STUDENT SUSTAINABILITY COMMITTEE

Funding Application – Step II

Funding Criteria

A. General Rules

1. Students, faculty, and staff are encouraged to submit requests for funding. Student-led projects require a faculty or staff sponsor in order to have funds awarded.
2. Funding can only go to university-affiliated projects from students, faculty, staff, and departments.
3. All SSC projects must make a substantial impact on students. This may be a direct impact or an impact through education and engagement. All SSC funding is 100% from student green fees, so the projects funded by the students must benefit them.
4. SSC encourages innovation and new technologies – creative projects are encouraged to apply.
5. Unless a type of expense is specifically listed below as having restrictions, SSC can generally fund it. The items referenced below should not be taken as comprehensive list.

B. Things SSC Can Fund, On A Case-By-Case Basis

1. SSC can fund feasibility studies and design work; however, it must work toward ultimately addressing a sustainability need on campus.
2. SSC can fund staff positions that are related to improving campus sustainability. Strong preference will be given to proposals receiving matching funding from departments and/or plans for maintaining continuity of the position after the end of the initial grant.
3. SSC can fund outreach events with a central theme of sustainability, provided their primary audience is the general campus community.
4. SSC discourages funding requests for food and prizes but will consider proposals on a case by case basis that prove significant reasoning.
5. SSC can fund repairs and improvements to existing building systems as long as it works toward the goal of improving campus sustainability; however, a preference is shown to projects utilizing new or innovative ideas.
6. SSC can provide departments with loans for projects with a distinct payback on a case by case base. Loans will require a separate memorandum of understanding between SSC and departmental leadership pledging to repay the award in full and detailing the payback plan.

C. Things SSC Will Not Fund:

1. SSC will not fund projects with a primary end goal of generating revenue for non-University entities.
2. SSC will not fund personal lodging, food, beverage, and other travel expenses.
3. SSC will not fund any travel expenses.
4. SSC will not fund tuition or other forms of personal financial assistance for students beyond standard student employee wages.

Your Step 2 funding application should include this application, the supplemental budget form, and any letters of support.

Please submit this completed application and any relevant supporting documentation to Sustainability-Committee@Illinois.edu. The Working Group Chairs will be in contact with you regarding any questions about the application. If you have any questions about the application process, please contact the Student Sustainability Committee at sustainability-committee@illinois.edu.

General & Contact Information

Project Name: Wastewater Elimination & Scale Up Restoration
Total Amount Requested from SSC: $12,000.00

Project Topic Areas: ☐ Land & Water ☐ Education ☐ Energy
☐ Transportation ☐ Food & Waste

Applicant Name: Parker Brand
Campus Affiliation (Unit/Department or RSO/Organization): Illinois Biodiesel Initiative / IBRL
Email Address: pjbrand2@illinois.edu

Check one:
☐ This project is solely my own ***OR***
☐ This project is proposed on behalf of (name of student org., campus dept., etc.):

Project Team Members

Name	Department	Email
Thomas Johnston	IBI/IBRL	tcj2@illinois.edu
Stephen Westman	IBI/IBRL	swestma2@illinois.edu
Alex Paez	IBI/IBRL	apaez3@illinois.edu
Allison Narlock	IBI/IBRL	narlock2@illinois.edu
Parker Brand	IBI/IBRL	pjbrand2@illinois.edu
Erik Pintoy	IBI/IBRL	epintoy2@illinois.edu
Aakash Patel	IBI/IBRL	asp3@illinois.edu
Omar Kazi	IBI/IBRL	omarak2@illinois.edu

Student-Led Projects (Mandatory):
Name of Faculty or Staff Project Advisor: Dr. Beth Conerty
Advisor's Email Address: bconerty@illinois.edu

Financial Contact *(Must be a full-time University of Illinois staff member)*
Contact Name: Dr. Beth Conerty
Unit/Department: Agricultural & Biological Engineering
Email Address: bconerty@illinois.edu

Project Information

Please review the proposal materials and online content carefully. It is highly recommended you visit a working group meeting sometime during the proposal submission process.

Please provide a brief background of the project, its goals, and the desired outcomes:

You may copy and paste your Step 1 application answer if nothing has changed.

