

LANE COUNTY FOOD WASTE TO ENERGY PROJECT

MUNICIPALITY TYPE : COUNTY

LANE COUNTY, OREGON

ESTIMATED TARGET FOR ANNUAL RENEWABLE ENERGY
PRODUCTION: 1 MW of Electricity

FUNDING AMOUNT REQUESTED: \$50,000

UPDATED APPLICATION

CONTACT INFO

Mike McKenzie-Bahr

Lane County Community & Economic Development Coordinator

125 E. 8th Avenue

(541) 682-4118

michael.mckenziebahr@co.lane.or.us

Section 1: Project Opportunity

Lane County is requesting \$50,000 from the Renewable Energy Feasibility Fund, to be matched by \$25,000 in County funds, to study the financial feasibility of constructing and operating a Lane County owned anaerobic digestion facility to process local food waste into energy.

Annually, 40,000 (forty thousand) tons of food waste ends up at the County-owned Short Mountain Landfill. A 2007 local food waste study identified and geospatially located 700 of the large non-residential food waste producing facilities within the Eugene metro area and estimated that they produce 17,870 tons of food waste annually. The study determined that the food waste could generate at least 1.2 megawatts of electricity from the anaerobic digestion process. (See Section 5).

We have already determined there is not enough long-term capacity in existing local anaerobic digesters to convert this food waste. Thus, this proposed feasibility study will focus on development of a new anaerobic digestion facility to produce renewable energy and solve the problem of food waste disposal. We plan to build upon the previous study and complete a comprehensive analysis to include costs and options for six project elements: 1) Identification, Collection and Transportation of Food Waste; 2) Anaerobic Digester Facility Options; 3) Anaerobic Digester Facility Energy Outputs; 4) Siting of Anaerobic Digester; 5) Revenue and Expense Review and ROI Estimates and 6) Recommendations from Feasibility Study Finding.

Building a community renewable energy project to process food waste will have multiple benefits to the local community:

1. New revenue generation for the municipality from energy production and new revenue in the community from the project and related spending.
2. New job creation anticipated in collection, separation, and energy facility and from related spending in the community. Using the ripple effect projections for investments in renewable energy projects, we anticipate approximately 62 FTE jobs and an economic increase of \$10 million.
3. Savings in food waste disposal costs. Pulling food waste out of the waste stream will save county taxpayers at least \$750,000 by reducing the cost to dispose of it at the Short Mountain Landfill.
4. Infrastructure for economic development. Adding sources of local energy will increase economic development opportunities through a variety of means. (See Section 4).

This project specifically meets the renewable energy development goals adopted by the Lane County Board of Commissioners. The Eugene-Springfield Metro Plan, adopted by Lane County, identifies as a primary goal the development of “environmentally acceptable energy resource alternatives.” Objective Number 6 is “facilitate the permanent use of solar energy and other decentralized energy sources to displace centralized energy supplies and diversify energy production.”

To help meet those goals, the Lane County Board of Commissioners adopted “Other Fees” for “waste diversion opportunities” to be charged to all solid waste generators in Lane County to fund programs and services of community benefit. As of 2008, a portion of this fee will be used for “projects approved by the Board that are designed to divert or prevent waste material from the landfill, including but not limited to research and development.” Funds from this fee will be used as the match for this grant request.

This project is also consistent with the acknowledged comprehensive plan as it meets two of the plans stated goals: “Work for a strong regional economy to expand the number of family-wage jobs available in Lane County” and “Contribute to appropriate community development in the areas of transportation and telecommunications infrastructure, housing, *growth management*, and land development.”

A food to waste energy project holds great potential, but it is not without challenges. We need to determine specific required business economics to determine the feasibility of the project before committing to seeking funding for a food waste to energy project. This study will entail comprehensive analysis that provides the necessary information to determine if the development project is viable. The research focus on the development of food-waste as a potential renewable energy source provides the opportunity to engage the issue of energy use and waste generation at the community planning level.

Lane County has formed the Willamette Valley Biomass Study Group, a multi-discipline team working to identify opportunities for biofuels from local cellulosic materials. Members include Lane County Community and Economic Development; Resource Innovations, UO Institute for a Sustainable Environment; Lane MicroBusiness; Northwest Cooperative Development Center; Lane Council of Governments; Oregon Environmental Council; Trillium FiberFuels, Inc.; Mater Engineering, Ltd.; Ater Wynne; Novus Group; Good Company; Sylvatex and Essential Consulting Oregon.

