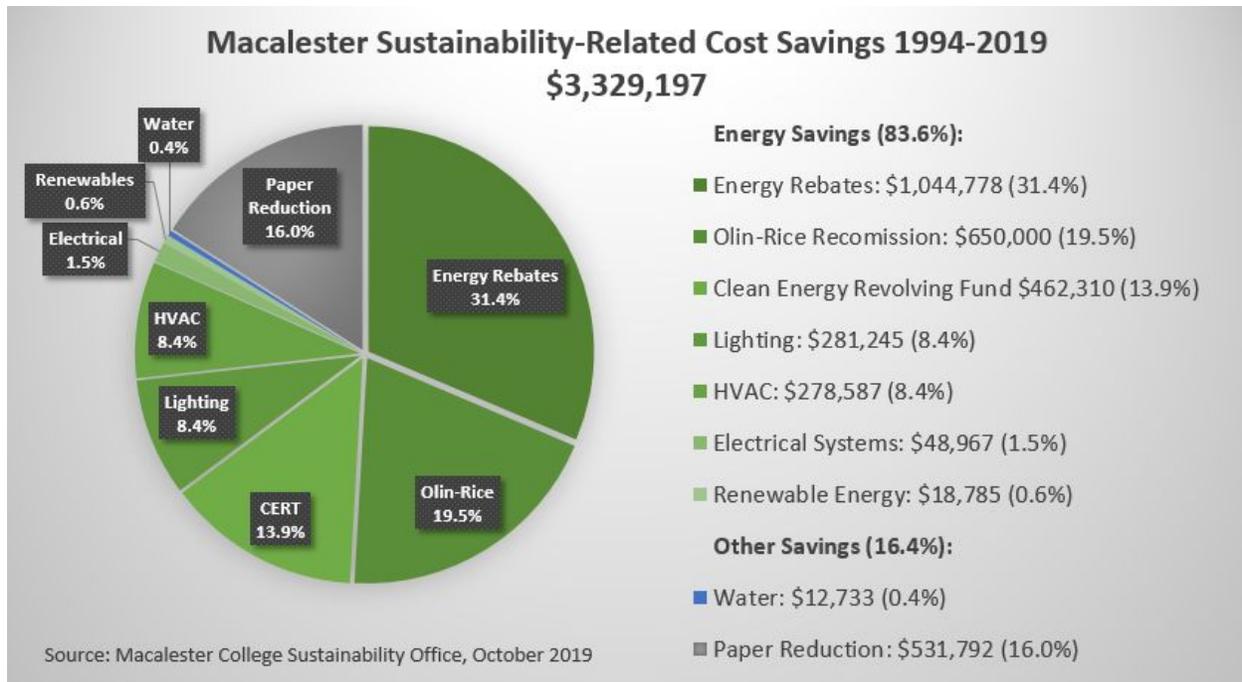


Sustainability-Related Cost Savings

September 2019



Macalester's sustainability-related operational initiatives have not only reduced our carbon footprint, as of September 2019 they have saved the college more than \$3 million.

Early actions, began in 1994, focused on projects that would increase energy efficiency and deliver cost savings. In 2007/08 a tangible shift was made to pursue sustainable practices as well. The college switched to Green Seal certified sanitary paper and paper towels, and electronic billing and communication with students. Most significantly, President Rosenberg signed the Presidents' Climate Commitment and the college hired its first Sustainability Manager.

Under the leadership of the Sustainability Manager the college looked back at sustainability-related projects completed prior to 2008 and calculated both cost savings and greenhouse gas (GHG) reductions. Going forward these two metrics have been tracked for new projects as well, such as:

- Clean Energy Revolving Fund (CERF) projects in energy and water efficiency
- Waste reduction from a 2009 waste food-to-pig food program

In 2014 the campus hired an Energy Manager. Collaborations between the Energy and Sustainability Managers have led to more granular and sophisticated measurement systems. The new systems strengthened data collection on energy usage, cost savings, and GHG

emissions and helped pave the way for additional sustainability-related projects. Projects excelling after 2014 include:

- Renewables and alternative energy, including solar and wind
- Lighting upgrade/retrofit and controls projects
- Electrical Systems such as Transformers
- HVAC including Direct Digital Controls and steam/water piping
- Central power/heating plant

Detailed information follows. Due to the change in data gathering as of 2014, the cost saving data is separated into pre- and post-2014.

