



The Regional Municipality of Durham
Report to: The Joint Works and Finance & Administration
Committees
From: C.R. Curtis, Commissioner of Works
R.J. Clapp, Commissioner of Finance
Report No.: 2008-J-13
Date: May 21, 2008

SUBJECT:

Durham Region Energy From Waste (EFW) Project: Detailed Business Case and Request for Proposals

RECOMMENDATIONS:

THAT the Works and Finance and Administration Committees recommend to Regional Council that:

1. Regional Council receive this report for information, including detailed analysis of EFW financial implications, potential budget and property tax impacts, and project risk assessment, based upon the business case report, "Durham-York-Energy From-Waste Facility: Business Case, May 2008," completed by Deloitte and Touche LLP for Durham Region, and provided herein as Attachment No. 1.
2. Regional staff be authorized, based upon the detailed business case, RFP principles and project specifications proposed herein, to finalize the EFW RFP and project agreement documentation, and issue the RFP to pre-qualified vendors in order to select a preferred vendor to:
 - a) Complete the requirements of the EA and EPA processes; and,
 - b) Design, build, and operate a Regionally-owned EFW facility on the preferred site 'Clarington 01,' as identified through the EA process and approved by the Regional Councils of York and Durham in January 2008.
3. Durham Region's RFP for the design, build and operation of the facility be issued on the following basis:
 - a) Only proposals submitted by the five pre-qualified vendors of RFQ 601-2007 will be accepted, including:
 - i. Veolia Environmental Services Waste to Energy Inc.; AMEC/Black & McDonald;
 - ii. Covanta Energy Corporation;

- iii. WRSI/DESC Joint Venture; Fisia Babcock Environmental GmbH; Kiewit Industrial Company; Morgan Stanley Biomass LLC; Babcock & Wilcox;
 - iv. Wheelabrator Technologies Inc. (A Waste Management Company); and,
 - v. Urbaser SA.
- b) As per the January 23, 2008 direction of Regional Council, the RFP will demonstrate the Region's commitment to protecting the health and safety of the residents of the Municipality of Clarington and Durham Region, by ensuring the successful proponent incorporates into the design and installation of the EFW facility, the most modern and state-of-the-art emission control technologies that:
- i. Meet or exceed the European Union (EU) monitoring and measurement standards;
 - ii. Commit to Maximum Achievable Control Technology (MACT) for emission standards and monitoring; and,
 - iii. Support the Region of Durham's aggressive residual waste diversion and recycling program, to achieve and/or exceed, on or before December 2010, a 70% diversion rate for the entire Region, with these programs continuing beyond 2010.
- c) The RFP will include provisions for continuous sampling of dioxins in addition to stack testing, as defined by EU2000/76/EC and MOE A-7 guidelines.
- d) Vendors will be required to demonstrate an ability to accommodate future expansion (scalability) as required to accommodate post-diversion residual waste volume growth up to a maximum capacity of 400,000 tonnes.
- e) Vendors will be required to demonstrate an ability to meet the requirements of up to a 25-year design, build and operate contract, with terms and conditions to be set out within RFP documentation.
- f) The RFP will be issued based upon current discussions with the Province (emissions and power purchase) not resulting in a material change to the results presented herein.
- g) The RFP will solicit proposals for the design, build and operation of an EFW facility of 140,000 tonnes of operating capacity at project start-up, based upon the following:

- i. Durham Region will provide a minimum of 100,000 tonnes of post-diversion waste commencing at project start-up;
 - ii. York Region will provide a minimum of 20,000 tonnes of post-diversion waste commencing at project start-up;
 - iii. Surplus capacity totalling 20,000 tonnes of operating capacity will be shared equally between the two Regions.
4. The Region of Durham enter into a Durham-York Memorandum of Understanding (MOU) with the Region of York which shall govern the process and cost sharing arrangement to complete the EA for Residual Waste and establish an energy from waste facility, including a York Region ownership, and capital and operating cost share of no less than 21.4%, based upon the recent conclusion of negotiations between the Regional partners and consistent with the following:
 - a) Durham and York shall construct a facility with an initial annual processing capacity of approximately 140,000 tonnes, with Durham responsible for the capital and operating costs for 100,000 tonnes of waste and York responsible for the capital and operating costs for 20,000 tonnes of waste;
 - b) York and Durham shall equally share the capital and operating costs for approximately 20,000 tonnes of surplus processing capacity;
 - c) The parties shall share equally (50/50) the cost of certain oversized capital components of the EFW Facility and site, where such oversizing is deemed to be operationally and financially prudent;
 - d) The party requiring future expansion of the facility shall pay for such expansion of processing capacity.
5. The Regional Chair and Clerk be authorized to execute the MOU, subject to review and approval by the Regional Municipality of Durham CAO, Commissioners of Works and Finance and the Regional Solicitor.
6. Subject to approval of Recommendation 2 above, the Regional Solicitor and Commissioners of Works and Finance be authorized to execute expanded and/or new agreements (to be shared 50/50 with York Region) with existing EFW consultants, in order to maintain continuity while advancing the EFW project, with agreements to include:

- a) Extension of the current contract with HDR Inc, including an increase for 2008 of up to \$300,000 (excluding applicable taxes), to accommodate recent requirements by the Regions for extended technical support related to emission technology and limits, including additional meetings/discussions with regulatory bodies as well as to provide continued technical expertise to the Regions as required to accommodate negotiations and agreement finalization with the preferred vendor, subsequent to the RFP evaluation process.
- b) Extension of the current contract with Deloitte and Touche LLP, with an increase for 2008 of up to \$175,000 (excluding applicable taxes), to continue to provide financial advisory services and expertise to the Regions regarding commercial best practices, the power purchase agreement with the Ontario Power Authority, and to accommodate negotiations and finalization of commercial terms with the preferred vendor subsequent to the RFP evaluation process.
- c) An increase in the 2008 EA Budget for public consultation (Genivar/Jacques Whitford) totalling up to \$100,000 to accommodate expansion of the public consultation process beyond normal EA requirements, to ensure timely responses to concerns raised by Committee and Council delegations and other members of the public, and to include additional meetings, preparation and presentations, other than those originally contemplated.
- d) Extension of the contract with the law firm Borden Ladner Gervais LLP, with an increase of up to \$200,000 (excluding applicable taxes), to continue to provide legal expertise to the Regions, including the power purchase agreement with the Ontario Power Authority, post-RFP negotiations with the preferred vendor, and advice associated with respect to the Environmental Assessment and approvals process.
- e) The required scope and/or budget changes or new agreements, totalling \$775,000, shared 50/50 with York Region, and as noted in Recommendations 6 a) to d) above, be financed from the 2008 Solid Waste Management operations.

REPORT

Attachment No. 1: Deloitte & Touche LLP: Durham York Energy From Waste Facility

1.0 **BACKGROUND**

- In 2005, the Regions of Durham and York partnered in a full Environmental Assessment (EA) process in order to establish an Energy from Waste (EFW) facility. On March 31, 2006, the Ministry of Environment (MOE) approved the terms of Reference for the EA Study. The selection of a preferred technology and the selection of a preferred site for the EFW facility have been completed through the EA process.

1.1 **Preliminary Business Case**

- The Regions of Durham and York retained Deloitte & Touche LLP (Deloitte) in 2006. The firm has since provided consulting/financial advisory services related to EFW, completed a service delivery analysis analyzing the potential roles of the private sector, and conducted a preliminary business case model to compare the EFW facility to other alternative options for waste disposal.
- On April 18, 2007, Durham Regional Council received the results of the preliminary business case "Preliminary Assessment of Waste Management Options for Durham," by Deloitte and Touche LLP and recognized that "...Energy From Waste (EFW) will cost under a best case scenario approximately 55% to 90% higher on a per unit basis than current Michigan landfill disposal costs..."
- The Request for Qualifications (RFQ) process was subsequently launched with the understanding that a more detailed project-specific analysis would be conducted as part of the RFP process approval once confirmation was made on key variables influencing costs (e.g. location, tonnage supply commitments, available revenues, sizing, etc.).
- In directing staff to complete the RFQ process, Regional Council formally recognized the thermal treatment of residual waste to be "...a viable potential option to secure a future long-term local solution for Durham residual waste disposal."

1.2 **RFQ Short-listed Vendors, Facility Location, Diversion and Emission Controls**

- On January 23, 2008 subsequent to the conclusion of the RFQ process, Regional Council approved the pre-qualified short-list of vendors as follows:
 - i. Veolia Environmental Services Waste to Energy Inc.; AMEC/Black & McDonald;
 - ii. Covanta Energy Corporation;
 - iii. WRSI/DESC Joint Venture; Fisia Babcock Environmental GmbH; Kiewit Industrial Company; Morgan Stanley Biomass LLC; Babcock & Wilcox;
 - iv. Wheelabrator Technologies Inc. (A Waste Management Company); and,
 - v. Urbaser SA.

- Clarington 01 was also approved as the preferred site of the location of the Durham/York EFW for submission to the Ministry of Environment as part of the Individual Environmental Assessment.
- Regional Council at the same meeting directed that the "...Joint Waste Management Group of the Regions of York and Durham be requested to agree to protect the health and safety of the residents of Clarington and Durham by incorporating into the design and installation of the EFW facility the most modern and state-of-the-art emission control technologies that meet or exceed the European Union (EU) monitoring and measurement standards; and,
- THAT the Joint Waste Management Group of the Regions of York and Durham be requested to commit to including in the Request for Proposals (RFP) and Certificate of Approval (CofA), Maximum Achievable Control Technology (MACT) for the emission standards and monitoring of the EFW facility; and,
- THAT the Region of Durham agrees to continue to support an aggressive residual waste diversion and recycling program in order to achieve and/or exceed on or before December 2010, a 70% diversion recycling rate for the entire Region and such aggressive programs shall continue beyond 2010."

1.3 May 13, 2008 Durham-York Joint Waste Management Group (JWVG) Meeting

- Regional Council asked Joint Waste Management Group (JWVG) to review the EFW proposed operational emission limits, in particular the HCL limit, the lead limit and consistency with CCME guidelines and monitoring of dioxins/furans with particular reference to continuous sampling using a regenerative cartridge system.
- JWVG reviewed a revised table of EFW Proposed Operational Limits with lower limits than the Ontario Guideline A-7 for all contaminants, and equal to or lower than European Union (EU) 2000/76/EC for all contaminants (including HCL). The lead limits proposed are to be consistent with the Canadian Council of Ministries of Environment, Operating and Emission Guidelines for Municipal Solid Waste Incinerators.
- The JWVG passed the following resolution on May 13, 2008, which will subsequently be brought forward to relevant Standing Committees and the Councils of Durham and York Regions:

"THAT, subject to Ministry of Environment acceptance of the Energy from Waste Emission Limits; and

Subject to the approval of the business plan, by Durham Region Council and York Region Council:

1. The Joint Waste Management Group adopt the revised Proposed Operating Limits for Hydrogen Chloride and Lead as indicated in Table 2 of the May 13, 2008 Memorandum (Item 8b), for inclusion in the Request for Proposal to be sent to selected vendors;
 2. The Joint Waste Management Group requires that the proposed Energy from Waste facility have continuous sampling of dioxins and furans using a state-of-the-art monitoring system (i.e. a regenerative cartridge system) with regular testing for ongoing emissions data results;
 3. The Joint Waste Management Group requires that current time air emission data be available to the public in various forums, including electronically; and,
 4. The comments made by the Committee members be received and referred to staff and the consultants for consideration and a response to the Committee at a future meeting.”
- Current specifications proposed for the RFP, and included in the more detailed business case included herein, accommodate all costs associated with full European Union (EU) compatibility, including the limits as proposed by JWMG for HCL, lead and NOx.

