

The Sustainability Fund Project Application

Background and Context:

The NCSU Sustainability Fund Advisory Board announces the second annual request for proposals to advance sustainability on campus. This RFP is for projects that have high immediate impact or for longer-term projects that have significant potential for high impact. Projects can focus on education, outreach, infrastructure or any other component of campus sustainability. Examples include workshop development and sponsorship, symposium development, projects aimed at some aspect of sustainability, pilot projects to demonstrate potential for successful use of longer-term funding, large-scale infrastructure improvements, or other creative uses of these student-fee derived funds. Faculty or staff directed projects are appropriate if accompanied by a statement indicating how students will participate in the project or how students will benefit from project completion. Students are encouraged (but not required) to develop projects in conjunction with a faculty mentor or advisor. Priority will be given to projects with matching funds from other public or private sources. Letters of support from advisors and partners are strongly encouraged (letters of support from additional funding partners are required).

Proposals are due February 27, 2015. Funding decisions will be made by May 1, 2015. Projects begin July 1, 2015. Mid-year reports are Due December 1, 2015 and final reports are due by June 15, 2016.

All materials must be submitted electronically. Please complete the following information:

Application Date: February 27, 2015

Project Title: Big Belly Solar Compactor Expansion Project

Total Requested Amount

*Total available for funding is \$120,000 for all projects in the current funding cycle. Individual project funding amounts will vary depending on number and scope of projects funded. In exceptional cases, funding renewal will be considered with re-application.

Applicant Information

Name of Primary Contact:

Please mark your status with an "X": Student Staff Faculty

Campus Affiliation (Name of Organization, Department, or Office): Students for Solar

Email Address:

Cell and/or Work Phone:

Campus Mailing Address:

If you are a student, please provide the following information:

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

Big Belly Solar Expansion Project

Name of Faculty or Staff Project Advisor (if applicable):

Faculty or Staff Project Advisor Contact Information:

Email Address:

Campus Address:

Phone Number: Day-time/Work:

Cell Phone:

Please organize your proposal into the following 8 sections and answer the prompting questions where applicable. Total proposal length should not exceed 6 pages (1 inch margins, 11 point font). Additional documentation (e.g., letters of support, maps, drawings, etc.) should be submitted as appendices and clearly labeled to aid committee review (does not count toward 6 page limit).

Please include a bulleted list of any attachments (including file names) here:

- Attachment A - Spec Sheet for Solar Compactor
- http://www.bigbellysolar.com/products/130_Mkt_TechnicalSpecs_2008_0208.pdf
- Appendix B – Letter of Support from the Office of Waste Reduction and Recycling
See attachment to email ([WRR_SupportLetter](#))
- Appendix C - Target Areas and Participants
See attachment to email ([Target areas and participants](#))

Please email your application materials to dasa-sfab-chair@ncsu.edu. Please include “Sustainability Fund Application” in the subject line. You will receive electronic confirmation that your materials have been received.

Please review the application materials and online content carefully. If you still have questions, please email the Fund Advisory Board Chair at dasa-sfab-chair@ncsu.edu with your specific question, or feel free to call 248-417-8343 with any questions.

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Big Belly Solar Compactor Expansion Project

Submitted to: The Sustainability Fund Board

Date: February 27, 2015

Big Belly Solar Expansion Project

Project Description

How we manage our waste on campus is a large aspect of sustainability at NC State University. With such a large staff and student body the amount of trash and recycling we produce can be overwhelming. What if there was a way to condense this waste down and manage it more effectively? While at the same time saving money, promoting sustainable action, and renewable energy on campus? The previous Students for Solar Big Belly Solar Compactor (BBSC) project brought these ideas to the forefront. The primary goals of this expansion project are to increase the number of solar compactors on campus to gather more data, further improve the efficiency of our waste management process, and to promote sustainable action.

