# *Thank you for your commitment to green initiatives at the University of Illinois. One of the final steps in completing the terms of the funding agreement for your project is the submission of a Final Report with key information about your project. You will also need to submit a detailed report of expenses (if you don't list it within this document) as well as supporting photos to showcase your project.*

# *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:** E2E Paradigm for Food Waste to Biofuel and Biomaterial

**Date of Report Submission:** 1/10/2019

**Project Purpose:**

Our student research team, under Dr. Yuanhui Zhang, has expanded the Environment-Enhancing Energy (E2E) research program to campus application by augmenting wet food waste produced through the dining halls. E2E uses hydrothermal liquefaction (HTL), a thermochemical process that uses pressure and heat, to convert various biowastes to renewable bio-crude. We first surveyed dining services food waste and discussed our findings available to campus affiliates. Next, we took dining waste and converted it into biofuel and asphalt at lab scale. This process will reduce UIUC’s food waste, advancing the Illinois Climate Action Plan efforts. Likewise, the project will bring awareness to food waste at a local level. The student research team will gain invaluable research skills as well as engineering experience.

**Project Summary:**

The project began in the start of spring 2018 semester and had four phases, each phase consisting of 2 months approximately. The first phase consisted of analyzing the feedstock sources from the dining hall for their energy content at laboratory scale in batch reactions and potential economical returns. In doing so, our team determined which food category had the greatest conceivable benefit to campus, based on quantifying the available waste and value recovery using HTL. The second phase of this project will consist of converting the oil phase of the laboratory HTL process into a refined product for the sustainability project. During this phase, the biooil was modified via chemical treatment to refine the petroleum alternative into a usable product that can substitute a campus cost. This portion of the work was essential to validating food waste HTL processing, as our projects can specifically improve UIUC sustainability. The following weeks focused on preparing a larger scale assessment for expanding the HTL scope of feedstocks for further energy recovery using waste at larger scale, as well as determining the potential impacts on campus with sizable amounts of food waste.

**Summary of Project Expenditures:**

To date, the following amounts have been spent on the originally funded categories:

* Scientific and Laboratory Supplies: $4223.99
* On campus- services and analysis: $ 3683.51
* Student hourly and Labor: $2000.00
* Social security, medicare, workers comp.: $90.50

**Problems/Challenges Encountered**

The primary challenge to accomplishing these project goals was maximizing the relevance and immediate returns to campus through our objectives. In project preparation, we had to thoroughly understand the level of waste related to food on campus to determine how much impact this technology could have. As our teams expertise was the technology and laboratory processes, we had to adapt our thinking to serve the campus instead of focusing on the scientific results, which also ultimately shed light on a refined action plan for campus and societal implementation of HTL.

**Student Involvement and Outreach to Date:**

Our team of graduate and undergraduate students was very successful in meeting campus officials to gather data for the sustainability analysis, engage the community both scientifically and informally about our initiative, and determine the possible impact of waste to biofuels for UIUC. Specifically, we attended conferences, both on and offcampus, and performed laboratory tours to teach several student groups and stakeholders about how the process of hydrothermal liquefaction. Our visitors learned how it can be a revolutionary technology for recovering value from different types of food waste, in general, and some were able to gain hand on experience by analyzing the waste and performing reactions. In our next funded phase, we hope to expand this for campus demonstrations at our pilot scale facility.

**Marketing and Promotion Efforts to Date:**

Thus far, we have participated in SSC events to discuss our projects with other sustainability project leaders. In doing so, we have been able to identify new contributors and stakeholders that will contribute to the expansion of the project at scale (Phase II). Once the complete findings have been analyzed and organized, our team can distribute the promising results to campus and larger media to divulge the value of our food waste mitigation project. A primary target for this upcoming objective is the Daily illini and local news outlets. Additionally, as part of our labs expertise in this area, a video describing HTL technology and campus impact will be shared in conjunction with Phase II developments.

**Additional Comments:**

Our research team has successfully submitted the scientific article *Experimental and model enhancement of food waste hydrothermal liquefaction with combined effects of biochemical composition and reaction conditions* to Bioresource Technology. Specific recognition has been given to the supporting agencies, including the UIUC Student Sustainability Community, for contributing to this initiative. The pictures included serve as examples to demonstrate some of our activities. More information or media can be provided at the committee’s request.

In addition to the above fields, please provide a detailed accounting of how the funding was spent as well as pictures of the final project in an email to sustainability-committee@illinois.edu. Thank you again for your commitment to sustainability.