The Illinois Biodiesel Initiative (IBI) is a student-led organization that works to promote the development of renewable energy production at the UIUC and to educate the campus community about the advantages of using biodiesel as a fuel source. Our primary focus is the production of biodiesel and soap from a feedstock of used vegetable oil obtained from University Dining Halls. This initiative reduces the total landfill waste produced by the University, while also offsetting carbon emissions and establishing a self-sustaining system of production for renewable energy and soap.

The primary benefit of biodiesel as an alternative fuel is that it can make use of a used product as a feedstock in its production rather than introducing more carbon to the atmosphere. According to the US Department of Energy, biodiesel emits approximately 74% less greenhouse gasses than conventional petroleum-based diesel. The energy return value of biodiesel relative to the energy required in its production is much higher than that of fossil fuels, which require more energy in their production and refinement than they ultimately generate.

In the past, biodiesel produced by IBI was utilized by University Garage and Carpool Services. With the recent addition of the glass-lined 400 gallon batch biodiesel reactor and relocation of IBI to the Integrated Bioprocessing Research Laboratory (IBRL), we plan to continue providing biodiesel to the University Garage and Carpool Services. The production processes for both biodiesel and soap, as well as quality control of these products are entirely managed by students working at the pilot plant in the IBRL. Involvement in IBI allows students to gain experience in research and process design, while working alongside like-minded students to achieve tangible goals which advance the sustainability of the UIUC.

The purchase of parts for a glass-lined 400 gallon batch biodiesel reactor would enable IBI to increase its production capacity, recycling larger quantities of used vegetable oil into biodiesel and soap. This purchase would also include a SpringPro T76 dry wash system, which would allow water to be substituted with resin in the biodiesel purification process, effectively eliminating wastewater and decreasing the amount of contaminated material which must be safely disposed of. Rather than producing and disposing of hazardous wastewater with every batch, the SpringPro T76 will allow us to run many batches before the resin must be disposed of. The waste resin is non-hazardous, solid waste that can be more easily disposed of than the wastewater otherwise produced. This makes the process safer for students handling equipment, and reduces the amount of hazardous waste produced on campus.

Where will the project be located? Are special permissions required for this project site?

If special permission is required for this location, please explain and submit any relevant letters of support with the application.

This project will be located at the IBRL. Access to the project site is restricted to students involved in the project who have completed the required safety training and gained approval from our faculty advisor, Dr. Beth Conerty. Project leads have card access to the facility and are responsible for other members of IBI while in the facility.

Other than the project team, who will have a stake in the project? Please list other individuals, groups, or departments affiliated directly or indirectly by the project. This includes any entity providing funding (immediate, future, ongoing, matching, in-kind, etc.) and any entities that benefit from this project.
Please attach letters of commitment or support at the end of the application.

The IBRL is a university affiliated bioprocessing research and development facility involved in the development of biofuel production and quality. IBRL provides the facility to house our biodiesel and soap production and provides staff to mentor IBI members. IBI and IBRL have been working together since Fall 2018 to bring our biodiesel production to a higher standard and to increase our biodiesel production capacity to make a bigger impact in campus sustainability. IBRL will benefit by showcasing the production system made by IBI to the University and to companies interested in using the IBRL facility for pilot scale projects.

The University of Illinois dining services provides IBI with used vegetable oil from university dining halls. Dining services will benefit from this project by being able to expand their commitment towards operating the dining halls in a sustainable manner.

The University of Illinois Garage and Carpool Services will purchase our biodiesel at market price. The Garage and Carpool Services will be able to decrease their fossil fuel dependence by blending biodiesel into their fuel.

How will this project involve and/or benefit students?
This includes both direct and indirect impact.

With this project, students will gain valuable production experience and learn how to apply engineering in a way that reduces the impact on the environment. Specifically, students will have to scale up the current reactor design of the BioPro 190 to the IBI custom 400 gallon reactor. Students will also have to implement parts and retrofit the reactor vessel for safer automatic additions of the methanol and methoxide during the reaction. In addition, standard operating procedures will need to be written for operating the larger reactor and transporting chemicals. Implementing the dry wash column for our process and measuring the impact of our improved process will help orient the next generation of engineers towards sustainable engineering.

