

# 2009 Clean Energy Revolving Fund Annual Report

June 2007- May 2008

## Overview

Macalester College's Clean Energy Revolving Fund (CERF) started in 2007. It received its initial funding from the Macalester College Student Government (\$20,000), from the Environmental Studies department (\$7,000), and from President Rosenberg's office (\$40,000). Four gifts were made by alumni for an additional \$290.

This report includes summaries of CERF's projects and impacts to date; the report covers activity from the 2007-2008 year as well as the 2008-2009 year. CERF's projects included insulation of student housing, a freezer replacement, water efficiency initiatives, and light bulb replacement. The fund also paid for a small amount of Sustainability Associate Justin Lee's time in 2009. CERF projects are estimated to save \$46,231, 2,166,705 lbs of CO<sub>2e</sub> and 260,000 gallons of water annually.

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## **37 Macalester St Water Efficiency**

**Project Overview** The water fixtures in student residence 37 Macalester St. were upgraded to more efficient fixtures in both bathrooms. The toilets were upgraded from 3 gpf to 1.6 gpf; showerheads from 4 gpm to 1.5 gpm and the sink aerators were upgraded from 3 gpm to 1 gpm.

**Project Goals** Save water and reduce building operational costs.

**PreProject Considerations** The Macalester heating Plant has experimented with low-flow fixtures in the past with poor results. Research showed that the fixtures themselves has improved in the last 5 years and that the quality issues were most likely not going to be a problem again. The plumbing system in the building is very old and the plumbers were concerned that if the volume of water moving through the pipes was reduced they would be more prone to clogging.

**The Project Process** Students researched low-flow fixtures and had a water usage analysis done by an outside company. Based on the results a financial analysis was done on the cost of the project and the anticipated savings.

**Lesson Learned** • The agreement was to install dual flush toilets with an average 1.0 gpf, There was a miscommunication and the Heating plant installed single flush 1.6 gpf toilets instead. • A formal memorandum of understanding for the work to be performed needs to be signed between CERF and Facilities Services.

**Project Contact** Curt Stainbrook, Mechanical Systems Manager (651) 696-6918  
stainbrook@macalester.edu

**Project Participants** Justin Lee - student David Schmidt - student Mike O'Connor – Chief Engineer  
Dave Sheele - Plumber

### **Project Snapshot**

#### *Economics*

Total Project Cost: \$1,508

Annual Cost Savings: \$1,476

Payback: 1.2 Years

#### *Environment*

Annual Water Savings: 260,000 gallons

#### *Equity*

No obvious impact

## **180/182 Vernon Ave Insulation**

**Project Overview** 180/182 Vernon Ave is an on-campus housing option and typically has 6 residents. The attic and walls were filled with blown-cellulose insulation. After this a contractor went around the house with a caulk gun and sealed cracks where air could infiltrate and/or heat could escape.

**Project Goals** The hope was to reduce the amount of gas required to heat the house. We also hoped to make the house more comfortable for the students living there.

**PreProject Considerations** The building has plaster interior walls, which do not tolerate being drilled into very well. For this reason we decided to pull off part of the siding on the outside drill holes into the walls that way. The cellulose insulation is essentially shredded newspaper treated with a fire retardant, which meets both our energy and material reuse goals.

**The Project Process** Student Justin Lee had contractors place insulation bids on three of the Language Houses on campus, and then performed energy audits to determine how much energy could realistically be saved.

**Lesson Learned** • The blown cellulose insulation does help seal air leaks, however it was determined cost effective to do hire another contractor to do more later.

