



## STAFF REPORT ACTION REQUIRED

### Authority to Enter into a Biogas Pilot Project Agreement with Enbridge Gas Distribution Inc. to Supply, Install, Own and Operate a Biomethane System at the Dufferin Waste Management Facility

<b>Date:</b>	May 3, 2010
<b>To:</b>	Public Works and Infrastructure Committee
<b>From:</b>	General Manager, Solid Waste Management Services
<b>Wards:</b>	All
<b>Reference Number:</b>	p:/2010/swms/May/014PW

#### SUMMARY

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The purpose of this staff report is to obtain City Council authority to enter into a Biogas Pilot Project Agreement with Enbridge Gas Distribution Inc. (“Enbridge”) to supply, install, own and operate a biomethane system (“BMS”) at the Dufferin Waste Management Facility. The pilot project will determine if biogas produced at the Dufferin Organics Processing Facility (“DOPF”) can be converted into a refined biogas, via the BMS, that is capable of being distributed across Enbridge's natural gas distribution system (the “Pilot Project”).

At its meeting on November 30, December 1, 2, 4 and 7, 2009, City Council directed the General Manager, Solid Waste Management Services to enter into discussions with Enbridge regarding the development of biogas refining systems at the new SSO Facilities and to report back on a recommended course of action for the procurement of a contract to design, build, own and operate biogas refining systems at the SSO Facilities.

#### RECOMMENDATIONS

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**The General Manager, Solid Waste Management Services recommend that:**

1. Authority be granted for the General Manager, Solid Waste Management Services, to enter into a Biogas Pilot Project Agreement with Enbridge Gas Distribution Inc to supply, install, own and operate a biomethane system, substantially on the terms set out in Attachment 1 and such other terms as may be satisfactory to the General

Manager, Solid Waste Management Services, and in a form satisfactory to the City Solicitor, and that the General Manager, Solid Waste Management Services be authorized to execute the Biogas Pilot Project Agreement on behalf of the City.

2. The General Manager, Solid Waste Management Services or his delegate, be authorized to administer and manage the Biogas Pilot Project Agreement, including the provision of any consents, approvals, notices and notices of termination, provided that the General Manager, Solid Waste Management Services may, at any time, refer consideration of such matters (including their content) to City Council for its determination and direction.
3. The General Manager, Solid Waste Management Services report on the results of the Biogas Pilot Project to City Council.
4. Subject to the execution of an agreement between Enbridge Gas Distribution Inc., and the City as set out in Recommendation 1, the General Manager, Solid Waste Management Services and the Deputy City Manager and Chief Financial Officer be directed to investigate options for funding the cost of the Pilot Project through cost savings resulting from displacing natural gas with biomethane or some other means.
5. In the event that the Biogas Pilot Project Agreement is not executed by September 1<sup>st</sup>, 2010, the General Manager, Solid Waste Management Services be authorized, at his sole discretion, to terminate negotiations with Enbridge.

### **Implementation Points**

1. In addition to this staff report, staff from Real Estate Division will prepare a staff report to Government Management Committee seeking authority to enter into a lease agreement with Enbridge for the use of space at the City's Dufferin Waste Management Facility in which to install the biomethane system.

### **Financial Impact**

Enbridge will supply, install, own and operate the entire BMS and will incur all associated capital and operating expenses over the term of the Pilot Project Agreement. Operation of the biomethane system is expected to commence in July 2011. The term of the Pilot Project agreement will expire on December 31, 2013.

SWMS will be required to provide a concrete pad on which Enbridge will install the biogas refining system and gate station. SWMS will also be required to provide connections to the DOPF's process water and biofiltration systems to receive effluent and tail gas from biogas refining respectively. The cost of providing these facilities is not expected to exceed \$101,760.00 net of HST recoveries (\$100,000.00 net of taxes). Funding for the capital cost item is included in the 2010 Solid Waste Management

Services Capital budget under item CSW004-6 (Dufferin – Disco SSO Processing Facilities).

Under the Biogas Pilot Project Agreement, the City will pay Enbridge for services to refine biogas supplied by the City to produce biomethane and to convey and inject the biomethane into the regulated natural gas distribution system. The biogas refining service provided by Enbridge will also include metering and providing information on the quantity of biomethane supplied to the natural gas distribution system.