The Study Group is currently working with a \$95,000 USFS Working Partnership grant, awarded to Lane County, to study bio-energy and biofuels opportunities from woody biomass. We are also currently working with the Oregon Seed Council to prepare a grant to study opportunities for creating energy from ryegrass straw. And we are applying for this grant to study food waste. All of these efforts build on a local vision of an Integrated Bioenergy Business Park where renewable energy facilities are co-located in order to maximize the uses of infrastructure and facility outputs.

These efforts are the result of the considerable outreach by local governments and non-profits, yielding broad-based support for local renewable energy alternatives. The City of Eugene's Sustainable Business Initiative Task Force, which included members of Lane County government, held roundtable discussions during 2005 and 2006 attended by more than 750 business leaders, government representatives, and residents. These opportunities for public input yielded support for green building; education and technical assistance for local businesses; reuse and recycling; financing and funding for sustainable businesses; biofuels; renewable energy; natural and organic foods; sustainability in public education systems; sustainable healthcare; natural products and sustainable forest products.

That was followed up by the Lane County Energy Roundup – a series of community forums to discuss Renewable Energy and Clean Energy options the community could pursue, culminating in a commitment from local government to support these efforts.

This project is extremely timely as we are building upon a recent study: Sustainable Energy Planning: Using Waste to Energy Feasibility Study as a Guide. By Ethan Nelson, A Terminal Project, presented to the Department of Planning, Public Policy & Management of the University of Oregon in partial fulfillment of the requirements for the degree of Master of Community and Regional Planning. June 2007. This is an extremely comprehensive look at the local opportunities for turning food waste into energy through anaerobic digestion. The missing elements of that study are what we are proposing in this study. For example, this particular study lacks a detailed pro-forma, site analysis, and analysis of a collection system.

Section 2: Statement of Work

Specifically, this project will answer: Is it possible to divert local food waste from the landfill and process it at a cost that allows for financing the construction and operation of a county-owned anaerobic digestion facility to process the food waste into energy?

In this section, we have broken the proposed feasibility study into project elements and included the questions for each element. This is followed by the data that will be collected/analyzed and the specific activities we will undertake to accomplish the study. We anticipate starting the study upon signing of a funding contract, approximately March 1, 2008 and having a final report by February 28, 2009.

Study Element 1: Identification, Collection and Transportation of Food Waste

Food Waste Inventory - What are types and amount of food waste available and what is the seasonal variability in individual and total food waste supplies?

Collection of food waste - What is the commercial food waste producers' interest in the project and what is the collection cost of commercial food waste?

Separation of food waste - What type of equipment is available and needed to maximize the separation of food waste? What is the cost for it at food waste source site?

Transportation of food waste - What are the vehicle options for transportation of food waste? What are the costs to transport food waste to AD site?

Data that will be collected/analyzed and the specific activities we will undertake:

More than 700 commercial food waste vendors in the Eugene/Springfield area have been identified and geospatially located. Estimates have been made of the amount of food waste generated. We will conduct interviews to confirm those estimates and identify other food waste feedstocks including: Fruit and Vegetable Wastes; Processed Foods; Product Destruction; Pet Foods; Confectionary; Commercial Catering, the Hospitality Industry and Segregated Residential Food Wastes. We will research seasonal variability in individual and total feedstock supplies. We will also conduct interviews with recycling equipment manufactures and waste haulers.

Study Element 2: Anaerobic Digester Facility Options

Pretreatment- What are the pretreatment options and costs to maximize AD performance? What are the odor issues for these options?

Processing- What are the AD facility design options, water requirements and cost estimates for construction and operation? Can it use wastewater? Should we consider additional feedstocks to enhance AD performance? What type of pilot can we conduct to test feedstock and AD performance?

Data that will be collected/analyzed and the specific activities we will undertake:

For pretreatment, we will evaluate methods for receiving feedstock streams at the digester site and pretreatment requirements. Odor control and contaminant issues shall be specifically addressed.

We will develop a matrix of AD technology types to answer the above questions and compare pros and cons of each approach. We will determine preliminary physical and process descriptions of AD configuration (size & material, equipment lists, organic loading rates, retention times, etc.) and expected performance. The use of "bulking agents" (i.e. paper, manure, straw, biosolids, etc.) may improve digestibility of food waste and result in a synergistic effect. We will evaluate proximal non food-waste for its co-digestion potential. We will perform a literature search and conduct interviews to assess the specifications, and performance of food waste to energy plants in North America and Europe including the U.C. Davis, Biogas Energy Project.

