AMERESCO
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Prepared for:

Ottawa Valley Waste Recycling Centre
Energy Assessment Report

February, 2011

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Executive Summary

Ameresco is pleased to provide an Energy Assessment Report for the Ottawa Valley Waste Recycling Centre buildings located near Pembroke, Ontario. This energy assessment identifies the investment required, savings and revenue opportunities that would be expected from a comprehensive approach to implementing such a program as well as opportunities involving the Ontario Solar FIT program and landfill gas reclamation.

A summary of the Ameresco program highlights include;

- An annual utility savings stream of $ 7,523
- An overall energy performance index improvement of 4.4%
- The program measures will mean an investment of $ 33,300
- Solar PV opportunities
- Landfill gas discussion

The recommended program of energy efficiency measures are summarised as follows.

Measure	Total Cost	Total Savings or Revenue	Simple Payback
Lighting Retrofit	$ 33,300	$ 7,523	5.27
Rooftop Solar – 100 kW	$ 600k-$700k	$ 78,430	7 - 9
Ground Mount Solar – 10 MW & Above (100 Acres Minimun)	Ameresco Owned and Operated	$ 30,000 ($300/Acre/Yr)	-

Note: The following utility rates used to calculate savings:
Electricity: 0.12 $/kWh
OPA FIT Roof-Mount Contract: 0.71 $/kWh
OPA FIT Ground-Mount Contract: 0.44 $/kWh

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APPENDICES

Introduction

In an effort to reduce energy costs for the Ottawa Valley Waste Recycling Centre, Ameresco Canada Inc has been retained to perform a site visit and energy audit. The measures considered in this report are listed below and the details of the measures along with the associated costs and savings are provided in the following sections.

Section	Measure
4	Lighting Retrofit
6.1	Rooftop Solar
6.2	Ground-Mount Solar
7	Landfill Gas

Familiarization with building use, occupancy and systems was achieved through the review of drawings, reports, information provided by OVWRC and though site visits. A review of the historical energy profile of the building has been completed as part of the study.

Energy efficiency measures related the various building systems have been analysed in a comprehensive manner including capital cost for each measure and associated savings.

We would like to acknowledge the support of OVWRC staff in conducting the audit.

1.1. Incentive Programs

Continuous Improvement Fund

The Continuous Improvement Fund (CIF) provides grants and loans to municipalities to execute projects that will increase the efficiency of municipal Blue Box recycling and help boost system effectiveness. The CIF started up in January 2008 and has a three year mandate to direct funding support to projects that will:

- identify and implement best practices,
- examine and test emerging technologies,
- employ innovative solutions to increase blue box materials marketed, and
- promote gains in cost-effectiveness that can be implemented province-wide.

Municipalities are awarded CIF support in two ways. CIF may approach a municipality to take on high priority projects that have been identified as needed by CIF staff, recycling industry experts and CIF committees. Or, municipalities may apply to CIF, identifying community-specific project concepts or those that may be of broader interest.

Feed-in Tariff Program

The Government of Ontario's *Green Energy and Economy Act* has created a new Feed-in Tariff (FIT) program to encourage renewable energy generation. FIT is a straightforward way to contract for renewable energy generation. It provides standardized program rules, prices and contracts. FIT refers to the specific prices paid to renewable energy suppliers for the electricity produced by the generating facility. The pricing structure provides a reasonable return on investment and is differentiated by project size and technology type.

Electricity Retrofit Incentive Program

The current Electricity Retrofit Incentive Program (ERIP) objective is to leverage energy conservation and load management opportunities undertaken within existing buildings within the commercial, industrial, institutional and agribusiness sectors. The metric for which the incentive is based, relates to the net reduction of electrical on-peak demand. Deadline for application for this program was December 2010 therefore the Electricity Retrofit Incentive Program will not be applicable to this project. New programs are expected to be launched in 2011 to replace ERIP.

EcoENERGY Retrofit Incentive for Buildings

The Natural Resources Canada ecoENERGY Retrofit Incentive for Buildings provides incentives based on estimated annual energy savings. The incentive was not included within this proposal as the program is no longer accepting applications as of January 22, 2011. A new program is expected to be launched in 2011 to replace the NRCan eco ENERGY incentive.

Facility Description

The OVWRC located at 1076 Woito Station Road consists of an Administration Building (5,822 ft²), a Materials Recycling Facility (MRF) (24,000 ft²), an Organics Facility (8,679 ft²), a Maintenance Garage (4,100 ft²) and three storage outbuildings. The facility was constructed in 2001/2002. The primary purpose of this facility is to manage the waste collection in the Pembroke area and to provide recycling and composting of collected materials.