Payment to Enbridge for the biogas refining service will not exceed \$ 10 per gigajoule of biomethane supplied to the regulated gas distribution system. The total annual payment for biogas refining services will vary with the quantity of biogas supplied by the City which will depend on the tonnage of SSO processed at the DOPF and on the efficiency of the processing operations.

In addition to the cost of the biogas refining service, SWMS will also incur the costs of supplying electricity and water to the biomethane refining system. Annual electricity and water costs will vary with the quantity of biogas supplied by the City.

Estimated annual biogas refining service payments to Enbridge over the term of the Biogas Pilot Project Agreement and the annual costs of electricity and water supplied to the biomethane refining system are presented in Table 1.

**Table 1: Biogas Pilot Project Operating Costs**

[Costs are net of HST recoveries unless noted]

Year	2011	2012	2013	Total
Biomethane Produced (GJ)	24,409	48,818	48,818	122,045
To Enbridge for Biogas Refining Service	\$250,335.71	\$556,296.00	\$557,948.22	\$1,364,579.93
Electricity and Water	\$26,986.19	\$55,624.59	\$57,276.81	\$139,887.59
Total SSO Processing SW0476	\$277,321.89	\$611,920.60	\$615,225.03	\$1,504,467.52
Total SSO Processing SW0476 [net of taxes]	\$272,525.45	\$601,337.07	\$604,584.35	\$1,478,446.86

Funding for the operation of the Pilot Project will be included in the Operating Budget Submission of the Solid Waste Management Services Division for 2011 and subsequent years.

The biomethane produced by this Pilot Project will be used by the City to reduce its purchases of natural gas. For each cubic meter of natural gas displaced by biomethane the City will save the commodity cost of the natural gas and also the cost of transporting the natural gas from out of Province sources, typically Alberta, to the border of the Enbridge service area. Distribution costs within the Enbridge franchise area would still apply. Annual costs savings will depend on the quantity of biomethane produced and will vary with changes in natural gas commodity and transportation costs.

The City’s purchases of natural gas are managed by the Facilities Management Division (FM). Enbridge will identify the quantity of biomethane supplied under this Pilot Project

to FM. FM will work with Finance Division to implement such administrative procedures as are necessary to assign the cost savings resulting from the displacement of natural gas to SWMS to partially offset the cost of the biogas refining services.

Biomethane production and the estimated cost savings resulting from the displacement of natural gas are presented in Table 2.

**Table 2: Summary of Estimated Biomethane Production, Pilot Project Costs and Cost Savings** [all costs and savings are net of HST recoveries]

<b>Biomethane Production</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>Total</b>
SSO processed at the DOPF (tonnes)	30,000	30,000	30,000	30,000	120,000
Biogas Supplied (cu. m.) <sup>1</sup>	0	1,500,000	3,000,000	3,000,000	7,500,000
Biogas Methane (cu. m.) <sup>2</sup>	0	900,000	1,800,000	1,800,000	4,500,000
Biomethane (cu. m.) <sup>3</sup>	0	711,000	1,422,000	1,422,000	3,555,000
Biomethane (GJ) <sup>4</sup>	0	24,601	49,201	49,201	123,003
<b>Pilot Project Costs</b>					
Capital	\$101,760.00	\$0.00	\$0.00	\$0.00	\$101,760.00
Operating <sup>5</sup>	\$0.00	\$277,321.89	\$611,920.60	\$615,225.03	\$1,504,467.52
<b>Total</b>	\$101,760.00	\$277,321.89	\$611,920.60	\$615,225.03	\$1,606,227.52
<b>Pilot Project Cost Savings</b>					
Commodity and Transportation Costs of Displaced Natural Gas (\$) <sup>6</sup>	\$0.00	\$186,559.70	\$396,326.72	\$434,108.16	\$1,063,985.59
<b>Net Pilot Project Costs</b>	\$101,760.00	\$90,762.19	\$215,593.88	\$181,116.87	\$542,241.93

Notes:

1. Assumes operation of biomethane system begins in July 2011.
2. Biogas is typically 60 percent by volume methane.
3. Assumes that the biomethane system recovers 79 percent of the biogas methane supplied.
4. 1 cubic metre of biomethane typically contains 34.6 gigajoules of energy.
5. Refining services cost of \$10.18 per GJ biomethane produced. Assumes electricity consumption of 11 kWh per GJ of biomethane produced. Assumed 2010 electricity cost of \$0.095 per kWh and increasing at 3 percent annually thereafter.
6. Based on natural gas price forecasts recommended by FM.

