



TITLE OF PROPOSAL: MAIN LIBRARY STEAM REDUCTION PROJECT

Organization Name:
Facilities and Services

Date of Submission:
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APPLICANT CONTACT INFORMATION

Project Lead

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PROJECT DESCRIPTION

This project will reduce the need for burning coal to fulfill the campus steam energy demand, by reducing the steam load at the Main Library. The Library's annual utility expense is almost \$1.3 million with steam accounting for \$775,000 of it. Much of the steam distribution equipment is original and in need of replacement. Specifically, this project will address Pressure Reducing Valves, Steam Traps, and Control Valve needs at the Main Library as follows:

Pressure Reducing Valve stations(PRV):

- There are seventeen main PRV stations in the building. The age of the stations vary, with the majority of them being forty plus years old. The building was designed for 2lbs of steam for perimeter radiation and 5lbs for air handler reheats. Several PRV stations are leaking through or are fixed in position and will not adjust with steam pressures ranging from 7 lbs to 13 lbs.
 - Mechanical room 2:
 - PRV1: AHU10, 11 and 12 reheat coils
 - PRV2: Radiation for center wing, and east entry
 - PRV3: Heat exchanger 1, 2(Radiation) and 3(Reheats). Move HX3 to PRV1 and combine PR2 and PRV3 together and install an automated control valve to turn on/off radiation with outside air conditions.
 - Mechanical room 444A:
 - PRV12: Serves heat exchanger 8 that serves reheats for AHU18-20, and the two rare book units.
 - 1st Stack Addition Attic:
 - PRV13: South Half of 1st thru 5th stack's radiation
 - PRV14: North Half of 1st thru 5th stack radiation

*Removal of asbestos from the piping will be required for installation of new PRV stations.

Steam Traps:

- The building steam traps have not been replaced for years and several of them are blowing through. There are approximately 800 traps in the building. With the steam pressure through the PRV station being much higher than the design value, the traps may have been damaged and are need of repair/replacement. This work needs to be done in conjunction or after PRV replacement.

Valve replacement:

- There is a broad style of control valves located in the building with many of these being original equipment and leaking through.
 - Replace the steam radiation valves in the 2nd, 3rd, and 7th additions of the main library. These valves were recently inspected by retrocommissioning and the valves leaking through had maintenance work orders entered to repair or replace them. There are still numerous radiation valves that are of original installation.
 - Install new thermostats and radiation zone control valves, in the 1st through 5th stack additions. The radiators on these zone valves are equipped with manual valves. The majority of these manual valves have been recently replaced. There are still manual valves that leak through and cause overheating of the stacks area. There are approximately 68 of zone valves. The steam supply to these zone valves is from two separate PRV stations, PRV13 and 14. There are isolation control valves on these two steam feeds that are currently under DDC control that



- shuts off the steam supply when temperature gets above 40F outside. Since there are isolation valves, the savings and benefits for replacing the zones valves will not be as significant.
- Install isolation control valves on the radiation steam mains that serve the 1st, 2nd, 3rd, and 7th additions. This would allow for more precise summer/winter switchover control, resulting in a reduction of unnecessary steam usage and overheating of the building in mild weather conditions. To achieve this, five control valves will need to be installed on the radiation steam mains and controlled through the DDC system.
1. Project goals
 - a. Reduce campus energy demand in the form of steam
 - b. Maintain the campus steam distribution equipment
 - c. Address needed projects identified by the award-winning Retrocommissioning teams.
 2. Definition of sustainability and the relationship of the project to this definition
 - a. While sustainability can refer to social, economic, and/or environmental issues, this project is directly related to the environmental impact of this campus. By reducing the steam load through proper maintenance of the steam distribution systems, we will reduce the need to burn coal for production of steam energy at the Abbott Power Plant.
 3. Feasibility evaluation
 - a. This project has been identified by staff at Facilities and Services and it will be implemented with F&S staff.
 4. Longevity and/or permanence of project results on campus
 - a. This project will extend the life of the steam distribution system in the Main Library, and it will contribute to the beginning of a preventive maintenance process for steam traps around campus.
 5. Project governance structure (if applicable)
 - a. Morgan will facilitate communication between SSC and the appropriate F&S personnel for this project. The PRVs will be addressed by Energy Services and the Steam Traps and Valves will be addressed by the Maintenance Division.
 6. A summary of communications with relevant campus administrative entities and Facilities & Services personnel
 - a. There have been two team meetings about this project so far this year. The most recent meetings was on March 2, 2012, and the following people were in attendance.
 - b. Stacy Wisegarver, Nathan Reifsteck, Karl Helmink, David Hardin, Carl Wegel, Roger Bensyl, Janet Spencer, and Morgan Johnston.
 7. Location, including any concerns that may arise from the chosen site (applicants are encouraged to consult with Facilities & Services prior to submitting their proposal to ensure selection of appropriate sites)
 - a. This location is the Main Library, which is currently being retrocommissioned.
 8. Comparisons to similar projects at other campuses, if applicable



