



## STUDENT SUSTAINABILITY COMMITTEE

### 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](mailto:sustainability-committee@illinois.edu).*

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**Project Name:** Now to be known as Geothermal exchange for greenhouses at UIUC Energy Farm ~~Geothermal exchange for greenhouses at UIUC Woody Perennial Polyculture Research Site~~

**Date of Report Submission:** 1/29/2022

**Project Purpose:**

The proposed project will involve the design, construction, and installation of a geothermal system to heat two greenhouses at the Energy Farm. The project was initially proposed to heat one greenhouse at the UIUC Woody Perennial Polyculture Research Site.

**Detailed Accounting of Expenditures to Date:**

Fall 2021

No expenses incurred.

Summer 2021

No expenses incurred.

Spring 2021

No expenses incurred.

Fall 2020

No expenses incurred.

Summer 2020

No expenses incurred.

#### Spring 2020

No expenses incurred.

#### Fall 2019

No expenses incurred.

#### Spring 2019

No expenses incurred.

#### Summer/Fall 2018

\$825.54 – Engineering design services by UIUC Facilities and Services (F&S)

\$1,323.62 – Soil moisture/temperature probe with auger from Fondriest Environmental, Inc. - to be used to measure soil moisture/temperature during winter when greenhouse is being heated by propane – data needed to help design geothermal system for winter 2019/2020.

#### **Project Progress to Date:**

##### Fall 2021

Oak Ridge National Laboratory (ORNL) was ready to progress with the project and they contacted the Illinois Department of Public Health (IDPH) to get an underground permit for the UTB. After several weeks of discussion with the County and State offices it was determined that the UTB would not be permitted by a variance to the well code. This is the first time the IDPH has been asked to permit a UTB, so it was not known before that permitting was not allowed. Subsequently, the ORNL researchers are working with several companies to remanufacture the UTB with fiberglass or other acceptable material. We expect the reconstruction to occur this semester, so that installation can take place during the summer.

##### Summer 2021

Oak Ridge National Laboratory (ORNL) is nearing completion of the Underground Thermal Battery (UTB). They have contacted Prairie Research Institute (PRI) to obtain quotes for drilling and installation of the battery. ORNL has contacted the Champaign County Health Department to obtain a variance for the UTB. We expected on the ground work to start in the Fall semester.

##### Spring 2021

ORNL has restarted work on the UTB and is expected to be done later in 2021.

##### Fall 2020

No work was undertaken. The Oak Ridge National Laboratory has remained partially closed, so work on the underground thermal battery has been delayed. We expect more progress in early 2021 for possible deployment in summer of 2021.

##### Summer 2020

No work was undertaken in this time period because of Covid-19 restrictions. The collaboration with Oak Ridge National Laboratory is continuing but work on manufacturing the thermal battery was delayed. It is not likely site work will start in 2020, so we are looking at 2021 before anything happens, and this depends on additional pandemic-related restrictions. I may submit another request to SSC for an extension, but this will depend on how the next few months pan out.

#### Spring 2020

ORNL suspended work on the UTB because of Covid-19.

#### Fall 2019

A revised cost for the system was obtained during the summer, and is now 3 times the original because more heating is needed for two greenhouses. Other funding was identified from the Illinois Clean Energy Community Foundation (ICECF) to cover the cost increase, but the submission deadline had passed; a submission in 2020 is planned.

In Fall 2019, a new design for the geothermal system was drafted to use excess heat from the Biomass boiler running at the farm. It is anticipated that storing excess heat in the ground would reduce the number of boreholes required for the geothermal system, substantially reducing the overall cost.

In December 2019 a collaboration was established with ORNL and the PRI to test a prototype UTB (see journal article attached to email). The UTB would be installed at the Energy Farm to heat the greenhouses. Once the initial installation is completed, additional UTBs could be added to increase the overall heating capacity of the geothermal system. The UTB would also utilize excess thermal energy from the biomass boiler. The project would be supported from the existing SSC grant, operational funds from ORNL, and research funding from the Illinois Water Resources Center. Also, a grant application to the ICECF is planned for February 2020. A scope change has been submitted to account for revisions to the original project.

#### Spring 2019

F&S determined that to meet the electrical load for the geothermal heat pumps, a new power source (transformer) would need to be installed at the WPP Farm. Initial estimates for the work range from \$50,000 to \$100,000. Because of this new information, we have decided to consider the greenhouses at the Energy Farm for installing the geothermal system. Tim Mies, the farm manager has agreed to be involved, and ample power is available for the system. The greenhouses are operated by Dr. Erik Sacks, Crop Sciences. We have had a private company (TCI Geothermal provide us a high-level cost for installing a geothermal system at both the WPP Farm and Energy Farm.

#### Summer/Fall 2018

The project was initially to be designed by F&S, but then moved to a capital project because of complexity. Now F&S retained engineering firm Grumman/Butkus Associates is assisting. Because of the delay bringing retained firm into project, installation of the borefield has been delayed to spring/summer of 2019. The installation could not be completed before January 1,

2019 (start of research project by Dr. DK Lee). Now will wait to install system in 2019 once the growing season starts and the greenhouse is no longer heated.

**Student Involvement and Outreach to Date:**

Fall 2021

None this semester.

Summer 2021

None this semester.

Spring 2021

None this semester.

Fall 2020

None this semester.

Summer 2020

None this semester.

Spring 2020

None this semester.

Fall 2019

Students from the Department of Civil and Environmental Engineering are modeling heat transport in the ground at the Energy Farm. An energy shaft was installed in Fall 2019 at the Geothermal Research Station (beside the greenhouses), and thermo-mechanical information collected from the shaft is being used in the model. This information will be used in the design of the UTB.

Summer/Fall 2019

Frank Holcomb, a Ph.D student in Civil and Environmental Engineering has been involved in the preliminary design of the geoexchange field. He attend meetings with F&S and Grumman/Butkus Associates.

Spring 2019

None this semester.

**Marketing and Promotion Efforts to Date:**

Project was added to iCAP website.

**Additional Comments:**

Summer 2019

Going forward, the project will now be known as “Geothermal exchange for greenhouses at UIUC Energy Farm.”