Study Element 3: Anaerobic Digester Facility Energy Outputs

Methane - What is the potential for biogas production and its potential uses?

Electricity - What are the conversion efficiencies from methane to electricity? What are the various uses and revenues?

Heat/Steam - What are the local opportunities for its use? What are the issues regarding delivery?

Wastewater - What will be the quantity and the potential uses? What is the cost for said uses?

Nutrients/Sludge - What is the estimated digestate quality and quantity for nutrient recovery to be used as fertilizer, compost agent and/or soil amendment? What are the technical aspects of nutrient concentration, separation, handling and storage? Is there opportunity for sale into the agriculture and horticulture market as organic fertilizer?

Data that will be collected/analyzed and the specific activities we will undertake:

To determine biogas production, we will perform industry standard calculations to estimate potential methane yields with a selection of feeding regimes. We will develop technical scenarios for utilizing biogas product, including biogas upgrade to pipeline quality and compression/storage for vehicular fuel. We will determine the type of equipment to be used for electrical conversion, microturbine vs internal combustion, and efficiencies and costs. Existing research analysis will be used to answer industry specific questions. For project specific data, we will conduct interviews with utilities, electrical equipment manufacturers; other power experts, Metropolitan Wastewater Management Commission and experts in the agriculture and horticulture market.

Study Element 4: Siting of Anaerobic Digester

What are the strengths, weaknesses, opportunities and threats (SWOT) given four development sites?

1. Metropolitan Wastewater Management Commission site on River Road
2. Metropolitan Wastewater Management Commission site on Aubrey Lane
3. Lane County site at the Glenwood Transfer Station
4. Lane County site at the Short Mountain Landfill

What are the zoning requirements for an AD facility? What permits and environmental studies are needed? What are the possible activities on each site with regard to an AD project? What are the estimated development costs needed on the properties to site a facility?

Data that will be collected/analyzed and the specific activities we will undertake:

We will review the MWMC siting process on its current AD facility. We will conduct specific research at each site to answer relevant zoning, planning and local and state development regulations questions.

Study Element 5: Revenue and Expense Review and ROI Estimates

What will it cost to build a food waste to energy plant and operate annually? What are the annual revenues and expenses? What are potential funding sources?

Data that will be collected/analyzed and the specific activities we will undertake:

We will develop a financial model for the development of a food waste to energy project (i.e. biogas plant). Capital expenditure, operations and maintenance, revenue, expenses, avoided costs, environmental credits, state and federal tax credits, funding sources, and costs of capital will be incorporated to assess the return on investment of the project. We will also identify potential project funding sources. We will use data collected from the other parts of this study to determine much of the above. Other data will be collected from relevant projects and interviews with AD and energy experts.

Study Element 6: Recommendations from Feasibility Study Finding

What have we learned? What are the next steps? This section will include an analysis of our finding regarding construction costs and annual operations; conclusions regarding SWOTs; conclusions

regarding risks and benefits of a food waste to energy project to the County and identification of next steps to be taken.

Section 3: Project Readiness

This food waste to energy study is our next step in a progression of initiatives that began several years ago as part of the an effort to study the economic development opportunities for what is now called “cleantech” and identify specific projects to undertake. Our activities, which include investments in time, money, resources and collaboration with community partners, have strategically positioned us to reach a successful conclusion to this study.

Three activities set the stage for where we are today. In 2005, Lane County was a partner in the Lane County Sustainable Business and Jobs: Preliminary List of Existing Firms and Potential Opportunities for the Southern Willamette Valley, prepared by the University of Oregon. This was followed in 2006 by the Eugene’s Sustainable Business Initiative Task Force. The Report and Recommendations from the Task Force included support for sustainable development that were adopted by the Lane County Board of Commissioners as part of the County’s Economic Development program. And in 2007, the Lane County Energy Roundup – a series of community forums that included topics on Renewable Energy and Clean Energy from utilities, NGOs, local and state experts and officials – helped identify the opportunities of energy from waste.

One of the financial items directly relating to this proposed study, is the “Other Fees” for “waste diversion opportunities” adopted by the Lane County Board of Commissioners, as a way to generate waste diversion opportunities.

