LEAGUE OF WOMEN VOTERS®
OF NEW JERSEY EDUCATION FUND

BIOMASS

Sewage Sludge to Energy

At present, the main contributors to waste to energy are municipal solid waste, manufacturing waste and landfill gas. Probably we are all most familiar with the first (MSW), which involves the garbage that the garbage men pick up regularly at our homes and which goes to a landfill, a transfer station, or incinerator. Today we are going to introduce you to something relatively new on the alternative energy radar: sewage sludge to energy. We will take you on a tour of how it is possible to produce energy to generate electricity in a waste water (sewage) treatment plant.

Biogas is a gas composed mainly of methane and carbon dioxide that forms as a result of biological processes in sewage treatment plants. According to the U.S. Environmental Protection Agency's "Climate Change State of Knowledge", methane is one of the greenhouse gases associated with global climate change. However, many of these facilities capture and burn the biogas (methane) for heat or electricity generation. The U.S. Energy Information Administration considers electricity generated from biogas to be "green power", and it may be used to meet renewable portfolio standards (RPS). Currently, in New Jersey there are 28 waste water treatment plants with anaerobic digesters to promote the process of sewage

sludge to energy, and one of these plants is in Ridgewood and will be the subject of this presentation.

Renewable Energy from Sewage Sludge

This report addresses the ways in which sewage sludge can be used as a renewable energy source. The report is comprised of an introductory explanation of the topic, a discussion of two innovations in the area, and specific details regarding each innovation in terms of costs, benefits, and environmental impact.

Many of us have experience with compost piles, and we can begin our report on renewable energy from sewage sludge with two analogies to a backyard compost heap. First, we know that we can purchase products in the garden store that hasten the decomposition of the organic matter in our compost piles. Second, we know that when we unload a bin of grass clippings that has been left out overnight, we can feel the heat that has been generated. This heat comes from methane, a gas that is a product of the process of decomposition.

The production and use of methane gas from sludge is the energy source that can be tapped from the waste water treatment plant, thus reducing the use of fossil fuel. In Ridgewood, the Waste Water Treatment Plant (Water Pollution Control Facility) is the largest consumer of electricity, larger than the hospital, municipal building, and schools. If current innovations can produce enough methane to power this facility, the result will be significant savings for Ridgewood. This is a method that can be copied by any municipal sewage treatment plant in New Jersey.

In considering the new procedures that increase the amount and availability of energy for use in a waste water treatment facility, it is helpful to provide a brief description of the process of solid waste management, which follows:
First, a filter separates solid from liquid waste. The waste water then undergoes a process of aeration (adding oxygen), chlorination, and de-chlorination. Solid waste is transferred to an

anaerobic (lacking oxygen) digester that is heated by a boiler to compact the waste. The material is then hauled by trucks off-site for disposal. A by-product of this process is biogas, or methane.

TWO INNOVATIONS THAT PROVIDE AND/OR ENHANCE ENERGY FROM SEWAGE SLUDGE

1. BIO-ORGANIC CATALYST

The Village of Ridgewood has had in place since November 2007 the use of a bio-organic catalyst (BOC) that causes larger amounts of biogas to be produced in the breakdown of sludge. This catalyst, like the products used to hasten the process in our compost piles, not only speeds decomposition but also produces larger amounts of methane. This increase is substantial; a 62% increase was realized during the pilot study period of Nov. 2007 to Nov. 2008.

The BOC is a bio-organic compound that is delivered to the waste water treatment site in 55 gallon drums. According to the BOC website, the product is nontoxic, hypo-allergenic, non-corrosive, non-irritating, bacteria-free, and biodegradable. This mixture is heated with the "sludge," causing breakdown of the organic matter and production of additional methane, which is then used for heating incoming loads.

A one year study in Ridgewood using a bio-organic catalyst was completed in Nov. 2008. This study showed that the BOC is both a money-saver and an energy-saver in several ways. First, the larger amounts of methane produced are used to heat the digester boiler, resulting in a savings for the village of the cost of natural gas, which was used previously. Second, the process results in a reduction in volume/weight of sludge, which lowers the cost of off-site disposal. More savings can be realized through an additional action of the BOC additive: it increases levels of dissolved oxygen in waste water, thus saving energy costs in the aeration procedure.

2. METHANE CAPPING PROJECT

A second innovation proposed to the Village of Ridgewood involves the employment of new technology that allows for the capture and use of methane that currently escapes into the atmosphere. The village council is considering the purchase of results of a study showing how

Ridgewood's excess methane could be used to generate electricity. This study would cost $38,000. If the project were to be implemented, it would cost $1 to $1.5 million. However, Village Engineer Chris Rutishauser predicts that the use of methane to produce electricity is estimated to result in a 30-40% reduction in the waste water treatment plant's electric bill.

