



Enviro-access

VERIFICATION REPORT (2011)

Highway 101 Landfill Gas Capture Project

By:

ENVIRO-ACCESS INC.

85, Belvédère Street North (Suite 150)
Sherbrooke (Québec) J1H 4A7
Tel.: (819) 823-2230
Fax: (819) 823-6632
www.EnviroAccess.ca

For:

HALIFAX RENEWABLE ENERGY CORPORATION

1600, Bedford Highway (Suite 100/218)
Bedford (Nova Scotia) B4A 1E8
Tel.: (902) 864-1567
Fax: (902) 864-6509

Version 1.2 — April 26, 2012

VERIFICATION STATEMENT

April 26, 2012

To the Management of:

HALIFAX RENEWABLE ENERGY CORPORATION

1600, Bedford Highway (Suite 100/218)
Bedford (Nova Scotia) B4A 1E8

ENVIRO-ACCESS has been retained by Halifax Renewable Energy Corporation (HREC) to verify, as an independent third party, the greenhouse gas assertion for emissions reductions prepared by *3P Analysis and Consulting* and dated April 23, 2012, entitled “**Greenhouse Gas Quantification Report 2011 — Highway 101 Landfill Gas Capture Project**” for the period from January 1, 2011 to December 31, 2011. HREC is the project proponent for the above mentioned GHG project. The total quantity of GHG reductions reported for this period is 50,736 tCO₂e.

The verification was conducted in accordance with *ISO 14064-3:2006 – Specification with guidance for the validation and verification of greenhouse gas assertions* in order to provide a reasonable level of assurance. The verification objectives were to verify the conformance with the requirements of ISO 14064-2, to assess GHG project's actual controls and to assess the accuracy of the GHG emission reductions calculations in the GHG report and assertion. The requirements of ISO 14064-2 and those specified in an agreement between HREC and the purchaser of emission reductions (Agreement), selected principles and requirements of the “Quantification Protocol for Landfill Gas Capture and Combustion (Version 1 - September 2007)” of the Alberta’s *Specified Gas Emitters Regulation* and sufficient control mechanisms to ensure an impartial presentation and the accuracy of the data used to calculate the GHG emissions reductions were the criteria for this verification.

The scope of the verification was, for the Project, the landfill gas capture and combustion for the production of renewable energy (electricity) at the Highway 101 landfill in Nova Scotia, including all necessary equipment and instrumentation and processes. The baseline scenario is the emission of all the landfill gas to the atmosphere. The verification team performed a documentation review and a site visit and used the following techniques and processes: review of calculations, interviews with HREC’s personnel and the purchaser of emissions reductions, assessment of the application of the monitoring plan and adequate maintenance of the equipment, crosschecking of data. The following GHG information has been verified: raw data used for calculation of emission reductions as well as results of calculation, evidence of the application of the monitoring plan and of adequate maintenance of the equipment. This information was historical by nature.

Based upon verifiable evidence, ENVIRO-ACCESS concludes that the information provided is true, accurate and supported. No significant errors, omissions or misrepresentations were identified and HREC’s greenhouse gas assertion meets all the verification criteria.

ENVIRO-ACCESS INC.
Manon Laporte, B.Sc., M.B.A.
President and CEO



TABLE OF CONTENTS

VERIFICATION STATEMENT

SECTION 1 INTRODUCTION	2
SECTION 2 VERIFICATION DETAILS	3
2.1 Roles and responsibilities	4
SECTION 3 METHODOLOGY	6
3.1 Review of documentation and site visits	6
3.2 Resolution of Clarification and Corrective Action Requests	6
SECTION 4 VERIFICATION FINDINGS.....	8
4.1 Remaining Issues, CARs and FARs From Last Verification	8
4.1.1 Calculation methodology	8
4.1.2 Raw Data Transfer.....	8
4.2 Project Implementation and eligibility to GHG programme	9
4.3 Baseline Scenario Justification and Identification of SSRs	9
4.4 Operational and Control Procedures.....	9
4.4.1 Maintenance of equipment	9
4.4.2 Operational parameters	9
4.5 GHG Information Management System.....	10
4.6 GHG data and information	10
4.6.1 Completeness of monitoring	10
4.6.2 Electricity generation	10
4.6.3 Accuracy of Emission Calculations.....	10
4.7 Quality of Evidence to Determine GHG Emission.....	11
4.8 Verification Records.....	11
4.9 Facts discovered after the verification.....	11
TABLE 2-1: VERIFICATION DETAILS	3
TABLE 2-2: PERSONNEL INVOLVED IN THE PROJECT	5