Regarding resources, we have spent time to put together the Willamette Valley Biomass Study Group, a team with the capacity to accomplish this study and identify opportunities for project implementation. The Study Group was formed, and then has grown, as part of \$95,000 U.S. Forest Service Partnership grant applied for and received by Lane County in July 2007. The grant is to study the energy opportunities for woody biomass. Elements of that study are similar to what is being proposed in this grant application: “Woody biomass resource assessment to determine feedstock availability, price, and location, and transportation challenges.” As part of that project, our team has collected the most recent studies regarding the use of the biomass as energy, conducted dozens of interviews, attended numerous conferences and symposiums and held public local workshops.

Because renewable energy opportunities involve complex issues and there are no “silver bullet” nor “one size fits all” approaches, the Biomass group is now looking at other large local waste streams to find synergy opportunities. We have reached out to include local expertise to assist in these efforts.

One of the major advantages we have regarding this proposed food waste study, is the initial work of identifying where the food is generated has been completed. Since that study is a year old, we will do some fact checking with this grant, but we do not need to duplicate the work of that study.

We are anticipating some challenges with the study, but believe we can overcome them to accomplish our goals. There is the possibility that as we work to answer questions in the study, more questions will be raised and there may be data that is more difficult or costly to acquire or develop than we anticipate. And there may be additional expertise that is identified during that study that we did not anticipate. We believe all of these can be overcome through the use of additional financial resources from the “Other Fees” for “waste diversion opportunities.”

Internal and external resources, their qualifications, and respective roles in the study.

Mike McKenzie-Bahr – Lane County Community & Economic Development Coordinator – 20 years of Business and Community Development, grant management and feasibility study experience – He will be the project manager, administer contracts for project team, assign tasks, assist with each project elements and gather finished study materials into a Final Report.

Marcus Kauffman, Program Manager, Resource Innovations, Institute for a Sustainable Environment, University of Oregon – He holds a Master’s of Community and Regional Planning with an emphasis on rural community development from the University of Oregon in 1998. Experience includes work for Sustainable Northwest and the Watershed Research and Training Center. – He will lead interview team for “Identification, Collection and Transportation of Food Waste” and prepare synopsis of material gathered in interviews. He will also assist preparing study results into Final Report.

Milo Mecham, Principal Planner, Lane Council of Governments –Leads the local and regional planning issues and programs at LCOG – He will lead “Siting of Anaerobic Digester” data gathering team and assist infrastructure finance-related analyses.

Larry Brice, President, Novus Group – 30 years of business management experience including large project development and raising capital- Former member of Governor Kitzhaber Committee for Economic Development. He will prepare “Revenue and Expense Review and ROI Estimates” for AD Facility and assist on “AD Facility Energy Outputs,” elements.

Joshua Skov, MA, LEED AP, Principal, Good Company – Holds an M.A. in Economics from the University of California, Berkeley, he is an adjunct instructor in the Department of Planning, Public Policy and Management at the University of Oregon and has expertise in infrastructure project due diligence and feasibility assessment for community, business and environmental issues and opportunities – He will prepare “Recommendations from Feasibility Study Finding” and assist on “AD Facility Energy Outputs” elements.

Dean Foor, PE, Essential Consulting Oregon (ECOregon) – Holds a B.S. in Civil Engineering, B.S. in Geomatic Engineering, and Certificate in Fermentation Science. Mr. Foor has more than 17 years of project management and engineering experience – He will lead the team that prepares “Anaerobic Digester Facility Options” elements and assist on “AD Facility Energy Outputs” element.

Additional resources who will provide expertise, data and guidance

Lane County Waste Management – Will review all food waste generation and diversion data and findings for “Identification, Collection and Transportation of Food Waste” section of study.

Peter Ruffier – Eugene Wastewater Director -Metropolitan Wastewater Management Commission – Will provide data and review on wastewater and siting issues on MWMC lands.

Robert Sprick – Operations Supervisor, Wastewater Division – City of Eugene, Metropolitan Wastewater Management Commission – Will provide anaerobic digestion facility operation expertise.

Eugene Water and Electric Board – Will provide data and expertise for energy production opportunities and potential energy source revenues.

SECTION 4: FUTURE PROJECT CONSIDERATIONS

If the study proves that a food waste to energy project is financially feasible we will use the study to seek funding and partners for the construction and operation of a food waste to energy AD facility.

It may also turn out that the project is only marginally financially feasible, but would be more feasible with additional types of feedstocks. For that reason we are seeking other funding to review other feedstock energy potential concurrently with this project.

