

Calvin Energy Efficiency Fund (CEEF) Design Project

Fall 2008
ENGR333a
Professor Heun

Most organizations, like Calvin, must weigh the long-term economic benefits of energy efficiency projects against short-term priorities such as maintenance, facilities upkeep, and capital improvement projects. Often, these tradeoffs lead to decision-making that focuses on short-term issues rather than on projects that could provide long-term economic, environmental, and social benefits. An additional disincentive to energy efficiency projects is that economic benefits of the projects (typically lower energy costs) are simply absorbed into the operating budget of the organization. The up-front costs for pursuing an energy efficiency project are very visible to decision-makers, but long-term savings are not. There exists a need to make the business case within organizations for sustainability implemented via energy efficiency. (See *Higher Education in a Warming World: The Business Case for Climate Leadership on Campus* at <http://www.nwf.org/CampusEcology/BusinessCase/index.cfm>.)

Many campuses and businesses utilize revolving energy efficiency funds to finance capital projects that provide economic, environmental, public relations, energy, and CO₂ emissions benefits. Energy efficiency funds provide organizations with a way to raise the visibility of the economic benefits of energy efficiency projects. Higher Education institutions that have implemented energy efficiency funds include Harvard University, UC-Boulder, and Macalester College, where the students demanded that the administration utilize such a fund. Calvin College is considering using such a fund as one aspect of an overall carbon emissions reduction and cost savings strategy. The Association for Sustainability in Higher Education (AASHE) has developed a guidebook for creating a campus sustainability fund. See <http://www.aashe.org/resources/pdf/CERF.pdf>.

Energy efficiency funds typically start with seed funding (from donor or other sources). Capital projects that improve energy efficiency are pursued with resources from the fund. Cost savings resulting from energy savings are plowed back into the fund over an agreed-upon time period, resulting in growth of fund balance over time. A growing fund can be used for ever-larger projects.

The question for you this semester is “*What would it take to implement a Calvin Energy Efficiency Fund (CEEF)?*” Corollary questions include:

- What energy efficiency projects could sustain a CEEF?
- Is it possible to adjust Calvin’s accounting systems to accommodate a CEEF?
- What sources could Calvin realistically tap for CEEF seed money?
- Could we accurately assess the energy and cost savings from CEEF projects? If not, what would be required to assess energy and cost savings from CEEF projects?
- What would a college policy statement that governs a CEEF look like?
- What would be required to make the case for a CEEF to the Calvin administration?

Your answer to these questions should take the form of a comprehensive and realistic plan for Calvin College to implement an energy efficiency fund. The plan must be appropriate for the mission of Calvin College (<http://www.calvin.edu/about/mission.htm>), be consistent with Calvin’s Sustainability Statement (<http://www.calvin.edu/admin/provost/documents/sustainability-v10.pdf>), Calvin’s history, Calvin’s commitment to creation care, Calvin’s commitment to sound fiscal management, and Calvin’s present context. Elements of your proposed plan should include:

- A list of energy efficiency projects that should be undertaken
- Means of monitoring and assessing the energy efficiency gains from each project
- A list of energy efficiency projects that were rejected and reasons why
- A detailed list of steps to be taken by Calvin to implement the energy efficiency projects
- A policy statement detailing how the fund should be governed
- A schedule showing a timeline for implementing the energy efficiency projects
- A cash flow diagram showing fund balance as a function of time for the next 50 years
- A realistic plan to generate seed money for the energy efficiency fund
- A recommendation for ways to change Calvin's accounting structures to accommodate the fund

Your deliverables are:

- (a) a final report that proposes a feasible approach for implementing an energy efficiency fund
- (b) two posters to be presented at the Calvin Environmental Assessment Program (CEAP) conference at 3:30 PM on Thursday 4 December 2008, and
- (c) an Engineering seminar on Monday 8 December 2008 in SB010 at 3:30 PM.

Each student must attend either (a) the CEAP Poster Session or (b) the Engineering Seminar.

Your final report will consist of:

- (a) a paper copy of your final technical memo with extensive appendices,
- (b) an electronic copy of your final report (.pdf format, one single file) to be posted at <http://www.calvin.edu/~mkh2>, and
- (c) a CD or DVD containing electronic copies of all posters, presentations, programs, and analysis tools that you developed during the project.

The customer for your final report is Calvin's Vice-President for Finance, Henry DeVries. The final written report should follow the technical memo format, including a two-page summary with conclusions. As a class, you should select an Executive Council that is responsible for coordinating and planning the final report and for writing the introductory two pages of the report. Each group must provide a detailed appendix (in technical memo format, of course) to the overall technical memo that describes the analyses performed and the contributions of the team.

You must distribute copies of your final report (all three elements) to the VP for Finance, your supporting resources (see below), and your professor. The final report is due on Wednesday 17 December 2008 before 4:30 PM. As a class, you must also send a note of appreciation to each resource for their assistance during the semester.

To develop the required plan, you must first brainstorm (as an entire class) several energy efficiency projects to be evaluated. You must develop ideas on your own *and* utilize your resources. Submit the list of energy efficiency projects to the professor by Monday 15 September 2008 at class. You need at least three times as many ideas as technical groups (so more than nine total documented ideas). The project ideas must be organized into three groups corresponding to the topics to be covered by each technical group.