How will you bring awareness and publicize the project on campus? In addition to SSC, where will information about this project be reported?

The updates to the project will be posted on our twitter (@UIUC_Biodiesel) and facebook page (@illinibiodiesel). Our current progress will be posted on our webpage on the IBRL website (https://ibrl.aces.illinois.edu/ibi/). Additionally, as we spread awareness of our club for recruiting efforts, we will also be spreading awareness of our project.

We are also interested in presenting on the growth of the Illinois Biodiesel Initiative and the biodiesel process we have built to the engineering council during one of their general meetings. Engineering RSOs and RSO leaders can be nominated for a monthly award by which they must present on the accomplishments of their RSO. We plan to nominate our RSO for an award closer to the completion of our upscaled reactor. Most importantly, once we are fully up and running with the new equipment in our process, our increased biodiesel and soap output will allow for more students on campus to become aware of our project and seek involvement.

Financial Information

In addition to the below questions, please submit the supplemental budget spreadsheet available on the Student Sustainability Committee website. Submission of both documents by the submission deadline is required for consideration of your project.

Have you applied for funding from SSC before? If so, for what project?

IBI has applied for funding from SSC in the past for a project titled "Illinois Biodiesel Initiative". This project was primarily seeking funding which the organization needed to begin production at the time of its founding. The project was focused on the start up of the club including purchasing a BioPro 190 reactor, analytical equipment, and safety equipment. They secured a combined amount of $32,354 from the Student Sustainability Committee (SSC), Cozad Design Competition, the Clinton Global Initiative, and the Engineering Design Council. Roughly $10,000 was obtained from SSC specifically.

Additionally, IBI has applied for funding from SSC for a project titled "Brewing the Best Bankable Biodiesel". UIUC garage and carpool required that the IBI preform quality tests on the biodiesel in accordance with ASTM D6751 standards. This project focused on acquiring analytical equipment for our quality control division. Conducting the quality tests within our facility is preferable in terms of long-term economic cost.

IBI applied for funding from SSC for a project titled "Illinois Biodiesel Initiative - Student Hourlies". This aimed to provide student hourly wages for two students for the summer period to continue biodiesel production throughout the summer. The application was denied due to the project not being directly focused on campus sustainability.

If this project is implemented, will you require any ongoing funding required? What is the strategy for supporting the project in order to cover replacement, operation, or renewal costs?
Please note that SSC provides funding on a case by case basis annually and should not be considered as an ongoing source of funding.

The ultimate goal of this organization is to become a self-sustaining campus initiative. This project will take us a step further to reaching that goal, but the process of becoming self-sustaining is still in progress. We are making strides with markets for our biodiesel, and securing these customers will be crucial in our path toward financial sustainability. If this project is implemented, it will allow us to come closer to funding the entire process. It will allow us to produce a larger quantity of biodiesel that can then be sold to the university's carpool services as well as a larger quantity of soap. Additionally, the dry-wash system will reduce the cost of waste disposal making the financial model for our entire process more favorable.

Please include any other obtained sources of funding. Have you applied for funding elsewhere?
Please attach any relevant letters of support as needed in a separate document.

Our club consults with Student Organization Resource Fee (SORF) and Engineering Council to aid in event and permanent equipment purchases. Both Engineering Council and SORF reimburse purchases that have been made. Of the two, Engineering council focuses on reimbursing for event purchases and SORF helps with any equipment purchases clubs need. IBI recently applied for SORF funding in order to buy methanol and a specialized centrifuge.

Environmental, Economic, and Awareness Impacts

How will the project improve environmental sustainability at the Urbana-Champaign campus? If applicable, how does this project fit within any of the Illinois Climate Action Plan (iCAP) goals?

Currently, campus purchases its biodiesel from a third party and also outsources the disposal of its used vegetable oil. Although campus has made great strides toward becoming more sustainable, our project will capitalize on this momentum and improve another aspect of sustainability by utilizing vegetable oil and converting it to biodiesel. This also reduces the transportation requirement for both the used vegetable oil and the biodiesel. We also bring awareness to students about the process of making biodiesel, spreading the message of environmental sustainability on campus.