Big Belly Solar of Massachusetts has been in business since 2003. Their mission is to transform the waste collection industry by offering smart solar-powered waste and recycling compactors. Their product has transformed the waste management plans of major cities and universities all over the nation. Examples include but aren't limited to; Philadelphia, Chicago, Raleigh, UW-Seattle, UC-Santa Barbara, and Boston University. The Big Belly Solar compactors are equipped with a solar panel on top that runs a compactor inside each unit. As trash and recycling are collected during the day, the compactors work to decrease the volume inside the bin while also increasing the capacity. The units can hold five times as much trash as a conventional bin on campus. The Big Belly's come with a CLEAN Management console that allows for more effective waste collection. The software allows for a down to the minute update on when the units are full. When the compactors have reached their limit a red light comes on and a signal is sent to the server notifying the user. The units work similar to a mobile phone, using cellular data to relay the information quickly and reliably. On a given day a staff member can use this console to effectively manage how and when they should service the units. "CLEAN can help to identify trends in waste generation, compare waste volume between waste streams in an area, and micro-manage the system in particular locations to meet the needs of the area."(O'Carroll par 10 2012).

The increased capacity and software of the BBSC units lead directly to cost and pollution savings. These aspects of the units will help us reach the project goal of a more efficient waste collection system. The time spent servicing trash bins, picking up litter, cleaning spills, and transporting waste to landfill add up throughout the year. By installing Solar Belly's in the most heavily used target areas on campus we can cut down the man hours, fuel costs, and CO2 produced by our process. The collaboration between Students for Solar, the Waste Reduction and Recycling Office, and the University Sustainability Office can allow this expansion project to have significant impacts.

Over the past nine months we have had the pleasure of working with the staff at the Waste Reduction and Recycling office. We have all worked hard to execute the pilot project of a Big Belly solar compactor at Carmichael bus stop. The project team has included; Analis Fulghum, Jeff Del Pinal, Nessa Stone, Sarah Ketchem, and Tommy West. The process has included multiple meetings, phone calls, emails, and other necessary methods to ensure on time installation and efficient management of the station. Everyone involved has played a key role in achieving the goals of our original pilot project. With the efforts put forward the station was installed in a timely manner on **October 8, 2014**. Since then the grounds management team has been servicing the station when prompted by the units. During this time the compactors have also been collecting data which another staff member and I have been monitoring. This data provides real evidence for the effectiveness of these units and the necessity for more on campus.

The staff has been so pleased with the units that they have already allocated end of year funds for the purchase of two more Big Belly duo stations. The purchase will take place in June and the units will be installed at more target areas. However, the team has agreed that even more compactors should be purchased in order to increase the amount data collected, effectiveness, and cost savings at the target

Big Belly Solar Expansion Project

areas. With more data from target areas across campus the project team can make comparisons between sites, and quantify the savings of these units.

Additionally, there is a chance for further collaboration. There has been an ongoing effort between the University Sustainability Office, the Office of Waste Reduction and Recycling, and multiple other groups on campus to reach the campus wide goal of diverting **65% of waste from landfills**. Nelson Hall, the home of the Poole College of Management has been a pilot for multiple programs related to this goal. One included a waste audit for the building that was conducted last semester. The audit was part of a LEED lab with a goal of evaluating Nelson Hall for LEED Existing Building certification. I was fortunate enough to participate and see the results of the audit. It concluded that Nelson Hall is currently only diverting **34% of its waste from landfills**. Liz Bowen, of the Sustainability Office and the rest of the Nelson Hall Waste Diversion proposal team believe a Big Belly compactor outside of the building can be an effective tool in reaching this goal.

NC State University would greatly benefit from expanding the Big Belly project. The pilot project has shown just how effective this product can be. This is why this project needs to move forward. It gives the university a unique opportunity. An opportunity to all work together towards the common goals of increasing waste management efficiency and raising awareness of sustainability at NC State.

Anticipated Outcomes

The BBSC project can have real impacts on both the economic and social aspects of sustainability. The economic savings directly relate to the increased capacity, reduced fuel costs, and decreased man hours. With the potential of reducing our pick up time by 80% these savings can be realized. These reductions are based off of multiple case studies and from our current data collected at the pilot compactor station. This station has gone from being serviced **five times a week** to just **one time a week**. The Big Belly station has played an active role in reducing the sheer size of waste to be managed and the amount of money spent servicing the Carmichael bus stop waste area. Further implementation can improve the way we operate within our waste collection system. By installing them at additional heavily used areas on campus their economic impact can be measured. This can lead to a more efficient waste collection system, while also saving more time and money.

