

CSF - Annual Grant Final Application

Harvill Retrofit Project

Grant Type

Annual Grant

Application Type

Final Application

Primary Project Manager

The Primary Project Manager is responsible for completing this application, answering questions posed by the Campus Sustainability Fund Committee, and completing all required reporting on project progress and outcomes. If the Primary Project Manager is a student who graduates in May 2023, the Secondary Project Manager must be a staff or faculty member OR a student who graduates after May 2023.

Primary Project Manager Name:

Camille Tinerella

Primary Project Manager Status:

Student

Primary Project Manager Email:

ctinerella1@email.arizona.edu

Primary Project Manager Department

ASUA

Secondary Project Manager

The Secondary Project Manager is the back-up for the Primary Project Manager if they are unable to complete any of the requirements of the Campus Sustainability Fund, particularly completing required reporting on project outcomes. Alternatively, the Secondary Project Manager could be co-facilitating the project with the Primary Project Manager should the proposal require or desire to have two Project Managers.

Secondary Project Manager Name:

Avery Berger

Secondary Project Manager Email:

averylynberger@arizona.edu

Secondary Project Manager Status:

Student

Secondary Project Manager Department

ASUA

Project Advisor Name:

Projects where the Primary and Secondary Project Manager are both students require the involvement of a staff or faculty member within project's Fiscal Officer's department. The Project Advisor contact must be a staff or faculty member within your department who is responsible for monitoring the project's budget, communicating with the Fiscal Officer, and reporting if both project managers are unavailable. Please ensure you have received consent from this individual to be the Project Advisor for your proposal and have informed them of your proposal's intent and budgetary needs. If this does not apply to you, type N/A for these responses.

Michael Hoffman

Project Advisor Email:

hoffmanm@arizona.edu

Project Advisor Department:

Facilities Management

Fiscal Officer:

The Fiscal Officer is a staff member within your department who is responsible for financial transactions and who will support reporting by pulling requested expenses against awarded funding and ensuring that funding is spent within awarded categories. Please coordinate with your department to properly identify an individual who is a designated Fiscal Officer. If awarded, this will be the individual who will help you access your project's funding. Please ensure you have received consent from this individual to be the Fiscal Officer for your proposal and have informed them of your proposal's intent and budgetary needs.

Erik Reinold

Fiscal Officer Email:

ereinold@arizona.edu

Fiscal Officer Department Name:

Facilities Management

Request Funding Amount:

\$37,600 (FY24)

Official Project Name:

Please be specific but concise as this name will appear on reports and our website. Creativity is encouraged!

Harvill Retrofit Project

Primary Project Category:

Energy

Secondary Project Category:

Built Environment

Background and Context:

Please provide any relevant background about your organization/team including your mission and/or expertise. Please also lay out the rationale for the proposed project, focusing on the issue that your project would address. This section is meant to give us more information about you and the context for the project, while the questions below provide space to go into detail about your proposal's specifics.

Response:

Housed under the Energy and Climate Committee of ASUA's Students for Sustainability, the Retrofit Sub-Committee is dedicated to promoting sustainability on the University of Arizona campus. Specifically, we are focused on renovating buildings on campus to promote energy efficiency. Per this mission statement, the Harvill Retrofit Project was created. The students involved in this project began by conducting extensive research on several campus buildings to determine their energy usage and other relevant metrics. This data was analyzed with help from Michael Hoffman and it was used to determine which building would be further studied. Out of the buildings that were researched, the Harvill Building was then selected for a variety of reasons. Due to its large size, the Harvill Building requires a significant amount of energy to conduct its necessary building functions. A lighting renovation would result in a large reduction in the building's energy consumption. This allows for greater energy savings than if another building was chosen. Additionally, this building houses many high-occupancy classrooms which numerous University of Arizona students use during their careers. Because of this, the Harvill Retrofit Project is aimed to maximize the volume of students benefited. All of these factors contributed to the selection of the Harvill Building for a retrofitting project. Following this decision, the members of the Retrofit Sub-Committee conducted an extensive lighting audit assessment of Harvill consisting of multiple steps. First, we surveyed the entire building and collected data on lighting count, luminosity, and other vital metrics. We then compiled the data and relayed it to Michael Hoffman and his team at Facilities Management, and attended meetings to discuss the results. Through this process, it was determined that many of the rooms had significantly higher luminosity levels than normal for fluorescent lighting which meant that the current lighting was wasting energy. The lux, a measure of illuminance based on light reflected off from surfaces, varied in different portions of the room. This indicates that light was not being adequately nor evenly distributed throughout the room. Fluorescent lighting is also less sustainable than LED lighting even when it has standard luminosity levels. It was concluded that a lighting renovation and switch to LEDs would result in an overall decrease in energy usage in the Harvill Building.

