Grand Rapids Green Revolving Fund

Fall 2025
ENGR333A
Calvin University
Prof. Heun

One of today's grand challenges is eliminating CO_2 emissions from energy generation in response to energy demand. Individuals, households, universities, corporations, cities, and nations tackle the challenge in different ways and for differing reasons, according to their spheres of influence. Cities reduce their carbon emissions to reduce costs, to do right by the environment, to lead regionally and nationally, and to improve climate resilience.

The City of Grand Rapids commissioned a Climate Action and Adaptation Plan (CAAP) that was approved recently [CAAP, 2025]. The plan "offers 16 goals to be met by 2030 that will help get us on the pathway to carbon neutrality by 2050" [CAAP, p. viii]. Key solutions [CAAP, p. 6] are

- 10% of all existing commercial buildings reduce energy [consumption] 20% per year until 2030 and
- 5% of all existing residential buildings reduce energy [consumption] 20% by 2030.

But how will those reductions be achieved? In the CAAP, Strategy 1/Action 1, Strategy 1/Action 3, and Strategy 3/Action 3 suggest that the City of Grand Rapids should "[e]xplore the feasibility of innovative financing solutions like creating a *green revolving fund*, …" [CAAP, p. 60].

A Green Revolving Fund (GRF) is an account with unique rules that align financial incentives with good intentions. Seed money establishes the GRF. Expenditures from the GRF are restricted to energy efficiency and renewable energy projects whose energy and cost savings are tracked carefully. Cost savings are routed back into the GRF, and the growing GRF balance enables larger efficiency projects over time. (See Figure 1.)

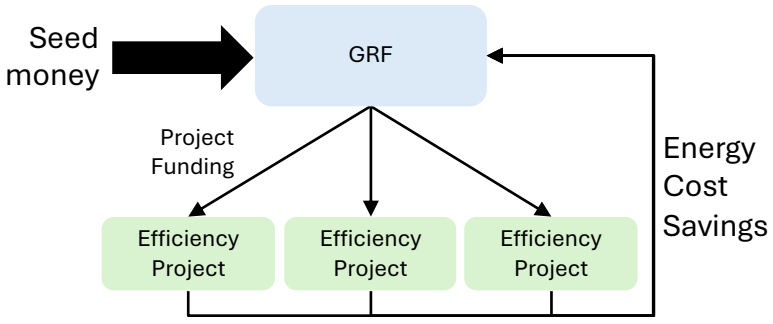

Figure 1. Green Revolving Fund operating strategy.

Your question for the semester is

What would it take for the City of Grand Rapids to establish and operate a GRF?

There are many considerations to answering this question, including, but not limited to:

- What will be the benefit of $1M initial investment (seed money)?
- What additional benefits could be achieved with more initial investment?
- Should the GRGRF apply only to energy efficiency and renewable energy projects at municipal facilities? Or can the GRGRF be used for energy efficiency and renewable energy projects at businesses and households?
- What are the policies by which the GRGRF should be governed?
- What energy efficiency and renewable energy projects should be pursued for the municipality and beyond?
- What will the cash flow for the GRGRF look like over the first, say, 10 years of its existence?
- What policies can be established to enhance transparency of GRGRF activities and spending?

The customer for your work is Grand Rapids Mayor David LaGrand.

You will pursue this project in small teams initially organized as follows:

- *Policy team*: develops Green Revolving Fund rules and regulations for governing internal and external GRGRF activities
- *Financial team*: provides financial analysis of the GRGRF, including cashflow projections
- *Internal and external efficiency project team*: develops and analyzes energy efficiency projects for internal and external GRGRF activities
- *Internal and external renewables project team*: develops and analyzes renewable energy projects for internal and external GRGRF activities

The efficiency and renewables teams must investigate both internal and external project ideas. For that reason, the efficiency and renewables teams will be larger than the policy and financial teams. You may find it necessary to adjust the configuration of teams and the size of teams throughout the semester. Please consult with the professor before changing teams. You should consider forming an administrative group to coordinate the work of the class.

The end-of-semester deliverables are:

(a) an Engineering department seminar on **Tuesday, 9 December 2025** at 4:00 PM in the **CFAC recital hall**.
(b) two posters to be presented at the Calvin University Sustainability Showcase at 4:00 PM on **Thursday, 11 December 2025** (**** venue TBD ****).
(c) a final report (in .pdf format) that provides detailed descriptions of your work during the semester, due on the final day of classes (**4 PM, Thursday, 11 December 2025**).