The average occupancy of the facility is estimated at 8 persons in the Administration building, up to 20 persons in the MRF, up to 4 persons in the Organics Facility and up to 8 persons in the Maintenance Garage during regular operation hours. The occupancy of the Administration building occurs mainly between the hours of 7:30 am through to 4:00 pm with negligible occupancy during evenings and weekends. The occupancy of the Recycling Facility varies depending on the time of year and as volume of materials require a single or double shift.

2.1 HVAC Systems

Administration Building

The heating for the building is achieved through electrical baseboard heaters located around the perimeter of the building. Cooling and make-up air is provided by a York rooftop unit. The unit is controlled with a manual thermostat.

Materials Recycling Facility (MRF)

The building is not heated with the exception of the two recycling lines which are each heated and cooled by a York rooftop unit. These units are controlled with programmable thermostats which set back the temperature while not occupied.

Two large exhaust fans on the main building are operated in the summer months to ventilate the facility.

Organics Facility

This building is heated by means of a ground-mounted Trane gas-fired AHU as well as two Propane-fired Trane Unit heaters, one of which is located in the mechanical room.

An NTI condensing boiler provides in-floor heating in order to maintain the composting materials at a desired temperature.

The building exhaust fan is controlled by a variable speed drive. Exhausted air enters a wood chip Biofilter adjacent the building before being discharged into the atmosphere.

Maintenance Garage

The heating for the building is achieved through one ceiling-mounted radiant heater and two Trane unit heaters controlled by manual thermostats. Make-up air is fed from the adjacent administration building and it is controlled by a CO_2 sensor. Four ceiling fans prevent temperature stratification. Two exhaust fans and one tailpipe exhaust fan are also used to control air quality.

Scale House

The Scale House is heated with electric baseboard heaters and cooled with a window-mounted AC unit.

2.2 Lighting Systems

Administration Building

The existing lighting system consists of 2 and 4 lamp 4-foot fluorescent luminaries using T-8 lamp and ballast technology.

Materials Recycling Facility (MRF)

The existing lighting system of the main building consists of 45 metal-halide luminaries while the sorting lines use T-12 lamp and ballast technology.

Organics Facility

The existing lighting system consists of 9 metal-halide luminaries in the processing facility and T-12 lamp and ballast fixtures in the mechanical room.

Maintenance Garage

The existing lighting system consists of 9 metal-halide luminaries as well as miscellaneous task lighting.

2.3 Process Equipment

Materials Recycling Facility (MRF)

Four 5hp conveyor belts (2 per line) controlled by vfds maintain the flow of recyclables through the sorting lines. The lead hand controls the speed of the conveyor belts via a control on the vfds.
A magnetic conveyor belt and an eddy-current field aid in the sorting of the recyclable materials.
Two 5hp hydraulic compactors feed materials into the bailer.
A 75hp bailer prepares the recyclable materials for transport in conjunction with a 5hp conveyor belt.
The hours of operation of the above equipment varies throughout the year depending on the volume of materials to be processed.

Organics Facility

Materials to be composted pass through a shredder and are delivered to the processing area via a conveyor belt. Operation of this equipment peaks in the spring and fall.

Leachate Collection System

In order to comply with environmental regulations a network of underground piping collects leachate from the landfill site to a sump pit where it is in turn transferred via two 5-hp pumps to a settling pond. One pump runs 24 hours per day, 7 days per week, year-round.

3 Utility Analysis

Utility data provided by OVWRC is summarized in Tables 1, 2 and 3. Complete utility details are included in **Appendix I**. It should be noted that electrical consumption has been steadily rising over the 3 year period of 2008-10, likely due to increased volume of materials being processed.

The performance indices for the electrical utility are summarized in Table 3. In evaluating the indices, the total building area of 42601 ft² has been used.

The total energy consumption over the THREE year period of 2008-10 has averaged 32.5 ekWh/ft². Electrical consumption makes up for 49% of the total energy consumption while propane makes up for 51% of the total energy consumption. It should be noted that 64% of the total energy is consumed by the waste diversion process.

An energy balance for the building electrical load as well as the propane usage was established based on the facility information provided.