Project Description:

Please provide a thorough description and explanation of your project. Describe the objective(s) and what will be accomplished. Describe how each objective will be achieved (listed as steps or goals, with anticipated timeframes for each). Explain how the project will be implemented (who does what?). Finally, please identify the core goals of your project and how you will measure the degree of its success includes the metrics you will track to measure the success or impact of your project (e.g., number of kWh saved, gallons of water saved, number of student training hours, etc.). Responses are limited to 3,000 characters including spaces.

Response:

In the Energy and Climate Committee of Students for Sustainability, our primary goal is to assist the University of Arizona's plan to achieve net-zero carbon emissions by 2050. The Harvill Retrofit Project is contributing to this goal by conserving energy in Harvill through a transition of fluorescent lights to LED lights. This change will improve the quality of lighting in classrooms and offices, and is environmentally, economically, and educationally beneficial. The Retrofit team conducted lighting audits in Harvill that consisted of recording the total volume of light fixtures and fluorescent lights per room and

hallway. We found inconsistencies such as different types of bulbs per classroom and broken lights. We determined that the best way to fix these issues is by replacing all of the lights in Harvill with LED lights. LED lights are more sustainable, especially when compared to fluorescent lights. 95% of the energy in LEDs is converted into light and only 5% is wasted as heat, whereas fluorescent lights convert 95% of energy to heat and only 5% into light (1). After receiving Laura Galvan's EEM calculations, we determined that Harvill currently requires 232 Watts of operational power while the proposed switch to LEDs would require approximately 145 Watts of operational power. These components illustrate that switching to LED lights would greatly reduce energy usage. Furthermore, LED lights are more cost effective. LED lights are known to have a long lifespan and require low maintenance, while fluorescent lights have a shorter lifespan when frequently switched on and off (2). Lights in Harvill remain on throughout the day and night, increasing the cost of energy consumption. While turning off these lights when the space is empty would save energy, the frequent switching would decrease the lifespan of fluorescent lights and require replacing them more regularly. Implementing LED lights throughout the Harvill Building would provide a viable solution to the labor, energy, and cost concerns associated with fluorescent lights. In addition, this project incorporates educational outreach strategies concerning energy saving. When conducting the lighting audit, we recognized that the lights remained on despite no one occupying a space. By educating students, faculty, and staff about energy conservation, we would eliminate this occupancy issue and further promote energy efficiency on campus. The Harvill Retrofit Project plans to utilize fliers, social media outreach, and a permanent art project in order to enhance educational outreach on campus. Overall, this may help others be mindful of their individual energy consumption and, ideally, apply these practices to their own homes.

1) <https://www.sepco-solarlighting.com/blog/the-advantages-of-led-lights-for-the-environment#:~:text=many%20environmental%20advantages.,Energy%20Efficient,5%25%20is%20wasted%20as%20heat.>
2) <https://www.stouchlighting.com/blog/fluorescent-vs-led-vs-cfl>

Project Summary Snapshot:

Please provide a short summary of your project. This summary will be used on our new website and other Office of Sustainability materials, if approved. Think of this as a hyper-concentrated summary to capture your project's scope and impact..

Response:

The Harvill Retrofit Project, led by Students for Sustainability, is focused on replacing the lighting in the Harvill Building from fluorescent to LED lights. To complete this project, lighting audits were conducted by committee members with assistance from Michael Hoffman. With the collected data, the committee determined that the switch in lighting would not only be more energy efficient, thus saving money, but would also improve the learning environment of classrooms in Harvill. Overall, the Harvill Retrofit Project strives to reduce energy use and improve students' experience on campus.

Project Feasibility and Logistics:

Please provide a description of the work that has been completed so far to make this project feasible. Have all relevant partners been contacted/coordinated with? Have you received consent or authorization from relevant departments or offices to complete your project (Housing and Residence Life, Facilities Management, Parking and Transportation, etc.)? Please identify them in your response. For example, have you received reasonable quotes for supplies? What research has been completed to lay the foundation for this project?