If Enbridge is not in default and upon the expiry of the Biogas Pilot Project Agreement, the City shall have the following options which may have a future financial impact:

1. The option to continue production of biomethane by entering into a new agreement with Enbridge whereby Enbridge would continue to own, operate and maintain the BMS on the basis of a new unit cost to be negotiated by Enbridge and the City.

2. The option to continue production of biomethane by purchasing the biogas refining system component of the BMS and contracting for the continued operation of the biogas refining system through a competitive procurement process. Enbridge would continue to own and operate the other components of the BMS, specifically the gate station, on-site biomethane pipeline, off-site biomethane pipeline and injection point, in order to protect the natural gas distribution system. The purchase cost would be based on the remaining undepreciated value of the entire BMS and determined by negotiations between Enbridge and the City.
3. The option to discontinue production of biomethane by decommissioning and removing the BMS, including removal of the biogas refining system, the gate station and the on-site biomethane pipeline and restoring the affected areas and facilities to the satisfaction of the City. The cost of this option would be based on the remaining undepreciated value of the entire BMS less the resale value of the biogas refining system and negotiations between Enbridge and the City.

SWMS will report back to Council on the recommended option prior to the expiration of the Pilot Project and set out what the financial implications of that recommended option are at that time.

Although the City will incur a net cost for the Pilot Project, if the Pilot Project is successful, future operation of the biomethane system beyond the term of the Pilot Project has the potential to generate significant cost savings for the City. Currently natural gas prices are depressed however future price increases in excess of inflation are forecasted. Biomethane production costs in the first years following the Pilot Project are expected to be lower than costs during the term of the Pilot Project due to operational efficiencies and increases in the quantity of biogas available. Thereafter biomethane production costs will increase at or below the inflation rate. The City's savings will increase over time as the difference between the natural gas purchase cost and biomethane production cost increases. Forecasted City savings for a 10-year period beyond the term of the Pilot Project are presented in Attachment 2.

The Deputy City Manager and Chief Financial Officer has reviewed this report and agrees with the financial impact information.

## **DECISION HISTORY**

City Council on November 30, December 1, 2, 4 and 7, 2009, adopted the recommendations in Item PW28.14, authorizing and directing the General Manager, Solid Waste Management Services to enter into discussions with Enbridge Gas Distribution Inc. regarding the development of biogas refining systems at the new SSO Facilities and to report back on a recommended course of action for the procurement of a contract to design, build, own and operate biogas refining systems at the SSO Facilities. The decision document can be found at:

<http://www.toronto.ca/legdocs/mmis/2009/pw/reports/2009-11-03-pw28-cr.htm#PW28.14>

## ISSUE BACKGROUND

In April 2009, SWMS engaged the services of FVB Energy Inc. (via RFP #9121-09-3034) to undertake a study comparing the various options to utilize the biogas generated by the SSO Facilities. Stakeholders including Enbridge were engaged during this study.

The following options were assessed on the basis of financial, environmental and risk criteria:

1. Cogeneration of electricity and heat based on the proposals submitted by THESI. THESI would design, build, own and operate a system to convert the biogas into electricity, to be supplied to the local grid and sold to the OPA under the FIT program, and into heat to be used on site to satisfy building or processing heating requirements;
2. Production of pipeline gas where a contractor would be engaged to design, build, own and operate a system to refine the biogas to meet quality requirements of the local natural gas distribution system, and where the resulting pipeline gas (aka biomethane) would be conveyed through the existing natural gas distribution system to displace a portion of the approximately 40 million cubic meters of natural gas consumed by City facilities annually; and,
3. Production of pipeline gas (i.e. biomethane), as above, with a corresponding plan to transition the solid waste collection vehicle fleet from diesel to compressed natural gas (CNG) fuel and thereby displace the approximately 4.4 million litres of diesel fuel consumed annually by solid waste collection vehicles.