1.4 Next Steps: EFW Request for Proposals (RFP)

- This report presents to Joint Works and Finance and Administration Committee and Regional Council, the results of the Durham detailed business case completed by Deloitte (Attachment #1), and estimated budget and property tax impacts based upon the business case results.
- It is recommended that Regional Council proceed to the Request for Proposals (RFP) stage of the EA process.

2.0 FROM PRELIMINARY TO DETAILED EFW BUSINESS CASE

- When Durham Region’s preliminary business case was completed in 2007, there were several key unknowns identified. Regional Council made a commitment at that time to conduct a more detailed business case as part of the RFP approvals process once key variables were confirmed.
- This report and its attachments present significant details regarding the proposed EFW facility for Durham and York Regions, as well as information on the future environment in which decisions will be made regarding the disposal of residual municipal solid waste in Ontario.

- The detailed cost estimates are based upon the following key variables that have been resolved since the preliminary business case was conducted and received by Regional Council in early 2007:
 - i. A technical 'basis of design' has since been established by the EFW technical team, including staff of York and Durham Regions and HDR Inc., the Region's experienced EFW technical advisor. The basis of design was developed to be consistent with the requirements of the Regions, specific direction from the Joint Waste Management Committee and Regional Council, and based upon the Durham Region RFQ approved short-list of vendors and their technology submissions (consistent with the EA process);
 - ii. Project specific capital and operating cost estimates have been established based upon the technical basis of design, vendor pricing for individual project components, inflation and risk assessments, and given requirements specified by Regional Council to incorporate modern, state-of-the-art emission control technologies. Recommended architectural features, an education centre, viewing gallery and district heating capability etc. have also added to the cost of the facility since the preliminary business case was conducted;
 - iii. The proposed initial capacity of the facility (140,000 tonnes of operating capacity) has been determined based upon confirmed tonnage commitments from the Regions of York and Durham, and including a capacity reduction based upon the aggressive diversion targets set by both municipalities since the preliminary business case was conducted;
 - iv. While no district heating assumptions were made in the preliminary business case, the detailed business case is considered conservative given that: while the design allows for the sale of thermal energy or industrial heat to customers in the vicinity of the Clarington 01 site (the Clarington Energy Business Park), no revenues have been assumed over the 25 years of the detailed analysis, while up-front capital and operating costs to enable this capability are now included in the analysis;
 - v. Consistent with the preliminary analysis, the detailed business case is based on, power sales revenues from the Ontario Power Authority estimated at eight cents, based upon current discussions, and no net benefits are assigned to in-house savings from the potential to utilize thermal energy in the adjacent Courtice Water Pollution Control Plant (WCPC);

- vi. The site location has been determined since the preliminary business case was completed and the detailed business case now includes adjusted (higher) transfer and haulage costs, based upon actual distances, tonnages and truck sizes; and,
- vii. A Memorandum of Understanding (MOU) between Durham and York Regions, including capital and operations funding and capacity utilization commitments has been developed for finalization. While the preliminary analysis looked only at overall project costs, the detailed business case assumes a 78.6% share of capital and operating costs for Durham Region. This can also be considered conservative, since MOU principles include 50/50 cost sharing for a proportion of up-front costs. This additional share of York financed costs is excluded from consideration in the business case since the MOU has yet to be approved by the Councils of York and Durham and these shared costs will be finalized, based upon the final Project Agreement.

3.0 DETAILED EFW BUSINESS CASE METHODOLOGY

- In addition to providing background on the existing environment from a financial perspective and an analysis of uncertainty and risks associated with making decisions on future residual waste disposal in Ontario, the business case methodology includes three essential parts, analyzed from the perspective of Durham Region, as follows:
 1. The Deloitte analysis first explores five waste disposal options and their potential to handle the Region of Durham's municipal residual waste disposal requirements over the long-term, including analysis of each of the following options:
 - i. Michigan Landfill (status quo);
 - ii. Brock Township Landfill;
 - iii. Stabilized Landfill;
 - iv. Other Ontario Landfill; and,
 - v. Energy from Waste.
 - Based upon the analysis of options, Deloitte determines that only two of these, EFW and Other Ontario Landfill, present viable options for disposal, consistent with Regional Council direction.
2. The Energy from Waste facility is compared in an economic analysis to the Other Ontario Landfill option to determine the net benefit/cost associated with development of the proposed EFW facility at the Clarington 01 site in Durham Region.

- The economic analysis calculates economic costs and benefits from the perspective of Durham taxpayers (excluding York Region's share of the project), and excluding consideration of financing alternatives, which are analyzed separately and subsequently in this report. The opportunity costs of EFW are included in the economic analysis, both through the process of applying a suitable discount rate, based upon the Region's estimated opportunity cost of capital, and through comparison of EFW to its 'next best alternative' and calculation of a net incremental benefit/cost. External/secondary benefits are dealt with separately, rather than being quantified as part of the analysis.
3. The third component of the business case analysis is a life-cycle costing analysis, which enables the Region to explore potential budget and property tax impacts, as well as potential methods of financing for each future residual solid waste disposal option.

4.0 EXPLORING WASTE DISPOSAL ALTERNATIVES

- The Deloitte analysis explores the EFW in comparison to five alternatives for waste disposal. Main findings around Durham's solid waste disposal options can be summarized as follows:

4.1 Landfill in Michigan

- While the decision to do nothing differently (status quo) is included for comparative purposes, and for the calculation of budget/tax impacts to the end of 2010, it is assumed to be unavailable as a true option for future residual waste disposal after December 31, 2010, based upon Ontario-Michigan State agreements, Regional Council resolution and unacceptable risks of border closure or penalties, which cause considerable cost uncertainties.
- Even if the Region of Durham were willing to continue to ship waste to Michigan over the long-term, it is unlikely that current favourable pricing would be available for this option on a go-forward basis. Long-haul costs continue to undergo adjustments to reflect the risks and uncertainty with respect to fuel prices, even without consideration of issues at the International border.
- Despite a continued abundant supply of landfill capacity in the State of Michigan, three quarters of the cost of this option are related to transfer and haulage costs which are significantly dependent on fuel costs, not to mention the impact of border and inspection penalties, to which the Region has been, and will continue to be exposed, even if the border remains open to Canadian waste shipments.

- On March 20, 2007, Regional Council passed the following resolution:

“The Region acknowledge the Ontario Minister of Environment’s agreement with Michigan State Senators Levin and Stabenow to reduce residual tonnages from Ontario to Michigan by 20% by the end of 2007, by 40% by the end of 2008, and to eliminate the shipments by the end of 2010 with the understanding that they will not ‘pursue passage of amendments to the Homeland Security Appropriations Bill (SA 4657 and SA 4617) or pursue similar current or future measures consistent with their constitutional duties.”

4.2 Brock Township Landfill

- While Brock Township Landfill is available as a Regional waste disposal contingency in the short-term, its relatively small size and lack of infrastructure make it easy to dismiss as a long-term municipal solid waste disposal site for the Region of Durham.
- Were the Region to rely on this facility for the disposal of all of the Region’s municipal solid waste, the landfill would be filled within a decade, leaving the Region once again without a long-term waste disposal option, and again exposed to significant market uncertainty. As was the case in the preliminary business case, this option is dismissed as a long-term solution.

4.3 Stabilized Landfill

- Deloitte reviewed the option of stabilized landfill, including regulatory, diversion and cost implications. Deloitte’s analysis screened out stabilized landfill given that for the significant cost required, incremental diversion benefits would be relatively minor, given Durham’s already successful diversion programs. The option would also require the uncertainty and delays associated with siting a landfill, including landfill property acquisition and a new EA and approvals process.

4.4 Other Ontario Landfill

- The alternative deemed in the business case analysis to be the ‘next best alternative to EFW, for the disposal of residual waste, after all diversion programs have been exhausted is “Other Ontario Landfill.” While this option may be comparable to EFW in the short-term, it has the disadvantage of increasing cost and uncertainty/risk over the longer term, due to exposure to fuel costs and a lack of Ontario landfill capacity to deal with projected demand.

4.5 EFW Facility

- Deloitte recommends EFW as the preferred method for disposing of post-diversion residual waste. Although the cost is comparable to Ontario landfill on a net present value basis, the significant up-front capital cost means tipping fees will be higher than landfill until such time as the project's debt is repaid. However, EFW provides a stable and viable long-term solution and can significantly reduce exposure to market uncertainties, particularly rising fuel costs and tipping fees for the long haul of waste to other Ontario landfills. The state-of-the-art facility proposed for Durham will also minimize impacts to health and the environment through an increased up-front capital cost for emission controls and district heating capability which can reduce the use of fossil based heating fuels by industrial facilities in the vicinity.

5.0 EFW: CAPITAL AND OPERATING COSTS

- The project specific capital and operating costs utilized in the business case are based upon significant enhancements being made to the base EFW facility. No financial valuation of environmental or other qualitative benefits are included in the financial business case calculations, although these benefits are discussed qualitatively.
- The enhancements directed or otherwise proposed for the facility have the impact of increasing the estimated up-front capital costs in the detailed business case analysis by approximately \$46.6 million, as compared to base facility costs. However, the following enhancements will definitely promote the Durham-York EFW facility to a state-of-the-art facility based upon international standards of technical quality and emission control:
 - Implementation of a Maximum Achievable Control Technology (MACT) solution surpassing A-7 guidelines;
 - State-of-the-art emission control technologies that meet or exceed the European Union (EU) monitoring and measurement standards;
 - Additional costs to include district heating compatibility for the Clarington Energy Business Park, including the incremental cost of including an extraction turbine in the EFW design and the addition of a heat exchanger, on-site district heating underground piping, and construction of a two kilometre common header loop for the Clarington Energy Business Park;
 - A cash allowance for enhanced architectural features, to be determined once a preferred vendor is approved and in consultation with the Municipality of Clarington;
 - Contingency odour control enhancements, in addition to base odour control measures, including a horizontal wet-scrubber roof-top odour control system;
 - Accommodation of an Education Centre and Public Viewing Gallery;
 - A double boiler instead of a single boiler to accommodate system redundancy and support district heating;

- A horizontal boiler configuration in order to decrease the height of the EFW facility, adding to the aesthetics of the Clarington Energy Business Park and the Municipality of Clarington;
 - Addition of a cash contingency to accommodate servicing and site improvements for the benefit the broader Clarington Energy Business Park adjacent to the facility.
- Other base assumptions for the cost analysis include the following:
- Air cooled condenser;
 - An enclosed waste tipping floor with a minimum storage capacity of four days and over sized to a future facility size of 250,000 tonnes per year;
 - Electricity output of 14 megawatts (MW) capacity, net of a 15% parasitic load, to provide up to 12 MW to the electrical grid;
 - Operating capacity of 140,000 tonnes per year; and,
 - Site infrastructure design for future capacity.