Response:

We contacted Facilities Management and The Office of Sustainability to assist in actualizing this project. Michael Hoffman provided measuring tools for the lighting audits and taught the committee members how to perform said audits. Five members of the SFS Energy and Climate Committee used a multi-purpose tool to measure the light intensity in the four corners of each room and counted the total unique lighting fixtures per room. In total, 25 hours were spent collecting data in the Harvill building. The compiled data was then sent to Facilities Management and used to determine which lights needed to be replaced and whether they were fluorescent or LED lights. In order to upgrade the lighting to LEDs, the existing fixtures either need to be completely replaced, or they need to be gutted and have new components installed. Of the 927 light fixtures in Harvill, 487 need fixture replacements, while the remaining require retrofit kits to install the LED light bulbs. With that being said, furniture and other objects would need to be moved in order to replace the lights in the classrooms. We have discussed this point and the potential need to contact UITS for the removal of said furniture with Laura Galvan of Facilities Management. It was determined that, should any extensive furniture removal be required, the

Facilities Management Electrical Shop would facilitate this step by handling communications and costs. We were advised by Michael Hoffman to replace all of the lighting in the Harvill Building in one installation instead of renovating different sections separately. This is due to the fact that multiple installations would result in a more expensive process. With this in mind, we worked with Michael Hoffman, Laura Galvan, and Brad Strizver to finalize a timeline. It has been confirmed that the entire retrofit would take between four and six weeks to complete. We acquired the full budget for this project by submitting an estimate request to Facilities Management through the Campus Sustainability Fund's resources webpage. We received estimate letter number 33636 with a total quote of \$99,900. We recognized that we were over budget with the two percent service charge, and relayed this information to the Facilities Management team to explore our options. After much communication with Michael Hoffman, Laura Galvan, and Trevor Ledbetter, it was confirmed that we are able to receive partial funding from the Utility Management Revolving Fund. Laura Galvan has provided us with an extensive energy-saving budget summary that determined \$6,593 would be received from the UMRF to supplement CSF funding. In addition to our preliminary budget, we have now added a budget request for our outreach art project which is described in the Student Leadership and Involvement section of the grant. This addition results in a total budget request of \$95,400.

Environmental Sustainability Outcomes:

Please provide a description of how you expect your project to advance environmental sustainability on campus. A definition of environmental sustainability is provided on our Resources webpage.

Response:

Replacing Harvill's outdated fluorescent lights with energy-efficient LED lights is an essential step to improving the building's energy use, and aligns with the broader goal of achieving net-zero carbon emissions by 2050. Switching to LED lighting would prevent the continual waste of the University's money, drain on the environment, and misuse of energy resources. Additionally, fluorescent light bulbs contain mercury, which makes non-hazardous disposal challenging (1). Although not perfectly recyclable, the removed light bulbs would be taken to a designated recycling yard on campus where a recycling company would remove the bulbs and recycle them at their facility. With this current outlet to properly recycle the fluorescent lighting, it is important to address this issue now instead of later to lessen the concern of proper disposal in the future. In addition, the new LEDs will be purchased through Electric Supply, Inc., which is an Arizona-based electrical supplier. LED lights are both longer lasting and energy efficient. LED lights are more durable because they are a solid-state light source and last approximately thirteen times as long as fluorescent lights (2). Additionally, they, unlike fluorescents, only emit visible light which reduces energy waste, as no other wavelengths are unnecessarily emitted. Harvill's existing energy consumption for lighting is 275,112 kWh/yr, and after the lighting retrofit, the expected energy consumption would be 159,958 kWh/yr. Thus, LED bulbs require 42% less energy than the fluorescents. From Laura's calculations, we have determined that the University currently spends approximately \$24,209.87 annually on lighting for Harvill. The proposed lighting costs for Harvill will be \$14,876.06 annually, thus saving the University \$9,333.82 each year. Thus, this project will pay for itself over a period of ten years due to energy and monetary savings. Additionally, this retrofit would decrease carbon emissions related to Harvill's energy consumption. Replacing the fluorescent lighting in the Harvill Building is essential to meet modern and sustainable energy standards.