Figure 1: Total Electrical Consumption

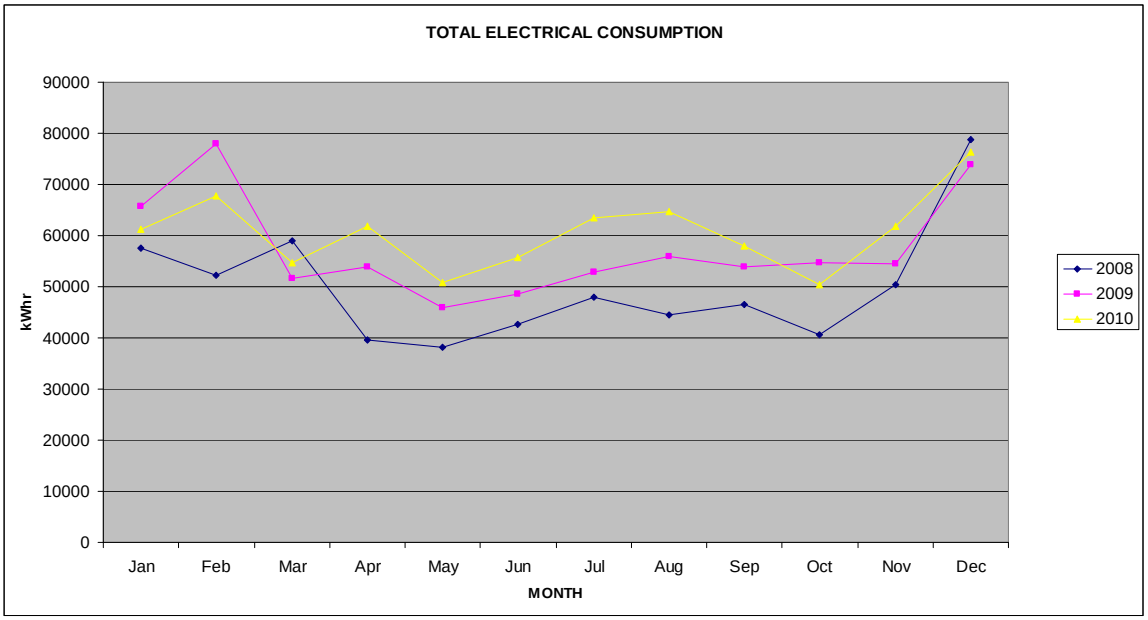


Figure 2: Electrical Demand

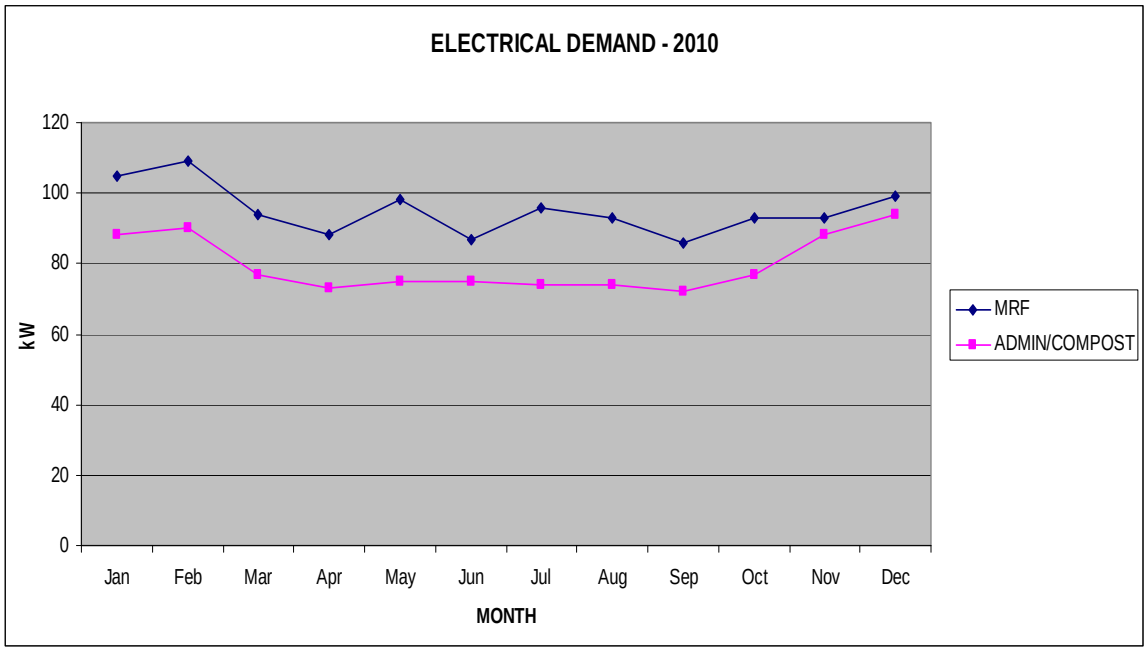


Figure 3: Propane Usage

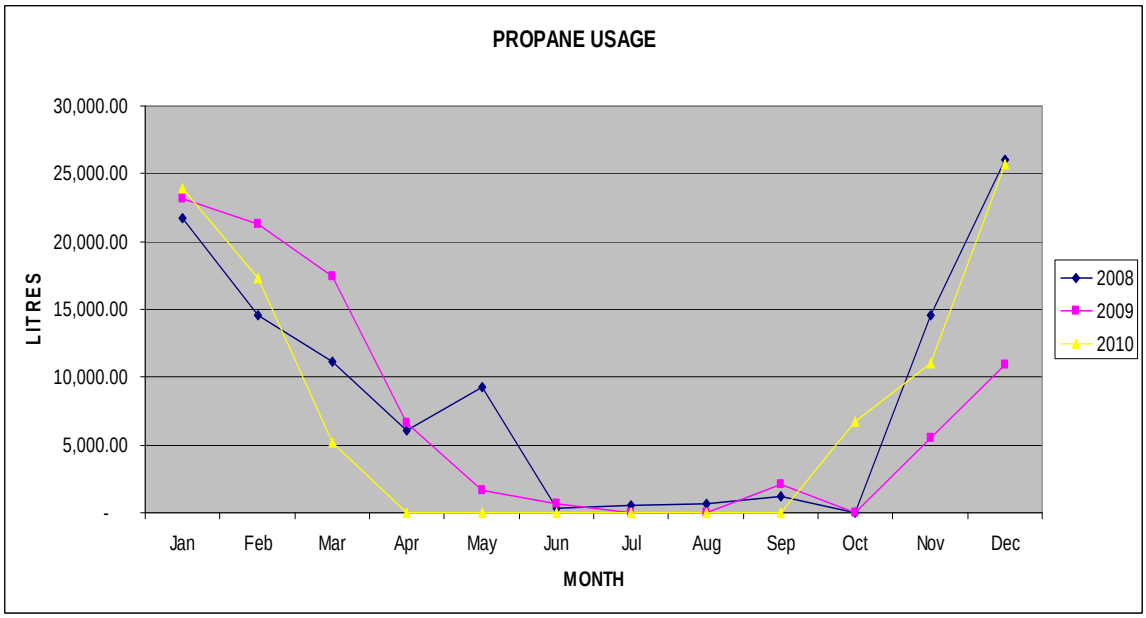