INTRODUCTION

ENVIRO-ACCESS was retained by Halifax Renewable Energy Corporation (HREC) to verify the greenhouse gas (GHG) emissions reductions for the “Highway 101 Landfill Gas Capture Project” (Project). The verification has been conducted in accordance with the principles and guidelines of *ISO 14064-3:2006 – Specification with guidance for the validation and verification of greenhouse gas assertions*. The Project started on November 1, 2006 (effective date) and is the result of a five-year (2008-2012) mutual agreement (Agreement) between Halifax Renewable Energy Corporation (HREC) and Nova Scotia Power Incorporated (NSPI), the purchaser of the emission reductions. The Project is implemented at the landfill site located at 1600 Bedford Highway (Suite 100/218) in Bedford, Nova Scotia.

The Project consists of capturing landfill gas (LFG) to produce renewable energy (electricity) using two generators. Equipment related to the Project includes wells, a network of pipes to transport the collected gas and a power plant located at the eastern edge of the landfill. A back-up flare is also available if necessary when the power plant is down for a long time. Measurement equipment and data logging system are used to record the LFG flow rate and methane concentration. A control system is also used to record information about each engine’s performance and electricity production.

The Project is registered on the CSA’s “GHG CleanProjects™ Registry” under the project identifier 5047-3414. The Project has been verified for three previous time periods, that is from January 1, 2008 to December 31, 2008 by *Bureau de Normalisation du Québec (BNQ)*, and from January 1, 2009 to December 31, 2009 and January 1, 2010 to December 31, 2010 by ENVIRO-ACCESS.

SECTION 1 VERIFICATION DETAILS

Details of the verification are summarized in the Table 2-1 below.

Table 1-1: Verification details

Organization	Halifax Renewable Energy Corporation (H.R.E.C.)
Title of project	Highway 101 Landfill Gas Capture Project (period 2011)
Objectives	<ol style="list-style-type: none"> 1. Conformance with applicable verification criteria within the scope of verification 2. Assessment of GHG project's actual controls 3. Assessment of the accuracy of the GHG emission reductions calculations in the GHG report and assertion
Criteria	<ol style="list-style-type: none"> 1. Requirements specified in the Agreement 2. Selected principles and requirements of the "Quantification Protocol for Landfill Gas Capture and Combustion (Version 1 - September 2007)" of the Alberta's <i>Specified Gas Emitters Regulation</i> (selected parts of the protocol were not used in the project document) <ul style="list-style-type: none"> ✓ There were a number of sources, sinks and reservoirs (SSRs) in the protocol that were not included in the project because the data was either unavailable or the SSR was not applicable (e.g. the SSR for distribution of thermal energy was unnecessary because all the heat from the combustion of the methane is used only to drive the engine generators and is not used in any other process; ✓ The formulas used in the quantification were taken from the mutual agreement; ✓ There was not a formal monitoring plan as the landfill gas (LFG) data logging system was already in place. 3. Sufficient control mechanisms to ensure an impartial presentation and the accuracy of the data used to calculate the GHG emissions reductions
Level of assurance	Reasonable
Scope	<ul style="list-style-type: none"> ➤ <u>Baseline scenario:</u> <ul style="list-style-type: none"> ✓ All of the LFG is emitted to the atmosphere (no capture and flare system in place) ➤ <u>GHG Project:</u> <ul style="list-style-type: none"> ✓ Capture and combustion of the LFG for the production of renewable energy (electricity) ➤ <u>Physical infrastructure, activities, technologies and processes of the GHG project:</u> <ul style="list-style-type: none"> ✓ Collection wells, network of pipes, blower, compressor, reciprocating engines for electricity generation, flare, measurement equipment (flowmeter, gas analyzer) ➤ <u>Sources, sinks, reservoirs:</u> <ul style="list-style-type: none"> ✓ Landfill gas recovery system operation ✓ Processing of LFG

