

**PETERBOROUGH UTILITIES INC.**

**PETERBOROUGH LFG GENERATION PROJECT**

**PROJECT DESCRIPTION REPORT**

**APRIL 2010**

*Submitted by*

**Dillon Consulting Limited  
235 Yorkland Boulevard, Suite 800  
Toronto, Ontario M2J 4Y8**

## TABLE OF CONTENTS

<b>LIST OF TABLES .....</b>	<b>II</b>
<b>1. INTRODUCTION.....</b>	<b>1</b>
1.1 GENERAL INFORMATION .....	1
<b>2. PROJECT INFORMATION.....</b>	<b>2</b>
2.1 PROJECT LOCATION.....	2
2.2 ENERGY SOURCES .....	2
2.3 PROJECT COMPONENTS .....	4
2.3.1 Gas treatment.....	4
2.3.2 Conversion from LFG to Electricity.....	5
2.3.3 Distribution of Electricity.....	5
2.4 RENEWABLE ENERGY CLASSES.....	6
2.5 PROJECT ACTIVITIES .....	6
2.6 NAMEPLATE CAPACITY .....	7
2.7 LAND OWNERSHIP.....	7
2.8 DESCRIPTION OF ENVIRONMENTAL EFFECTS.....	7
2.8.1 General.....	7
2.8.2 Heritage and Archeological Impact.....	8
2.8.3 Natural Heritage Impact.....	8
2.8.4 Impact on Water Bodies.....	8
2.8.5 Impact on Air Quality Including Odour.....	9
2.8.6 Impact on Noise Environment.....	9
2.8.7 Impact to Land Use and Surrounding Areas.....	9
2.8.8 Impact to Province and Local Infrastructure.....	9
2.8.9 Impact to Public Health and Safety.....	10
2.8.10 Impact to Protected Areas and Provincial Plans and Policies.....	10

## **LIST OF TABLES**

<b>TABLE 2.1 – TYPICAL COMPOSITION OF LFG .....</b>	<b>4</b>
<b>TABLE 2.2– KEY OPERATING UNITS .....</b>	<b>5</b>
<b>TABLE 2.3 – ENGINE GENERATOR SPECIFICATIONS – NAME PLATE CAPACITY .....</b>	<b>7</b>

## **LIST OF FIGURES**

<b>FIGURE 2.1 - SITE LOCATION – PETERBOROUGH COUNTY LANDFILL.....</b>	<b>2</b>
<b>FIGURE 2.2 - WASTE-TO-ENERGY PROJECT – FLOW DIAGRAM.....</b>	<b>3</b>

## 1. INTRODUCTION

This document describes a Landfill Gas (LFG) Generation Project under the guidelines of Technical Bulletin One “*Guidance for preparing project description report*” as part of an application under Renewable Energy Approval, O.Reg.359/09.

General information about the proposed project, including project and site description, source of renewable energy as well as brief descriptions of anticipated environmental impacts (various discipline) are provided in this Project Description Report (PDR).

### 1.1 General Information

*Project Name:*

Peterborough LFG Generation Project

*Project Description:*

The waste-to-energy project consists of two (2) LFG fueled reciprocating engine gensets with combined generating capacity of 2 MW of electricity. The proposed engines are the GE Jenbacher (Model 320) each rated at 1 MW. The LFG is collected from within the Peterborough County/City landfill and supplied to the engines via a collection and delivery pipe network. Additional flare capacity will be installed in the facility to burn excess gas.

*Project Contacts:*

Name	Title	Address	Phone	Fax	Email
John Wynsma	Applicant	1867 Ashburnham Drive, Peterborough, Ontario	705-748- 9301	705-748- 3138	JWynsma@pui.ca
Mark Tracey	FVB Energy, Energy Consultant	3901 Highway 7, Suite 300, Vaughan, Ontario	905-265- 1837 ext. 310		MTracey@fvbenergy.com
Amir Iravani	Dillon Environmental Consultant	235 Yorkland Blvd, Suite 800, Toronto, Ontario	416-229- 4647	416-418- 3561	AIravani@dillon.ca