Figure 4: Energy Balance

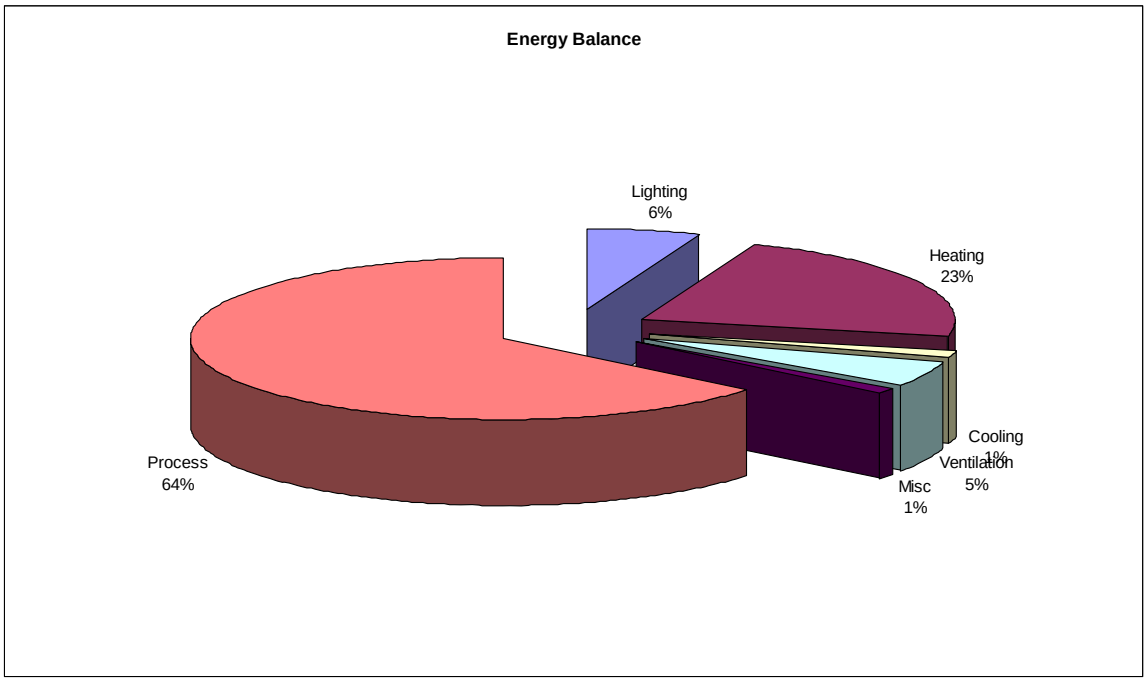


Table 1: Annual Utility Data

Period	Electricity kWh	kW	Energy ekWh
2008	597,999	-	795,575
2009	689,136	-	671,486
2010	728,461	173	673,808
Average	671,866	-	713,623