	<ul style="list-style-type: none"> ✓ Onsite co-generationsSystem ✓ Flaring ✓ Net electricity production/usage (GHG emissions reductions for non-renewable electricity displacement by renewable electricity produced by HREC are not accounted in the Project) <p>⇒ <u>Types of GHG included:</u></p> <ul style="list-style-type: none"> ✓ CO₂ ✓ CH₄ <p>⇒ <u>Time period:</u></p> <ul style="list-style-type: none"> ✓ From January 1st, 2011 to December 31st, 2011 <p>⇒ <u>Relative size (in CO_{2eq}) of the GHG Project:</u></p> <ul style="list-style-type: none"> ✓ 50 000 tCO_{2e} <p>⇒ <u>Methodology used for verification:</u></p> <ul style="list-style-type: none"> ✓ ISO 14064-3:2006 – Specification with guidance for the validation and verification of greenhouse gas assertions
Materiality	<p>⇒ <u>Qualitative:</u> Verifier's professional judgement</p> <p>⇒ <u>Quantitative:</u> 5 % threshold on GHG emissions reductions calculations (aggregate or disaggregate) or any discrepancy</p>

1.1 ROLES AND RESPONSIBILITIES

Verification body

ENVIRO-ACCESS is accredited according to *ISO 14065:2007* with the Standards Council of Canada under the “Greenhouse Gas Accreditation Program (GHGAP)”¹ for the scope “Waste Handling and Disposal”, which include landfill facilities. The verification team member(s) were appointed according to their skills and ability to perform verification activities. The verification team was composed of only one member:

Mr. Dominic Beaulieu, eng., GHG-V

85, Belvédère Street North, suite 150

Sherbrooke (Québec) J1H 4A7

T. (819) 823-2230

F. (819) 823-6632

dbeaulieu@enviroaccess.ca

The independent review was conducted by:

Mr. François Roberge, eng., M.A.Sc., GHG-V, GHG-IQ

225, av. du Président-Kennedy, local 2150

Montréal (Québec) H2X 3Y8

T. (514) 284-5794

F. (514) 284-6034

froberge@enviroAccess.ca

¹ <http://www.scc.ca/en/programs-services/ghg>

An impartiality risk assessment was also performed to evaluate conflicts of interest (real and potential) and to manage them according to an internal procedure. No conflict of interests was identified for this mandate.

Project proponent

The table below presents the people involved in the project management, their respective role(s) and contact information.

Table 1-2: Personnel involved in the project

Name	Role / Responsibility	Coordinates
David McLennan <i>(HREC)</i>	Project Proponent	1600, Bedford Highway Suite 100-218 Bedford (Nova Scotia) B4A 1E8 Tel: (902) 864-1567 Fax: (902) 864-6509 DBM@Highland-Energy.com
Les Carroll <i>(HREC)</i>	Operations Manager	1600, Bedford Highway Suite 100-218 Bedford (Nova Scotia) B4A 1E8 Tel: (902) 864-1567 Fax: (902) 864-6509
Ileana de la Teja <i>(HREC)</i>	Data Collection and Handling	1600, Bedford Highway Suite 100-218 Bedford (Nova Scotia) B4A 1E8 Tel: (902) 864-1567 Fax: (902) 864-6509
Evans Jones <i>(3P Analysis and Consulting)</i>	Assistance in the Preparation of GHG Report (GHG consultant)	78 Balmoral Drive Guelph (Ontario) N1E 3N6 Tel: (519) 763-6967 Evan.Jones@eajonesque.com

SECTION 2 METHODOLOGY

2.1 REVIEW OF DOCUMENTATION AND SITE VISITS

During the desk review all relevant documents for the verification initially provided by the client and publicly available were reviewed. The main documents are listed below:

- ✓ GHG report and assertion (“Greenhouse Gas Quantification Report 2011 — Highway 101 Landfill Gas Capture Project”)
- ✓ Raw data and GHG emission reductions calculation (“LFGCalculator2011v1”)
- ✓ Verification report for the last period (“VERRPRT_HREQ 2010 FINAL v.2.2”)
- ✓ Procedures regarding the measurement, calibration and data handling of the GHG information (“Greenhouse Gas Procedures — Highway 101 Landfill Gas Capture Project”)
- ✓ Mutual agreement between HREC and Nova Scotia Power Incorporated (NSPI) (“Emission Reduction Benefit Supply Agreement”)
- ✓ The GHG project plan (“Greenhouse Gas Project Plan — Highway 101 Landfill Gas Capture Project”)

An on-site visit has been performed on January 24, 2012. The main focus of the visit was to verify the raw data used for calculation of GHG emission reductions as well as all GHG information and information system controls. Mr. Dominic Beaulieu conducted these verification activities.

