

**College and University Recycling and Waste Reduction Program  
Grant Proposal 2007  
Solar-Powered In-Vessel Compost Initiative, Ohio University**

**I. Executive Summary**

The Department of Facilities Management proposes the purchase and installation of a 4.92 kW pole barn roof mounted solar photovoltaic array for our future in-vessel composting system. This array would be grid-tied and capable of supplying the equivalent of 35% of the electricity needs of the composting unit as well as the pole barn on site. When the system is not in use and not consuming the total output of the solar PV array, any additional electricity generated would be fed back into the grid.

Ohio University plans to purchase and install a solar-powered in-vessel composting unit in the spring of 2008 capable of managing 2.5-3 tons of organic waste generated by campus eateries per day. Diverting Ohio University's biodegradable and compostable waste from the Athens-Hocking landfill will allow us to shrink our ecological footprint, reduce our waste management and landscaping costs, decrease pre- and post-consumer food waste, produce a valuable soil amendment, and create new learning and research opportunities for faculty and students. Further, the project will serve as a model for the state, region and nation, as the largest in-vessel composting initiative at any university in the country. Supplying this system with a source of renewable "green" energy through the use of a solar PV array will serve to reinforce the educational and operational value of our composting unit, and decrease the cost of our utilities on site.

This project fits squarely within our overall academic priorities by providing opportunities for learning and research on solid waste management, environmental engineering, sustainable agriculture and landscaping, and the need for alternative and renewable energy sources. A number of faculty members have already expressed an interest in integrating this project into their undergraduate and graduate curricula from the departments of engineering, plant biology, geography and environmental studies. Through the composting initiative, Ohio University would strengthen its position in the state as a hub for progressive campus sustainability and environmental efficiency programs, and would be recognized state-wide for pioneering the use of a large scale in-vessel composting system.

In March of this year, President Roderick McDavis signed on to the Presidents Climate Commitment ([www.presidentsclimatecommitment.org](http://www.presidentsclimatecommitment.org)), which requires that our university move toward climate neutrality through the development of a comprehensive plan to reduce greenhouse gases. The compost initiative will thus provide our campus with a model for a larger-scale renewable power system which will serve to inform future construction and renovation projects. Using a solar array to power the composting system will **offset 9,000 lbs of carbon emissions each year**, resulting in roughly 270,000 lbs of carbon avoided over a period of 30 years of operation. The installation of a solar energy source for the system would also free up additional resources at the department of facilities management in a time when rising energy costs have led to serious budget constraints at public institutions of higher education.

Biodegradable waste, like targeted recycled materials, is a valuable resource. Properly managed, it can be converted into a rich soil amendment which can be used for campus landscaping and local agricultural purposes. Currently, Ohio University has no established system for capturing organic waste from campus eateries including our public dining areas and our residential dining halls. Food waste ends up either in our dumpsters or in our sewer system.

The total cost of the proposed project described in this document is **\$100,970.00** which includes a solar photovoltaic array, a water line to the site, a drainage line, a telephone line, a portable restroom, the necessary waste bins, and the production of all communication and education materials. This proposal for the College and University Recycling and Waste Reduction Program targeting organic material requests a sum of **\$50,000** from the Ohio Department of Natural Resources toward the solar PV array, as well as the costs of running a water line to the site. Matching funds totaling **\$29,445.00** will be provided through the operational budgets of two Ohio University departments: Facilities Management and Auxiliaries. Additional funding from the Ohio Department of Development totaling **\$21,525.00** will be requested for the proposed solar PV array to supplement ODNR funds allocated for this purpose.