Relative to the first two options, the third option – the pipeline gas option, with the complementary plan to transition the solid waste collection fleet to CNG fuel – offered the potential to provide additional financial and environmental benefits and therefore was recommended as the preferred option. The recommendations of the study were reflected in the recommendations in Item PW28.14 which were adopted by City Council on November 30, December 1, 2, 4 and 7, 2009 (see Decision History above).

Biomethane is chemically similar to natural gas and is most efficiently and safely transported through a regulated natural gas pipeline system. The Ontario Energy Board has granted Enbridge the sole rights to distribute natural gas within a franchise area that includes the GTA. Therefore, transporting the biomethane from the DOPF for use at City facilities will require access to the Enbridge natural gas distribution system.

The proposed BMS will be the first connection of this type to Enbridge's natural gas distribution system. Enbridge is very supportive of the pilot project but cautions that the quality standards, designs and practices necessary to ensure that this type of connection to the natural gas distribution system is safe and secure do not yet exist. Enbridge has offered to develop the necessary standards, designs and practices for the pilot project and has suggested that this can be done most efficaciously if Enbridge is contracted to supply, install and operate the BMS.

Transportation of the biomethane produced by the pilot project is only possible if access to Enbridge's natural gas distribution system can be gained. Access to the natural gas distribution system can be gained only if Enbridge supplies, installs and operates the BMS and by doing so develops the necessary new standards, designs and practices. Staff are therefore requesting that Enbridge be contracted to supply, install and operate the BMS.

Once the necessary standards, designs and practices are established, future connections of this type to the Enbridge natural gas distribution network will not necessarily require Enbridge's participation in the refining and supply of biomethane.

## **COMMENTS**

The DOPF processes approximately 30,000 tonnes of SSO annually and converts the organic fraction of the SSO material into digester solids and biogas. Based on the past performance of the DOPF, each tonne of SSO processed results in the production of approximately 100 cubic metres of biogas, of which 60 percent by volume is methane. The DOPF produces approximately 3 million cubic metres of biogas annually, which contains energy equivalent to:

- approximately 1.8 million cubic meters of natural gas, which could satisfy the heating and hot water requirement of approximately 600 homes; or,
- approximately 1.5 million litres of diesel fuel which is approximately 35% of diesel fuel consumed annually by the City's solid waste collection vehicles.

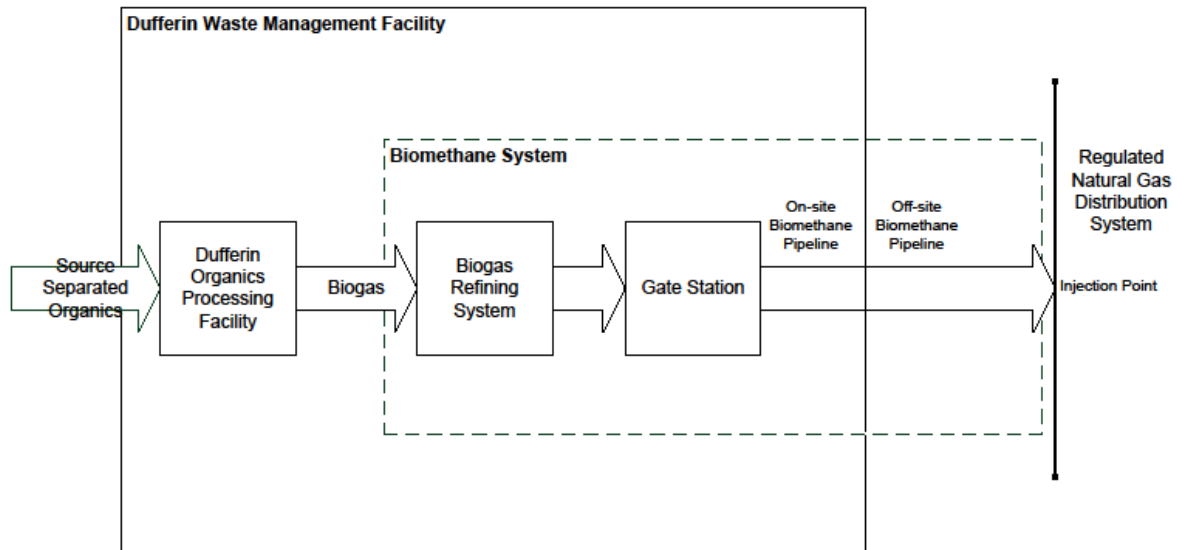
Currently the biogas produced at the DOPF is combusted in an enclosed flare without energy recovery.