The site’s strategic areas were visited. They include the measurement and data logging equipment, the office where all test results and logs are kept and the generators of the power plant.

The following persons were present throughout the visit and were interviewed by the verifier:

- ✓ David McLennan, project proponent;
- ✓ Les Carroll, project operations manager;
- ✓ Ileana De la Teja, in charge of data collection and handling.

Elements of discussion between the Project’s personnel and the verifier included control mechanisms and data collection and handling.

2.2 RESOLUTION OF CLARIFICATION AND CORRECTIVE ACTION REQUESTS

The objective of these verification activities was to resolve the requests for clarification or corrective actions and any other issues which needed to be clarified for Enviro-access’ positive conclusion on the GHG assertion. A Clarification Request (CL) is a request made by Enviro-access to the project participants during verification if the information provided is insufficient or unclear. A Corrective Action Request (CAR) is a request raised by Enviro-access when material discrepancies are found or if Forward Action Requests (FARs) raised in last verification have not been resolved. A Forward

Action Request (FAR) is a request made by Enviro-access to be dealt with at the next verification period.

Quality and accuracy of the data and documents presented during the on-site visit was high. To guarantee the transparency of the verification process, the CLs, CARs and FARs raised and responses that were submitted to HREC are documented in more detail in section 4 below.

SECTION 3 VERIFICATION FINDINGS

In the following sections, the findings of the verification and the conclusions as to whether all the verification criteria were met are stated. No clarification requests or corrective action requests were raised for this verification.

3.1 REMAINING ISSUES, CARs AND FARs FROM LAST VERIFICATION

Remaining issues from the previous verifications were discussed with the project proponent to assess how they were addressed. The verification report for the preceding period contained two FARs.

3.1.1 Calculation methodology

***FAR #1 – HREC2010:** Despite the conclusion of the verification team, Enviro-access recommends to review the calculation methodology in order to obtain a conservative result for the GHG emission reductions calculation.*

The calculation methodology was not revised by HREC for the period 2011. Although the methodology was not reviewed, the error in the quantification of the GHG emission reductions is not material.

***FAR #2 – HREC2010:** Despite the conclusion of the verification team, Enviro-access recommends that HREC provides objective evidence that the purchaser of emission reductions is aware and approves the calculation methodology used for the GHG emission reductions calculation.*

The last verification report contained a FAR concerning the calculation methodology. The calculation methodology used by HREC was not in conformance with what was found in the Agreement. It is to be noted that this discrepancy is not material and that it does not affect the result of the GHG emissions reductions calculations.

The verifier concludes that the calculation methodology is appropriate and that it causes no significant error in the calculation of GHG emission reductions. Therefore, the FAR #2 is closed.

3.1.2 Raw Data Transfer

The verification report for the last verification period noted that the raw data transfer frequency could be further increased by installing a device for reading, transferring and recording data from the data logger continuously on his computer. Such a device was not yet operational at the time of the site visit. However, the installation was on going and the device should be operational by the end of January 2012.

Since the installation of this device is only an improvement since last verification, the verifier concludes that the frequency of raw data transfer is acceptable and in conformance with what is stated in the “Greenhouse Gas Procedures”.

3.2 PROJECT IMPLEMENTATION AND ELIGIBILITY TO GHG PROGRAMME

The project implementation has been verified in the last verification. This element remains unchanged for this verification period.

Although the Project is registered on the CSA's "GHG CleanProjects Registry", it is not registered under any GHG programme, but is the result of a mutual agreement.

3.3 BASELINE SCENARIO JUSTIFICATION AND IDENTIFICATION OF SSRs

The baseline scenario justification and identification of SSRs have been verified in the last verification. This element remains unchanged for this verification period.