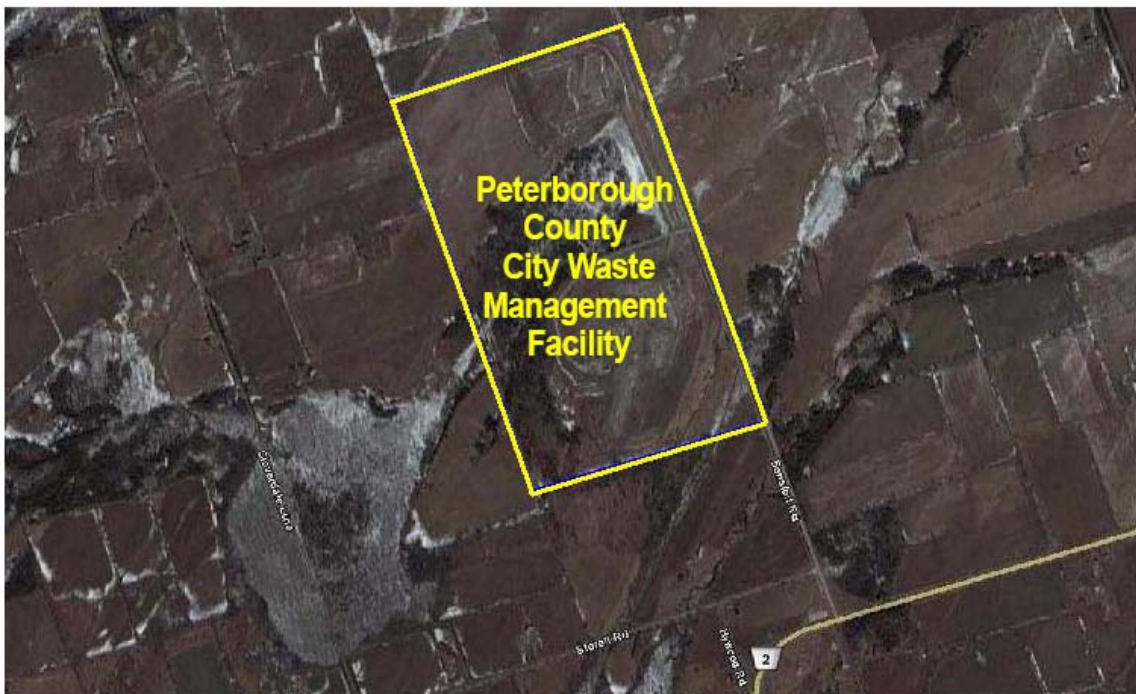
## 2. PROJECT INFORMATION

### 2.1 Project Location

The facility will be situated on approximately 0.051 ha (0.126 acres) of land located within the property boundary of a 25.7 ha (63.6 acres) landfill site located at 1310 Bensfort Road in the Township of Otonabee-South Monaghan, Ontario. The facility complies with the Township's Official Plans. The location of the Peterborough County/City Waste Management Facility is shown in Figure 2.1, below.

