existing DDC system to	Upgrade the existing DDC system to support enhanced building control strategies, expand energy use monitoring through submetering interfaces and provide data to the informational kiosks for transparent facility operations.	\$458,510
28.05-UMM	Kiosk	Communicating information to the student body, faculty and visitors is cumbersome, difficult to keep current and consumes significant natural resources.	Informational kiosks equipped with interfaces to a wide range of data sources will provide real-time information at strategic locations throughout the campus.	\$95,851
11.04-UMM	Power Factor Correction	On average, the annual power factor for the three phase main electrical service is 84%. This lower power factor contributes to excessive monthly electrical charges.	Installation of capacitor banks will significantly increase the power factor and reduce these excessive charges.	\$14,070
Totals for Selected FIMs				\$4,479,215

Insulated
concrete
form
(ICF)
construction
at Green
Prairie
Community
residence
hall



A large wind turbine is silhouetted against a vibrant sunset sky. The sun is a bright, glowing orb on the horizon, casting a warm orange and yellow light. The sky transitions from a deep orange near the horizon to a soft purple and blue at the top. The turbine's three blades are spread out, and its tall tower extends from the bottom center towards the top of the frame. In the background, there are faint silhouettes of other structures and utility poles.

60%

*of Morris's electricity
comes from wind*



First

Large-scale wind turbine at a
public US university



2 turbines produce

**10.5
million
kWhrs**

per year

A photograph of a lake with two large white wind turbines in the background. In the foreground, three people are in a red canoe on the water. The sky is clear and blue. The text is overlaid on the right side of the image.

3,150,000

gallons of water
avoided each year
by using wind
turbines

10,500,000 kWh produced per
year by turbines

8,500,000 kWh used by campus
per year



2,000,000 kWh of “extra” energy produced by
wind!