**Our timeline for the project is as follows:**

Jan 2007	Creation of new waste sorting system at Baker University Center
Jan – July 2007	Monitoring of waste; education/promotion efforts
May 2007	Announcement of ODNR awards
July 2007	Allocation of ODNR funds
July 2007	Application submitted to ODOD for Energy Loan Fund Grant
July 2007	Release of the RFP for the solar array
Sept 2007	Allocation of ODOD grant
Sept – Dec 2007	Review of submitted proposals and final selection
Jan 2008	Construction of pole barn and installation of solar array
Feb 2008	Submit application to OEPA for Class II permit
Mar 2008	Delivery of in-vessel unit
May 2008	Launch of the in-vessel composting process
June 2008	Expiration for C & U Recycling and Waste Reduction Program funds
June 2008	Begin application of compost to university grounds

**II. Project Details**

**1. Need**

In an average month, Ohio University produces about 400 tons of landfill waste – up to 14 tons per day – plus 30-33 tons per month of grounds waste<sup>1</sup>. Disposal of landfill waste costs roughly \$25,000 per month. The opening of the new Baker University Center on January 2, 2007 has increased the solid waste produced by our campus significantly; the dining areas in this facility alone are serving 2,500 meals per day on average.

A waste audit performed by ODNR in 2005<sup>2</sup> revealed that as much as 25% of the landfill waste stream on a university campus (roughly 3.5 tons per day in the case of Ohio University) is composed of biodegradable organic waste including meat, fish, dairy products, fruits and vegetables, cooked foods, sewage biosolids, and non-recyclable paper products (napkins, contaminated paper goods, etc.).

Based on the experiences of other university campuses that have implemented composting programs, we estimate that we would be able to capture approximately 50% of the biodegradable waste stream for composting. A 2.5-ton per day in-vessel system could process all of the recoverable organic waste generated by the campus eateries at Ohio University, turning waste into soil in 15 days with no odors, no vector or pathogen control issues, and minimal staff involvement.

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<sup>1</sup> From July 2005 through June 2006, Ohio University produced 4,846.47 tons of landfill waste according to the Athens-Hocking Recycling Center.

<sup>2</sup> ODNR, Division of Recycling and Litter Prevention. (2005). University Waste and Recycling Program Audit: Columbus, OH.

Further, by diverting up to 1 ton of grounds waste per day into the in-vessel composting system from our grounds waste composting site, we could further reduce costs by reducing pre- and post-consumer food waste and minimizing private screener charges for our landscaping waste.

We estimate that an in-vessel composting system of this type would require approximately 1,750 kWh of electric power per month, in addition to any electricity required for the operation of the heating system and lighting for the pole barn. The solar PV array discussed in this proposal is designed to offset an average of approximately 600 kWh per month (averaged over a 12 month period). Any excess energy produced when the unit is not in operation would be sent back to the utility grid. This type of system offers the benefits of being virtually maintenance free, more efficient and more cost effective than comparably sized photovoltaic systems with batteries.

## 2. Project Budget and Match Commitment

Description	Quoted Cost	Funding		
		ODNR	DOD	Matching Funds
<b>6.15 kW solar array</b>				
30 units: SunPower 205W Module (24)	36,900.00	15,375.00	21,525.00	
2 units: SunPower 3300W Inverter	5,550.00	5,550.00		
SPRx Solar Inverter Monitor	400.00	400.00		
Installation	7,650.00	7,650.00		
Additional materials (small parts, wire, clamps, etc.)	3,920.00	3,920.00		
Shipping Charges	1,000.00	1,000.00		
<b>Water Line (approx. 2000')</b>	30,000.00	16,105.00		13,895.00
<b>Drainage Line</b>	3,600.00			3,600.00
<b>Telephone Line (approx. 500')</b>	5,500.00			5,500.00
<b>Portable Restroom</b>	350.00			350.00
<b>Waste Bins (50 units, includes shipping)</b>	3,100.00			3,100.00
<b>Compost Communication &amp; Education Materials</b>	3,000.00			3,000.00
<b>TOTAL</b>		<b>50,000.00</b>	<b>21,525.00</b>	<b>29,445.00</b>

### Budget Item Description

**6.15 kW solar array** – 30 module, pole barn flush mounted utility interactive system without battery back-up, designed to offset an average of 600 kWh per month

**Water Line** – Approximately 2000' to Dairy Barn on Dairy Lane

**Drainage Line** – Site area drainage line running approximately 500' to retention pond

**Telephone Line** – Approximately 500' to AEP pole

**Portable Restroom** – For intermittent short-term use by staff

**Waste Bins** – SSI Shaefer 64-gallon roll-out waste containers (50 units), includes shipping from Charlotte NC

**Compost Communication & Education Materials** – Printed signs, brochures, newsletters and web-based materials designed for the purpose of informing campus community members and the public of waste sorting procedures and the progress of the project

Ohio University submits this proposal to the Ohio Department of Natural Resources through the Market Development Grant program to cover **\$50,000** of the cost of this project. These funds will be applied toward the solar PV array, as well as a portion of the cost of running a water line to the site.