Table 2: Annual Utility Costs

Period	Electricity	Propane
2008	$ 75,637	$ 57,910
2009	$ 83,305	$ 42,944
2010	$ 86,227	$ 43,002
Average	$ 81,723	$ 47,952

Table 3: Annual Performance Indices

Period	Electricity kWh/ft²	W/ft²	Energy ekWh/ft²
2008	14.0	-	18.7
2009	16.2	-	15.8
2010	17.1	4.1	15.8
Average	15.8	-	16.8

4 Efficiency Measures

4.2 Lighting Retrofit – Administration Building

Simple Payback – 5.23 years

Scope of Work

- Retrofit of existing 34 W Fluorescent T8 Lamps and Ballasts with 28 W Fluorescent Lamps and Ballasts

Benefits

- Savings of electrical consumption

Substantiation of Energy Savings

Estimated energy savings of $ 517 (4,306 kWh) per year based on electrical savings.

Impact on Maintenance

- Maintenance and replacement costs will be reduced due to the installation of new lamps and ballasts

Expected Life of Measure

- Lamps and Ballasts – 20 years

4.3 Lighting Retrofit – MRF

Simple Payback – 3.83 years

Scope of Work

- Removal of existing 400W Metal-Halide Light Fixtures
- Installation of Hi-Bay, High-Output T8 Light Fixtures

Benefits

- Savings of electrical consumption

Substantiation of Energy Savings

Estimated energy savings of $ 5,282 (44,015 kWh) per year based on electrical savings.

Impact on Maintenance

- Maintenance and replacement costs will be reduced due to the installation of new lamps and ballasts

Expected Life of Measure

- Lamps and Ballasts – 20 years

4.4 Lighting Retrofit – Organics Facility

Simple Payback – 6 years

Scope of Work

- Removal of existing 400W Metal-Halide Light Fixtures
- Installation of Hi-Bay, High-Output T8 Light Fixtures

Benefits

- Savings of electrical consumption

Substantiation of Energy Savings

Estimated energy savings of $1,050 (8,749 kWh) per year based on electrical savings.

Impact on Maintenance

- Maintenance and replacement costs will be reduced due to the installation of new lamps and ballasts

Expected Life of Measure

- Lamps and Ballasts – 20 years

4.5 Lighting Retrofit – Maintenance Garage

Simple Payback – 6 years

Scope of Work

- Removal of existing 400W Metal-Halide Light Fixtures
- Installation of Hi-Bay, High-Output T8 Light Fixtures

Benefits

- Savings of electrical consumption

Substantiation of Energy Savings

Estimated energy savings of $ 675 (5,624 kWh) per year based on electrical savings.

Impact on Maintenance

- Maintenance and replacement costs will be reduced due to the installation of new lamps and ballasts

Expected Life of Measure

- Lamps and Ballasts – 20 years

5 Program Summary

The energy study results provided in this report outlines a program that would see an annual savings of $7,523. The efficiency improvement represents a 9.2% reduction in the annual electrical costs.

The energy performance index will improve from 32.5 ekWh/ft² to 31.1 which is a 4.4% energy efficiency improvement in terms of resource consumption.

Table 4: OVWRC Cost & Savings Summary

Measure	Total Cost	Total Savings	Simple Payback
Administration Building Lighting Retrofit	$ 2,700	$ 516	5.2
Recycling Facility Lighting Retrofit	$ 20,250	$ 5,282	3.8
Maintenance Building Lighting Retrofit	$ 4,050	$ 675	6
Compost Facility Lighting Retrofit	$ 6,300	$ 1,050	6
Program Sub-Total	**$ 33,300**	**$ 7,523**	**5.27**

Table 5: OVWRC Energy Savings Summary

	Electricity kWh	Cost $/yr	Cost $/ft²
Before	671,866	$81,722	$1.92
Savings	62,694	$7,523	$0.18
After	609172	$74,200	$1.74
% savings	9.2%	9.2%	9.2%

Note: The Following utility rates used to calculate savings: Electricity: 0.12 $/kWh

6 Ontario Power Authority FIT Program

The Province of Ontario through the Green Energy Act, more specifically through the Feed-In-Tariff (FIT) Program administered by its agency, the Ontario Power Authority, has taken an aggressive approach aimed at encouraging solar photovoltaic (PV) energy development in Ontario. The Solar PV FIT Program offers commercial and municipal organizations a unique opportunity to develop renewable electricity generation projects on their property. These projects offer significant opportunities for revenue generation as the generated electricity can be sold and put back onto the electrical grid with a guaranteed rate structure fixed for 20 years. Ameresco has a large number of solar PV projects, both ground and roof mount currently under way and we have been involved in solar applications for more than 20 years. We have the capability to design, finance and implement these projects while providing our clients with the assurance of being around to maintain and guarantee system performance for the duration of the contract term.