Planned future reconstruction of the DOPF will increase its capacity to process SSO and will also improve the rate at which SSO is converted into biogas. The biogas production rate of the reconstructed DOPF may be as high as 7.5 million cubic metres annually.

Since the beginning of 2010, the negotiations with Enbridge have centered primarily on the development of a financial model to assess the net financial cost and benefits to the City as well as the development of commercial terms that could form the basis of an eventual Biogas Pilot Project Agreement. The negotiations between the parties have resulted in the preparation of the commercial terms detailed in Attachment 1 to this report.

The Pilot Project will take the DOPF's biogas and refine the biogas into biomethane through Enbridge's BMS. The BMS proposed by Enbridge has four main components: (1) a biogas refining system ("BRS"), 2) gate station, 3) on-site biomethane pipeline, and 4) off-site biomethane pipeline and injection point to convey the biomethane to the Enbridge regulated gas distribution network (See Figure 1). A site plan and location plan showing the BMS and the possible locations of the off-site biomethane pipeline are provided in Attachments 3 and 4 respectively.

**Figure 1: Biomethane System**



The BRS is a self-contained modular unit. Currently the existing rate of biogas production at the DOPF warrants only a single BRS unit. Planned future reconstruction of the DOPF is expected to increase the rate of biogas production and installation a second BRS may be warranted in the future.

The biogas will be refined to Enbridge's specifications through the BRS into biomethane. The biomethane will then be piped and injected into Enbridge's natural gas distribution system. Enbridge will continuously measure the quantity of biomethane produced by the BMS and will report the information to the City.

The quantity of biomethane produced by the Pilot Project will be credited to the City which will reduce the quantity of natural gas purchased by the City. The Deputy City Manager and Chief Financial Officer and the General Manager will investigate options for funding the cost of the Biogas Pilot Project through cost savings resulting from the displacement of natural gas.

The Pilot Project will generate emission reductions by destroying methane and by displacing some of the natural gas consumed at City facilities. The City will retain ownership of all of the emission reductions produced in the Pilot Project. The emission reduction during the Pilot Project is approximately 7,135 tonnes of green house gases which will be retained by the City.

During the period of the Pilot Project, SWMS will evaluate the performance of the BMS system. At the same time, SWMS and Fleet Services will conduct an evaluation of the performance of CNG fuelled solid waste collection vehicles. Fleet Services has ordered a



CNG solid waste collection vehicle capable of using natural gas and is expected to be in service later in 2010, with two more being added in 2011.

A key condition to the Pilot Project moving forward is the granting of a lease to Enbridge. Real Estate Division staff are currently working on a report to Government Management Committee which will seek authority to enter into a lease agreement with Enbridge for the use of the space at the Dufferin Waste Management Facility.

Solid Waste Management Services has negotiated the commercial terms outlined in Attachment 1 which have been reviewed by Legal Services and will form the basis for the negotiation of Biogas Pilot Project Agreement with Enbridge for the design, construction and operation of the biogas utilization system proposed by Enbridge.

Staff recommend that negotiations with Enbridge for the Biogas Pilot Project Agreement be finalized based on these commercial terms and that an Agreement be entered into. Staff believe these terms are fair and reasonable.

The Fair Wage Office has reported that the recommended firm has indicated that it has reviewed and understands the Fair Wage Policy and Labour Trades requirements and has agreed to comply fully.

## **CONTACT**

Brian Van Opstal, M.Eng. P.Eng. Manager, Operational Planning, New Infrastructure Development & Contracted Services, Solid Waste Management Services, Telephone: 416-397-0143, Fax: 416-392-4754, E-mail: [bvanops@toronto.ca](mailto:bvanops@toronto.ca)

## **SIGNATURE**

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Geoff Rathbone  
General Manager  
Solid Waste Management Services

## **ATTACHMENTS**

Attachment 1: Commercial Terms of Biogas Pilot Project Agreement

Attachment 2: Forecasted Potential Savings

Attachment 3: Site Plan Showing the Proposed Location of the Biomethane System

Attachment 4: Location Plan Showing the Proposed Off-Site Biomethane Pipeline  
Routing and Injection Point