



Grand Rapids Green Revolving Fund: Project Teams

ENGR333 Students

Engineering Department, Calvin University, Grand Rapids, MI

Calvin  1876
UNIVERSITY

Introduction

The City of Grand Rapids' Climate Action and Adaptation Plan (CAAP) outlines sixteen strategic goals designed to place the city on a path toward carbon neutrality. To support progress toward these goals, Calvin University's engineering department is evaluating the feasibility of establishing and operating a Green Revolving Fund for the city.

The Grand Rapids Green Revolving Fund (GRGRF) would use an initial pool of seed capital to implement energy-efficiency and sustainability projects across municipal and community sites. As these projects generate energy and cost savings, those savings would flow back into the fund, enabling a continuous cycle of funding new projects and increasing energy efficiency city wide.

This poster highlights the project opportunities identified by the student project teams, outlining the kinds of efficiency improvements the GRGRF could support and the potential environmental impact of these initiatives.

Objectives

Goal: Provide a comprehensive set of project opportunities that the Grand Rapids Green Revolving Fund (GRGRF) could pursue to establish and expand the fund.

Supporting Objectives:

- Identify high-impact internal (city-owned) and external (community-partner) projects.
- Define example projects appropriate for different stages and scales in the fund's development.
- Estimate potential energy savings and emissions reductions for each project category.
- Prioritize projects based on feasibility, impact, and alignment with CAAP goals.

Each team estimated costs, energy savings, emissions reductions, and financial returns while focusing on specific areas.

Project Team 1

Municipal projects

- VFDs:** Specify existing equipment voltage and amperage to estimate installation cost and energy savings
- Solar Panel System:** Using unit area and generation rate, users specify available area and budget to estimate system size, cost, and annual energy production

Table 1. Sample table of solar panel analysis

Panel Area (ft²)	Area (ft²)	Number of Panels	Panel Cost (\$)	Annual Energy (\$)	Annual Energy (kWh)	Annual Savings (kWh)	Annual Return (Year)
2	144	8	\$7,043.70	20	\$300.00	300000	9.9
3	216	9	\$8,143.90	20	\$300.00	300000	9.9
4	290	10	\$10,143.90	20	\$300.00	300000	9.9
5	399	13	\$13,879.17	20	\$400.00	300000	9.9
6	525	15	\$15,204.60	20	\$500.00	300000	9.9
7	660	18	\$16,530.00	20	\$600.00	300000	9.9
8	800	20	\$16,867.20	20	\$700.00	300000	9.9
9	950	23	\$16,142.70	20	\$800.00	300000	9.9
10	1100	25	\$16,418.20	20	\$900.00	300000	9.9
11	1250	28	\$16,279.40	20	\$1000.00	300000	9.9
12	1400	30	\$16,651.80	20	\$1100.00	300000	9.9
13	1550	32	\$16,924.20	20	\$1200.00	300000	9.9
14	1700	35	\$17,196.60	20	\$1300.00	300000	9.9
15	1850	38	\$17,469.00	20	\$1400.00	300000	9.9
16	2000	40	\$17,741.40	20	\$1500.00	300000	9.9
17	2150	42	\$18,013.80	20	\$1600.00	300000	9.9
18	2300	45	\$18,286.20	20	\$1700.00	300000	9.9
19	2450	48	\$18,558.60	20	\$1800.00	300000	9.9
20	2600	50	\$18,831.00	20	\$1900.00	300000	9.9
21	2750	52	\$19,103.40	20	\$2000.00	300000	9.9
22	2900	55	\$19,375.80	20	\$2100.00	300000	9.9
23	3050	58	\$19,648.20	20	\$2200.00	300000	9.9
24	3200	60	\$19,920.60	20	\$2300.00	300000	9.9
25	3350	62	\$20,193.00	20	\$2400.00	300000	9.9
26	3500	65	\$20,465.40	20	\$2500.00	300000	9.9
27	3650	68	\$20,737.80	20	\$2600.00	300000	9.9
28	3800	70	\$21,010.20	20	\$2700.00	300000	9.9
29	3950	72	\$21,282.60	20	\$2800.00	300000	9.9
30	4100	75	\$21,555.00	20	\$2900.00	300000	9.9
31	4250	77	\$21,827.40	20	\$3000.00	300000	9.9
32	4400	80	\$22,109.80	20	\$3100.00	300000	9.9
33	4550	82	\$22,382.20	20	\$3200.00	300000	9.9
34	4700	85	\$22,654.60	20	\$3300.00	300000	9.9
35	4850	87	\$22,927.00	20	\$3400.00	300000	9.9
36	5000	90	\$23,199.40	20	\$3500.00	300000	9.9
37	5150	92	\$23,471.80	20	\$3600.00	300000	9.9
38	5300	95	\$23,744.20	20	\$3700.00	300000	9.9
39	5450	97	\$24,016.60	20	\$3800.00	300000	9.9
40	5600	100	\$24,289.00	20	\$3900.00	300000	9.9