The social aspect of sustainability is impacted by the design of the compactors. The hopper-style ensures the safety of these units, reduces litter, and promotes sustainable action and renewable energy. The solar panels on top of the units can add a technological excitement for sustainability in the pilot areas. The openings on them require a user to pull the handle down to place trash and recycling into the unit. This is effective in promoting sustainable action. A person cannot simply throw their trash at the top. This leads to them having to think about what they are putting in, while also cutting down on spills and litter. This will also cut down on the critters who are attracted to the trash bins. This sustainable action can lead to a more sustainable mindset for everyone using the BBSCs.

Promotion of the compactors took place during the pilot project. This included an informative A-frame display put out by Waste Reduction and Recycling for the first week. After which, the office sponsored the purchase of advertising side panels for the units. The advertisement identified where the funds came from, the groups involved, and how the units worked. This allowed the compactors to be effective tools in raising awareness of the use of sustainability funds throughout our university.

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Project Benchmarking

Big Belly Solar compactors have been implemented on several campuses and cities all over the nation. Their benefits have changed several universities' waste collection plans and have led to a more efficient use of time and money. Notable places include; the City of Raleigh, UNC Chapel Hill, and Duke University. Chapel Hill currently has 7 duo stations, and Duke has 15 double stations. Raleigh has also embraced the BBSC's and placed them at every corner downtown. Before the inception of these units they were servicing their bins twice a day seven days a week. After they replaced the conventional bins they cut the service time down to once or twice a month. This is due to the fact that the BBSC's hold five times as much and also notify them when they are full. The city has been able to cut man hours down by nine hundred and thirty hours a year. The process of getting the solar compactors in place involved many different stakeholders. The Raleigh Sustainability Office got Solid Waste Services, Planning, the Urban Design Center, Public Works, Construction Management, and many more to work together. This led to an overall enthusiasm for the benefits brought to the city and a reduction in miscommunications. The compactors also align perfectly with the Clean is Green Raleigh branding campaign. Overall, the BBSC's have brought different groups together through a shared excitement for sustainability while also saving the city money. The inception of them has brought social, economic, and technological benefits to the city of Raleigh.

The expansion of the BBSC project can help the university become more efficient in managing our waste, increase awareness, and help us move towards campus wide sustainable goals. The pilot project has given us a small amount of data, but enough to prove the effectiveness of this product. These are the reasons why the expansion is both beneficial and necessary.

Metrics for Assessment

The success of this project can be directly measured by how the units affect our waste collection process. The pollution and monetary savings can be measured by evaluating the data provided by the software and workers. The time it takes to service the bins and the frequency can be compared to the current baseline numbers. This is something that is tracked by the CLEAN software. For example, our current pilot station has gone from being serviced **five times a week** to just **once a week**. This proves how the units can reduce fuel costs, and man hours. Replacing more trash bins in the most heavily used/serviced areas is the intent of this project. This can allow for a more effective assessment of the cost savings. The data provided by the single pilot station is a good start but expansion is needed to have a greater impact on efficiency, and cost savings. Having an accurate time of when to pick up can lead to less CO2 released from fuel combustion. Not to mention, with enough of these on campus we can reduce our number of trips of waste to landfill. This would have a larger impact on pollution savings by cutting down the distance traveled.

However, the success of this project can't just be measured on a monetary scale. One of the project's goals is to increase awareness and sustainable action. More solar compactors on campus can raise more awareness about sustainability. As expressed earlier, these have the potential of increasing awareness throughout the areas they are placed in. Their design holds students accountable for deciding what goes into the bins. This can lead to spreading a sustainable mindset to everyone who comes into contact with the compactors. The solar panels on top of the units can excite faculty, staff, and students about the possibility for renewables on campus. With enough Big Belly's on campus we can increase the exposure of the project and the effectiveness of raising awareness of sustainability.

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Cost Savings

Yes, the BBSC project can lead to cost savings. However, the overall cost savings are not realizable until more extensive data has been collected. Below is preliminary information provided by the office of Waste Reduction and Recycling.