We estimate that the total cost of purchasing and installing the PV array for the in-vessel composting unit will be **\$55,420.00**, including the 24 Sunpower residential PV modules, the 2 SPRx high efficiency inverters, the SPRx solar inverter monitor, additional small parts, and the complete installation of project equipment, including all labor, conduit, wire, grounding equipment and additional hardware needed for a NABCEP and NEC compliant system.

If our application for ODNR funding is successful, we plan to submit a proposal to the Ohio Department of Development (ODOD) for grant funding for this solar PV array to supplement ODNR funds allocated for this purpose. Through the Energy Loan Fund Grant Program (<http://www.odod.state.oh.us/cdd/oe/elfgrant.htm>), Ohio University will have access to an incentive of \$3.50 per watt, for a total of **\$21,525.00**. We estimate that the process of applying for and receiving this funding will take approximately three months total from the time that the application is submitted.

The departments of Facilities Management and Auxiliary Services at Ohio University have committed to providing the 50% cash match to this grant, in addition to any additional costs (both initial and ongoing) associated with this project. Thus, Ohio University commits to providing **\$29,445.00** toward the purchase and installation of other related items for the composting project, including additional funding for the water line, full funding for the drainage line, the telephone line, the portable restroom, the waste bins, and the production of all communication and education materials. The two departments (Facilities Management and Auxiliary Services) will be sharing costs equally. These matching and additional funds will be derived from the operating funds allotted to each of these departments.

### **3. Diversion Rate**

A waste audit performed by ODNR in 2005 revealed that as much as 25% of the landfill waste stream on a university campus (roughly 3.5 tons per day in the case of Ohio University) is composed of biodegradable organic waste including meat, fish, dairy products, fruits and vegetables, cooked foods, sewage biosolids, and non-recyclable paper products (napkins, contaminated paper goods, etc.). Data specific to six sampled buildings at Ohio University indicated that food waste comprised 42.46% of the waste stream by weight. It is unlikely that this statistic was representative of the total waste stream, as indicated from data derived from waste samples at the four other campuses that were surveyed. Further, data from campuses across the country point to a figure of about 20-25% for organic matter in the total waste stream. This estimate is supported by Larry Cooper of the ODNR Recycling and Litter Prevention Programs department.

Assuming that we were ultimately able to capture 50% of the biodegradable waste stream, this would amount to 1.75 tons per day. A balance of ground waste would be added to the food waste each day in order to maintain the proper carbon to nitrogen ratio, as well as optimal moisture levels.

Based on the figure of 1.75 tons of biodegradable waste diverted per day, we would expect to divert approximately 615 tons of waste per year from the Athens-Hocking landfill. In addition, we would process approximately 260 tons per year of grounds waste. The total waste processed by the in-vessel system operating at capacity would be equal to 875 tons per year.

#### **4. Sustainability**

The funds needed to sustain the composting initiative will be derived from the operational budgets of Facilities Management and Auxiliaries. The project is also widely supported in our campus community (including faculty, staff and students), indicating that there is a high likelihood that there will be continued pressure to implement the project.

#### **5. Transferability**

As the largest in-vessel composting unit at any college or university in the nation, the Ohio University compost project will serve as an excellent economic and environmental model for other colleges and universities. Our waste reduction and recycling programs have already been recognized for their success in design and implementation; we seek to expand and complement our reputation for progressive waste management with this proposal project. We are prepared to openly share all of our knowledge and planning documents with any other institutions interested in implementing similar systems through our printed materials as well as our university web sites. Every effort will be made to publicize the progress of our project, on outside resource pages and national newsletters.

