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Generating Biogas from Source Separated Organic Waste for Energy Production - overview

Background

The City of Toronto is committed to reductions in greenhouse gas emissions, specifically carbon dioxide (CO₂), as demonstrated through the City's commitment to a 20% reduction target, relative to 1990 levels by 2005. As outlined in the Environmental Plan, the City advocates reduced greenhouse gas air emissions, the support for green power, the promotion and use of district heating and cooling and the promotion and development of green industry. In addition, the City of Toronto is committed to waste reduction and minimization, stipulated by the Task Force 2010 targets of 30 percent diversion of household waste by 2003; 60 percent of household waste by 2006; and 100 percent of household waste by 2010.

In October 2000, Toronto City Council authorized staff to undertake a feasibility study on anaerobic digestion, to be conducted in co-operation with Enwave District Energy Limited. Anaerobic digestion has the potential to divert source separated organic waste (SSO) from other methods of disposal and to produce biogas as a fuel for renewable energy. Anaerobic digestion therefore has the potential to contribute towards waste diversion, greenhouse gas emission reduction and renewable energy procurement.

This study is a joint undertaking between the City of Toronto Works and Emergency Services Department (Technical Services and Solid Waste Management Divisions), the Federation of Canadian Municipalities (FCM) Green Municipal Enabling Fund (GMEF) and Enwave District Energy Limited (Enwave). In addition, the Ministry of Environment and Ministry of Energy will participate in consultation with the Environmental Services Section of the City of Toronto Works and Emergency Services Department to complete this study.

Purpose

This study is intended to evaluate the feasibility of siting an anaerobic digestion facility on City-owned property (in the Port Lands area) which would process municipal organic waste to generate biogas for the district energy needs of Toronto's downtown core. This treatment of organic wastes through anaerobic digestion may have a significant role to play in assisting the City to meet its waste diversion, greenhouse gas emission reduction and renewable energy goals as adopted by City Council.

Project Overview

Waste Diversion

Achieving the City's waste diversion goals requires significant increases in the diversion of organic wastes. By receiving SSO wastes an anaerobic digestion facility could not only help divert the City's waste, it could also earn revenue to offset operational costs and potentially improve conditions for digestion and biogas generation.

Greenhouse Gas Emissions

The majority of methane emissions attributed to municipal sources result from the uncontrolled anaerobic decomposition of organic waste and wastewater sludge at disposal facilities. Controlled processing of organic wastes to contain or prevent the atmospheric release of methane will contribute significantly towards reducing City greenhouse gas emissions.

Renewable Energy

An integrated approach to renewable energy in the Port Lands would include the linkage of anaerobic digestion and co-generation technologies.

Organic solid waste diverted from landfill is used to produce biogas fuel for renewable energy in other parts of the world. The renewable energy produced by these systems is used for electricity generation, district heating and other uses. In Toronto, Enwave is committed to producing thermal energy (steam and/or hot water) to meet its customers' energy requirements in a cost effective and environmentally friendly manner. This approach would provide a potential market for the biogas that could be produced by anaerobic digestion. Enwave would consider either directly purchasing the biogas to produce steam or hot water for district energy in the Port Lands area, or purchasing the steam and/or hot water produced with the biogas from others. The procurement of biogas from an anaerobic digestion facility represents an opportunity to remove a portion of Enwave's natural gas requirements from the commodities market. This would provide for increased stability in energy rates for all Enwave customers during volatile periods in energy prices.

This study to assess the feasibility of anaerobic digestion in the Port Lands and a potential co-generation project contemplated by Toronto Hydro and Boralex are therefore complementary initiatives that form part of an integrated renewable energy concept. The co-generation facility could convert biogas derived from an anaerobic digestion facility into thermal energy (steam and/or hot water) and electricity. The proposed location for this co-generation facility is adjacent to the Paperboard Industries International facility on Basin Street in the Port Lands. Paperboard Industries International would receive thermal energy from the co-generation facility. Thermal energy would also be used by Enwave to supply their downtown district-heating clients. The electricity would be used by Toronto Hydro.

Project Objectives

The first objective of this study is to produce detailed technical and financial information regarding the feasibility of siting an anaerobic digestion facility near the Port Lands area in Toronto. In addition, the study is intended to assess the option of securing the SSO processing capacity that will not be treated by the Dufferin anaerobic digestion facility. The study will also address the terms and conditions of the agreement with the FCM Green Municipal Enabling Fund, which is providing the majority of financial support to the study.

A second objective is that the study will focus on an integrated approach whereby the biogas that would be produced by anaerobic digestion is transferred to a co-generation facility contemplated by Toronto Hydro and Boralex. The study will therefore consider the information available regarding the Toronto Hydro and Boralex intention to construct a co-generation facility in the Port Lands.

Deliverables

The main project deliverables include the following three components:

Component A. Waste Diversion and Renewable Energy Production

The study will consider the possibility of siting an anaerobic digestion facility in the City Port Lands area to anaerobically digest organic wastes to produce biogas to be used by the proposed Toronto Hydro/Boralex co-generation facility.

Component B. Energy Transmission

The study would consider that renewable energy in the form of biogas would be transferred to the proposed Port Lands co-generation facility. The study will develop detailed qualitative and quantitative information on the construction and operation of a suitable pipeline transportation system between the potential anaerobic digestion and co-generation facilities.

Component C. Quantification of Environmental Benefits

The study will quantify the environmental benefits of diverting organic wastes from landfill disposal and the generation of renewable energy to reduce consumption of non-renewable sources of heat and electricity. This will include assessing the greenhouse gas emission reductions through avoided landfill releases, off set smog precursor emissions, and displacement of non-renewable energy sources by a renewable source.

The project will also include a summary of all applicable acts (i.e. Environmental Assessment Act, Environmental Protection Act) regulations and guidelines and "next steps" in relation to facility siting and residuals management.

Timeline / Budget

The primary consultant for the project is MacViro Consultants Incorporated with EnviroRIS and Allen Kani Associates as part of the consultant team. The total project cost is \$120,000.00, which includes a \$60,000.00 grant from FCM/GMEF, a \$40,000.00 study from Enwave and the remaining \$20,000.00 from the City's Solid Waste Management Division. The project is scheduled for completion by early summer 2002.

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