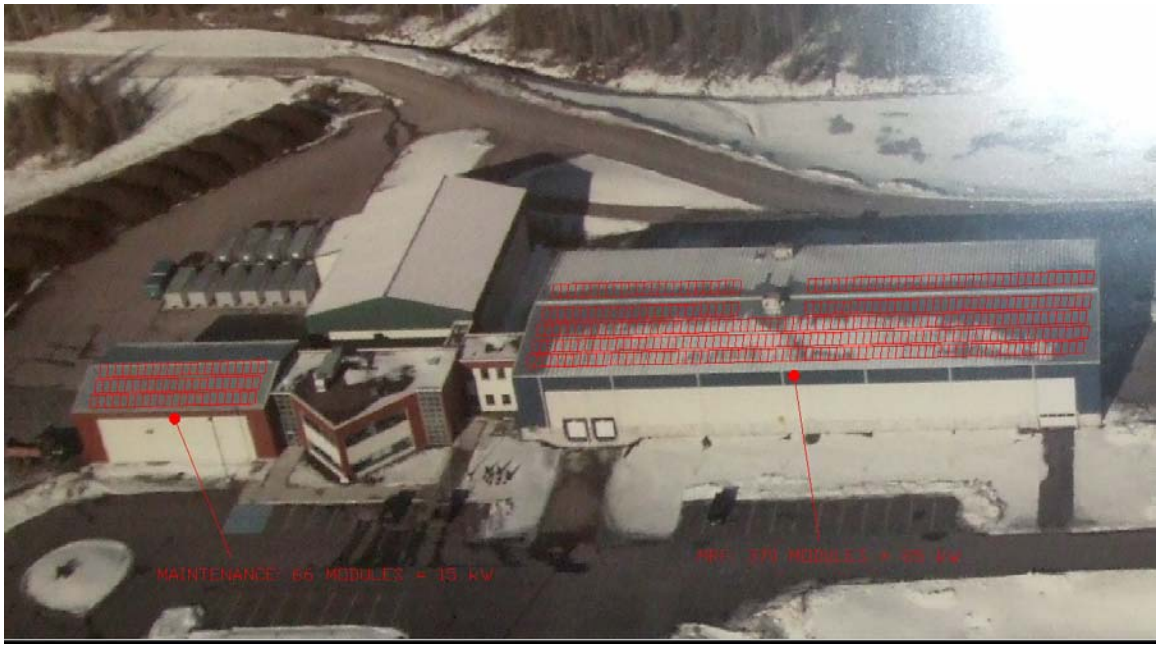
Depending on the size and type of installation (roof vs. ground mounted) the Solar PV FIT Program will pay between $0.443 and $0.802 per kWh for a term of 20 years for electricity generated by a solar PV system as per the following table.

Table 6: Solar PV FIT Program Rates

Type	Size	Rate
Rooftop	≤ 10 kW	80.2 ¢/kWh
Rooftop	>10 kW ≤ 250 kW	71.3 ¢/kWh
Rooftop	>250 kW ≤ 500 kW	63.5 ¢/kWh
Rooftop	> 500 kW	53.9 ¢/kWh
Ground-Mounted	≤ 10 kW	64.2 ¢/kWh
Ground-Mounted	>10kW ≤ 10 MW	44.3 ¢/kWh

6.1 Rooftop Solar Photovoltaic

Figure 3: Conceptual Rooftop Solar PV Layout



Based on a 100 kW PV system the following analysis would apply:

• 100 kW of solar panel capacity inclined at 30 to 45 degrees – roof-mounted and south facing

• Energy production based on historical data for solar PV in Ontario is 1100 kWh/kW/year

• 100 kW times 1100 kWh/kW/yr = 110,000 kWh annual energy production
Based on these figures, a 100 kW PV system would produce approximately 110,000 kWh's per year at the facility.

Referencing appendix II in the OPA Guidelines, this would result in the following basic terms:

• System size between 10 kW and 250 kW

OPA contract price = $0.713/kWh - Term of 20 years

Therefore the OPA would be prepared to pay $0.713 times 110,000/year = $78,430 per year for 20 years, or $1,568,600 over the term of the agreement.