Each ENGR333 student must attend either (a) the Engineering department seminar or (b) the Sustainability Showcase poster session.

The final report will consist of:

(a) an electronic copy of your final report (.pdf format) to be posted at https://matthewheun.com, and

(b) a flash drive, .zip file, or other means of conveyance containing electronic copies of all models, spreadsheets, posters, presentations, programs, and software analysis tools that you developed during the project. A well-organized copy of all Teams files will be sufficient.

You must submit copies of your final report (all three elements) to Prof. Heun.

Posters must be prepared from a template provided on Moodle. Posters must be submitted via email to slc@calvin.edu **one week** prior to the Sustainability Showcase poster session date (i.e., **Thursday, 4 December 2025**).

Students must send notes of appreciation to each person who provided assistance during the semester.

Prior to the first class meeting each week (typically Tuesday), each student must submit a weekly timecard that includes

- hours worked on the project and
- a brief (1 paragraph) description of work accomplished.

Student teams are encouraged to share relevant information obtained from external sources and from your own research throughout the semester. To facilitate information sharing, consider forming an executive team to coordinate the work of the teams. Executive team members should mostly be relieved of their group's other responsibilities.

The professor will select students to form groups. To apply for one of the available groups, prepare a cover letter and resume and submit on Moodle by 8 PM on **Tuesday, 2 September 2025**. Your cover letter should indicate which group piques your interest and why you believe you are qualified to be included in that group. (Please supply first, second, and third choices.) Group assignments will be announced via Moodle by the evening of **Thursday, 4 September 2025**.

An initial task for each group is to develop a schedule of your activities for the semester that includes all important dates and coordination among groups. Schedules must be discussed during oral progress reports (see below).

There will be three short, in-class progress reports in the form of oral presentations. A longer, in-class final presentation will summarize results of the project. Each student must give either (a) a progress report presentation or (b) part of the final presentation. The customer will be present at all presentations. The presentations must be professional quality, must concisely report your progress, and must provide sufficient technical detail for customer, professor, and peer review of your progress.

The in-class progress reports must use the following outline:

- Status relative to your schedule (and any re-planning that has occurred since your last report)
- Work accomplished since your last report (including policy, financial, and technical details)
- Issues or concerns (and plans for addressing them)
- Work planned for upcoming reporting period

The final in-class oral report should *not* follow the outline above. Rather it should summarize the work of the entire semester. You must bring printed copies (6-up, double sided to save paper) of all in-class presentations for customer, professor, and resource persons.

The professor, in conjunction with the customer, will select an exemplary student for a teamwork award at the end of the semester.

Despite the presence of an external customer for your work, the professor will assign final grades (in consultation with the customer). Students will be assessed on (a) the quality of their team's report, (b) peer evaluation, and (c) hours worked.

Supporting Resources:

- The customer: Grand Rapids Mayor David LaGrand, mayor@grand-rapids.mi.us. Be aware that email messages are screened by the Mayor's assistant. Please coordinate and aggregate questions before reaching out to Mayor LaGrand.
- Support personnel:
    - City of Grand Rapids Chief Sustainability Officer Annabelle Wilkinson, awilkinson@grand-rapids.mi.us.
    - Foresight Energy Management Vice President Mike Troupos, mike@fsmgmt.co.
    - Grand Rapids Climate Coalition member Jonathan Hand, ogyhand@gmail.com.
    - Calvin University CERF manager Brett Hoogewind, brett.hoogewind@calvin.edu
- City of Grand Rapids Climate Action and Adaptation Plan. https://www.grandrapidsmi.gov/Government/Departments/Sustainability/Climate-Change/Climate-Action-and-Adaptation-Plan
- GR Climate Coalition priority items for the CAAP (draft document provided on Moodle)
- The GR CAAP [CAAP, 2025]
- Previous ENGR333 projects available at https://matthewheun.com.
- Classroom learning on energy, exergy, and economics, especially the Fall 2008 project
- Prior laboratory and lecture classes, especially business and electrical engineering courses
- Independent research

References

City of Grand Rapids, Climate Action and Adaptation Plan (CAAP), 2025. https://www.grandrapidsmi.gov/Government/Departments/Sustainability/Climate-Change/Climate-Action-and-Adaptation-Plan

ENGR333
Grand Rapids Green Revolving Fund Project schedule
Fall 2025

Note: Bold schedule items involve customer and resource participation, 15:00–15:50 in Science Building Room 343.