5.1 EFW Capital Costs

- A detailed capital cost estimate is included in the table which follows, based upon the assumptions above. Base facility items are provided separately from recommended additional items, added since the preliminary business case analysis was conducted in 2007.

Capital Cost Items	Total (\$2008)
Required Basic Items	
Hard Costs	
Site Development	7,136,000
Buildings	14,976,000
Processing Equipment	2,632,000
Ash Storage	2,210,000
Power Block Equipment	84,734,000
	<u>111,688,000</u>
Soft Costs	
Contingency	22,338,000
Engineering/Cont Observations	10,722,000
Permitting	804,000
Surveying and Soils Report (est)	67,000
Construction Management	5,361,000
	<u>39,292,000</u>
Subtotal	150,980,000
Recommended Optional Items	
Allowance for District Heating Capability	
Incremental Costs for Extraction Turbine	2,560,000
Heat Exchanger and Onsite Piping	1,229,000
Piping to Customers	650,000
Subtotal for District Heating	<u>4,439,000</u>
Full EU Compatibility	1,536,000
Dioxin Sampling	180,000
Contingency Odour Control Enhancement	2,048,000
Allowance for Enhanced Architectural Features	9,000,000
Viewing Gallery	1,024,000
Education Center	512,000
Contingency for Site Improvements	10,200,000
Differential Costs for System Redundancy	17,699,000
Subtotal	46,638,000
Recommended Base Case	197,618,000
Share Allocation	
Durham	155,327,748
York	42,290,252
Total	<u>197,618,000</u>

- It should be noted that these costs are shared between York and Durham Regions and for the purpose of the business case analysis it is assumed that all capital costs are shared on the basis of a 78.6% Durham and 21.4% York distribution, making the Durham share approximately \$155 million. This is a conservative assumption for the business case, since a principle of the Durham York MOU is that certain components of capital costs for site works and/or the facility that are based upon an expanded facility size (over sizing) will be shared 50/50. These details will be finalized as part of the future co-owners agreement and the project agreement with the vendor. The result of increasing York's capital share to reflect this arrangement will have a positive impact for the Durham business case, lowering the cost of the EFW option.

5.2 Operational Costs

- The table following includes estimated annual operating costs for the EFW facility and, similar to the capital cost table above, identifies the base facility plus recommended additional items separately. The Durham and York shares are provided, also based upon a 78.6% / 24.4% split.

Operating and Maintenance Cost Items	Total (\$2008)
Required Basic Items	
Labour	2,941,000
Annual Maintenance & Repair	2,159,000
Major Repair and Replacement Cost	996,000
Utilities & Reagents	1,559,000
Rolling Stock O&M Cost	112,000
Miscellaneous Cost	787,000
	<u>8,554,000</u>
Property Tax to Clarington	968,000
Process Residual Haul & Disposal	4,264,000
Profit and Contingency	1,702,000
	<u>6,934,000</u>
Subtotal	15,488,000
Recommended Optional Items	
Allowance for District Heating Capability	
Incremental Costs for Extraction Turbine	92,000
Heat Exchanger and Onsite Piping	11,000
Piping to Customers	13,000
Subtotal for District Heating	<u>116,000</u>
Full EU Compatibility	472,000
Dioxin Sampling	81,000
Contingency Odour Control Enhancement	33,000
Allowance for Enhanced Architectural Features	187,000
Viewing Gallery	125,000
Education Center	13,000
Contingency for Site Improvements	-
Differential Costs for System Redundancy	400,000
Subtotal	1,427,000
Recommended Base Case	16,915,000
Share Allocation	
Durham	13,295,190
York	<u>3,619,810</u>
Total	<u>16,915,000</u>

6.0 DELOITTE' S ECONOMIC ANALYSIS

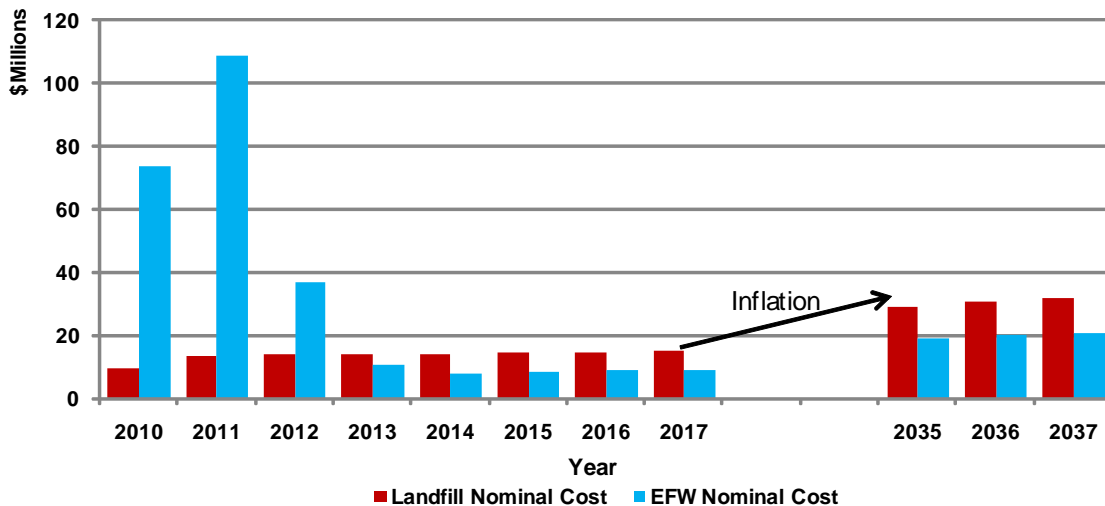
- Deloitte has completed an economic analysis that compares EFW to Other Ontario Landfill. The economic analysis, summarized in this section, demonstrates the Durham cost streams without consideration of financing, and presents the nominal and net present value calculations for each cost stream to convert dollars to a common year (2008) using a range of discount rates. The economic analysis includes:
 - a. EFW land costs estimated at \$80,000 per acre, based upon recent transactions in the vicinity of the EFW site;
 - b. Inclusion of discount rates to reflect the opportunity cost of utilizing Durham Region capital, based on the Region's estimated long-term cost of borrowing;
 - c. Significant annual capital replacement costs are included within the EFW option to account for replacement of EFW facility and equipment at the end of their useful life, and to ensure the Regions have a well maintained facility consistent with industry standards at the end of the 25-year operating contract;
 - d. A residual value of \$80 million for the building and land is assumed at the end of the 25 year operating contract, based upon lifecycle costing of the facility and equipment;
 - e. All haulage and transfer costs, including Durham specific transfer and haul costs to deliver municipal solid waste to the facility, in addition to Durham's share of ash disposal costs, are included, based upon the assumption of other Ontario haulage and disposal (outside of Durham Region);
- The economic analysis excludes:
 - a. Any quantitative valuation of intangible benefits resulting from higher than regulatory emission controls being included in the EFW project, or greenhouse gas credits (GHG), etc. despite the costs of implementation being included;
 - b. Any quantitative valuation of intangible financial or environmental benefits resulting from the sale of district or industrial heat to the proposed new OPG office building, Courtice Water Pollution Control Plant, or other industrial or commercial neighbours already adjacent to, or that locate in the future, within the Clarington Energy Business Park;
 - c. Methods of financing available to Durham Region to lessen the impact of EFW capital investment, neither Federal Government Gas Tax subsidy, nor debenture costs;

NO CHANGE

d. Any quantitative valuation of the benefits to the Municipality of Clarington from the enhanced architectural treatment of the facility, Energy Business Park infrastructure servicing and roads infrastructure recommended as part of the project to promote and assist in marketing the development of Clarington’s new Energy Business Park.

- The figure below demonstrates the nominal operating costs associated with both EFW and Other Ontario Landfill. In the early years the EFW option is more expensive than the Other Ontario Landfill option, however, over time, the costs of the landfill option outstrip the costs of the EFW because of greater inflation exposure for the Other Ontario Landfill options.
- The EFW option is less exposed to increases in haulage costs because hauling distances are minimized.

Nominal EFW Economic Cost Streams



- In terms of comparing costs on a present value basis, the table below shows that the cost differences between the two options are quite marginal. The Region’s long-term borrowing rate, which can be used to discount the cash streams to reflect the opportunity cost of capital, is 5%. At a 5% discount rate, the EFW option has a net cost of \$1.4 million compared to the Other Ontario Landfill option.

Yr	Other Ontario Landfill NPV's @ Varying Discount Rates			REVISED EFW NPV's @ Varying Discount Rates		
	Nominal			Nominal		
	0%	5.0%	6.0%	0%	5.0%	6.0%
2010	9.27	8.41	8.25	73.92	67.05	65.79
2011	13.53	11.69	11.36	108.72	93.91	91.28
2012	13.75	11.31	10.89	36.97	30.42	29.29
2013	13.97	10.95	10.44	10.33	8.09	7.72
2014	14.21	10.60	10.02	8.02	5.99	5.66
2015	14.45	10.27	9.61	8.35	5.93	5.55
2016	14.71	9.96	9.23	8.68	5.88	5.45
2017	14.98	9.65	8.86	9.03	5.82	5.35
	-	-	-	-	-	-
	-	-	-	-	-	-
2035	29.19	7.82	6.05	19.03	5.10	3.95
2036	30.46	7.77	5.96	19.92	5.08	3.90
2037	31.80	7.73	5.87	20.84	5.06	3.85
NPV Subtotal (\$2008)	552.12	249.80	218.05	552.25	331.46	306.50
Residual Value (\$2008) ^{Note}				80.25	80.25	80.25
Total (\$2008)	552.12	249.80	218.05	472.00	251.21	226.25
Economic Benefit of EFW Compared to Other Ontario Landfill						
NPV				80.12	(1.41)	(8.20)
% Savings				14.5%	-0.6%	-3.8%

Note: The residual value of the EFW was independently calculated by Deloitte in 2008 dollars considering land value, depreciation and life cycle, including recognition of significant annual maintenance and major repairs/replacement assumed within the cost streams over the initial 25 year term to support the good state of repair of the asset. Considering this separate calculation to establish the 2008 residual value, it was then applied by Deloitte to each of the results.

- The present value analysis is conservative for the EFW option and does not include potential revenues from the district heating/cooling for the Energy Park, the appreciation of land value related to the overall development of the Energy Park, and benefits from the sale of GHG credits.
- With respect to the sale of GHG credits, if you assume the sale of EFW GHG credits at Environment Canada estimates for the price of GHG credits, a present value benefit of \$6 million (at a 6 percent discount rate) is generated. If these revenues and value appreciation were factored into the present value analysis, the EFW option would be less costly to the Region than traditional landfill.
- There is an up-front weighting of costs for the EFW option as compared to the Other Ontario landfill option. The Other Ontario Landfill option has no up-front costs, and is based upon the acquisition of a transfer, haulage and landfill disposal contract estimated for the same 25-year period. By issuing a tender for landfill in the Ontario market (excluding the potential export of Durham waste to the United States), the Region will be subjected to significantly higher exposure for inflationary factors like fuel costs and uncertainty around landfill capacity or tipping fees.
- The EFW, while subject to a higher up-front cost, is deemed beneficial compared to the Other Ontario Landfill option given the following:
 - The advantage of a stable long-term secure and local waste disposal option with certainty in municipal solid waste disposal for a period possibly exceeding 50 years;

- The commitment to honour the agreement between the Ontario Minister of the Environment and GTA leaders and Michigan State Senators to stop the shipment of waste to Michigan by December 31, 2010;
- The risks associated with relying on the construction of new landfill capacity in Ontario to accommodate the current long-term landfill shortage and the prospect of the shortage that could be caused by a future U.S. border obstruction or closure;
- The price risks associated with the shortage of Ontario landfill options; and,
- Significantly higher exposure to fuel/haulage costs in the absence of a local waste disposal solution.