The cost of a solar PV system varies depending on size, location, panel type, roof-type, electrical connection, metering requirements, etc. For the purposes of this preliminary analysis we have assumed a range of $6,000 to $7,000 per kW, therefore the cost of a 100 kW system for the MRF would be $600,000 to $700,000. The solar PV system would add an additional 137.5 tonnes/year of GHG avoidance to the program. With an initial capital cost of between $600,000 and $700,000 and a revenue stream of approximately $1.57 million over 20 years, we believe the rooftop solar PV measure merits a more detailed analysis which would include the following:

- Detailed concept and design specific to the facility
- Solar resource study (solar measurements)
- Roof coverage, racking system, and load-bearing analysis
- Implementation plan
- Detailed budget and financial analysis
- Initiate discussions with the Ontario Power Authority
- Initiate discussions with Ottawa Hydro

6.2 Ground Mount Solar Photovoltaic

A preliminary site assessment and evaluation was also conducted regarding potential solar ground mount opportunities. Given the large parcel of available land neighbouring the MRF and landfill operations, we believe that further consideration is warranted to explore the merits of a larger ground mount solar installation. Typically these initiatives are economically and financially viable for installations of 10 MW and above. This size installation would require between 60 and 100 acres of available land. Other considerations include topography and land classification, proximity to grid connection and capacity of electrical system. As part of our preliminary assessment, we have made further inquiries pertaining to the above considerations and have determined that a ground mount solar system of 10MW would in fact be viable. The parcels of land we visited during our site analysis were relatively flat and clear of brush and totalled approximately 22 acres or 4.2 MW based on the aerial images we obtain from Google Earth. We would need to further investigate the viability of utilizing additional portions of the property such that we have an adequate footprint to accommodate an installation of approximately 10MW.

Figure 4: Conceptual Ground-Mount Solar PV Arrays

Typically Ameresco seeks to enter into lease arrangements whereby an annual royalty is paid to the land owner in return for the use of land. In these scenarios, Ameresco provides all necessary capital and assumes the on going performance risk associated with the solar electricity generation. The annual royalty is based on size of installation and total acres of land leased. In the case of OVWRC, we would anticipate an annual royalty in the range of $300/acre or approximately $30,000 per annum for 20 years.

For either of the rooftop or ground mount solar initiatives, we would propose to undertake this work given sufficient interest from the OVWRC. We would be pleased to meet with and present to the OVWRC's governing board of directors to discuss the solar PV measure in greater detail towards gaining their approval to proceed with further study. Ameresco is flexible in our approach to renewable energy projects of this nature as we ultimately seek to accommodate the needs and requirements of our clients. There are a variety of contract structures that can be explored depending on risk appetite and desired ownership structure. This could range from traditional engineering, procurement and constructing whereby OVWRC owns the assets to design, build, own and operate models with Ameresco bringing the necessary capital investment and assuming all performance risk for the duration of the contract.

7 Landfill Gas – Methane Gas Heat Exchange/Transfer

We have undertaken a preliminary review of the methane gas reclamation estimates to further evaluate the viability of investment in a heat exchange system whereby the heat of the burned off-gases could be utilized to generate heat for the OVWRC facilities. The preliminary estimates we shared with our internal technical staff specializing in this area suggest that there could be sufficient levels of methane to utilize as a fuel source for the building heating load. This preliminary evaluation also indicates that the building load itself may not be sufficient to warrant investment in a heat exchange system. There could be other potential uses for the methane gas that could be explored as well such as power generation. Having said this, we believe that rather than completely dismissing this measure at this time, it would be best to re-evaluate once actual data is obtained for a sufficient period of time in the range of 12 months of operation. This would allow for a more accurate assessment and evaluation of return on investment for such a measure. Ameresco would be pleased to assist and work with OVWRC at a future point should it be decided to further investigate this measure.

Appendix I

Tables 7 & 8: Utility Summary

A summary of the utility history of the OVWRC is provided in the following tables. The history covers a period of 3 years from 2008 to 2010.

Table 7: Electrical Consumption (kWh)

MONTH	2008	2009	2010
Jan	57,546	65,765	65,036
Feb	52,297	77,878	67,830
Mar	58,929	51,599	54,731
Apr	39,654	53,846	61,936
May	38,191	45,895	50,821
Jun	42,567	48,537	55,752
Jul	47,981	52,776	63,390
Aug	44,500	55,843	64,651
Sep	46,490	53,779	58,008
Oct	40,630	54,774	50,368
Nov	50,502	54,503	61,809
Dec	78,712	73,941	74,130
TOTAL	**597,999**	**689,136**	**728,462**

Table 8: Propane Consumption (L)

MONTH	2008	2009	2010
Jan	21,769	23,212	23,947
Feb	14,568	21,337	17,310
Mar	11,129	17,452	5,233
Apr	6,108	6,660	-
May	9,248	1,601	-
Jun	316	700	-
Jul	563	-	-
Aug	662	-	-
Sep	1,200	2,100	-
Oct	-	-	6,687
Nov	14,513	5,542	10,981
Dec	26,001	10,928	25,683
TOTAL	**106,077**	**89,532**	**89,841**