BUDGET, FUNDRAISING, AND TIMELINE

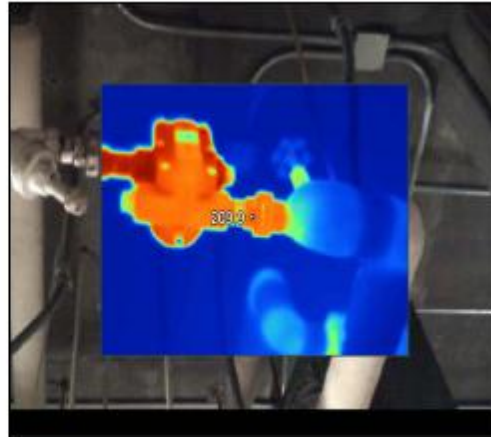
I. Detailed Budget

1. Provide a detailed budget of the full project costs: initial costs, life-cycle operation, maintenance costs, and an analysis of the project's rate of return

Repairing steam traps and broken control valves is one of the most cost effective things that we can do. The Vet Med ESCO project with guaranteed savings projected a payback of 1.5 years on this type of work at that location.



Existing Steam Trap



Thermal Image of Same Trap (Operable)

2. Detail both the specific budget items and the total funding amount being requested

Pressure Reducing Valve stations (PRV):

The cost to replace the PRV stations is approximately \$75,000.

Steam Traps:

Based on an average cost of \$250 per trap, the cost to repair the steam traps is approximately \$200,000. In our letter of inquiry, we had assumed there were about 640 steam traps, based on some old building records, but now we have an estimate of approximately 800. This is still an unknown quantity, and it will be clarified once the project has been approved with funding.

Valve replacement:

- There are still numerous radiation valves that are of original installation. Updating the remaining control valves would approximately be \$25,000.
- The estimated cost to replace the zone valves and thermostats would be around \$95,000.
- Five control valves will need to be installed on the radiation steam mains and controlled through the DDC system. The estimated cost would be: \$35,000.

Total Project Cost:

The total cost for this project is \$430,000, and we are seeking a grant from SSC for half that amount: \$215,000.

Funding Requested from SSC: \$215,000.

3. Provide supporting documentation (such as quotes from F&S or outside contractors) for project components, if obtained before proposal is due.

See attached Project Scope Statement



4. Answer the question: If the Student Sustainability Committee does not fund the full requested amount, will the project be able to move forward?

If SSC does not award the 50 percent project costs, the full project will be scaled back to fit the funding committed, with priority being given to the PRV implementation, followed by Steam Traps, followed by Valve Replacement. The unfunded components will then be on hold until funding is identified at some time in the future.

II. Fundraising

1. List any cost-share funds provided by the applying department and partners
Facilities and Services will provide a fifty percent share of the costs.

2. List any grants or other sources of funding that have been obtained or applied for, and please attach letters of support. If these funds are limited to a certain component of the project, please specify. If other funding cannot be obtained for this project, please explain.

If a grant becomes available from DCEO for this work during the qualifying period, the scope will be expanded to address more of steam distribution system needs on campus.

3. Please quantify staff time allocated to the project beyond the normal responsibilities of those involved

NOTE: Preference will be given to those projects that seek additional funding from other sources including the Illinois Clean Energy Community Foundation, Environmental Change Institute, Office of Sustainability, Facilities and Services, UIUC departments, SORF, and agencies like the US Dept. of Energy or the EPA. This priority is given to encourage cost sharing and to allow the funds available to support a greater number of sustainability projects on campus.

III. Timeline

- If the project is dependent on the receipt of funding from this committee, provide an estimated timeline listing the length of time from start to finish and detailing the length of time that each component will take.