3.4 OPERATIONAL AND CONTROL PROCEDURES

3.4.1 Maintenance of equipment

Evidence of the application of the maintenance program for the equipment (generators and others) were provided by HREC. Also, calibration reports for the calibration of the measuring equipment (flowmeter and gas analyzer) were provided. The following evidence were provided to the verifier:

- Service sheets
- Daily engine check sheets
- Production sheets

The verification team concludes that maintenance and operation of the LFG collection equipment and associated instrumentation is adequate and monitored properly.

3.4.2 Operational parameters

Operations parameters were verified to make sure that the generators were operating in the range of operational parameters specified by the manufacturer.

In the technical description of the generators, the three following technical data are given **for one unit**:

- Fuel Gas LHV: 918.35 Btu/ft³
- Energy Input (@Full load): 10.678 MBtu/hr
- Gas Volume (@Full load): 11,627 SCFH

The energy input has been calculated by the verifier for all data of the verification period covered were lower than the energy input rated by the manufacturer. The highest value is for November 18, 2011 (15.8 MBtu/hr).

The verifier concludes that the generators were operated inside the range of operational parameters specified by the manufacturer for energy input.

3.5 GHG INFORMATION MANAGEMENT SYSTEM

The monitoring of operational parameters is detailed in the “GHG Quantification Report 2010”. The application of this monitoring program has been verified and the verifier concludes that it was conducted in conformance with what is described in the GHG report.

The same person as last verification period is responsible for all of the data collection and handling: Ms. Ileana de la Teja. The verification team member accompanied Ms. de la Teja during a typical transfer of data from the data logger to the laptop computer, as described in the section “Handling of Data Logger Information” of the “Greenhouse Gas Procedures”.

The verifier concludes that the handling of data logger information is in compliance with what is stated in the “Greenhouse Gas Procedures”.

3.6 GHG DATA AND INFORMATION

3.6.1 Completeness of monitoring

A representative sample of the data presented in the GHG report was intersected with the data recorder on-site. Thus, 192 data provided in the “LFGCalculator2011v1” were compared with those present in the recorder. Of all the cross-checked data, there was no discrepancy between the data logger and those contained in the “LFGCalculator2011v1”.

The verification team concludes that the monitored data were complete and no discrepancies were found between raw data and the data used to calculate GHG emission reductions.

3.6.2 Electricity generation

In order to assess that the LFG is destroyed by the generators, the theoretical amount of electricity produced was calculated and compared with the amount of electricity produced by the Project and billed to the purchaser of emission reductions. The result of the calculation performed by the verifier is of the same order of magnitude of the electricity produced by the Project.

The verifier concludes that the LFG, i.e. the methane, collected was actually destroyed by the generators of the Project.

3.6.3 Accuracy of Emission Calculations

All calculations of “LFGCalculator2011v1” were assessed by the verifier to ensure the spreadsheet did not contain discrepancies and thus, the GHG emission reductions calculation stated in the GHG assertion is accurate.

In the sheet “Methane destroyed”, data in the column for “Volume of Landfill Gas Delivered at 1 atmospheric pressure (m³)” did not correspond to the results calculated in sheet “CH₄ Flow data” (based on raw data) for three months. The error for this discrepancy is 0.3 % which is under the materiality threshold. In addition, these values

are not used to quantify the GHG emission reductions of the Project. The verifier concludes that this discrepancy is not material.

3.7 QUALITY OF EVIDENCE TO DETERMINE GHG EMISSION

The objective evidence provided to the verification team by HREC is sufficient, complete and credible. HREC's personnel were transparent and had a cooperative attitude throughout the verification activities.

3.8 VERIFICATION RECORDS

All documents provided initially by HREC or collected in the course of verification activities (copies, pictures, questionnaires, electronic files, correspondence) are stored in electronic format on a server with secure access or in a folder with restricted access only if a hard copy is available. All these documents will be retained for a minimum of ten (10) years.

The verification records can be provided upon request on reasonable grounds with the permission of HREC.

3.9 FACTS DISCOVERED AFTER THE VERIFICATION

If significant discrepancies are discovered after the verification, Enviro-access, HREC and the purchaser of the emission reductions shall be notified. Where appropriate, the verification report, the GHG assertion as well as the GHG report will be rectified and the update will be provided.