1) <https://www.energy.gov/eere/articles/study-environmental-benefits-leds-greater-cfls>

2) <https://www.relumination.com/six-advantages-of-led-lighting-over-fluorescent-bulbs/#:~:text=LED%20lighting%20is%20more%20energy,LEDs%20use%2020%25%20less%20power.>

3) <https://www.squareone.ca/resource-centres/home-improvement/led-lighting-the-environmentally-friendly-efficiency-option>

Social Sustainability Outcomes:

Please provide a description of how you expect your project to advance environmental sustainability on campus. A definition of social sustainability is provided on our Resources webpage.

Response:

The Harvill Building houses over 30 classrooms with an occupancy of over 1,500 students. Since so many students enter the building every day, enhancing the educational environment of Harvill would be very beneficial. While replacing the lighting may not be immediately recognized (as the project is more utilitarian in nature), other benefits to those who frequent the

building would not go unnoticed. Replacing the fluorescent lighting in Harvill with LEDs would enhance social sustainability through improving the quality of light and eliminating UV radiation. Quality of light directly influences vision, mood, and cognitive abilities (1). LED lights can emit light in specific directions (2) which can increase lighting intensity in a classroom, thus improving students' ability to see well in class. LED lights can also have a cooler lighting temperature closer to natural lighting (2). This is beneficial because a large majority of classrooms in Harvill do not have windows and must rely solely on artificial lighting. Cooler artificial lights have also been proven to promote more academic success (3). The current fluorescent lighting in Harvill is warmer, so replacing them with LEDs would create a superior environment for students to succeed. Fluorescent lights also release potentially harmful UV radiation (4) (light on a broader spectrum), whereas LED lights do not. LEDs use diodes which emit only light in the visible spectrum. Thus, replacing fluorescent lights with LEDs further diminishes any possible harm to students through the reduction of UV exposure. Furthermore, the fluorescent lights in the Harvill Building contain mercury, a toxin, which requires the light bulbs to be disposed of as hazardous waste. Broken light bulbs would pose a risk to the health and safety of those using the space. LED light bulbs are not composed of any toxic compounds, so these potential hazards would be mitigated. To safely dispose of the fluorescent lights would be safely and responsibly disposed of through the University's dedicated recycling yard. Because the change of lighting may not be immediately noticeable by students, we also plan to install a commemorative art piece to increase awareness of our project and its benefits. As students graduate and incoming classes are admitted, this permanent display will allow students to learn about the project for many years. This can pique interest in LED lights and their benefits to the classroom and beyond, which may result in others investing in switching to LED lights in other rooms, facilities, and their own homes.

1) <https://www.tcpi.com/psychological-impact-light-color/>

2) <https://www.energy.gov/energysaver/led-lighting>

3) https://journals.sagepub.com/doi/full/10.1177/2158244012445585#_i23

4) <https://www.stouchlighting.com/blog/fluorescent-vs-led-vs-cfl>

Student Leadership & Involvement:

Please provide a description of how you expect your project to benefit students on campus regarding the creation of leadership opportunities or student engagement. What leadership opportunities exist within your proposal? If you plan to hire/ or involve students, please describe in what capacity. For example, if you plan to hire students, create an internship, or seek student involvement, please describe relevant details thoroughly (wages, responsibilities, duration of job, extent of involvement, how you will solicit/ market these opportunities etc.).

Response:

The Harvill Retrofit team is a part of SFS which prides itself on being fully student-led and providing direct engagement opportunities for student members to improve their campus in a sustainable context. Over the last two years, our Retrofit team has been composed of 20 dedicated students (averaging 10 per semester). The team members have varying degree paths with some more directly related to this project than others. Nonetheless, this diversity of backgrounds and approaches allows the entire team to engage in an interdisciplinary project related to sustainability and participate in many relevant experiences. These experiences include energy auditing, retrofitting buildings, grant writing, and collaboration in a team setting. These are quality skills to possess in the job market that separate the students in the Harvill Retrofit Project from others on the job market in their respective fields.

Three students, Avery Berger, Julia Petty, and Camille Tinerella have had the opportunity to develop professional leadership skills due to their positions as project leads. Through their involvement in the project, they have gained priceless experience in delegation, collaboration, communication, and more. As this project moves forward, these involvement opportunities would continue through its completion.