The steam trap replacement component can begin as soon as funding is available, and the PRV and valve upgrades can begin once the engineering review of existing conditions is complete. The full project should be able to be completed by the end of fiscal year 2013.

- If the project is ongoing or has a specific start date, please include a timeline with specific dates from the start of the project until completion
- Please provide a firm end date: June 30, 2013.

ENVIRONMENTAL, SOCIAL, AND ECONOMIC IMPACTS

I. Renewable Energy Projects

If the project will generate renewable energy, estimate:

- The amount of energy it will generate
- The significant energy inputs required to complete and maintain the project
- Net amount of clean energy created by the project

II. Energy Efficiency Projects

If the project will lead to energy savings, estimate:



1. The amount of energy and money the project will save on an annual basis and for the lifetime of the project

Because this is the first steam project to be completed as a full-on comprehensive project, rather than through individual ad hoc maintenance work-orders, we do not yet have specific energy savings projections for this campus or this specific building. We do have a reasonable payback estimate provided by the contractor on the ESCO at Vet Med, which indicates a 1.5 year payback for steam traps (see attached). The ESCO estimate shows a cost of \$260.78 per trap, and associated savings of \$176.04 per trap. The Vet Med ESCO calculations used the FY10 variable savings rate for steam, which was \$10.4730/1,000 pounds of steam. Therefore, the anticipated energy savings is 16.81 klb per steam trap (= \$176.04/10.473). With 800 steam traps, the energy savings should be approximately 13,447 klbs per year. The current energy savings rate for steam on campus is \$19.17 per klb, so this project is projected to save about \$257,778.99 per year. The additional savings from PRV replacements and Valve replacements are not currently quantifiable.

2. Any significant energy inputs required to complete and maintain the project.
This project does not need energy inputs.
3. Net amount of energy saved by the project.

Projected savings: 13,447 klbs of steam per year
There is not a lifetime limit on these savings.

**For all estimates, please provide a yearly estimate and an estimate for the lifetime of the project. Please also provide supporting information regarding your estimates.*

III. All Projects

Greenhouse Gas Impact

Effect on greenhouse gases (if applicable): Detail your project's reduction of greenhouse gases by the offset use of fossil fuel energy sources normally used by the university. Unless you have data more relevant to your project, please visit the University of Illinois Urbana-Champaign Energy Management website (http://www.energymanagement.illinois.edu/energy_data.cfm) to determine the cost of energy on campus (provide estimates using both the fixed and variable cost rates).

GHG Emissions

Electricity: 1.672 CO₂ lb/kWh
Steam: 244.9 CO₂ lb/klb
Chilled Water: 144.6 CO₂ lb/mmbtu

Diesel: 22.2 pounds CO₂/gallon
Gasoline: 19.4 pounds CO₂/gallon

3,293,170.3 CO₂ lb savings
from the 13,447 klb of savings per year

Other Environmental Impact and Metrics

Detail other environmental benefits of your project, and quantify them if possible. Even if benefits do not directly translate into cost savings, please list them and provide metrics for assessment. Examples may include: Educational benefits, storm-water benefits, waste reduction, food production, habitat preservation, etc. In addition, please list significant positive and negative environmental impacts, using quantifiable metrics if possible.



Social Impact

Detail both positive and negative social impacts, if applicable.

Economic Impact

Detail both positive and negative economic impacts using quantifiable metrics if possible.

Cost savings

OUTREACH AND EDUCATION

SSC strives to fund projects that will be highly visible and have a positive impact on the lives of the University of Illinois Urbana-Champaign students that pay the fee. Selected projects will be required to publicize their project in press releases, prepare presentations, install a permanent plaque at the project site, install stickers where appropriate, and mention the support of the Student Sustainability Committee. With that focus, please include a short publicity and engagement plan that addresses the following:

This is not a highly visible project in that the changes occur in mechanical areas behind the scenes. However, Facilities and Services has a number of student employees that will be involved in the implementation of this project. This project will be included on the F&S website with credit to SSC for the contribution, and the project will be included on the iCAP portal once it is active.

If SSC is interested in doing a joint press release about this endeavor, F&S is happy to participate.

- Visibility of the project to students
- Role that students will play in the project
- Opportunities for involvement in classroom curriculum
- On-site publicity of SSC funding
- Media opportunities
- Any additional information

PROPOSAL SUBMITTAL

Please send the completed project application to:

Mckenzie Beverage, Program Advisor to the Student Sustainability Committee
mbeverag@illinois.edu