**FIGURE 2.1 - SITE LOCATION – PETERBOROUGH COUNTY LANDFILL**

#### PETERBOROUGH, ONTARIO



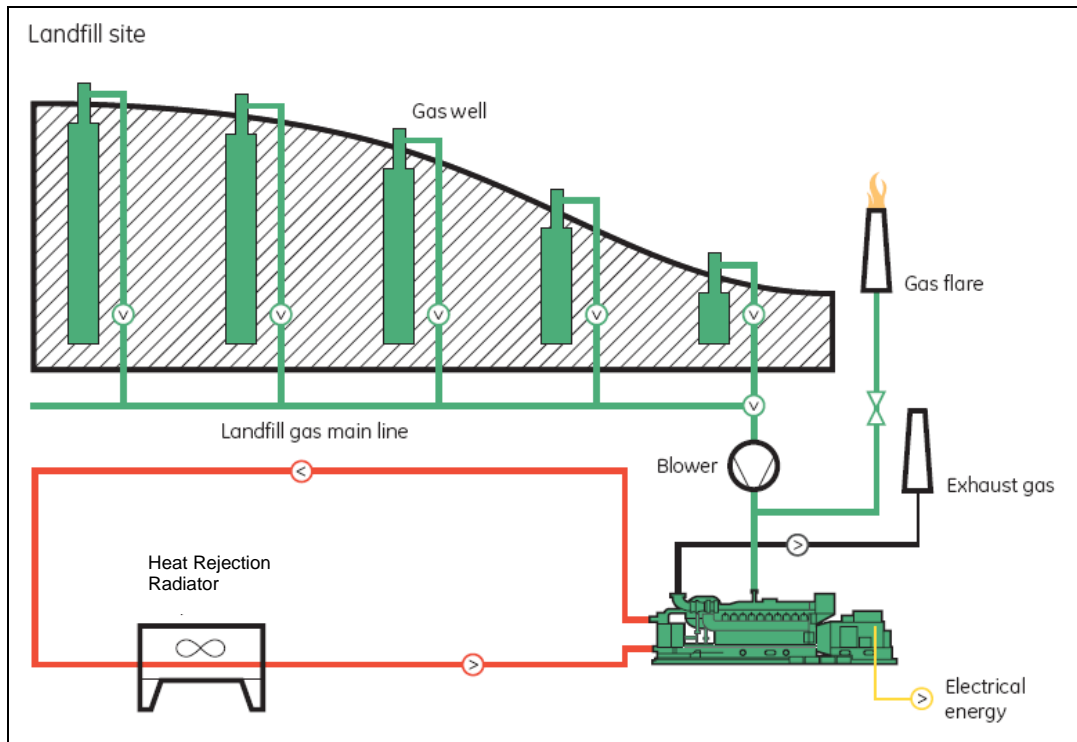
### 2.2 Energy Sources

The primary fuel source for the proposed project is LFG. It supplies the engines that will convert the LFG into useful energy in the form of electricity. LFG is a gas produced from three basic processes that occur in a landfill. Most of the gas is produced from bacterial decomposition of organic waste such as food and garden wastes, wood, paper, street cleanings and textiles. Volatilization is another process that produces gas from the organic wastes converting from a liquid or solid to a gas. There are also chemical reactions that take place in the landfill when certain chemicals come in contact with each other.

Currently, a portion of the LFG is collected and burned in a flare to reduce odours on the site and to reduce the contribution towards greenhouse gases. The current flare is not sized to collect all the gas produced and some LFG is released to the environment. With the addition of the generation

facility the goal will be to collect as much LFG as possible and convert it to electricity. A schematic flow diagram of waste-to-energy from LFG is presented in Figure 2.2, below.

**FIGURE 2.2 - WASTE-TO-ENERGY PROJECT – FLOW DIAGRAM**



Source: GE Jenbacher GmbH & Co OHG, 2008

Additional flare capacity will be installed in the generation facility so most of the LFG produced will be burned when the engines are down for maintenance. During times of maintenance or shut down, a small amount of electricity would be purchased from the local power distribution grid to operate equipment.

The typical composition of LFG is shown in Table 2.1, below.

**TABLE 2.1 – TYPICAL COMPOSITION OF LFG**

Component	Percent by Volume	Characteristics
Methane	45-60	Methane is a naturally occurring gas. It is colourless and odourless. Landfills are the large source of man-made methane emissions.
Carbon Dioxide	40-60	Carbon dioxide is naturally found at small concentrations in the atmosphere (0.03%). It is colourless, odourless, and slightly acidic.
NMOCs (non-methane organic compounds)		NMOCs are organic compounds that may occur naturally or formed by synthetic chemical processes. NMOCs most commonly found in landfills include acrylonitrile, benzene, 1,1-dichloromethane, carbonyl sulfide, ethylbenzene, hexane, methyl ethyl ketone, tetrachloroethylene, toluene, trichloroethylene, vinyl chloride, and xylenes.
Sulfides	<1%	Sulfides are naturally occurring gases that give the LFG mixture its rotten-egg smell. Sulfides can cause unpleasant odours even at very low concentrations.
Hydrogen	<0.2%	Hydrogen is an odourless, colorless gas.
Carbon Monoxide	<0.2%	Carbon monoxide is an odourless, colorless gas.

## 2.3 Project Components

The main components of the proposed generation facility include, gas treatment, conversion from LFG to electricity and distribution of electricity. These components are described in more detail in the following sub-sections.

