President's Climate Commitment Fund

Amplify Grant Program

PROJECT REPORT

NAME OF PROJECT

Geoexchange Model

PROJECT TEAM

Ryder Maston '26 and Gillian Will '26
Professor Carr Everbach, Engineering

SUMMARY AND GOALS

Briefly restate the original **goals** and **scope** of the project. Please include any description of process, timelines or stakeholders. Please describe any changes to goals as the project developed.

We began our project with the goal of increasing the Swarthmore community's understanding of the geoexchange being installed on campus through the development of a physical and interactive model. With support from Hannah Ulloa in the office of sustainability and Professor Carr Everbach in the Engineering Department, we filed for an Amplify Grant with the goal of having a working model ready for an event on Earth Day 2024. During the fall 2023 semester, Ryder met with Professor Carr and Hannah to discuss the possibility of building a model. Gill joined the project team early during the Spring 2024 semester and the Amplify Grant was granted in early February. The goals of the project remained largely the same through the build process, and the physical components were completed on April 8th, 2024. At this time the project team decided to focus primarily on the winter version of the geoexchange system to demonstrate to students on Earth Day with goals to add to the summer version at a later date. The team continued by designing graphics for the model, creating a model of Mertz Hall to represent campus buildings, and preparing an elevator pitch on the model for students. On Earth Day 2024, Hannah and Ryder ran a tabling event in the recently opened Sharples Commons to demonstrate the model to community members, receive feedback and announce Swarthmore's Solar plan. This concluded the work done on the model during the Spring Semester, although Gillian and Professor Carr both had plans to test the model and use it at events in May.

PROGRESS AND CHALLENGES

Briefly restate the intended **outcomes** or deliverables for the project. Please describe **accomplishments** and/or **challenges** that you faced.

The primary deliverable for our project was a functional and aesthetically pleasing model of the geoexchange system. In addition, our goal was to run at least one event during the Spring 2024 semester to demonstrate the models usefulness. Finally, we wanted to receive student feedback from the model to track its success and write this final report.

Our biggest accomplishment of the project to date has been the successful implementation of the model at a tabling event on Earth Day 2024. The model received lots of student interest and helped demonstrate to students a few core concepts of geoexchange including the purpose of the geoexchange wells, the importance of heat pumps, and why the geoexchange system being fully electric is important. That being said, we were also able to build a model of the system in winter mode that helps clarify a few major concepts of geoexchange. Creating a way for the model to run effectively in summer mode proved a challenge for us, and future work could be put into building a better summer model. Finally, the temperatures recorded within the water fluctuates somewhat with room conditions as well as how long the model runs and sometimes do not demonstrate the temperature gradients as well as we had hoped.

IMPACT

Please describe the intended impact, as well as any success that has been evaluated so far. Include methods for tracking lasting impact over time and any limitations identified.

Our project was intended to increase campus understanding of how geoexchange works and why it will be beneficial to our campus. As an extension, we hoped the project would ease student concerns about To Zero by Thirty-Five construction and garner support for sustainability projects on campus. Our first implementation of the model received responses from 29 students that were tracked in a spreadsheet to be added to in the future. The first event recorded an average understanding of 4 out of 5, with most students stating principles of geoexchange relating to heat pumps, geothermal wells, and the process being fully electrified. Primary limitations include a relatively small student population at Swarthmore and questions becoming repetitive over time.

REFLECTION

Please share your feedback and perspective on the project. What do you see as the greatest strengths? Greatest challenges (aside from financial)? What skills, knowledge or experience do you feel you have gained?

I believe the greatest strengths of the project come from its unique approach to spreading awareness about geoexchange. Many students on campus have heard about geoexchange or seen a diagram, but most students we interacted with were unable to explain how the process worked. The model demonstrates this process in a visual and interactive way that hopefully resonates with students over time. Challenges of the project come mostly from the difficulty of modeling a complex process with parts

and designs that are cheap and simple compared to ones used in the project. These restrictions were challenging to us attempting to design a functional model and challenging to students who may struggle to connect functions of the model to their respective campus components. Personally, we feel as though our understanding of the geoexchange system has improved ten fold. We have had opportunities to interact with community members that are directly involved in the implementation of geoexchange on campus, and we have also learned how to share the work these people are doing with students on campus. We have been able to develop some technical skills such as physical and graphic design, and maybe more importantly have gained valuable experience communicating with a diverse group of people including project mentors and students on campus.

LOOKING AHEAD

Please describe any future plans (or ideas) for funding, expansion, or continuation of the project.

In the near future we are looking forward to Gill completing some testing of the model to better understand how to best explain the model to students and help us use the temperatures generated by the model to support our claims. In addition we hope to continue using the model at sustainable tabling events in the future to help explain geoexchange to students and visitors alike. Continuation of the project could include improving the thermal properties of the model, creating a better functioning summer mode that could be toggled on a cycle with the winter mode, and model maintenance over time.

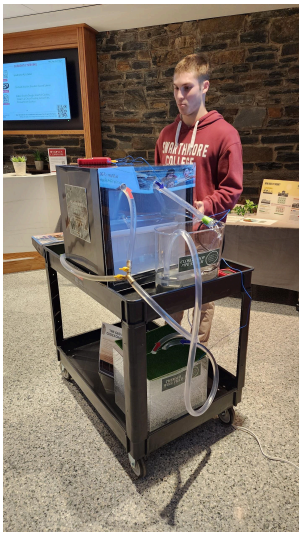
BUDGET

Please attach the final actual budget with the total award amount.

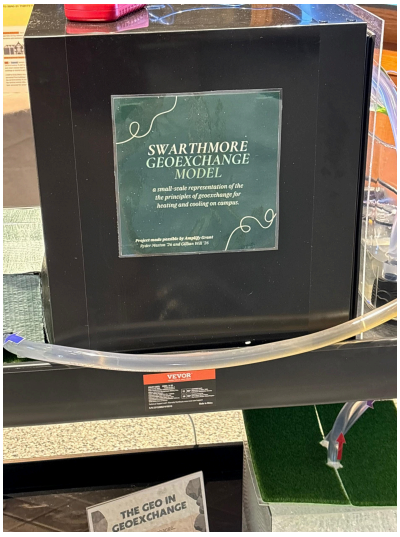
Final Budget Sheet

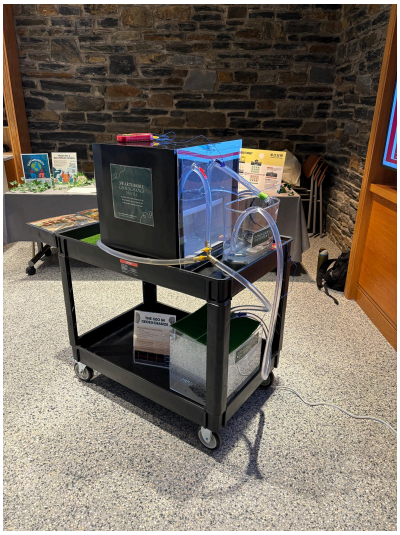
PHOTOS AND RESOURCES

Please attach any photos or additional resources relevant to your project implementation.




SWARTHMORE
GEOEXCHANGE
MODEL


SWARTHMORE
GEOEXCHANGE
MODEL
a small-scale representation of the
the principles of geoexchange for
heating and cooling on campus.
VEVOR
THE GEO IN
GEOEXCHANGE




THERMAL
WELL FIELD