Table 1: Cost Savings Prior to 2014

Pre-2014 Sustainability Cost Savings Projects					
Project	Date Completed	Annual Savings	Years Since Project Was Completed	One Time Savings	Total Savings
Xcel Rebates*	1994 - January 2013			\$884,744	\$884,744
Olin-Rice Energy	December 2006	\$50,000	13		\$650,000
Paper Products	2007	\$24,795	12		\$297,540
HP Printer Rebates	2007 - October 2011			\$44,832	\$44,832
E-billing	Summer 2008	\$11,220	11		\$123,420
New Student Packets	Summer 2008	\$5,000	11		\$55,000
Reunion Email	Summer 2008	\$1,000	11		\$11,000
CERF	May 2009	\$46,231	10		\$462,310
Kagin Coffee	Summer 2009	\$2,500	10		\$25,000

TOTAL		\$140,746			\$2,553,846
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*Rebates 1994 to 2007 = \$589,521.92

Rebates 2008 to 2013 = \$295,221.60

Projects Prior to 2014

Energy Efficient Projects:

Xcel Rebates - Due to our recommissions and energy efficiency work, Macalester College has received \$884,744 in rebates from Xcel Energy since 1994.

Olin-Rice Energy - Olin-Rice was recommissioned by Facility Services because it was the largest energy user on campus. Lights and vents hoods were given occupancy sensors to save energy when a room is vacant, and the electric motors in the heating, ventilation, and cooling (HVAC) system were replaced with more efficient Variable Speed Drives (VSD - controls speed of electric motors). These adjustments save the college \$50,000 in energy costs annually and to date have saved \$650,000.

Clean Energy Revolving Fund (CERF) - From 2007-2009, CERF has invested in several campus energy and water efficiency projects. The group's work includes insulating student apartments, installing low-flow fixtures, purchasing Energy Star appliances, and installing LED efficient light bulbs. CERF projects are estimated to save \$46,231, 2,166,705 lbs of CO_{2e} and 260,000 gallons of water annually. CERF was merged with the Technology, Equipment, and Maintenance Sustainability Fund in 2009. To date, CERF has saved the campus \$462,310.

Kagin Commons Coffee Urn - In the summer of 2009, Facilities Staff researched how long coffee urns needed to heat up and asked Bon Appétit to turn on coffee urns only an hour before an event instead of keeping them on continually. The result is estimated to be \$2500 in annual cost savings, and to date, \$25,000 in savings.

Recycled Products:

Paper Products - Macalester College switched from using regular sanitary paper and paper towels to using comparable Green Seal certified products. Green Seal is a non-profit organization that develops standards and certifies products to ensure that purchases are as environmentally friendly as possible. By switching to the Green Seal products, Macalester College reduced its negative environmental impact and now saves \$24,795 annually, and \$297,540 to date.

100% Recycled Letterheads - From September 2008 to September 2014, switching to recycled letterhead is estimated to have saved 102 trees, 8,934 lbs CO_{2e} (the greenhouse gas emissions equivalent of driving two cars for nearly a year), 37,083

gallons of wastewater, and 4,762 pounds of solid waste. In addition, the letterhead paper turned out to be cheaper than the original non-recycled paper, but the cards and envelopes are slightly more expensive. Overall, the change will have a minute financial impact on the budget, and therefore is not displayed on the chart.

Recycling Rebates - Information Technology Services returns old printers to Hewlett-Packard for recycling and receives a rebate for each of the printers returned. Since 2007, these rebates total \$44,832.