#### **6. Performance**

##### **Goals**

- To achieve a 50% rate of capture of the organic waste stream within the first year of operation;
- To educate the campus community regarding new waste sorting procedures and the composting unit's solar PV array;
- To educate the campus and wider community regarding the need for waste reduction, recycling and renewable energy systems;
- To improve the health and fertility of our grounds (both on the Athens and regional campuses) through the provision and application of nearly 900 tons of compost per year as a soil amendment;
- To demonstrate tangible savings realized by the composting initiative in order to justify further expansion;
- To provide a model of in-vessel organic waste composting and renewable energy systems for other universities and large-scale institutions in Ohio and in the larger region.

Audits of our waste stream, as well as of the organic materials waste stream, will be performed on a monthly basis to identify possible contamination issues and opportunities for improving diversion rates. Further, informal surveys of the campus community will be administered by the Office of Resource Conservation in order to assess the extent to which sorting procedures are understood, and the educational goals of the projects have been achieved.

#### **7. Education**

The compost initiative is situated within the context of Vision OHIO, which counts among its core values a *commitment to the region expressed through stewardship of shared resources*. Further, the project contributes to our Vision OHIO regional strategic thrusts aimed at the *preservation, restoration and enhancement of a healthy natural environment, including terrestrial and aquatic ecosystems; the promotion of sustainable development, both on and off campus by encouraging design, planning, and building practices that reduce energy consumption and waste, and that use locally produced goods and services; the enhancement of multi-disciplinary research in the fields of*

*energy, environment and economics; and the development of new markets for products and services in these fields.*

This in-vessel system would be the largest of any university in the United States. Professors in the departments of Plant Biology, Environmental Studies, Geography, and Engineering fully support this project and have committed to including it in curriculum at both the undergraduate and graduate levels. Research opportunities are available exploring efforts to encourage students, staff and faculty to properly source separate, as well as the processes involving in composting food and other biodegradable waste.

## **8. Facility Details**

A new waste sorting procedure has already been established at the Baker University Center as of January 2007. Dining services employees are being directed to separate out all pre-consumer food waste, and bins have been set up in the public areas to accommodate patrons. Table tents and signage provide information regarding the fact that all the service ware in use is biodegradable and should be placed in the bins labeled "Compost". These materials would be duplicated and adapted for use in other campus eateries once we are prepared to handle the additional waste.

A solar-powered in-vessel composting system is ideally suited to meet the needs of Ohio University, featuring a highly efficient contained system which has the capacity to manage all forms of organic waste (including meat, dairy, biodegradable service wear, and grounds waste), while speeding the processing of waste into usable soil, controlling odors, vectors and leachates, and minimizing staff time needed for operation.

A number of suppliers offer composting technology systems that optimize the natural composting process by controlling airflow, moisture levels and temperatures thereby accelerating the decomposition cycle of organic wastes. These composting tunnels require minimal maintenance and consume relatively small quantities of electricity and water. One or two operators per shift can staff the systems, depending on the system chosen. The vessel can be loaded every day eliminating the need to store waste, minimizing vector attraction and odors. They can be left unattended for days in the event of illness or absenteeism. Compost produced after 14 days within a composting tunnel is very similar to soil in appearance, with a dark color and similar texture. Material is reduced in volume by approximately 30% and pathogen reduction has occurred. Additional curing may be required depending on application.

The site that has been designed for use by the composting initiative is an undeveloped area of the Ridges precinct of our campus. Access to the site is off of Dairy Lane. The site is approximately 2 miles from Baker University Center. There are several acres available for development at this site; however, the final site size for this particular project has yet to be determined. An access road does exist to this site, but will require further development and surfacing in order to withstand truck traffic. Water, electricity, drainage lines, and telephone lines will need to be extended to the site, most likely from Dairy Lane. The site topography is gently rolling and the cover is grass. No wetlands or trees are currently on the site.

## **9. Markets**

We do not plan to sell the finished compost product, as this would require periodic quality testing for which we do not currently have the resources, both financial and technical. Further, there are some concerns that the university would incur liability by distributing or selling this product to outside customers. All of the finished compost generated by the in-vessel unit will be applied to the grounds of Ohio University, both on the Athens campus and also the other five regional campuses.