### 2.3.1 Gas treatment

The LFG must be treated prior to combustion in the engines. The untreated gas would reduce the life of the engines and increase operating costs. Required treatment of the LFG will depend on the gas composition but the following are the most common:

- a. Gas Condenser/Cooler – This is a mandatory treatment that removes moisture from the gas stream.
- b. TSA – This treatment lowers the concentrations of siloxanes in the LFG. Initial testing indicates the siloxanes are low enough such that TSA treatment is not required. Provision will be made on the generation site in the event that levels change over time and this treatment must be added.
- c. H<sub>2</sub>S Removal – This treatment lowers the levels of H<sub>2</sub>S in the LFG. Initial testing indicates the H<sub>2</sub>S levels are low enough such that treatment for H<sub>2</sub>S is not required. Again, provisions will be made on the generation site in case the levels change over time and this treatment must be added.

### 2.3.2 Conversion from LFG to Electricity

The LFG is converted to electricity through combustion in high efficiency reciprocating engines that are designed to burn low Btu gas. The engines are directly coupled to a generator that will produce electricity at 600V.

### 2.3.3 Distribution of Electricity

The engine gensets are connected to a 600V bus using the generator breakers. Electrical energy, net of electricity used for station services, is stepped up to the utility voltage of 27.6 kV. Station service supplies power to auxiliary loads on genset, gas treatment system, flare system and LFG blowers. The high voltage side of the transformer is connected to the 27.6 kV utility line through a fused disconnect switch. A short length of new 27.6 kV line will be constructed on the landfill site and will connect the generating facility to the Hydro One’s existing distribution system, upgraded to 27.6 kV line voltage.

Detailed description of key operating units and their expected operating schedules are summarized in table 2.2, below.

**TABLE 2.2– KEY OPERATING UNITS**

	<b>Generator Sets</b>
<b>Schedule</b>	24 hours per day, 7 days per week
<b>Description</b>	Two (2) LFG-fuelled GE Jenbacher Type 3 Generator Sets (Model 320) with a nominal output of 1063 kW each. Emissions from each genset discharge through a stack that is 0.5 m in diameter, that stands 8.5 m above grade. Each engine is cooled via 8 fin-fan coolers.
	<b>LFG Blower system</b>
<b>Schedule</b>	24 hours per day, 7 days per week
<b>Description</b>	Two regenerative LFG blower systems ROTRON® Model DR909 will be installed to extract LFG and direct it to the generator sets. Only one blower will be operating at any given time (second blower is for back-up). The blower is cooled with two fin-fan coolers.
	<b>Step-up Transformer</b>
<b>Schedule</b>	24 hours per day, 7 days per week
<b>Description</b>	A Step-up transformer will connect power generated at the plant to the grid, at 27.6 kV.
	<b>LFG Flare system</b>
<b>Schedule</b>	When excess gas is generated that cannot be used by the generator sets OR when the generator sets are being maintained / repaired
<b>Description</b>	One (1) new flare used to combust excess LFG not used in the LFG gensets and during gen-set maintenance periods. The flare has the capacity to handle 500 CFM of LFG. Emissions discharge from the flare through a stack that is 1.52 m in diameter, standing 12.2 m above grade.

## 2.4 Renewable Energy Classes

The proposed project is a “biogas facility” as per the interpretation provided in Part I of O.Reg. 359/09 (i.e. “a renewable energy generation facility at which biogas is used to generate electricity but does not include an anaerobic digestion facility”). There are no specific classes assigned to this type of facility under O. Reg. 359/09.

## 2.5 Project Activities

Project activities for the construction, operation and decommissioning phases are summarized below.

### *Construction Phase*

The waste-to-energy facility is located on an existing landfill site that has the road infrastructure needed to serve the site during the construction and operational phase. The key construction activities involved in the project are:

- a. Prepare site base appropriate for equipment slab foundations.
- b. Install fencing (site security).
- c. Install underground LFG line and leachate line from facility to tie point approximately 100 feet away.
- d. Pour slab foundations for the equipment modules and electrical equipment.
- e. Install the following equipment components:
  - Gas treatment module(s)
  - Two genset modules
  - Electrical room module.
  - Flare blower skid
  - LFG flare
  - 600V / 27.6 kV step-up transformer
  - Fused 27.6 kV isolating switch
  - Drop from 27.6 kV utility pole.
- f. Interconnect wiring and piping between skids.
- g. Adjust site to final grade.
- h. Testing and commissioning of systems / equipment.

It is expected that the construction phase would start in spring of 2011 and will continue for a duration of 6 to 9 months.