Project Team 2

Waste Resource Recovery Facility (WRRF)

- VFDs:** Implement VFDs for aeration blowers
- Geothermal Heating:** Install system to reduce cost to heat and cool a building

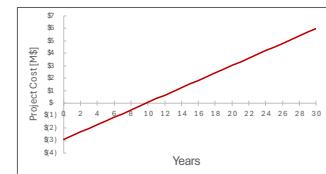


Figure 1. Estimated savings over time from geothermal using WRRF energy data

- Energy Star Improvements:** Replace outdated equipment with new efficient models
- Tree Planting:** Plant in low equity neighborhoods
- Public Transportation**
- Green Bus Roofs:** Plants placed above bus stops

Results

The savings for all the projects were divided into electric savings (Figure 5), natural gas savings (Figure 6), and CO₂ savings (Figure 4). The saving values were converted to be in terms of yearly savings for every \$1000 invested into the project. This levelsizes the savings based on the scale of the project.

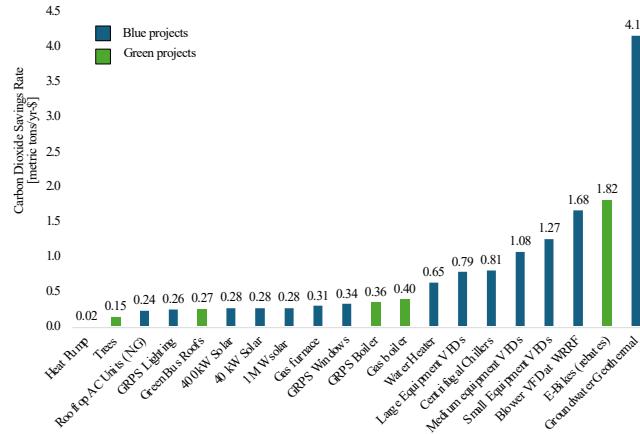


Figure 4. Metric tons of carbon dioxide saved annually per \$1000 invested

Project Team 3

Grand Rapids Public Schools (GRPS) Projects

- Energy Efficient Windows:** Replace 1953 windows with double paned windows
- Lighting Controls:** automatic in bathrooms
- Boiler Replacement:** improves efficiency by 26%

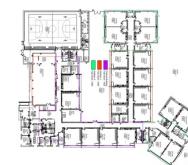


Figure 2. Floor plan of building from which energy data was obtained

E-bikes

- Create an e-bike program by means of either providing bikes on loan or offering rebates
- Worth analyzed via publicity and reduction of vehicles on the road

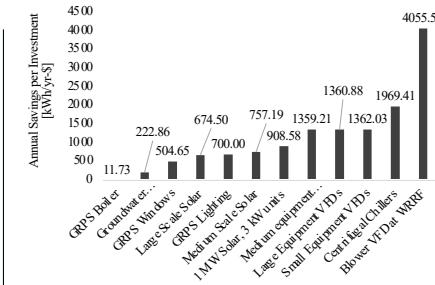


Figure 5. Annual electrical savings in kWh per \$1000 invested

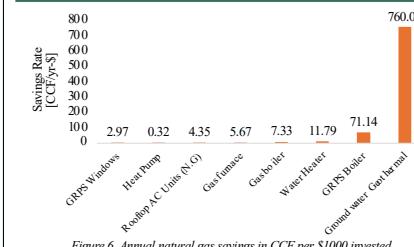


Figure 6. Annual natural gas savings in CCF per \$1000 invested

The project teams have identified and developed a diverse set of internal and external energy-efficiency opportunities that can launch and sustain a green revolving fund in Grand Rapids. These projects demonstrate meaningful potential for reducing energy use and lowering emissions, thereby supporting the city's CAAP goals. Through the feasibility study of these projects, a clear foundation for the GRGRF's initial investment strategy is established.

Next steps for future development of the GRGRF:

- Refining project scopes
- Gathering detailed project quotes
- Transitioning projects toward implementation

Acknowledgements

We gratefully acknowledge the support and guidance of Mayor LaGrand and Professor Heun throughout this project.

We would also like to thank Marc Bennett from the Grand Rapids Public Schools, the Grand Rapids Sustainability Team, Brett Hoogewind, TowerPinkster, and the Grand Rapids Wastewater Treatment Team whose insights were essential to this project's development.



Conclusions