**Project Contact** Mike Hall – Building Maintenance Manager (651) 696-6754 hall@macalester.edu

**Project Participants** Justin Lee - student

### **Project Snapshot**

#### *Economics*

Total Project Cost: \$7,375

Annual Cost Savings: \$1,015

Payback: 7.3 Years

#### *Environment*

Annual Savings: 967 therms, 4520 kg CO<sub>2</sub>

#### *Equity*

More comfortable living space

## **1662 Princeton Ave. Insulation**

**Project Overview** 1662 Princeton is an on-campus housing option and typically has 4 student residents. The Attic was insulated with HeatLock soy-based foam insulation. The closed-cell foam simultaneously insulates and air seals the house, which is very useful in homes as old and leaky as this residence.

**Project Goals** The hope was to reduce the amount of gas required to heat the house. We also hoped to make the house more comfortable for the students living there. Another goal was to test out the HeatLock foam. Foam insulation is more expensive than blown cellulose and has a higher rate of insulation, so this house is an experiment to see if the cellulose or the foam is more cost-effective in the long run.

**PreProject Considerations** The insulation work had to be done before students moved in for the beginning of the semester. The foam also required a lot more holes to be drilled in the walls than the blown cellulose we have used in other projects, so we had to make sure that the painters would be able to handle the additional work on the short timescale.

**The Project Process** Building Manager Mike Hall contacted CERF interested in trying out this new insulation product on one of the particularly drafty houses on campus. Justin Lee did the energy savings calculations and created the proposal to send to CERF. The entire project turn-around was about a week.

### **Lesson Learned**

- Insulation immediately cut drafts and water leakage into the basement and made the house more comfortable.
- CERF will compare the cost-effectiveness of Foam vs. Cellulose insulation at the end of the current heating season.

**Project Contact** Mike Hall – Building Maintenance Manager (651) 696-6754 hall@macalester.edu

**Project Participants** Justin Lee - student

### **Project Snapshot**

#### *Economics*

Total Project Cost: \$1,618

Annual Cost Savings: \$607

Payback: 2.7 Years

#### *Environment*

Annual Savings: 486 therms, 2428 kg CO<sub>2</sub>

#### *Equity*

More comfortable living space

## **1668 Princeton Ave Insulation**

**Project Overview** 1668 Princeton is home to the Russian House and typically has 4 student residents. The wall cavities, roof and basement walls were all insulated with HeatLock soy-based foam insulation. The closed-cell foam simultaneously insulates and air seals the house, which is very useful in homes as old and leaky as this residence.

**Project Goals** The hope was to reduce the amount of gas required to heat the house. We also hoped to make the house more comfortable for the students living there. Another goal was to test out the HeatLock foam. Foam insulation is more expensive than blown cellulose and has a higher rate of insulation, so this house is an experiment to see if the cellulose or the foam is more cost-effective in the long run.

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### **Lesson Learned**

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- CERF will compare the cost-effectiveness of Foam vs. Cellulose insulation at the end of the current heating season.

**Project Contact** Mike Hall – Building Maintenance Manager (651) 696-6754 hall@macalester.edu

**Project Participants** Justin Lee - student

### **Project Snapshot**

#### *Economics*

Total Project Cost: \$6,025  
Annual Cost Savings: \$991  
Payback: 6.1 Years

#### *Environment*

Annual Savings: 792 therms, 3962 kg CO<sub>2</sub>

#### *Equity*

More comfortable living space

## **Vegetarian Coop – Freezer Replacement**

**Project Overview** The Vegetarian Coop has a large communal kitchen for the 20 residents to use. One of the freezers needed to be replaced. In the middle of a hot kitchen it had ice coating several inches of exterior pipe. Facilities Services purchased a new Energy Star Freezer.

**Project Goals** Save electricity and create a better kitchen environment for the residents.

**PreProject Considerations** The freezer needed to be a large upright model to handle all of the food used in the Coop and fit into the limited space. Repairing the existing freezer was determined to not be an option by Facilities Services, and so it was recycled.

**The Project Process** A Kill-A-Watt was installed on the existing freezer to determine how much energy it used and confirm that it was wasting significant amounts of energy. A new model freezer was then chosen and a proposal submitted to the CERF board. Facilities handled the purchasing, replacement and recycling.