1. Normally we empty cans 1x/per day (Monday thru Thursday), 2x/per day on Friday (morning & afternoon), 1x on Saturday at select locations (Service Agreements & High Profile areas).
2. Approximately 2-3 minutes per can.
3. Our labor rate is \$28.19 per hour
4. **Waste** - East Wake Transfer Station, 820 Corporation Parkway, Raleigh, NC - 9.92 miles away. **Recycling** - Sonoco, 111 South Rogers Lane, Raleigh, NC 27610 - 8.95 miles away
5. We have approximately 300 outdoor sites. Each site consists of a recycling and trash container

Based on this information a **sample estimation** of savings for a target area is provided:

The Atrium/Brickyard

- Approximately 12 bins outside the atrium x 2.5 (average) minutes per container = 30 minutes a day spent servicing the bins at the atrium
- 30 minutes a day x 4 days = 120 minutes spent servicing Atrium bins Monday – Thursday
- 120 minutes / 60 minutes in an hour = 2 hours spent servicing Monday-Thursday
- Friday the bins are serviced twice a day, so 30 minutes of service a day x 2 = 60 minutes or 1 hour spent servicing these bins on Friday
- Saturday the bins are serviced one time, this is an additional 30 minutes to the weekly total
- Approximately 3 hours and 30 minutes are spent weekly servicing the 12 bins according to these numbers
- 3 hours and 30 minutes x \$28.19 per hour = **\$99 a week** spent to service the bins
- \$98 a week x 4 = **\$394 a month** spent servicing the atrium bins
- \$394 a month x 12 months in a year = **\$4,735 a year spent servicing the bins at the atrium**

Replacing bins with 2 BigBelly Duo stations

- Potential to reduce the service time by 80% and replace half the bins
- 3 ½ hours a week x 4 weeks in a month = 14 hours a month servicing Atrium bins
- 14 hours a month x 12 months in a year = **168 hours a year servicing** Atrium bins
- 168 hours x 28.19 per hour = \$4,735
- 168 hours a year x .80 = **134 hours of potential reduction**
- We could reduce our service time for this target area to **34 hours a year**
- 34 hours a year x \$28.19 per hour = \$958.50 spent servicing the Atrium bins per year
- \$4,735 – \$958.50 = **\$3,776.50 in potential savings from cut down service time**

Total Cost for 2 BigBelly Duo Stations = (\$6,318 + \$300.00 in shipping) x 2 = \$ 13,236.00

\$ 13,236.00/ \$3,776.50 = 3.5 years to pay back for BigBelly duo station at the Atrium

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These numbers are only approximations, based on preliminary information provided. A more detailed look into the payback period and savings will be achieved through more data collection and specification. Expanding the project to more than one pilot area can provide enough information to conduct more specific cost savings. Big Belly Solar provides assistance for these calculations by providing project specific technical reports. Fuel cost reduction can also be vital aspect of savings. These units have a quick payback period because of their low cost in bulk and minimal maintenance. The city of Raleigh Waste Management can be a good source to see the price they got for their large amount of units. The larger the scale of the implementation, the larger the savings can be in the future.

Broader Vision

The Big Belly Solar Compactor Expansion project has great potential for long term benefits. These benefits include increased efficiency/cost savings, sustainable awareness, and collaboration amongst departments involved in sustainability. The pilot project for the compactors has shown how effective they can be. However, with a larger number of these on campus we can see how much more effective they can be in helping to manage our waste. . There is no doubt that the single pilot station has had an impact on campus. Whether it is through cost/pollution savings, or raising awareness of sustainability on campus this product is proven and effective.

One of the most exciting aspects of the project is the scalability. The BBSC's success in the pilot project should be enough evidence to support expansion. A larger number of compactors in multiple areas can give our waste management staff the chance to notice trends in waste pickup and make improvements in efficiency. Past projects at other universities often started out with small numbers, but once the savings have been evaluated they doubled and even tripled their units on campus. By placing these units all over the city Raleigh has expressed a commitment to sustainability in their waste management. The inception of BBSC's at NC State has been an extension of the ideas of our surrounding community onto campus.

Project Milestone

- May 1, 2015– Decision will be made whether the project will move forward.
- May - July 1, 2015 – Further discussion of target areas, and plan. Solar compactors will be ordered.
- August-October 2015 – Installation of compactors in target areas in time for beginning of school year.
- August – December, 2015 – Data collection, service to bins
- December 15, 2015 – Mid-year report submitted
- December 15, 2015 – June 15, 2016 – Continuation of data collection, service to bins
- June 15, 2015 – Final report including results of expansion

Sustained funding for the BBSC's will not be extensive. The main cost comes from the yearly service fee for the software. They have minimal maintenance that is comparable to the bins already on our campus. The reduction in service hours and fuel costs alone will offset the minimal maintenance costs. These costs have been added to the total amount requested for a one year pilot. The savings from these compactors can have real impacts on our waste collection process.