***5,000,000** kWh is what actually goes
to the power company

Morris Biomass Gasification plant



70 percent

of Morris's heating and cooling needs







annually burns

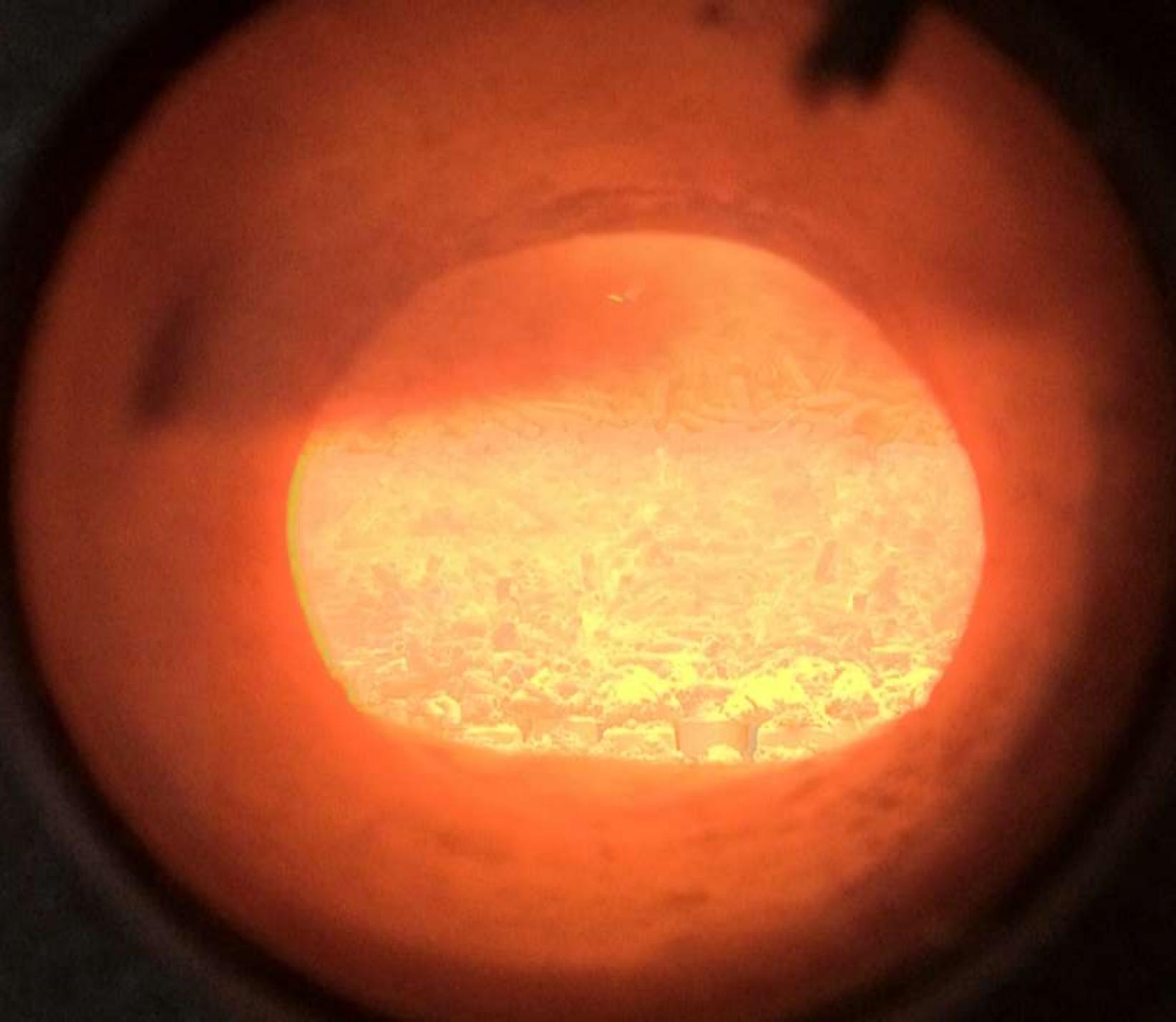
9,000 tons

of biomass

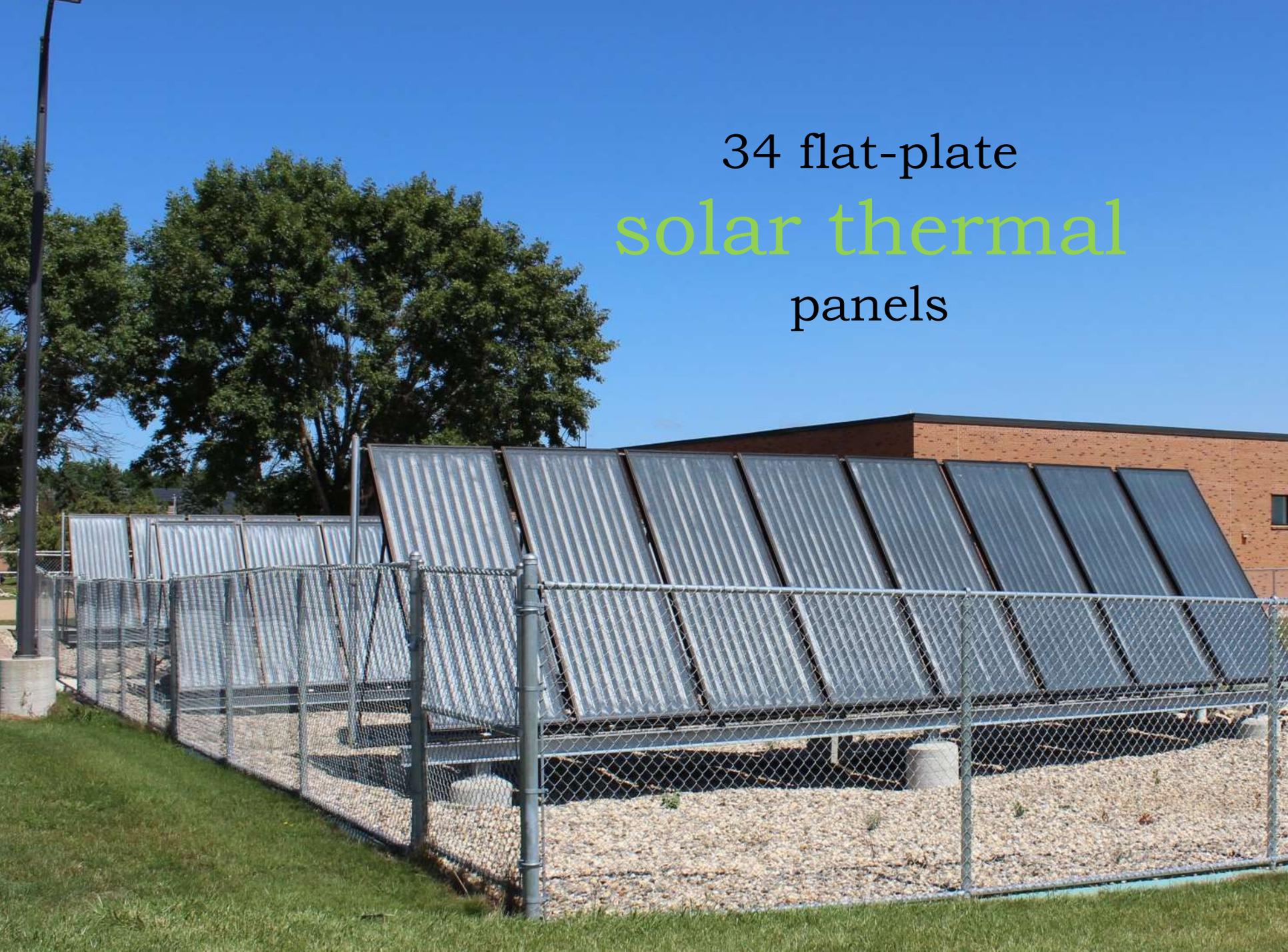
corn cobs







34 flat-plate
solar thermal
panels



An aerial view of an indoor swimming pool. The pool is rectangular with a light blue tiled deck. A large green slide is visible on the right side. Several people are swimming in the pool, and a lifeguard is standing on the deck. The water is clear and blue. The deck has a pattern of small dark squares.

annually offsets

270 MMBtu

of natural gas use



2007 – 2012 = **1,000,000** kWh energy reduction



40%
reduction
in
carbon
footprint

Jacqueline Johnson

Chancellor

Lowell Rasmussen

Vice-Chancellor Finance and Facilities

Lisa Harris

Assistant to Vice-Chancellor Finance and
Facilities

Mike Vangstad

Maintenance and Operations Supervisor

Jim Barbour

Biomass Gasification Scientist