By adding to the third-party fuel consumption with on-campus made biodiesel, IBI will not only be saving the university money, but also contributing to iCAP's efforts to reduce total campus greenhouse gas emissions. Through the combined efforts of IBI and iCAP, we hope to make the university self sustaining and reduce our carbon footprint.

To expand on our collaboration with iCAP's objectives, one of the possible strategies for reducing campus CO_2 emissions is to convert campus vehicles to a renewable fuel source. IBI's current plan is to sell our on-campus made biofuel to University Garage and Carpool Services, thereby reducing the campus fleet emissions, and directly contributing to iCAP's mission to have a 20% reduction in campus fleet emissions by 2035. IBI will be supplying biodiesel to university services as an addition to what they already receive, increasing the biodiesel percentage used by the university.

Another point emphasized by iCAP is the necessity to support and nurture co-curricular sustainability programs. By supporting these programs, the university can move away from third party markets and reduce CO_2 emissions at the same time. For IBI, this would involve the production and sale of cleaner burning biofuel to the university, and using the profit to improve our process to better compete with outside markets.

With the assistance of SSC funding, IBI plans on implementing a new dry-wash system for our biodiesel in order to completely eliminate the production of wastewater from our process. Not only would the biofuel production process become cheaper and more efficient, but it would also reduce the energy spent by the Division of Research Safety to incinerate a 50 gallon barrel of methanol/water for every batch of biodiesel. By reducing our wastewater production, IBI fits into iCAP's goal to establish water conservation targets for the university and to decrease the upper limit of campus water demand.

In iCAP's vision for the University of Illinois, the goal is to reduce the waste produced to essentially zero. In order to complete this goal, the campus needs to recycle its waste. IBI positively impacts this goal by using used vegetable oil from the campus dining halls as the basis for our biodiesel, effectively reducing the amount of used vegetable oil disposed in the Urbana-Champaign area. By recycling the vegetable oil, the produced on-campus waste is reduced and the fuel can be used by the university to drive their buses, making a co-curricular sustainability cycle.

How will you monitor and evaluate the project's progress and environmental outcomes? What short-term and long-term environmental impacts do you expect?
Some examples include carbon emissions, water conservation, green behavior, and reduced landfill waste.

We would expect that increased production and use of biodiesel will decrease waste and provide environmental benefits by substituting fossil fuels. In the Urbana-Champaign area, increased biodiesel production should result in a lower amount of used vegetable oil disposed into landfills. Reduced negative impacts of emissions which result from biodiesel substituting petrodiesel are difficult to model due to the complexity of factors relating to agricultural, production, and engine conditions. While there is no agreed scientific model on comparing emissions, there are noticeable trends from between the emissions produced from each fuel. Biodiesel is a more oxygenated fuel which will result in a greater amount of complete combustion along with a reduction of harmful particulate matter. The self-lubricating property of biodiesel will reduce wear to engines and inorganic/metallic emissions which result from engine wear.

According to the US Department of Energy and Argonne National Laboratory, biodiesel decreases emissions by 74%. Using estimates from the DOE, we will conduct an annual audit of the amount of biodiesel produced, used vegetable oil processed, and emissions reduced. We plan to publish these results on the IBI page of the IBRL website.

The SpringPro T76 will result in an improved environmental impact by reducing the amount of waste water generated in our separations processes. The only waste produced being a non-toxic resin that can be reused and disposed of in regular trash. The SpringPro T76 will dramatically reduce the impact of waste from our separations process. We plan to also include the amount of wastewater we saved and the amount of non-toxic waste produced in our audit.

What are your specific outreach goals? How will this project inspire change at UIUC?

Our outreach goals are to inspire environmentally friendly approaches towards engineering projects. Our organization allows students to participate in environmentally sustainable projects and shows how partaking in environmentally sustainable ventures could be a career path for a variety of majors. Once a steady production of biodiesel is achieved, IBI will be able to focus more efforts to promoting the benefits of biofuels at events like Engineering Open House (EOH). We hope that other students can be inspired to develop environmentally sustainable engineering projects from the demonstration of IBI's project. IBI also promotes students to actively take part in campus self-sustainability.

If applicable, how does this project impact environmental injustice or social injustice?

Not Applicable.