### **Lesson Learned**

- This was the first CERF project, so there were a few iterations of the proposal and how to conduct a cost/benefit analysis.

**Project Contact** Mike O'Connor – Chief Engineer (651) 696-6231 oconnor@macalester.edu

**Project Participants** Justin Lee - student

### **Project Snapshot**

#### *Economics*

Total Project Cost: \$579

Annual Cost Savings: \$147

Payback: 3.9 Years

#### *Environment*

Annual Savings

2,397 kWh

O2 Saved: 847 kg

#### *Equity*

No obvious impact

## **Campus T-8 Lighting retrofit – Preliminary Report**

**Project:** Replacing all (~18,800) 4-foot, 32-Watt fluorescent light bulbs on campus with 25-Watt florescent bulbs.

**Main benefits:** Electricity savings, campus energy budget reduction, and carbon reduction.

**Auxiliary benefits:** Aesthetic warm-color lighting and a mobilization of students and departments to participate in campus energy projects.

**Cost:** ~\$70,000

**Annual savings differential:** ~\$42,000

**Payback:** 1.7 years

**ROI:** 60%

**Project developers:** Justin Lee '08, Matt Kazinka '11

**Estimated environmental reduction:** 1,074,000 lbs CO<sub>2e</sub>

### **Project Explanation**

This campus-wide initiative began as a pilot project developed by Justin Lee. In fall 2007, he developed a proposal to replace 1,200 bulbs in the hallways of Macalester's science and humanities buildings. The Clean Energy Revolving Fund covered the cost of the project (\$4,200). The lightbulbs were installed mainly by a group of volunteers on a Saturday in August with assistance from the student custodial assistant department.

We decided to expand the project because the estimated energy savings were substantial and would easily apply to the entire campus. In October, Justin and student Matt Kazinka began counting all of the 4-foot florescent bulbs on campus using architectural drawings and hand counts when no drawings were available. The tally of all the 4-foot florescent bulbs was far higher than was expected: nearly 18,800 bulbs, which would cost about \$70,000 to buy.

The project was not entirely CERF-funded because CERF only had \$67,000, some of which was already invested in other projects. Student organizers then turned to the Macalester College administration for the required extra funding, hoping that the project could be used as a stepping stone to increase the size of CERF thereby allowing Macalester College to undertake other large projects. Through discussions with the Vice President of Finances, the student organizers arranged a payment agreement and purchased the bulbs.

To install the light bulbs, student custodial assistants were employed over winter break to install the bulbs in the hard-to-reach areas of campus. Once the second semester began, students were recruited and engaged in the process through volunteer work so that entire buildings could be retrofitted at once.

This project was fairly simple but required a lot of small, precise work. The lack of details in some of the architectural drawings complicated the process, as did the absence of some other drawings. Student organizers also struggled with the funding aspect because the size of the project required a lot of initial financial commitment even though the plan guaranteed a substantial payback. Hopefully the success of this project will make future initiatives like it more possible.

## CERF Annual Savings

Project	Annual Cost Savings	Annual Carbon Savings (lbs)	Annual Water Savings (Gallons)
<b>Lighting Upgrades</b>			
25 W Fluorescent Bulbs	\$42,000	1,074,000	0
<b>Insulation Projects</b>			
180-182 Vernon Ave	\$1015	4520	0
1662 Princeton Ave	\$602	2428	0
1668 Princeton Ave	\$991	3962	0
<b>Water Efficiency</b>			
37 Macalester St	\$1476		260,000
<b>Appliance Upgrades</b>			
Vegetarian Coop Freezer	\$147	847	0

<b>Annual Cost Savings</b>	\$46,231
<b>Annual CO<sub>2</sub> Savings</b>	1,085,757 lbs
<b>Annual Water Savings</b>	260,000 gallons

\*All savings are estimates.