Thereafter, you will pursue this project in small groups of approximately 4 students each. There will be one policy group, one financial group, and three technical groups. The policy group must (a) review the NWF and AASHE references given above and study energy efficiency fund policies of other colleges, (b) set objectives for managing the fund in consultation with other members of the class and your resources (financial objectives, educational objectives, carbon emissions objectives, etc.), (c) develop

plans for adjusting Calvin's accounting systems to create the space for the fund, (d) develop a policy statement for the CEEF, and (e) communicate and coordinate with other groups so that all groups understand how the policy will impact their work.

The financial group must (a) develop financial tools for assessing each potential energy efficiency project in a way that allows easy comparison among all candidate projects, (b) collect relevant cost information from technical groups, (c) evaluate the financial impact of each potential energy efficiency project on the CEEF, and (d) develop a cash-flow diagram for the CEEF as a function of time.

The technical groups will focus on technical, schedule, and cost aspects of specific energy efficiency projects. If required, they must develop designs for metering and assessment systems to verify that ongoing energy savings are being achieved. They must develop detailed designs including schedule, parts list, and up-front costs. They must predict future energy and cost savings and communicate these to the financial team.

The professor will select students to fill the groups. To apply for one of the available groups, prepare a cover letter and resume and deliver it to your professor by Monday 15 September 2008 at class. Your cover letter should indicate the group in which you are interested and why you are qualified for that position. Group assignments will be announced via Knightvision in the evening of Monday 15 September 2008.

As a class, you may find it necessary to adjust the projects being addressed by each group as the semester progresses. For example, if none of the projects assigned to a group appear technically or financially feasible, you may need to re-distribute the projects among the groups. Or, new ideas may emerge that require study. Those may be pursued.

All groups must arrange a tour of Calvin's existing physical plant facilities (including our co-gen plant) with Paul Pennock (see *Supporting Resources* below). All groups must arrange a meeting with Don Winkle and Chuck Holwerda to brainstorm energy savings ideas on campus.

The first tasks for each group will be to develop a schedule of your activities for the semester. The schedule must show milestones corresponding to points of interaction with other groups.

There will be three short, *individual*, in-class progress reports in the form of oral presentations. There will be a longer in-class final presentation that summarizes the results of the CEEF project. Each student must give either (a) one of the progress report presentations or (b) part of the final presentation. 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 follow 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 technical and cost details)
- Issues or concerns (and plan for addressing them)
- Work planned for upcoming reporting period

The final in-class oral report need not follow the outline above. Rather it should summarize the final technical details of your work, how your work was used in the final plan for your group, and the conclusions for your group.

Bring printed copies (6-up) of your in-class presentations for guests and the professor.

Although the customer for this report is the VP for Finance, final grades will be assigned by your professor. Students will be graded on (a) the quality of their team's contribution to the overall effort of the classes and (b) peer evaluation. The professor, in conjunction with our external resource persons, will select an exemplary student for a teamwork award at the end of the semester.

Supporting Resources:

- Paul Pennock, Calvin Physical Plant: contact for physical plant tours and general physical plant information
(616) 262-9230 (mobile)
ppennock@calvin.edu (email)
- Don Winkle, Calvin Physical Plant: contact for physical plant information and energy saving ideas
(616) 437-2643 (mobile)
- Chuck Holwerda, Electronics Shop, 6-6438
- Henry DeVries, VP for Finance, hdevries@calvin.edu, 6-6148
- Classroom learning on exergy, energy, economics, and thermal analysis
- Prior laboratory and lecture classes
- Independent research

ENGR 333 CEEF Project Schedule (2008)

Full-group project meetings are held Tuesdays 11:30–12:20 in SB102

Day	Date	Activity
Mon	8 Sep	Project introduction, objectives, deliverables, introduction to resources
Mon	15 Sep	At least nine energy efficiency project ideas due to Prof. Heun at class Cover letters and resumes due to Prof. Heun at class Student assignments posted on Knightvision in the evening
Tue	16 Sep	Project work day (Meet in the classroom for group work)
Tue	23 Sep	In-class group presentations (7 minutes + 2 for questions) Use required outline.
Tue	30 Sep	Project work day (Meet in the classroom for group work)
Tue	7 Oct	In-class group presentations (7 minutes + 2 for questions) Use required outline.
Tue	14 Oct	Project work day (Meet in the classroom for group work)
Tue	21 Oct	Project work day (Meet in the classroom for group work)
Tue	28 Oct	Project work day (Academic Advising)
Tue	4 Nov	In-class group presentations (7 minutes + 2 for questions) Use required outline.
Mon	17 Nov	Project work day (Meet in the classroom for group work)
Tue	18 Nov	Project work day (Meet in the classroom for group work)
Wed	19 Nov	Project work day (Meet in the classroom for group work)
Fri	21 Nov	Project work day (Meet in the classroom for group work)
Tue	25 Nov	Project final presentations (13 minutes + 2 for questions)
Wed	26 Nov	Project final presentations (13 minutes + 2 for questions) Report on final results. Note dates! Depart for Thanksgiving AFTER the presentations!
Thur	4 Dec	CEAP Poster Session
Mon	8 Dec	ENGR Department Seminar 3:30 PM in SB010
Wed	17 Dec	Final report due at 4:30 PM