### *Operation Phase*

The LFG generated at the landfill is expected to keep the gensets at baseload (nameplate output) for all operation hours. The availability of the engines should be 95 percent or better. A LFG flare will burn any excess gas that is available when the gensets are running or off-line. During genset operation, the gas treatment system will extract moisture in the LFG and dispose of it through a leachate drain that will be connected to the existing leachate collection system. The leachate generated on site is pumped and treated in a waste water treatment plant.

The maintenance required for the facility consists of the following:

- a. Annual preventative maintenance on 600V switchgear, replace filters, general lubrication, small motor PM, etc.
- b. Engine top-end overhaul every 30,000 hours (every 4 years).
- c. Engine major overhaul every 60,000 hours (every 8 years).

The facility will be unmanned but an operator will visit the site regularly to inspect and maintain the facility and to respond to any facility alarms or outages. The control system will be equipped with a pager system to notify the operator in charge of any problems, and the facility will be monitoring 24 x 7 at the Peterborough Utilities' operations control center.

### ***Decommissioning***

The decommissioning of site will involve the removal of all equipment listed above as well as demolition of the foundations, disconnection of underground gas lines and overhead power line, and removal of site fencing. The subject site will be reinstated to conditions similar to its landfill surroundings.

## **2.6 Nameplate Capacity**

The make, model and nameplate ratings of the proposed engine-generators are summarized in Table 2.3, below.

**TABLE 2.3 – ENGINE GENERATOR SPECIFICATIONS – NAME PLATE CAPACITY**

	<b>Engine-Generator 1</b>	<b>Engine-Generator 2</b>
Engine Manufacturer	GE Jenbacher	GE Jenbacher
Engine Model No.	JGS 320	JGS 320
Nameplate Rating (kW)	1059	1059
Generator Manufacturer	Stamford	Stamford
Generator Model No.	PE 73482	PE 73482

## **2.7 Land Ownership**

The land for the proposed generation facility will be leased from the landfill owner – The City and County of Peterborough.

## **2.8 Description of Environmental Effects**

### **2.8.1 General**

The proposed waste-to-energy project will generally reduce environmental impact in two folds, (1) by capturing and combusting LFG, the facility will reduce emissions of Greenhouse Gases (GHGs)

such as methane (CH<sub>4</sub>) as well as air contaminants and will reduce odorous emissions from the landfill; (2) through generation of power from waste the facility will displace approximately 2 MW of electricity that otherwise had to be potentially generated by fossil fuel burning or non-renewable power plants. A further benefit of the project is that jobs will be created during construction.

These effects and those described below are based on a preliminary analysis. These will be updated and refined through the Renewable Energy Assessment (“REA”) process.

### **2.8.2 Heritage and Archeological Impact**

As indicated above, the site for the proposed project is located within the property boundary of Peterborough County/City Waster Management Facility and based on work completed for the Environmental Assessment of the landfill, no heritage or archeological impact is anticipated. This will be verified during the REA process.

### **2.8.3 Natural Heritage Impact**

The main natural heritage features surrounding the site are coniferous and mixed forest/wetland communities to the north and west, and the deciduous forest/wetland communities to the south. The wetland feature in proximity to the active landfill areas is the Crystal Springs non-provincially significant wetland. Hydrogeological investigation of this wetland feature indicates that it is principally a groundwater discharge point. A cedar-hemlock organic swamp vegetation community located within the Crystal Springs Wetland and several hundred metres from the North and South Fill Areas is considered to be provincially rare to uncommon.

Previous inventories of the local natural heritage attributes surrounding the active landfill areas revealed that there are no federal or provincial species at risk on or immediately adjacent to the landfill property. Similarly, the flora or fauna species documented on the site are not regionally rare or uncommon.

The natural heritage features documented in proximity to the landfill are outside of the lands in use by the *active* landfill operation. Future works are proposed to take place within the existing footprint of the landfill and will not encroach into adjacent natural heritage features. Further, the water budget in the Crystal Springs Wetland is expected to be unaffected by the proposed infrastructure both during the construction and operational phases of the project. Access to the construction site will occur on existing roads and staging will take place within the landfill property. As a result, it is not anticipated that vegetation removal will be required for the construction of this project and wildlife disturbance should be minimal.