6.1 The Qualitative Benefits of the Increased Capital Investment

- The recommendation to include \$46.6 million of additional optional capital costs up-front, may result in the EFW option having a higher NPV cost (depending upon the discount rate), as compared to the Other Ontario Landfill option which involves no up-front investment of capital. However, Works and Finance staff feel confident that incorporating these costs will result in wider benefits that justify their inclusion, as noted in the following:

6.1.1 MACT and Full EU Compatibility

- The proposed MACT EFW will meet or exceed European Union (EU) standards and will include significant monitoring, including dioxin testing, as well as enhanced odour controls.
- Despite the additional cost, this is consistent with Council direction, and provides for a facility that, including a reduction of approximately 1.4 million truck kilometres per year, will minimize health impacts and provide for a safe solid waste disposal solution. The EFW, as currently proposed, is also estimated to produce approximately 44% less greenhouse gases, as compared to landfill.

6.1.2 District Heating Revenues

- The inclusion of district heating capability within the up-front capital cost allows the Region to capitalize on future revenue opportunities associated with the district heating initiative for the local energy park in Clarington. It also provides local industries in the vicinity of the facility with an opportunity to reduce their carbon footprint by reducing reliance on fossil fuels for heating and/or industrial processes. District heating revenues are not currently a part of this business case. Any revenues would be in addition to the financial benefits provided from producing electricity to power more than 19,000

Ontario homes from the reuse of municipal solid waste (approximately \$7 million per annum).

6.1.3 Clarington Energy Business Park Development (CEBP)

- Not only will the up-front investment in district heating provide for additional revenues in the future, the availability of cost-effective district heating in the future will be an attractive feature for enterprises looking to locate their businesses in the Clarington Energy Business Park (CEBP).
- The proposed EFW project will be the first energy related project to locate within the proposed CEBP. In addition to providing necessary servicing infrastructure to the CEBP, it is also proposed that the Region contribute to development of the proposed 'Energy Park Boulevard,' including land acquisition, boulevard construction, and lighting etc., subject to successful conclusion of a Host Community Agreement.
- In addition to anticipated costs of \$10.2 million for site works to initiate and attract development opportunities to the broader CEBP, the following are also envisioned in the EFW specifications:
 - Costs to accommodate architectural treatment of the facility to ensure the facility is consistent with the 'look' envisioned by the Municipality of Clarington for the CEBP, and with the architectural treatment to be determined with the preferred vendor, in consultation with Clarington;
 - Incorporation of a horizontal boiler system to reduce the height of the EFW facility;
 - Construction of a truck access road at the south end of the property behind the EFW facility to avoid trucks in the main areas of the CEBP;
 - An education centre and viewing gallery at the facility to ensure transparency and promote to the public the benefits of a world class EFW facility.

7.0 EFW BENEFITS AS SUMARIZED BY DELOITTE

- Deloitte recommends the Region pursue an EFW facility because it "...provides the best opportunity for a viable, long-term and environmentally sustainable local solution to the Region's waste management challenges." Deloitte notes the following advantages over next best alternative of Other Ontario Landfill:
 - **Is a truly local, long-term solution:** The EFW is a local solution that is technologically and environmentally sustainable and provides the Region and its residents with an incentive to reduce and divert its waste through more environmentally friendly practices and increased recycling. The facility would have the capacity to manage the Region's post-diversion waste for at least a 25 year period, and likely beyond 50 years.

- **Is a partnership solution:** The EFW is an inter-regional partnership between Durham and York and would benefit from capital funding using Federal Gas Tax revenues.
- **Creates new jobs:** Once the facility is in operation, 33 new, highly skilled positions would be created.
- **Delivers value for money:** The EFW option is more beneficial to the Region and its residents from both an economic and financial perspective. With the application of the Federal Gas Tax funding, the Region can pay off the debt on the facility within 6 years. With the application of energy revenues generated by the facility, the EFW option is a more cost effective option on a per tonne basis and it is not exposed to the public policy, competition, and capacity risks related to the Other Ontario Landfill option. In addition to lower operating costs over time, the EFW positions the Region to capitalize on revenue opportunities associated with the creation of carbon markets through the sale of carbon credits and revenues to be realized from a district heating initiative for the local energy park.
- **Is better for the environment:** The EFW produces 44 percent less greenhouse gases than landfill which would minimize the carbon footprint of the facility. The proposed facility is being subjected to a full study and consideration by the public through the EA process and Council proceedings.
- **A Healthy and Safe Solution:** The EFW would be built to meet European Union (EU) standards which, together with dioxin testing and enhanced odour controls, would provide a facility that minimizes health impacts. These added controls, together with a reduction of about 1.4 million truck kilometres per year, demonstrate that the EFW would be a safer solution.
- **Provides a source of renewable energy:** The EFW facility enables the productive reuse of waste to generate enough electricity to power more than 19,000 homes and to support a district heating initiative.
- **Is fiscally predictable and responsible:** The EFW would be owned by Durham and York Regions and would involve a partnership with a private entity that would design, build and operate the facility over 25 years under contractual terms. The long-term operating contract with the private entity, if structured properly, can ensure:

- i. Cost certainty;
 - ii. The asset is properly maintained through appropriate investments; and,
 - iii. The service levels are constant over the facility's life cycle.
- Deloitte also notes that in contrast with the closure of the Michigan border to municipal solid waste, the capacity of the Ontario landfill market will continue to diminish and cause market pressures.
 - The option "Other Ontario landfill" exposes the Region to significant risks and uncertainty with respect to service levels, costs and sustainability. Also current best practice, based on the European applications, is that a proximity principle ought to apply to waste management to reduce the environmental risks associated with shipping waste and to provide a local incentive to reduce and divert waste.
 - While noting that municipal decisions related to waste management are not easy and are highly contentious, Deloitte notes that the Region is to be commended for its commitment to find a local solution that ensures that its residents have control over future waste management strategies, while simultaneously promoting more progressive and environmentally sustainable behaviour. Deloitte states, the EFW option is the best option available to the Region in its efforts to reduce and divert waste and to bring stability to its waste management planning.

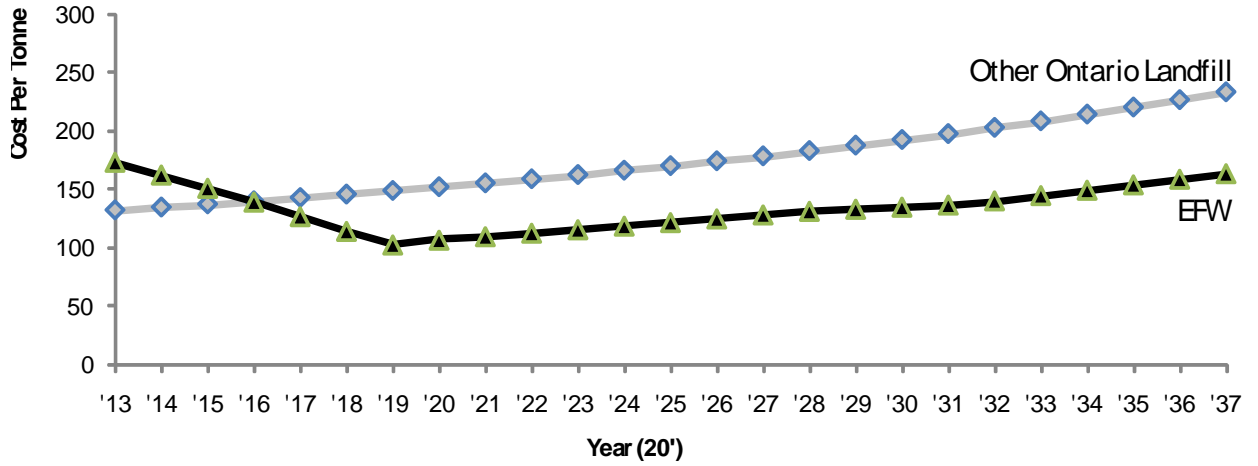
8.0 BUDGET AND PROPERTY TAX IMPLICATIONS

- It is recommended herein that the Region of Durham proceed to the RFP stage of the procurement process.

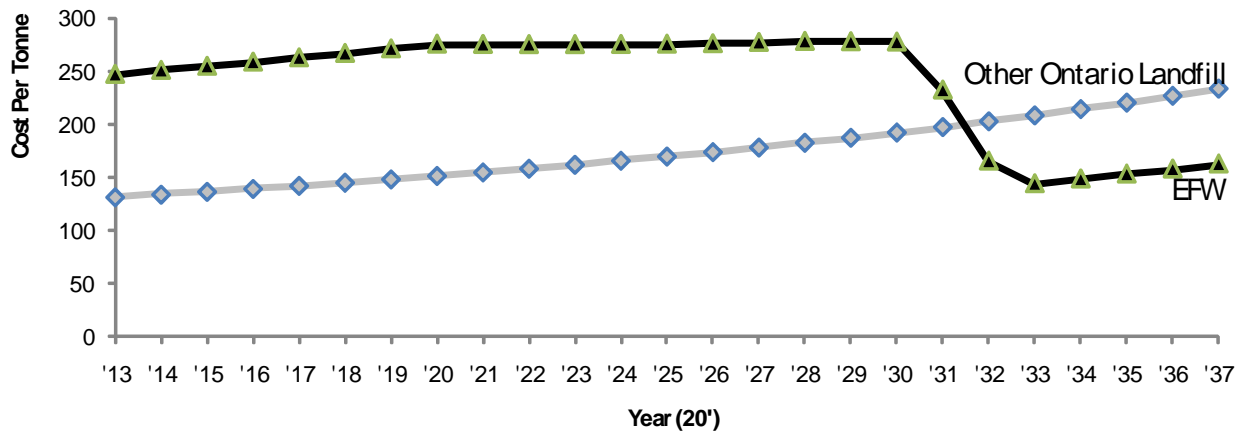
8.1 Proposed Financing

- An option for financing which is conducive to funding the proposed EFW facility capital cost is Federal Government Gas Tax funding. The February 2008 Federal Government Budget provided for the permanent extension of Federal Gas Tax funding to municipalities. By 2009-2010 the annual amount of Federal Gas Tax funding will be \$16.5 million per year.
- Use of the Federal Gas Tax money to up-front a portion of capital costs will provide a faster pay down of the principle portion of the debenture costs each year, resulting in the EFW capital being paid off within a six years.
- Subject to approval of the EFW project, the Commissioner of Finance would recommend the use of annual Federal Gas Tax revenues to accelerate the retirement of the debt financing for the facility. With the application of energy revenues generated by the facility, the EFW option is a cost effective option and it is not exposed to the public policy and capacity risks that the Other Ontario Landfill option is exposed to.