Waste Reduction:

Pig Food Waste Recycling Program - As of February 9, 2009, food waste from Café Mac is picked up by Barthold Farms, cooked in a special truck, and transformed into feed for free range pigs. Making pig food out of Café Mac food waste reduces waste hauling fees and keeps organic waste out of landfills and incinerators. The program is expected to save money through reducing waste hauling fees, which will at least pay for the program. So far, the program has cut trash output by 50%.

Electronic Media:

E-billing - The Student Accounts Office switched from paper bills to a new eBilling process in the summer of 2008. Moving to eBills reduced paper needed for bills and envelopes and saved the cost of postage. It also utilized technology that was already available and increased customer service as well as saved money. The switch saves \$11,220 annually, and to date has saved \$123,420.

Greening Reunion - As part of a Greening Reunion project, the alumni office avoided mailing 9,318 postcards by sending emails, which saves over \$1000 in mailing costs annually (\$11,000 to date) and reduces paper use.

Electronic New Student Packets - Student Life saves \$5,000 (\$4,500 in postage) annually by switching pre-arrival materials from a printed binder to online materials. To date, the savings equal \$55,000.

Cost Savings Projects After 2014

Post-2014 Sustainability Cost Savings Projects				
Project Type & (# of Projects)	Project Name & (# of Projects)	Total Cost	Annual Cost Savings	Total Cost Savings to Date
Renewables and Alternative Energy (4)	Solar Photovoltaic Projects (3)	\$198,755	\$20,711	\$18,484
	Wind (1)	\$10,594	\$402	\$301
Lighting (36)	Lighting Upgrade/Retrofits Projects (32)	\$587,828	\$154,142	\$278,560
	Lighting Controls Projects (4)	\$11,130	\$4,388	\$2,685
Electrical Systems (4)	Transformers Projects (1)	\$1,000	\$2,003	\$7,557
	Other Electrical Equipment Projects (Heat Tape) (3)	\$43,407	\$13,616	\$16,410
Building, Heating, Ventilation, Air Conditioning (HVAC) (19)	Ventilation/Air Handling Unit (AHU) Projects (3)	\$40,713	\$24,029	\$78,838
	Retrocommissioning Projects (3)	\$(5,940)	\$12,685	\$43,392
	Steam/Water Piping Projects (1)	\$658	\$1,084	\$5,122
	Other HVAC Projects (1)	\$22,882	\$8,421	\$9,129
	DDC Control Upgrades (8)	\$57,301	\$28,849	\$67,071
	Variable Speed Drives Projects (3)	\$2,305	\$5,079	\$6,860
Central Power/Heating Plant (1)	Other Central Power Upgrades (1)	\$7,823	\$28,160	\$68,175

Water (2)	Showers, campus-wide (1)	\$9,251	\$4,469	\$10,256
	Sinks, campus-wide (1)	\$5,296	\$12,227	\$2,477
Excel Rebates 2014-2019				\$160,034
Total (66)		\$993,003	\$320,265	\$775,351

Projects After 2014

Renewables and Alternative Energy

Solar Photovoltaic Projects (3 projects):

Solar panels were installed on Markim Hall, Theater Building, and Ordway Field Station PV Solar Panel Installation.

Annual cost savings - \$20,711

Wind Projects (1 project):

The Olin-Rice Hall Wind Turbine needed an Inverter Replacement.

Annual cost savings - \$402

Lighting

Lighting Upgrade/Retrofit Projects (32 projects):

Retrofitting all fluorescent, metal halide, and incandescent lights across campus with LED lights that are brighter, expend less energy, and keep campus safer (brighter sidewalk lights).

Annual Cost Savings - \$154,142

Lighting Controls Projects (4 projects):

Replacing old, unreliable occupancy automatic light sensors with new devices. Also includes photosensors to utilize daylight harvesting in rooms with windows.