### **2.8.4 Impact on Water Bodies**

A small watercourse has been identified on the south-eastern corner of the Peterborough landfill site. The proposed works are well removed from this watercourse and will take place within the area of existing infrastructure. As a result, it is not anticipated that this work will have impacts on the watercourse. In order to protect the watercourse from impacts, best management practices such as erosion and sediment control measures should be included in the design. These measures may include isolation of the active construction site from the watercourse and the preparation of a dewatering/pumping plan to deal with water that may accumulate in the construction area into the established storm water management pond.

### **2.8.5 Impact on Air Quality Including Odour**

An Emission Summary Dispersion Modelling (ESDM) Report has been completed in accordance with s.26 of O. Reg. 419/05. The project is subject to s.18 of O. Reg. 419/05 and emissions from the proposed project were modelled using the Ontario Ministry of the Environment (MOE) model in the Appendix to O. Reg. 346. A total of 11 contaminants were identified with only 5 of them having regulatory limits on Ontario. The predicted Point of Impingement (POI) concentrations were below the corresponding limits. The maximum predicted concentration of nitrogen oxides (NOx) was predicted at approximately 24% of the limit (based on MOE ½-hour criterion for NOx).

As described previously the scope of this project is to add a generation facility to the existing LFG collection system which utilizes a flare, and provide a secondary flare. It is expected that the generation system will result in a reduction in the existing odours emitted by the landfill site through the enhanced collection of LFG, treatment of the gas, the more efficient combustion of the LFG, and more reliable utilization of the gas (generation and redundant flares). An Odour Study will be conducted for this application, as per the requirements of O.Reg. 359/09. The potential for the project to result in odour impacts at the nearest sensitive receptor(s) will be evaluated using air dispersion modeling techniques (i.e., US EPA AERMOD Dispersion Model). The study will utilize the methodologies, techniques and frameworks described in the following MOE documents: Air Dispersion Modelling Guideline for Ontario, V.2.0, Proposed Revisions to Odour-based Ambient Air Quality Criteria and Development of an Odour Policy Framework – A Position Paper and Proposed Approach to the Implementation of Odour-based Standards and Guidelines.

No dust emissions are anticipated from the proposed facility during operation.

### **2.8.6 Impact on Noise Environment**

A comprehensive noise impact assessment was completed based on noise modelling under the worst-case noise emission scenario at the landfill. The noise impact assessment assumed a worst-case noise emission scenario and included the implementation of noise mitigation measures to achieve compliance with corresponding minimum performance limit for a Class 3 Area. The results of the noise impact assessment indicate that the waste-to-energy project will be in compliance with applicable MOE noise requirements at all times.

### **2.8.7 Impact to Land Use and Surrounding Areas**

As noted, the project will be constructed on an existing landfill and the proposed use complies with the Township's Official Plan. Local residents with a view of the site may experience a visual impact from the new facilities but these would be minor given the current use of the site. Short term construction impacts may also result from increased road traffic, noise and dust, but long term effects are not expected.

### **2.8.8 Impact to Province and Local Infrastructure**

Local and provincial roads may experience additional wear from heavy construction loads. Hydro One's existing distribution line along Bensfort Road will be upgraded to 27.6 kV line voltage. This may result in some temporary power outages to local customers and periodic traffic disruptions along Bensfort Road during the construction phase of the project. Connection to the provincial grid

has been considered under the FIT program and no negative effects are predicted during the operational phase of the project.

### **2.8.9 Impact to Public Health and Safety**

The generating station and step-up transformer area will be fenced to prevent unauthorized access and to ensure public safety during construction and operation phases. Applicable OHSA, PUI and Hydro One safety policies and procedures will be adhered to during the construction phase of the project for work undertaken within the project site and along distribution line right-of-ways. Appropriate signage, flagging and other safety measures will be taken to notify the public and ensure public safety.

The project will result in the release of fewer greenhouse gas and odourous emission from the landfill into the atmosphere. The project will also produce approximately 2 MW of power, reducing our reliance on non-renewable sources of energy and further offsetting greenhouse gas emissions from fossil based generators. No public health and safety issues are expected.

### **2.8.10 Impact to Protected Areas and Provincial Plans and Policies**

No protected areas or provincial plans are expected to be impacted by the proposal. The project supports the goals of the Province's *Green Energy and Green Economy Act, 2009*.