Gas Tax Financing to Pay Down Debt Principle



100% Debenture Financing: No Use of Gas Tax Funding



8.2 Budget and Property Tax Impacts

- The following chart compares the 2008 approved Durham Solid Waste Management disposal costs to estimated future budget disposal costs for the proposed EFW facility versus Other Ontario Landfill option, based upon the Deloitte business case, and assuming full application of the Region's Federal Gas Tax allocation to debt principle until the debt is paid down, as noted above.

Disposal Cost Comparison Between EFW and Landfill Alternatives

	Year	\$ millions				Regional Tax Impact	
		EFW	Landfill	Annual Variance	Cumulative Variance	EFW	Landfill
Michigan	2008	9.6	9.6	0.0	0.0		
	2009	9.3	9.3	0.0	0.0	-0.09%	-0.09%
Other Ontario	2010	9.3	9.3	0.0	0.0	0.00%	0.00%
	2011	13.5	13.5	0.0	0.0	0.96%	0.96%
EFW	2012	13.7	13.7	0.0	0.0	0.04%	0.04%
	2013	18.3	13.9	4.4	4.4	1.03%	0.04%
	2014	17.1	14.2	2.9	7.3	-0.27%	0.04%
	2015	15.9	14.5	1.5	8.7	-0.29%	0.07%
	2016	14.6	14.7	(0.1)	8.7	-0.27%	0.04%
	2017	13.3	15.0	(1.7)	7.0	-0.31%	0.07%
	2018	12.0	15.3	(3.3)	3.7	-0.29%	0.07%
	2019	10.7	15.5	(4.8)	(1.2)	-0.29%	0.07%
	2020	11.1	15.8	(4.7)	(5.9)	0.09%	0.07%
	2021 - 2025	63.8	89.8	(26.0)	(31.9)		
2026 - 2030	78.2	110.0	(31.8)	(63.7)			
2031 - 2035	93.2	134.5	(41.3)	(105.0)			

9.0 SENSITIVITY ANALYSIS

- Deloitte performed sensitivity analysis to determine which of the input variables has the greatest influence over its economic performance. The Deloitte analysis demonstrates that the variables with the greatest impact on the analysis are haulage costs and the price for the electricity generated by the facility.
- Like the Other Ontario Landfill option, haulage inflation has a significant impact; however, the impact is less for the EFW option because the haulage distance is being minimized.
- The price of electricity achieved under a Power Purchase Agreement (PPA) also has an impact on the economic performance of this option. The higher the price, the lower the cost of this option. Durham and York have asked for the 11 cent pricing available under the Renewable Energy Standard Offer Program and if a level consistent with this is achieved, it would significantly

reduce the cost of the EFW option to the Regions. Consistent with the conservative nature of the economic modeling conducted for this report, an eight cent per kWh price was used as the base case.

10.0 A REVISED MEMORANDUM OF UNDERSTANDING WITH YORK REGION

- It is recommended that the Region of Durham enter into a Memorandum of Understanding with the Region of York.
- York Region has agreed to an increased commitment to the project, and in particular has increased its share of the capital contribution. The Region of York's commitment on tonnage remains at 20,000 tonnes per year for the first phase of the project, although York Region has agreed to take responsibility for half of the cost of building in excess capacity to accommodate growth totaling 20,000 tonnes.
- The following highlight some of the key terms contained within the draft MOU:
 - Based on a projected processing capacity of 140,000 tonnes, Durham shall commit a minimum of 100,000 tonnes per year, and York shall commit a minimum of 20,000 tonnes;
 - The additional 20,000 capacity in the facility shall be allocated equally between York and Durham;
 - York and Durham shall share the capital construction costs and shall have an equity interest in the facility based on their proportionate share of the total tonnage allocation, representing a 21.4% interest for York and 78.6% for Durham;
 - Durham Region will own the land on which the facility is located;
 - York and Durham shall share on a 50/50 basis, agreed upon site works and facility costs, which are based upon the expanded facility size (250,000 tonnes to 400,000 tonnes) where it is financially prudent to build these costs up-front;
 - Each Region may borrow excess capacity not required by the other party;
 - The cost of upgrades to the facility shall be allocated based on each Region's respective equity interest; and,
 - The cost of any future expansion shall be borne by the Region requiring the additional capacity.

11.0 POWER PURCHASE OPTIONS AND NEGOTIATIONS WITH THE PROVINCE

- Regional staff are currently working with the Ministries of Energy and Environment staff to finalize the terms and pricing for a Power Purchase Agreement (PPA), as well as draft preliminary emissions guidelines. Although current negotiations will not be used to determine final emissions guidelines (part of the EA and approvals process and including preferred vendor participation), it will assist the Region in confirming specifications to be utilized within the RFP document.

- The Region is currently in discussions with the Province at both the staff and political levels and anticipates finalization of a PPA prior to RFP issuance. While Regional staff anticipate a higher benefit to the project based upon current negotiations, for the purpose of the detailed business case staff have been conservative in anticipating an average electricity price to the project of eight cents per kWh, consistent with the preliminary business case analysis in 2007.

12.0 OVERVIEW OF RFP PROCESS

- The RFP will be issued to obtain proposals that may lead to the execution of a Project Agreement with the preferred vendor for the provision of all labour and materials required to design, construct, operate and maintain a facility to convert municipal solid waste into usable energy for a term of 25 years.
- Under the terms and conditions of the agreement, the preferred vendor will be required to maintain the facility to a state consistent with industry standards, and ready for continued long-term utilization by the Regions of York and Durham at the end of the 25-year agreement.
- If following their substantive evaluation of the Proposals, the Regions select a preferred vendor, then the proponent will enter into negotiations with the Regions to finalize the terms of the Project Agreement, which is to be substantively included within RFP documentation, thereby minimizing terms subject to final negotiation to a three to six month period.

13.0 RFP PROPOSED BASIS OF TECHNICAL DESIGN

The EFW is proposed to consist of the construction of a state-of-the-art municipal solid waste (MSW) incineration and energy recovery unit. The project will include two boilers of the mass-burn water-cooled wall design, with a total nominal guaranteed processing rate of 140,000 tonne-per-year municipal solid waste incineration capacity; a steam turbine-based electricity cogeneration unit and heat rejection equipment; flue gas treatment equipment; ash handling facilities; and the medium-voltage work necessary to connect the new unit(s) with the utility grid.

- The EFW Project specifications are based upon the following main concepts:
 - Municipal solid waste incineration and energy recovery;
 - Two municipal solid waste boilers;
 - Mass-burning grate water-cooled wall type;
 - Live steam at 43 bars/346°C (620 psig/655°F) minimum to 62 bars/483°C (900 psig 900°F) maximum at boiler outlet;

- One extraction-condensing steam turbine unit;
- Heat rejection system with an air-cooled condenser capable of condensing the design steam flow bypassing the turbine;
- Closed Cycle Cooling Water system for cooling of plant auxiliaries using a fin-fan cooler and incorporating the existing plant auxiliary cooling loads;
- 100% steam turbine bypass;
- All facilities located indoors, including the flue gas treatment equipment devices;
- Tipping floor, refuse storage pit, and refuse cranes to be sized to receive, store, and supply fuel to two units with a total throughput capacity of 140,000 tonne per year, and a potential future expansion unit with a processing capacity of 110,000 tonne-per-year in a single expansion unit.
- Bottom ash to be quenched in a water bath, dewatered via hydraulic ram, and discharged onto a vibrating plate conveyor for transport to, and storage in a landfill/monofill; fly ash to be conveyed for separate treatment, storage and disposal in a hazardous waste landfill;
- Incorporate state-of-the-art flue gas treatment equipment to comply with European Union (EU) emissions standards;

Table 2: Air Emission Limits (Revised May 13, 2008)

Pollutant	Units	Ontario Guideline A-7	EU Directive 2000/76/EC EU Limits	Proposed Operational Limits
Total Particulate Matter	mg/Rm ³	17	9	9
Sulfur Dioxide (SO ₂)	mg/Rm ³	56	46	35
Hydrogen Chloride (HCl)	mg/Rm ³	27	9	9
Hydrogen Fluoride	mg/Rm ³	Not Specified	0.92	0.92
Nitrogen Oxides (NO _x)	mg/Rm ³	207	183	180
Carbon Monoxide (CO)	mg/Rm ³	NS	46	45
Mercury (Hg)	µg/Rm ³	20	46	15
Cadmium (Cd)	µg/Rm ³	14	Not Specified	7
Cadmium (Cd) + Thallium (Tl)	µg/Rm ³	Not Specified	46	46
Lead (Pb)	µg/Rm ³	142	Not Specified	50
Sum of (As, Ni, Co, Pb, Cr, Cu, V, Mn, Sb),	µg/Rm ³	Not Specified	460	460
Dioxins/Furans (ITEQ)	ng/Rm ³	0.08	0.092	0.06
Organic Matter (as Methane)	mg/Rm ³	66	Not specified	49

NOTES:

Rm³ = "Reference Cubic Metre" – i.e. 1 cubic metre at Standard Temperature and Pressure (298 °K, 1atm)

All concentrations corrected to 11% O₂

All values represent 24 hour averages

mg = milligrams = 10⁻³ grams

µg = micrograms = 10⁻⁶ grams

ng = nanograms = 10⁻⁹ grams

- Lime slaking system and associated lime handling accessories;
- Emissions to be continuously monitored for CO, O₂, SO₂, NO_x, HCl and opacity;

- Combustion temperature, fabric filter inlet temperature, steam flow, and powdered activated carbon addition rate also to be continuously monitored for compliance with regulated limits;
- All incinerator-boiler units to be controlled from a centralized control room; and,
- Incorporation of sustainable design features and architectural treatment that improves the aesthetic nature of the facility and allows it to blend into the surroundings of the selected site.

14.0 **SIZING CRITERIA**

- Plant sizing was based on detailed evaluation of both Regions needs for disposal of residual waste and projected diversion rates. Initial projections were analyzed and adjusted to reflect increased diversion rates. In Durham, Council direction was to reach 50% diversion by 2007. This goal was reached as result of collection changes in 2007. Furthermore, Regional Council in 2008 instructed staff to investigate the feasibility of reaching 70% by the end of 2010. Assuming increased diversion rates of 60% to 70%, combined with future population growth, plus a guaranteed 20,000 tons of York Region municipal waste, a 140,000 tonne EFW plant will have capacity for the next 15 years.
- The facility is being designed close to capacity to ensure continued expansion of diversion programs as well as optimal operating efficiency of the plant. Better plant efficiency provides cleaner combustion conditions and improved emission control.
- The initial Facility will include two 70,000 tonnes/year units and have incremental expansion capability to a total guaranteed processing capacity of 400,000 tonnes per year. This dual unit design will provide for minimal periods of scheduled down time for maintenance as each unit can be serviced independently.
- Durham will provide 110,000 tonnes per year to the new EFW Facility, including 10,000 tonnes of excess capacity to accommodate growth or other unanticipated tonnages generated by the Regions. York Region will provide the remaining 30,000 tonnes per year of initial tonnage, including 10,000 tonnes of excess capacity. The EFW facility will also be partially designed for expansion capability for processing an additional 110,000 tonnes per year in a single expansion unit.
- The new Facility will be designed for a total as-received municipal solid waste processing capacity of 19,000 kg/hr (20.9 tons per hour), with a design point higher heating value of 12,560 kJ/kg (5400 Btu/lb). The boiler will have the ability to operate on a continuous and stable mode within 70 to 100 percent of the thermal load at the design point, and within 60 to 100 percent of municipal solid waste throughput at the design point. Live steam will be generated at a

minimum of 43 bars/346°C (620 psig/655°F) minimum and a maximum of 62 bars/483°C (900 psig/900°F) at boiler outlet.

