

Semesterly Report

*Thank you for your commitment to green initiatives at the University of Illinois. One of the ongoing requirements listed in the terms of the funding agreement for your project is the submission of semesterly reports with key information about your project. In addition to this form, please provide additional financial documentation and/or progress photos if available.*

*Please be as accurate as possible in describing the project (including possible setbacks or challenges in meeting the initial goals of the project). Not fully meeting your project's goals will not disqualify you from making future funding requests as long as your reports are as complete and accurate as possible. If you have any questions, please contact the Student Sustainability Committee, at* *sustainability-committee@illinois.edu**.*

**Project Name:** High Resolution Temperature Profiling and Thermal Analysis for Geothermal Energy Alternatives

**Date of Report Submission:** 8/16/2017

# Project Purpose:

Establishing a geothermal exchange experiment for evaluating the feasibility of geothermal energy on campus, and sharing the knowledge with campus and community for future geothermal energy development. The following report only include the updates after previous report on 12/22/2016.

# Detailed Accounting of Expenditures to Date:

The budget has been managed within the revised scope of the project since previous report on 12/22/2016. The major budget items after previous report include (1) the installation of land line power for electricity, and (2) the Distributed Thermal Response Test in spring with the participation from the University of Wisconsin – Madison and Wisconsin Geological & Natural History Survey. The detailed budget updated to 6/30/2017 are shown in the attached file (1- 303692-547005-547080-547A00-2017-06.pdf).

# Project Progress to Date:

Three students involved in this project were awarded funding for a student led project from the SSC to develop an innovative Thermal Response Testing (TRT) Device by collaborating with students from the University of Wisconsin – Madison (UW-Madison). After communicating with SSC, some tasks on this project have been modified to maximize the benefits from both projects and help our students extend further the learning experience and broader impacts. The modification will enable our students to develop instruction materials for both project, performing a TRT experiment, and develop a workflow for data analysis from this Geothermal Research Station at the Energy Farm. One broader impacts is that we can use this material for teaching and demonstration of future students from multiple departments such as Energy and Sustainability Engineering program (EaSE), Department of Civil and Environmental Engineer (CEE), Department of Natural Resources and Environmental Sciences (NRES), and other student organizations. These efforts have shifted the resources from the original proposed two items: (1) the development of a webpage to demonstrate the temperature difference between the surface and subsurface, and (2) a sensitivity analysis of the optimal installation depth and cost for a potential vertical closed-loop system. The new opportunities will allow us to directly engage a larger group of students. If we followed the original proposal, (1) it is uncertain about how many student would view the website without large efforts on prompting them, and (2) a sensitivity analysis of the optimal installation depth and cost for a potential vertical closed-loop system can be part of the class homework or semester project with our guidelines. Now, instead of passively waiting for student involvement, the results of the geothermal experiment will be included in class learning materials if we include it as part of an academic course work.

# Student Involvement and Outreach to Date:

The three students involved this project and won another student projects are one undergraduate student from NERS and two graduate students from EaSE. One of the EaSE student graduated in May 2017. A new CEE undergraduate student joined the team in July 2017. Moreover, a CEE doctoral student, Mr. Franklin Holcomb (fholcom2@illinois.edu), has requested to use the Geothermal Research Station to develop his Ph. D. dissertation.

Two videos about the geothermal experiment have been produced by the communication team at the Prairie Research Institute (PRI), and are available on the PRI You Tube channel:

Video 1: <https://youtu.be/BFLjf9MJWvA>

Video 2: <https://youtu.be/iw0s3xkW8Lw>

Professor Stephen Altaner from the Department of Geology brought his entire Geology 380 (Environmental Geology) class to the Geothermal Research Station for a field lecture on April 17th, 2017

# Marketing and Promotion Efforts to Date:

The project team leveraged the initial data from the Energy Farm in a proposal to the DOE Office of Energy Efficiency and Renewable Energy. In early July 2017, this proposal for an innovative application of deep geothermal exchange on the UIUC campus was approved and the team will collaborate with several other UIUC campus units, the UW-Madison, and several industrial partners. The funding press release from DOE is included below, and the award negotiations are still in progress.

[https://energy.gov/eere/articles/energy-department-announces-4-million-geothermal-deep- direct-use-feasibility-studies](https://energy.gov/eere/articles/energy-department-announces-4-million-geothermal-deep-%20direct-use-feasibility-studies)

There have been many visitors from campus, the local communities, and other research institutes across the globe to the Geothermal Research Station. For example, the Office of the Vice Chancellor for Research (OVCR) and US Army Construction Engineering Research Laboratory have jointly awarded a new research development grant to the team to leverage this project to further improve the efficiency of geothermal exchange systems at US military installations and at Allie bases. The PI and US Army South Command arranged a site visit and demonstration at the Geothermal Research Station on August 10th, 2017 to the government and military delegates from Argentina, Brazil, Chile, Colombia, Peru, and US Army.

Additional requests have been made by national and international research institutes to visit the station. It is expected scientists and engineers from the Indiana Geological Survey, University of Western Ontario (Canada), University of São Paulo (Brazil), Chinese Academy of Sciences (China), China University of Mining and Technology (China), and National Chiao Tung University (Taiwan) will visit the Geothermal Research Station in the Fall of 2017.

One peer-review journal manuscript is in preparation based on the geothermal experiment. Several presentations about the research have been made by the team at symposia, conferences, and workshops.

# Additional Comments:

This project's successful contributions were only possible because of the strong support received from the SSC, UIUC Energy Farm, Facilities & Services (F&S), and many other campus units. We are planning to share more photographs and video of the research activities in the near future.