Appendix II

Table 9: Electrical Consumption Data

ADMINISTRATION BUILDING

Equipment	Type	Qty	kW	Hours	Days	Weeks	kWh
lighting	T-8	1	8.73	11.5	5.0	52	26,112
plug load	Misc	1	5.82	11.5	5.0	52	17,408
bb heating		1	12.50	24.0	7.0	14	29,400
MAU		1	2.00	11.5	5.0	52	5,980
cooling		1	17.47	24.0	7.0	6	17,606
ventilation		1	1.10	24.0	7.0	52	9,610
							106,115

MATERIALS RECYCLING FACILITY

Equipment	Type	Qty	kW	Hours	Days	Weeks	kWh
Lighting	MH	45	0.45	6.0	7.0	52	44,226
Lighting - Lines	T-12	16	0.04	6.0	7.0	52	1,398
Exhaust fans	48" - 1.5 hp	2	1.50	6.0	7.0	26	3,276
RTU	Heating	2	2.00	6.0	7.0	30	5,040
RTU	Cooling	2	2.00	6.0	7.0	30	5,040
Compactors	5 hp Hydraulic	2	2.00	6.0	7.0	52	8,736
Conveyor Belts	5 hp	6	5.00	6.0	7.0	52	65,520
Baler	75 hp	1	75.00	4.5	6.0	52	105,300
Baler	5 hp conveyor	1	5.00	4.5	7.0	52	8,190
							246,726

MAINTENANCE BUILDING

Equipment	Type	Qty	kW	Hours	Days	Weeks	kWh
lighting	MH	9	0.45	10.0	5.0	52	10,530
Unit Heater	Propane	2	1.00	8.0	7.0	26	2,912
Ceiling fans		4	0.35	24.0	7.0	26	6,115
Exhaust fans		2	3.00	2.0	5.0	52	3,120
Tail Pipe Exh.		1	3.00	1.0	5.0	52	780
							23,457

Appendix II

Table 9: Electrical Consumption Data – Cont'd

ORGANICS FACILITY

Equipment	Type	Qty	kW	Hours	Days	Weeks	kWh
lighting	MH	14	0.45	8.5	5.0	52	13,923
lighting	T12	4	0.04	24.0	7.0	52	1,398
Unit Heater	Propane	1	1.00	8.0	7.0	26	1,456
MAU		1	2.00	8.5	5.0	52	4,420
Exhaust fans		2	3.00	24.0	7.0	52	52,416
Ceiling fans		9	0.35	24.0	7.0	26	13,759
Boiler		1	0.10	24.0	7.0	30	504
water pump		1	1.00	24.0	7.0	26	4,368
Schredder	75 hp motor	1	75.00	4.0	5.0	52	78,000
Conveyor belt	5 hp motor	2	5.00	4.0	5.0	52	10,400
							180,644

LEACHATE COLLECTION

Equipment	Type	Qty	kW	Hours	Days	Weeks	kWh
Pump	5hp	1	5.00	24.0	7.0	52	43,680
							43,680

SCALE HOUSE

Equipment	Type	Qty	kW	Hours	Days	Weeks	kWh
lighting	T12	4	0.04	11.5	7.0	52	670
Heating	bb	2	3.00	12.0	7.0	26	13,104
Cooling	DX - window	1	1.00	8.0	7.0	12	672
							14,446

TOTAL kWh **615,067**

Appendix III

Table 10: Propane Consumption Data

PROPANE USAGE

ADMINISTRATION BUILDING

Equipment	Type	Qty	BTU	Hours	Days	Weeks	BTUh
MAU	York	1	400,000	8	7	20	448,000,000
DHW Boiler	Propane	1	23,000	24	7	52	200,928,000
							648,928,000

MATERIALS RECYCLING FACILITY

Equipment	Type	Qty	BTU	Hours	Days	Weeks	BTUh
MAU	York	2	180,000	7	7	23	405,720,000
							405,720,000

MAINTENANCE BUILDING

Equipment	Type	Qty	BTU	Hours	Days	Weeks	BTUh
Unit Heater	York	2	200,000	7	7	23	405,800,000
							405,800,000

ORGANICS FACILITY

Equipment	Type	Qty	BTU	Hours	Days	Weeks	BTUh
Unit Heater	York	1	200,000	8	7	26	291,200,000
MAU	York	1	180,000	8	7	20	201,600,000
Boiler	NTI	1	190,000	8	7	26	276,640,000
							769,440,000

TOTAL BTUh 2,274,888,000

TOTAL L 94,787