- The steam turbine-generator will have the capacity to pass the live steam generated by the boiler units at the design point steaming capacity. An extraction cycle will be incorporated with a suitable tap and valve arrangement to provide extraction steam or hot water for the future district energy system. The main condenser will be capable of condensing the steam generated by the incinerator-boiler at the design point steaming capacity, with the steam turbine running either in full condensing mode or in full bypass mode or under any level of controlled steam extraction.
- The balance of plant systems will be sized for the worst case scenario resulting from the boilers at the design point steaming capacity, and the steam turbine either running in full condensing mode or in full extraction mode or under any level of controlled steam extraction.
- The tipping floor and storage pit will be sized for a potential expansion of up to 110,000 tonnes-per-year of operating capacity in a single expansion unit. Utility service (electricity, water, sewer, etc.) will be sized for the future ultimate facility processing capacity of 400,000 tonnes per year.

15.0 EU MONITORING AND EMISSION STANDARDS

- In keeping with Council's direction to design the most modern and state-of-the-art emission control technologies that meet or exceed the European Union (EU) monitoring and measurement standards, and commits to Maximum Achievable Control Technology (MACT) for emissions and monitoring, the proposed air emissions Table 2 (see page 28) was approved by JWMG on May 13th, 2008.
- Modern EFW plants are subject to the most stringent pollution control standards of virtually any industry in the world. The EU standard has been seen as a leader in this field due in part to their vast use of these facilities for waste management.
- The RFP for the EFW facility require vendors to guarantee the Operational Limits presented in the attached Table 2 (see above) for the specified contaminants of concern. This table also lists the corresponding limits specified in Ontario's Guideline A-7 and the appropriate EU standards.
- The RFP will require vendors to provide continuous monitoring of key operational parameters and all regulated contaminants that can be reliably monitored on a continuous basis (where practical). Proven technologies do not exist to continuously monitor all of the specified contaminants however, in these cases, other process parameters or surrogates will be monitored continuously or frequently to ensure that the emissions of the specified contaminant are being properly controlled on a continuous basis in keeping

with EU and A-7 principles. The RFP will also require routine quarterly or semi-annual stack testing of regulated contaminants that can not be continuously monitored

16.0 **CONCLUSIONS AND NEXT STEPS**

- Based upon the detailed business case report and analysis presented herein, including economic and life cycle costing analysis and analysis of potential financing, it is recommended that the Region proceed to the next RFP phase of the EA process in order to select a preferred vendor to:
 - a) Complete the requirements of the EA and EPA processes; and,
 - b) Design, build, and operate a Regionally-owned EFW facility on the preferred site 'Clarrington 01,' as identified through the EA process and approved by the Regional Councils of York and Durham in January 2008.
- After evaluation of several potential waste disposal alternatives, it is concluded that EFW is the best available option for the long-term disposal of Durham's post-diversion residual waste. Despite the up-front capital investment required, the EFW option is comparable to the cost of the Other Ontario Landfill Option and also removes the significant risk and uncertainty with respect to both fuel costs and a shortage of available landfill capacity, even excluding the possibility of disruption, higher costs and or closure of the Michigan border.
- The recommended financing for the EFW facility would be to use the Federal Gas Tax. This allows for the debt on the facility to be paid down within six years and fully mitigates any impacts to property tax rates. Applying this funding to debenture principle each year allows the Region to attain secure long-term disposal for decades with a positive impact to property tax rates.

C.R. Curtis, P.Eng. M.B.A
Commissioner of Works

R.J. Clapp, CA
Commissioner of Finance

Recommended for Presentation to Committee

G.H. Cubitt, MSW
Chief Administrative Officer

Attmt.

Durham-York Energy-From-Waste Facility

Business Case
Prepared for the Region of Durham

May 15, 2008

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1. Executive Summary

The Region of Durham (“Durham” or “Region”) is almost at the halfway point in the implementation of its *Long Term Waste Management Strategy Plan: 2000 to 2020* (Strategy). This Strategy is focused on increasing waste diversion efforts and in 2007 Durham achieved its target of 50 percent diversion. To continue to proactively manage the waste management needs of its residents, Durham has established a new target of 70 percent by the end of 2010. While Durham is showing demonstrable progress in increasing its waste diversion success, the end of shipments to Michigan of Ontario’s residual municipal solid waste (MSW) by January 1, 2011, poses a critical challenge to the sustainability of Durham’s waste management activities. In response to this challenge, Durham has partnered with the Region of York (York) to explore the development of an Energy from Waste (EFW) facility to process residual MSW.

The proposed EFW facility has gone through two stages of environmental assessment under the Environmental Assessment Act (EA), and a Request for Qualifications (RFQ) process has been completed to pre-qualify bidders to respond to a Request for Proposals (RFP) to ultimately deliver an EFW solution consistent with the EA process. The RFP will be issued subject to Council approval, based upon the findings of this business case report. This business case includes an analysis of possible waste management options including: (i) Continue shipping to Michigan; (ii) Maximize usage of the Brock Landfill; (iii) Transport waste to other Ontario Landfills; (iv) Develop a new Stabilized Landfill solution; and (v) EFW. The findings of this business case provide an analysis of these options to assist in guiding Durham’s decision-making process on issuing the RFP.

In this business case, the five options noted above were screened against a set of criteria reflecting a preference for a timely, local, and technologically viable solution to meet Durham’s waste management needs. The result of this screening process left two clear options for further consideration: (i) Other Ontario Landfill; and (ii) EFW.

This business case provides a comprehensive risk and cost evaluation of the EFW and Other Ontario Landfill options and makes a final recommendation. In this assessment, both options were evaluated using an evaluation framework guided by principles that the selected option should:

- Be a local solution that is realistic, long-term and not a local landfill;
- Protect and promote environmental sustainability and environmentally sensitive behaviour;
- Foster multi-government partnership and cooperation;
- Achieve value for money;
- Advance the productive reuse of waste materials;
- Promote the public interest through transparency and evidence-based decision-making; and
- Ensure appropriate public ownership/control.

It is recommended that Durham pursue an EFW facility because it provides the best opportunity for a viable, long-term and environmentally sustainable local solution to Durham’s waste management challenges. On balance, the EFW option has the following advantages over the Other Ontario Landfill option. It:

- **Is a truly local, long-term solution:** The EFW is a local solution that is technologically and environmentally sustainable and provides Durham and its residents with an incentive to reduce and divert its waste through environmentally friendly practices and

increased recycling. The facility would have the capacity to manage Durham's post-diversion waste beyond a 25 year period, and possibly beyond 50 years.

- **Is a partnered solution:** The EFW is an inter-regional partnership between Durham and York providing benefits from the sharing of a significant capital investment.
- **Creates new jobs:** It is estimated that the \$200 million capital investment would create approximately 1,000 direct and indirect jobs during construction. Once the facility is in operation, 33 new, highly skilled positions would also be created.
- **Delivers value for money:** The EFW option is beneficial to Durham and its residents from an economic and financial perspective. With revenues generated by the facility from the sale of electricity, the EFW option is comparable to the cost of landfill but not exposed to the same public policy, competition, and capacity risks as the Other Ontario Landfill option. In addition to the lower operating costs over time, the EFW positions Durham to capitalize on revenue opportunities associated with the creation of carbon markets through the sale of carbon credits and revenues to be realized from a district heating initiative for the Clarington Energy Business Park (Energy Park).
- **Safe for the environment:** The EFW produces 44 percent less greenhouse gases (GHG) than landfill which would minimize the carbon footprint of the facility. The proposed facility has been subject to full study and consideration by the public through the EA process and Council proceedings.
- **A healthy and safe solution:** The EFW would be built to meet European Union (EU) emission standards which, together with dioxin testing and enhanced odour controls, would provide a facility that minimizes health impacts. These added controls, together with the estimated elimination of about 1.4 million truck kilometres per year, demonstrate that the EFW would be a safer solution.
- **Provides a source of renewable energy:** The EFW facility enables the productive reuse of waste to generate the electricity to power more than 19,000 homes and support district heating in the vicinity of the facility.
- **Is fiscally predictable and responsible:** The EFW would be owned by Durham and York and would involve a partnership with a private entity that would design, build and operate the facility over a 25-year contract. The long-term operating contract with the private entity, if structured properly, would ensure: (i) cost certainty; (ii) that the asset is properly maintained through appropriate investments; and (iii) that service levels are adequate over the facility's life cycle.

In contrast, with the impending closure of the Michigan border to MSW, the capacity of the Ontario landfill market is likely to diminish and cause increased market pressures.

While the Other Ontario Landfill option would be convenient from a timing and availability perspective, it could expose Durham to a significant number of risks that create uncertainty with respect to service levels, costs and sustainability. Also, the current best practice, based on the European applications, is that a proximity principle ought to apply to waste management to reduce the environmental risks associated with shipping waste and to provide a local incentive to reduce and divert waste. This long-haul option could also place Durham in a difficult position with other municipalities, similar to the Michigan experience.

A decision to pursue the development of an EFW would be consistent with Durham's 1999 long-term waste management strategy. Municipal decisions related to waste management are not easy and they are highly contentious. However, Durham is to be commended for its commitment to find a local solution that ensures that its residents have control over future waste management strategies, while simultaneously promoting more progressive and environmentally sustainable behaviour through the aggressive pursuit of increased diversion. The EFW option is the best option available to Durham in its efforts to reduce and divert waste and to bring stability to its waste management planning.

2. Introduction

2.1 Purpose of Business Case

This business case has been commissioned by Durham to provide a comprehensive risk and cost evaluation and final recommendation on the waste management options available to the municipality. The findings of this business case will help guide Durham's decision-making on whether or not to proceed with the issuance of an RFP for the design, build and operation of an EFW facility.

This business case builds on the preliminary business case undertaken by Durham (and Deloitte) in 2007 during the first stage EA studies to inform decision-making around the release of the RFQ. That preliminary business case identified, analyzed and compared residual MSW disposal under landfill and or thermal treatment options. In addition, Durham and York undertook analysis of potential delivery options that involved the public and private sectors to varying degrees with respect to the financing, design, construction and operation of a local EFW facility. The results of these studies were the identification of an EFW solution that would:

- Be publicly owned with the private sector to design, build, and operate the facility under a single contract of up to 25 years with renewal periods within that timeframe;
- Have the capacity to process up to 250,000 tonnes of MSW (post-diversion) per year, with future scalability required to accommodate growth as high as 400,000 tonnes per year over the life of the anticipated contract; and
- Have technology that achieves: (i) thermal treatment of MSW and recovery of energy followed by recovery of materials from ash/char; or (ii) processing of MSW to recover recyclable materials and produce solid recovered fuel (SRF) followed by the thermal treatment of the SRF to produce energy.