Annual Cost Savings - \$4,388

Electrical Systems

Transformers Projects (1 project):

Decommissioning idle transformers.

Annual Cost Savings - \$2,003

Other Electrical Equipment Projects (Heat Tape) (3 projects):

Installed equipment and controls to regulate the heat tape for only when it is needed (runs continuously December-March). Heat tape keeps ice dams from forming on building roofs.

Annual Cost Savings - \$13,616

Building, Heating, Ventilation, Air Conditioning (HVAC)

Ventilation/Air Handling Units (3 projects):

Replacing standard efficiency air handling unit (AHU) motors with premium efficiency motors/retrofitting controls for an "Unoccupied Mode" where speed and supply fans are reduced by 50% install control system to control the amount of outdoor air and fan energy in kitchen.

Annual Cost Savings - \$24,029

DDC (Direct Digital Control) Upgrades (8 projects):

Utilize existing and new occupancy sensors to reduce exhaust and air supply in empty rooms/AHU and HVAC recommissions.

Annual Cost Savings - \$28,849

Retrocommissioning (3 projects):

See DDC upgrades.

Annual Cost Savings - \$12,685

Steam/Water Piping (1 project):

Repair and replace all of the steam traps on campus.

Annual Cost Savings - \$1,084

Other Heating Ventilation Air Conditioning (HVAC) (3 projects):

Replacing and expanding building automation system (BAS) to control HVAC equipment/using lighting occupancy sensors with building's BAS to save exhaust and air supply when room is unoccupied.

Annual Cost Savings - \$8,421

Variable Speed Drives (VSD) (3 projects):

Installing, replacing, enhancing Variable Frequency Drives (VFD - controls AC motor speed and torque) to slow fans in rooms with low occupancy.

Annual Cost Savings - \$5,079

Central Power/Heating Plant

Other Central Plant Upgrade (1 project):

Commission engineering study to see if there was an opportunity to improve efficiency and reduce energy costs of the campus chiller.

Annual Cost Savings - \$28,160

Water

Showers (1 project):

Replacing 2.5 gallon per minute shower heads with 2.0 gallon per minute shower heads all over campus.

Annual Cost Savings - \$4,469

Sinks (1 project):

Replaced a total of (866) 2.0 & 2.5 GPM sink faucet aerators in all buildings on campus except for the language houses with 1.0 or 1.5 GPM aerators.

Annual Cost Savings- \$12,227

Xcel Energy Rebates

2014-2019

Receive rebates from Renewables, lighting retrofits, steam trap repairs, control optimization, HVAC controls, and other areas.

Annual Cost Savings- \$160,034

Pre-2014 Total (as of 10/1/19)

- Total Annual Cost Savings: **\$140,746**
- Total Cost Savings to Date: **\$2,553,846**

Post-2014 Total (as of 10/1/19)

- Total Cost: **\$993,003**
- Total Annual Cost Savings: **\$320,265**
- Total Cost Savings to Date: **\$775,351**

GRAND TOTAL (as of 10/1/19)

- Grand Total Annual Cost Savings: **\$461,011**
- Grand Total Cost Savings to Date: **\$3,329,197**

TOTAL from Sustainability Office

(Summer 2008 though 10/1/19)

- Total Annual Cost Savings: **\$386,216***
- Total Cost Savings: **\$1,792,135.08***

*Calculating savings Summer 2008 through 10/1/2019

Total Savings

\$3,329,197		Grand Total Saved as of Oct. 1, 2019
- \$ 589,521.92		Xcel Rebates 1994 to 2007
- \$ 650,000		Olin-Rice Energy 2006
- \$ 297,540		Paper Products 2007
= \$1,792,135.08		

Annual Savings

\$461,011		Grand Total Annual Cost Savings as of Oct. 1, 2019
- \$ 50,000		Olin-Rice Energy 2006
- \$ 24,795		Paper Products 2007
= \$ 386,216		