Furthermore, in the pursuit of providing unique opportunities to students, the Retrofit team is exploring additional opportunities for student engagement and involvement in outreach. Through the commemorative art project, there would be opportunities through student art competitions, and facilitating the art project. The current structure of this art project consists of a student competition for the design followed by a voting period open to all university students via a Google form. This art project would create additional roles for student leadership through both coordinating the logistics of creating the artwork and designing the artistic inspiration. Additionally, the mural (our first choice for the art project) would allow for a larger and more diverse group of students to have deeper involvement in helping to paint and create the mural. Overall, this project engages not only those who interact with the Harvill Building, but also the students who learn about this project through outreach and are involved directly with the commemorative artwork.

Education, Outreach, and Behavior Change:

What opportunities does this project provide for members of the campus/ community to learn about sustainability? How will your project educate the campus community and/or incorporate outreach and behavior change? How are you reaching beyond the "sustainability choir?" Please provide a description of how you expect your project will communicate its impacts to the campus community. What is your plan for publicizing your project on campus? How visible and accessible will your project be to the general campus population?

Response:

The Harvill Retrofit Project aims to spread values of sustainability throughout the campus community and amplify awareness about energy efficiency. Fliers, social media campaigns, and our art project would allow us to expand our outreach. Each of these pieces would be aimed to educate students on the social and environmental benefits of LEDs. We hope to encourage these individuals to use sustainable lighting in their homes and advocate for a switch to LEDs in their work environments. Through creating opportunities for involvement, we hope to initiate a greater general awareness regarding sustainability.

First, fliers would be posted in Harvill. As Harvill is a commonly scheduled building, these fliers would reach beyond the 'sustainability choir.' These fliers would highlight information regarding the new lighting in Harvill and the benefits that it brings to students' eyes and educational environment. Once the project is completed, additional fliers sharing exact statistics on energy savings would be dispersed. Since fliers are not the most sustainable form of outreach, the Retrofit team is dedicated to using fliers that are recyclable and only print the volume needed to prevent unnecessary waste.

The Retrofit Team is also planning on using our online presence for outreach. To do this we would post about the project on the Students for Sustainability website, the Students for Sustainability Instagram, and other campus environmental organizations' Instagram accounts, such as Find your Environment (previously Green Guides), Arizona Environment, Arizona Divest, and UArizona Sustainability to further expand awareness. The current followers of these accounts may be in the 'sustainability choir', but they would be able to share these posts allowing their networks to view them as well.

Finally, a commemorative art project would be installed on the Harvill Building. This would add a permanent component to the education and outreach in this project. Possible ideas include a mural, a painting done on reclaimed wood, or a laser engraved plaque. We prefer the mural as it maximizes student interaction with the artwork and involves multiple opportunities for student engagement. However, the precise details necessary for a mural have yet to be confirmed with Chris Kopach (Facilities Management), so we are considering other options if the mural is infeasible. Regardless of which project is pursued, funding has been allocated within the current budget to complete it. Furthermore, a possible design has already been created if any issues arise with the design competition (see student leadership and involvement for more).

Timeline:

Please describe the timeline of your project. The timeline may be estimations at the point of this Preliminary Application but providing this is especially important if your project is a time-sensitive event. Funds may not be used as reimbursement for projects already completed, therefore a realistic amount of lead time should be given in order for proposals to be eligible for review. Please describe when your project will take place, key dates for when certain elements must start or be completed by, or any other known dates. Timeline extensions will be granted on a case-by-case and limited basis.

Response:

Due to the high-volume use of the Harvill Building, there are additional constraints that had to be considered when developing the timeline. We have discussed timeline plans with Michael Hoffman, Laura Galvan, and Brad Strizver (FM) and we anticipate that this project can be completed in four to six weeks during the summer months. Since classes would not be in session and the building would have less overall use, a summer renovation would prevent negative impacts on those using the building. The Harvill Building is quite large and has several lights, as it spans four floors with classrooms, offices, and meeting rooms, each with three to ten light fixtures. Each light fixture ranges from one to three bulbs, meaning there is a high volume of lights in need of replacement. After working closely with Laura Galvan from Facilities Management, it has been determined that there are a total of 927 light fixtures in the building. This process of changing lights in this volume can be a time-consuming task, so depending on the available labor force, the project could take longer than four to six weeks. However, this is the timeline that has been discussed and confirmed between the Retrofit Group and Facilities Management. We will continue to work with FM to determine the exact dates the renovation will occur.