We plan to conduct a pilot project processing food waste in an existing anaerobic digester. Our goal is to conduct this pilot towards the end of this study period. The pilot will utilize existing AD infrastructure, such as at MWMC and/or on-farm manure digester.

We have already determined that there is not long-term capacity in the publicly owned MWMC AD facility to process the amount of food waste we believe to be available. So if the project proves feasible we will need to seek funding to construct a new AD facility.

We have identified sources of private sector capital and joint public/private investment for renewable energy projects. This builds upon the public financing identification done by the Oregon Department of Energy. Using that information, we will meet with funders to identify appropriate funding for the project, including the Energy Trust; Energy Loan Fund and federal funds.

There will be a wide range of stakeholders invited to engage in the development project, including other government agencies, private sector businesses; non-profit organizations, and local utilities. These will include the Metropolitan Wastewater Management Commission, as the goal will be to use their supply of treated wastewater for the digester and the Eugene Water and Electric Board, which is promoting the use of renewable energy.

A food waste to energy facility is one building block in our long-range goal to develop a series of renewable energy projects. We are envisioning an Integrated Bioenergy Business Park where renewable energy facilities are co-located in order to maximize infrastructure and operations synergies. Several studies have determined that integrated bioenergy systems are superior to traditional fossil fuel systems in terms of environmental compatibility and expected benefits. These included efficiencies of integration with improved economics over a stand-alone system, water re-use opportunities and added value from plant waste streams that can become feedstock in an adjacent facility.

The Integrated Bioenergy Business Park would be designed to promote greater innovation and technology development related to converting the vast regional stock of waste materials and cellulosic biomass into commercially competitive Bioenergy, biofuels and beneficial bi-products using local production capabilities. The goal of the project is for Lane County to have a cluster of bio-based industries producing fuels, chemicals, power, products and materials. (See Supplemental Graphical Images File).

We believe this proposed feasibility study is a step towards meeting the Oregon Renewable Energy Action Plan's goal to encourage and accelerate the sustainable production of energy from renewable sources, stimulate economic development, particularly in rural parts of the state, and improve the environmental future of the state. We thank you for your consideration of this proposal.

Section 5: Other Information

Lane County Food Waste Tonnage and Cost, 2007.

Study/Location	Total Waste (ton)	Percent Food Waste	Total Food Waste (ton)	Short Mountain Disposal Fee (\$45/ton)	Total Food Waste* (cubic yard)	Cost to Producer for Landfill Disposal** (\$53.25/yard)
City of Eugene (2003)	117,327	13.6%	15,956	\$ 718,041	29,825	\$ 1,588,191
Short Mountain Landfill (2006) Food Waste Assessment (2007)	291,000	13.6%	39,576	\$ 1,780,920	73,974	\$ 3,939,107
	17,870	100.0%	17,870	\$ 804,128	33,401	\$ 1,778,600

* 1 cu yard of vegetative food waste weighs ~1,070 lbs. (National Recycling Coalition Measurement Standards and Reporting Guidelines)

** Disposal based on City of Eugene rates for 1 cu. yard container with 1 pickup per week. (City of Eugene, Schedule 1 to Solid Waste and Recycling Collection Administrative Rules, Effective 7/1/2004)

Sources: City of Eugene Solid Waste and Recycling website, Short Mountain Landfill Engineer Daniel Hurley, Food Waste Assessment (this study). 2007

Food-Waste Generation by Facility Type, ESMA. 2007.

Type of Facility	Number of Facilities in ESMA	Food Waste Produced (tons/year)	Average generation per facility (tons/year)
Food Processors	45	276	6.14
Hospitals	3	612	203.89
Senior Residential Facilities	18	539	29.97
Colleges/Universities	2	728	363.95
K-12 Schools	71	577	8.13
Correctional Facilities	6	125	20.85
Supermarkets	40	3,203	80.06
Restaurants	516	11,810	22.89
Total	701	17,870	25.49

Annual Electrical Generation Potential from Food-Waste Biogas, ESMA.

Biogas Source	Heating Value of Biogas (MMBtu)	High Efficiency (48%) in kW	Medium Efficiency (37%) in kW	Low Efficiency (25%) in kW
Non-Residential Low Estimate	61,919	1,374	1,059	716
Non-Residential High Estimate	72,239	1,604	1,236	835
Residential Low Estimate	92,879	2,062	1,589	1,074
Residential High Estimate	108,359	2,405	1,854	1,253
Total Low Estimate	154,799	3,436	2,649	1,790
Total High Estimate	180,598	4,009	3,090	2,088