In summary- Two projects in Ridgewood address the conversion of sewage sludge to renewable energy:
(1) A bio-organic catalyst that produces more methane in the decomposition process (This project is currently in place.)
(2) A project to cap excess methane that currently escapes into the atmosphere (This project is under consideration.)

Each of these projects is treated separately in the remainder of this report as costs, benefits, impact on environment, and other factors are addressed.

ECONOMIC AND PHYSICAL EFFICIENCY

Bio-Organic Catalyst

BOC hastens and enhances the digestion of fatty acids in waste, providing a more compacted residue, which lowers the costs for the village of final tow-away. The additive also produces biogas (methane) that can be used to generate electricity. The catalyst has been used as a pilot project in Ridgewood since November 2007. During the pilot project Ridgewood increased the amount of methane produced by 62% while reducing the consumption of natural gas by 70%. The volume/weight of sludge was reduced by 29%, lowering the projected cost of off-site disposal by $18,945. Reduction of energy costs for waste water aeration are projected at $48,000 annually. The program is eligible to receive grants from the NJ Clean Energy Program, as well as from carbon trading credits.

Methane Capping Project

This project, if implemented, will cost $1 million to $1.5 million. Federal grants and other sources could lower this amount by 50-60%.

Savings would come from lower electricity bills, estimated at a 30-40% decrease.

RENEWABLE ENERGY FROM SEWAGE SLUDGE *Two innovations at Ridgewood* ***Waste Water Treatment*** *Plant*		
	BIO-ORGANIC CATALYST	METHANE CAPPING PROJECT
Present Status of Operation	In place at Ridgewood Waste Water Treatment plant as pilot project since November 2007	Under consideration by Ridgewood Village Council. Pilot study has been done in New York City Estimated that the apparatus could be operational within 6 mos. to a year of formal approval and funding
Economic Efficiency and Environmental Impact	Cost: Purchase of 55 gallon drums totals $55,000 annually, but is offset by projected savings listed below. Benefits: 1. 62% increased methane production produces an annual savings of $38, 500 for natural gas purchases (compared with baseline period). 2. Increased bio-organic yields offer potential of further savings of $24,000 – 31,000 through the reduction of the amount of natural gas needed to heat boiler. 3. More efficient reduction of volume/weight of sludge results in reduction of off-site disposal costs, with an est. savings of $18,945 and a reduced carbon footprint due to fewer truck trips 4. Reduction of energy costs for aeration as a result of O2 addition to waste water during bio=catalyst process. Projected daily savings of $132.67 or annual savings of $48,000.	Cost: The Village may 1.Purchase the results of a study done in New York City at a cost of $38,000. 2. Authorize implementation of project at a cost of $1 – 1.5 million (less $38,000 cost of study) Federal grants and other sources could lower this cost by 50 – 60% Benefits: 1. Possible savings of 30 – 40% of waste treatment plant's electric bill. 2. Reduce methane escaping into the atmosphere – methane is a contributor to global warning
	Total projected annual savings of $130,345 (figures from Bio-Organic Catalyst One Year Study)	

An additional step has been set in motion in Ridgewood's continuing process of producing additional methane to be converted into energy at the Ridgewood Waste Water Treatment Plant. It has been dubbed "The Sludge Fund", and it is the Engineering Department proposal to turn waste into revenue. This creative approach works as follows: For a fee, companies that collect sludge from septic tanks in the area can drop it off to be treated at the facility during "downtimes" at the plant. The fees generated from this treatment save taxpayer dollars and eventually provide more methane that will be converted into electricity. The facility has recently accepted its first delivery of 500 gallons of sludge to be treated during slack hours at the plant to raise money for Ridgewood.

SOURCES

Page 1- U.S. Environmental Protection Agency, “Climate Change State of Knowledge”

Page 3- Bio-Organic Catalyst website: http://.bio-organic.com

Page 3- Village of Ridgewood Pollution Control Department: “Anaerobic Digester Optimization

with Bio-organic Catalyst: One year Study, November 2007 – November 2009,” p. 30

Page 4 – The Villadom Times: “Council interested in methane conversion concept,” Oct. 14, 2009, p. 4

Page 4 – The Villadom Times: “Council agrees to save $57,000 and the environment,” April 8, 2009, p. 3

Page 7 – The Villadom Times: “Sewage Treatment Plant accepts first sludge delivery,” Feb. 3, 2010, p. 7