Day	Date	Activity
Tue	**2 Sep**	**Project introduction, objectives, deliverables** **Introduction of customer and resources** Resumes and cover letters due to Prof. Heun
Thur	4 Sep	Groups assigned via Moodle
Tue	9 Sep	Project workday (Meet in the classroom for group work) (Section A during session b; Section B during session a)
Tue	**16 Sep**	**In-class group presentations (5 minutes + 2 for questions) Use required outline.**
Tue	23 Sep	Project workday (Meet in the classroom for group work)
Tue	**30 Sep**	**In-class group presentations (5 minutes + 2 for questions) Use required outline.**
Tue	7 Oct	Project workday (Meet in the classroom for group work)
Tue	14 Oct	Project workday (Meet in the classroom for group work)
Thur	**23 Oct**	**In-class group presentations (5 minutes + 2 for questions)** **Use required outline. **** Note: Thursday after advising break ******
Tue	28 Oct	Debrief presentations and project workday
Tue	4 Nov	Project workday (Meet in the classroom for group work)
Tue	11 Nov	Project workday (Meet in the classroom for group work)
Tue	18 Nov	Project workday (Meet in the classroom for group work)
Tue	20 Nov	Project workday (Meet in the classroom for group work)
Tue	**25 Nov**	**Project final presentations Part I (10 minutes + 4 for questions)** **Report on final results. Don't go home early for Thanksgiving break!**
Tue	2 Dec	Project workday (Meet in the classroom for group work)
Thur	**4 Dec**	**Project final presentations Part II (10 minutes + 4 for questions)** **Report on final results.**
Thur	4 Dec	Peer and Project Assessment due
Tue	9 Dec	ENGR Department Seminar 4:00 PM (CFAC recital hall)
Thur	11 Dec	Sustainability Showcase poster session, 3:30 PM (Venue TBD) Final report due

Grand Rapids Green Revolving Fund Project
Peer and Project Assessment

Fall 2025
ENGR333
Prof. Heun

Throughout this semester, you analyzed rebound and backfire for CO_2 emissions reductions. Now, your professor would like your feedback about the process in the form of a peer and project assessment. Part of your grade for the project will be determined by the quality of your peer and project assessment. Your response is and will remain confidential. Peer and project assessments are due at **3:30 PM** on **Thursday, 4 December 2025** in Prof. Heun's office.

1) Write one paragraph identifying one or two members of the class who performed exemplarily during this project. Provide examples of their supererogatory efforts.

2) Create a bullet-point list of 3 personal learnings (takeaways) from the project.

3) Create a bullet-point list of 3 suggestions for future ways to reduce Calvin's CO_2 emissions. In other words, what are your personal suggestions for Calvin moving forward?

4) Write one paragraph answering these questions: If you put this project on a resume, would you list it as "community service?" Does engineering (as a discipline) value volunteer work and community service? Why or why not?

5) Write one paragraph describing if or how your participation in this project caused you to alter your behavior this semester. Did you see any connections between your own personal behavior and CO_2 emissions reduction? If you didn't change your behavior at all, describe why not.

6) What nontechnical skills did you learn in the course of this project? Do you expect that these non-technical skills will be relevant to your future work as an engineer? If so, why? If not, why not?

7) Write three paragraphs addressing this question: what are the connections between (a) energy efficiency and (b) the twin challenges of (i) energy resource depletion and (ii) climate change caused by global warming?

8) Write one paragraph detailing your role and contributions to your small group team. Conclude the paragraph by assigning yourself a letter grade for your work on the project. Justify your grade.

9) Write one paragraph each detailing the roles and contributions of the three (or four) other team members. Conclude the paragraphs by assigning a letter grade for your teammates' work on the project. [Total of three (or four) paragraphs and three (or four) individual letter grades.]

10) Write one paragraph indicating any topics relevant to the content of ENGR333 that, in your opinion, would be interesting for future classes to study. Also provide any suggestions for improvements to the structure of this project in future years.

When writing paragraphs assessing yourself and your peers, you may wish to use the following rubric.

Did the individual:

- Research useful information for your group?
- Display punctuality in meeting deadlines?
- Thoroughly complete assigned duties?
- Share equally in work performed by the group?
- Perform work of high quality or did their work often require revision?
- Help direct the group in setting goals?
- Help direct the group in meeting goals?
- Encourage group members to share ideas?
- Display empathy during group discussions and work?
- Listen to ideas from other group members?
- Participate in helping the group work together better?