The intent behind this more detailed business case is to validate the findings of the preliminary study through a more rigorous analysis and evaluation of the options. This business case is conservative in all its assumptions. If this business case validates the EFW option, its findings will be used to support the possible release of an RFP to identify a preferred vendor to deliver the EFW solution.

Role of Deloitte

Deloitte was retained by Durham to develop this business case. In doing so, Deloitte was responsible to:

- Obtain relevant cost and revenue inputs from Durham and its advisors;
- Where necessary, conduct independent research and analysis to confirm key assumptions; and
- Work with Durham to identify the options to be analyzed, methodology to be applied, and the framework and criteria used to evaluate and select the preferred option.

Please refer to the final page of this report for additional information related to Deloitte's role.

2.2 Background

Municipal Partnership

Durham and York have partnered since 2005 to find a shared solution to their MSW management needs. The process has progressed through two stages of the EA process and a RFQ process.

Under the partnership agreement between the Regions, the following roles and responsibilities have been agreed to:

- York and Durham will own the EFW facility;
- The EFW facility will be located within Durham;
- The Region and York will continue to partner on the completion of the EA study;
- The Region will lead the RFP to engage the preferred vendor to design, build and operate the EFW facility;
- Durham pursuing commercial arrangements to secure the revenue stream(s) that result from the sale of energy (electricity or heat/steam) generated by the EFW facility; and
- York and Durham guarantee waste quantities.

York and Durham have developed a decision-making framework for finding a shared solution to their residual MSW needs that is guided by two fundamental principles. The first principle is to reduce long-term dependence on waste disposal by achieving waste diversion targets through the use and promotion of recycling. The second principle is to find a stable and viable long-term solution (i.e. in 25 to 50-year time frame) that is cost-effective, reliable and above all minimizes impacts to human health and the environment.¹

Context for Action

In 2004, all of Durham's residual MSW was being disposed at landfills and, as a result of the closure of the Toronto Keele-Valley landfill, Durham came to rely almost entirely on Michigan landfills for the majority of its residual disposal needs. As a result of this reliance, Durham reviewed its residual waste disposal strategy and established a task force to identify and examine its long-term disposal options. York reached similar conclusions during this time-frame.

The decision to examine waste management alternatives was timely because, in 2006, legislation was proposed by the Michigan State Legislature to stop the importing of Ontario municipal waste to landfills within the State. The State's legislation was followed up by legislation introduced in the United States Congress that may have closed the Michigan border to Ontario's waste within 90 days. In response to this threat, the Ontario government was able to reach an agreement with the U.S. Senators from Michigan to phase out and terminate the export of MSW from Ontario to Michigan landfills by the end of 2010. Within this timeframe Ontario municipalities agreed to reduce their shipment of waste by 20 percent by 2007 and a further 20 percent reduction by the end of 2008. In return, the US Senators from Michigan have agreed that they will not pursue amendments to the bill.

Progress to Date

Table 1 below outlines the critical steps that have been completed under the partnership between the Regions and anticipated next steps.

¹ Regional Municipality of Durham, *Request for Qualifications to Design, Build and Operate an Energy from Waste Facility*, July 12, 2007, p. 8.

Table 1: Partnership Progress and Next Steps²

Project milestone	Estimated timeframe
Prepared EA Terms of Reference	2005
Submitted EA Terms of Reference to Minister for Approval	December 2005
EA Terms of Reference Approved	March 2006
Initiated EA Study	March 2006
Evaluated “Alternatives to” the Undertaking (i.e., Technologies)	2006
Selected Preferred Approach to Manage Residual Wastes	2006
Evaluated “Alternative Methods” of Carrying Out the Undertaking (i.e., Siting)	Late 2006 - End 2007
Selection of Preferred Durham/York Site	End of 2007
RFP to Identify a Preferred Technology and Vendor	Early 2008
Selection of Preferred Durham/York Technology Vendor	Late 2008
Complete Site Specific Studies to Confirm Suitability and Documentation to Support Approvals	2008
Submit EAA Approval Documentation to Minister for Approval	Early 2009
EA Review and Approval by Minister	2009-2010
Implementation of Undertaking	2010-2012

As noted earlier, this business case is being undertaken to inform Durham’s decision to issue the RFP to identify the preferred technology and vendor.

Findings of the EA process³

In order to compare the environmental impacts of the EFW’s thermal treatment process with remote landfill disposal, Durham retained Genivar Inc. and Jacques Whitford Ltd. to conduct a lifecycle analysis as part of the “Alternatives to” study under the EA process. This work has resulted in a variety of studies conducted under the EA process that are available on Durham’s website noted in footnote two below (collectively, the “EA Study”). The consultants noted that the analysis is not intended to provide a complete assessment of the environmental impacts of the residual waste processing systems, but rather to provide a relative comparison of alternatives that can be used as a tool to support the decision making process. A summary of findings is provided below:

The two systems (landfill and EFW) were analyzed in terms of energy consumption/savings, greenhouse gas emissions, acid gases, pollutants that cause smog, heavy metals, dioxins and emissions to water. This analysis was made using a model developed with the cooperation of the U.S. Environmental Protection Agency as well as extensive peer review and stakeholder input. The comparison model also took into account net emission reductions, which occurred as a result of reduced energy generation requirements. These lower energy requirements offset emissions that would otherwise be released during the production of electricity. The model also considers the benefits that stem from the recovery of metals in the thermal

² Regional Municipality of Durham, http://www.durhamyorkwaste.ca/study_schedule.php, May 8, 2008.

³ Information contained in this sub-section is taken directly from the summary prepared for the document titled, “Supplement to Annex E-5: Comparative Analysis of Thermal Treatment and Remote Landfill on a Lifecycle Basis,” dated July 4, 2007 and available at <http://www.durhamyorkwaste.ca/media.php>.

treatment facility. The recovered metals can be recycled, which offsets the additional energy and environmental effects required to bring new metals to the market.

These results show that, for the situation in York and Durham, residual waste managed by thermal treatment is better than the remote landfill scenario with respect to energy consumption/generation, emissions to air of greenhouse gases, acid gases, pollutants that cause smog, and emissions to water. The future benefits of thermal treatment over remote landfill are that thermal treatment provides a local source of energy, and generates a greater quantity of energy than remote landfill. Thermal treatment also has a lesser impact on the global and local airsheds since it has lower emissions to air of greenhouse gases, acid gases and smog precursors than the remote landfill scenario. Furthermore thermal treatment has lower emissions to water, therefore reducing the potential impacts on local water resources. Remote landfill has lower emissions to air than thermal treatment for heavy metals and dioxins.

It was further noted that the emissions to air of heavy metals and dioxins from thermal treatment are very small and can be further reduced by modern air pollution control equipment. These emissions are well within the regulatory limits and less than the emissions of these contaminants from many other established industrial sources such as metal refining, wastewater treatment or fossil fuel based electricity generation.

Pre-Qualified Private Vendors

An RFQ was issued July 12, 2007, asking those interested in bidding on the EFW project to submit their qualifications to design, build, and operate an EFW facility for Durham and York. As set out in the RFQ, the Preferred Proponent's responsibilities would be to:

- Assist with environmental approvals and other approvals as required (e.g. building permits, servicing agreement, health and safety, etc.);
- Provide the Thermal Treatment Technology;
- Design and construct the EFW facility to the performance and size specifications developed by the Regions;
- Finance all construction obligations between milestone progress periods payments;
- Implement expansions and modifications to the EFW facility as directed by the Regions;
- Operate and maintain the EFW facility;
- During the operational period, comply with performance specifications developed by the Regions;
- Finance operations between milestone contract payments; and
- Meet environmental and health and safety requirements.

The RFQ process resulted in the following pre-qualified vendors chosen to respond to the possible RFP:

1. Veolia Environmental Services Waste to Energy Inc., AMEC, and Black & McDonald;
2. Covanta Energy Corporation;
3. WRSI/DESC Joint Venture, Fisia Babcock Environmental GmbH, Kiewit Industrial Company, Morgan Stanley Biomass LLC, and Babcock & Wilcox;
4. Wheelabrator Technologies Inc.; and
5. Urbaser SA.

Preferred Site⁴

Earlier this year, Durham Regional Council approved, on the basis of their consultant's recommendation, Clarington 01 as the preferred site for the EFW facility. Clarington 01 is a 12-hectare site located between Courtice Road and Osbourne Road in the Municipality of Clarington. This site, which is owned by Durham, is located in the Clarington Energy Business Park (south of Highway 401) – an area that includes commercial properties, CN Rail tracks, the Courtice Water Pollution Control Plant, and the Darlington Nuclear Generating Station.

Provincial Context for Municipal Waste Management

For more than 20 years, the province of Ontario has maintained a passive approach to the development of waste management policy, approving few new landfills or landfill expansions, banning incineration as a waste management option, only to reverse the ban a few years later.⁵ In 2003, the current government promised to implement policies to move Ontario towards a 60 percent diversion target. In 2004, the Ontario Ministry of the Environment (MOE) released a discussion paper on moving towards a 60 percent target, however, consultations have not yet been followed up with the regulatory or policy changes required to support the diversion target.⁶

Three pieces of legislation govern various aspects of waste management in Ontario—the *Environmental Protection Act, 1990*; the *Environmental Assessment Act, 1990*; and the *Waste Diversion Act, 2002*. The *Environmental Protection Act* provides the MOE with the responsibility and powers to regulate waste management. The establishment or operation of a waste management facility in Ontario requires an MOE certificate of approval.⁷ The *Environmental Assessment Act* mandates that public entities (i.e., municipalities) to undertake an environmental assessment for waste management activities including expanding an existing landfill or establishing an EFW. The *Waste Diversion Act* governs recycling activities in the province and defines what wastes are to be recycled and how those materials are to be handled.

From a policy perspective, the MOE has two key policy guidelines that apply to municipal waste. The first is Guideline A7 which regulates emission standards for municipal systems. The second is Guideline A8, introduced in 2004, which provides guidance for the implementation of the Canada-wide standards for mercury, dioxins and furan emissions. These two policies apply to municipal incineration facilities.

The provincial regulatory and policy landscape has been fairly static for the last decade. However, recent actions taken by the MOE indicate that the government may be on verge of a regulatory and/or policy transformation, largely as a response to the waste management challenges posed by the anticipated closure of the Michigan border in 2010. On March 23, 2007, the MOE amended O. Reg 347 under the *Environmental Protection Act* to create a streamlined approvals process for demonstration or pilot waste management technologies and projects. The amendment is intended to incent proponents to test and collect data on new approaches to waste management. If successful, projects would be in a better position to obtain rigorous environmental approvals and technology acceptance critical to long-term viability and success.⁸ The amendment also exempts these pilot projects from the *Environmental Assessment Act*.

⁴ Regional Municipality of Durham, http://www.durhamyorkwaste.ca/study_schedule.php, May 8, 2008.

⁵ Maureen Carter-Whitney, "Ontario's Waste Management Challenge: Is Incineration an Option," Canadian Institute for Environmental Law and Policy, 2007, p. 4.

⁶ Ibid., p. 28.

⁷ Ibid., pp. 20-21.

⁸ Ibid., p. 23.

Also in March 2007, the MOE implemented a regulation amendment under the *Environmental Assessment Act* to rationalize the EA process for waste projects. The regulation established three categories with progressively more intense environmental assessment requirements. The first category of projects is those with minimal environmental effects, such as composting facilities, which no longer require approval under the Act. The second category of projects is those with known environmental impacts (i.e., landfills) which are now subject to an environmental screening—though they can be bumped up to full environmental assessments. The last category is those projects with significant environmental impacts (i.e., disposal of hazardous waste or incineration without an energy component) which are subject to a full environmental assessment. The MOE made this regulatory change to “improve the EA process and to give municipalities and industry more effective tools for managing waste⁹.”

It is clear from these regulatory amendments that the Ontario government is eager to have the municipal and private sectors search for new, environmentally sustainable solutions to the waste management challenges facing the province.

Durham Region’s Waste Management Strategy

Context

The *Residual Waste Disposal Planning Study Background Document 2-1: Purpose and Need for the Undertaking*¹⁰, published in December 2005 as part of the Durham/York Residual Waste Study, briefly outlined several previous attempts to bring a long-term waste management solution to Durham. In the late 1980s, the regional municipalities of southern Ontario were rapidly running out of landfill capacity and banded together with the province to establish short-term contingency landfills while at the same time working on a longer-term solution. Each regional municipality was required to select a site for a contingency landfill with a short-term (5-year) capacity. Durham selected a site in Pickering and designated it as P1 Contingency Landfill. By 1990, however, lingering environmental concerns and strong opposition from residents forced Durham to cancel plans to develop the P1 Contingency Landfill.

In 1990, the newly elected provincial government established the Interim Waste Authority Ltd (IWA), a cooperative engagement between the provincial and regional GTA governments. The IWA was mandated to establish long-term landfill capacity spread across 3 landfills in the GTA meeting the requirements of the *Environmental Assessment Act* and the newly established *Waste Management Act*. A preferred Durham Region site was selected in Pickering but the initiative was cancelled in 1995.

Current Strategy

In 1999, Durham adopted a “*Long Term Waste Management Strategy Plan: 2000 to 2020*”. The primary objective of the plan was to “Develop a long-term waste management strategy plan to investigate technically feasible waste reduction and waste disposal opportunities in an environmentally and financially responsible manner.”¹¹ The main goals of the waste plan were:

- To divert at least 50 percent of the residential waste from disposal by 2007 or earlier (Durham is committed to achieving a goal of 70 percent diversion by the end of 2010);

⁹ Ontario Ministry of the Environment, “PROVINCE’S NEW RULES HELP MUNICIPALITIES MANAGE WASTE BETTER: Small Communities, New Technologies and Recycling Projects to Benefit,” March 23, 2007, <http://www.ene.gov.on.ca/en/news/2007/032301.pdf>.

¹⁰ http://www.durhamyorkwaste.ca/pdfs/study/Background_Document_2-1_Purpose_and_Need_for_the_Undertaking.pdf

¹¹ Regional Municipality of Durham, *Region of Durham Long-term Waste Management Strategy Plan: 2000 to 2020*, <http://www.region.durham.on.ca/departments/works/waste/ltwmstp.pdf>, 1999.

- To secure an alternate source for the disposal of residential waste, when Toronto's Keele Valley Landfill Site is closed;
- To implement an integrated residential waste management system for the collection, processing and disposal of:
 - Blue Box recyclables;
 - Food and yard waste compostables;
 - Residual garbage wastes; and
 - Special wastes; and
- To consider an "energy-from-waste" facility for the disposal of residual garbage waste.¹²

Figure 1: Region of Durham Waste Management Strategy (1999)



Durham has implemented several initiatives to enable it to achieve its goal. In July 2006, Durham introduced the green bin collection of organics in the Cities of Oshawa and Pickering and the Towns of Whitby and Ajax, thereby joining the Municipality of Clarington, and the Townships of Brock, Uxbridge and Scugog which began diverting kitchen organics from the waste stream in 2003. To encourage residents to divert material from their waste stream, bag limits have also been established, with residual waste collection occurring every other week.

Of the 232,957 tonnes of municipal waste produced in 2007, Durham was able to divert 116,671 tonnes from landfill through Blue Box, Green Bin, compost, and reuse programs to successfully achieve its target diversion rate of 50 percent by 2007.

The opening of a new Material Recovery Facility occurred in January 2008, and with the newer sorting technology, Durham can continue to expand and optimize its already successful Blue Box recycling program. In addition, new curbside programs will be introduced in the municipalities of Clarington in 2009, and Brock, Scugog and Uxbridge in 2008 that will increase diversion rates and result in less waste requiring disposal. Durham

¹² Ibid.

also continues to actively promote the importance of waste diversion through ongoing community education programs and media campaigns.

The ultimate goal for Durham is to continue to invest in local waste management solutions that will help it achieve its diversion target of 70 percent.

3. Drivers and Pressures

The Region is reviewing and making decisions on its waste management options in a dynamic public policy, economic, social, environmental and technological environment. Everyday, variables that affect waste management choices are changing—from the price of fuel to innovations in waste management technologies that open up new possibilities for environmentally sustainable waste management practices. This section attempts to highlight some of the key circumstances and trends affecting the waste management choices facing Durham, as it faces the challenge of finding a solution that is needed to address the impending closure of the Michigan landfill market.

3.1 Public Policy Environment

Public policy around the natural environment and climate change has reached top-of-mind status with the public. This heightened awareness of environmental and climate change issues make the normally contentious matter of waste management even more contentious. This certainly has been the case for Durham as it has investigated its own waste management options, with the community consensus being that a local landfill is not a viable solution for residents.

The Ontario government has been particularly aggressive in outlining measures aimed at reducing the province's contribution to climate change. Ontario's Go Green Action Plan includes measures to:

- Phase out the use of coal for generating electricity;
- Invest over \$17 billion in public transit initiatives;
- Establish a 1.8 million acre greenbelt to protect important natural systems from urban sprawl;
- Promote urban intensification and communities connected by public transit under the Places to Grow Act;
- Strengthen energy efficiency standards; and,
- Implement an aggressive renewable energy policy.¹³

Of particular significance to waste management issues in the Go Green Plan (Plan) is the Ontario government's GHG targets. The Plan states that Ontario will achieve "...emission reduction targets of six percent below 1990 levels by 2014, 15 percent below 1990 levels by 2020, and 80 percent below 1990 levels by 2050."¹⁴ For municipalities, this means that waste management options will need to consider and contribute to Ontario's climate change targets.

Along with climate change and sustainability considerations, municipal governments will also have to wrestle with how to address the capital investments that will likely be necessary to move forward with waste management projects, especially more innovative and technologically complex projects. In this respect, the announcement by the Federal government that gas tax funding transfers to municipalities would be made permanent gives local governments a viable funding source for waste management infrastructure investments. For Ontario municipalities, this will mean an annual revenue stream of almost

¹³ Ontario Ministry of the Environment, "ONTARIO ALIGNS WITH LEADING STATES AND PROVINCES TO FIGHT CLIMATE CHANGE: Province Joins The Climate Registry," January 16, 2008, www.ontario.ca/environment.

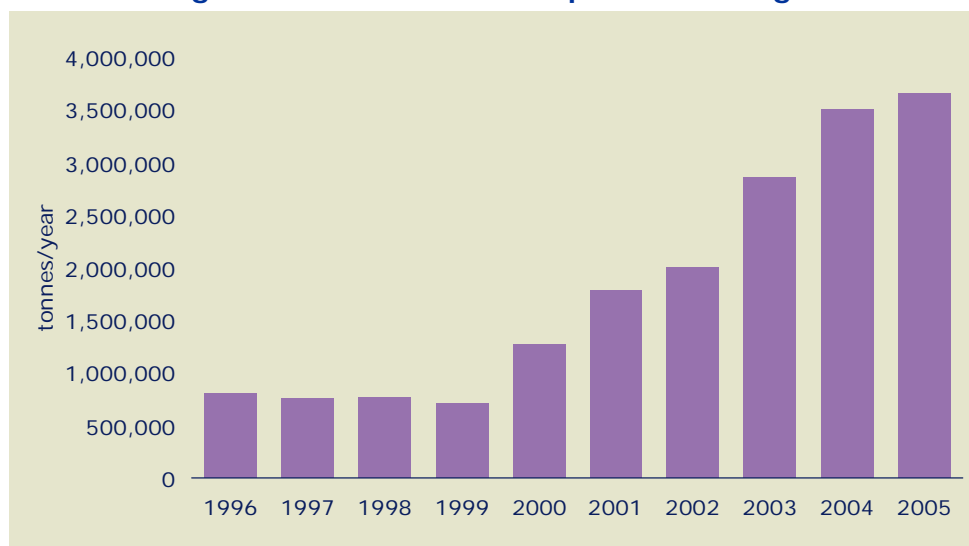
¹⁴ Ibid.

\$800M¹⁵ and for Durham it means annual funding of more than \$16M¹⁶ that can be used to fund a range of critical capital investments, including investments in waste management solutions.

3.2 Ontario's Waste Management Capacity

Since the early 1990's Ontario municipalities have become increasingly dependent on Michigan as a backstop for their waste disposal. With the impending closure of the Michigan border, the 3.66 million tonnes per year being shipped to Michigan for disposal will now need to be disposed of domestically.

Figure 2: Ontario Waste Exports to Michigan



Source: Ontario Waste Management Association, "Setting the Stage - Ontario's Waste Management Crisis")

As of August 2006, the MOE reported in its fact sheet "How Ontario Manages its Waste: The Basic Facts and Figures" that the province had a total of 91 million tonnes of approved landfill capacity available. Since this time, EA approvals have been granted for expansions at several sites including: (i) An additional 15 years of capacity at the Green Lane Landfill, which was purchased in 2006 by the City of Toronto for its long-term waste-management planning; (ii) An additional 20-25 years of capacity at the Walker Waste Disposal facility, up to 850,000 tonnes per year; (iii) An additional 25 years of capacity at the Warwick Landfill, up to 750,000 tonnes per year; and (iv) An additional 11 years of capacity at the Navan Landfill which will continue to accept 234,750 tonnes per year during that period.

Accounting for close to one-quarter of the waste being shipped annually to Michigan for disposal, the "Toronto Factor" is considered to have had a significant influence on the decision by state and federal legislators to close the border to Canadian waste. Toronto reacted by purchasing the St. Thomas, Ontario, Green Lane Landfill for its disposal needs which, after its proposed expansion, will remove close to 1 million tonnes of available annual capacity in the Ontario disposal market. The capacity at this facility has a limited lifespan.

¹⁵ Infrastructure Canada, Gas Tax Fund, http://www.infrastructure.gc.ca/ip-pi/gas-essence_tax/index_e.shtml, accessed May 8, 2008.

¹⁶ Association of Municipalities of Ontario, AMO Allocation of Federal New Deal Gas Tax Revenues For Environmentally Sustainable, http://www.amo.on.ca/AM/Template.cfm?Section=Agreements_and_Allocation1&CONTENTID=32916&TEMPLATE=/CM/ContentDisplay.cfm, accessed May 8, 2008.

With these and other proposed expansions, total Ontario landfill capacity will rise to approximately 140 million tonnes.¹⁷ However, the province will still lack sufficient landfill and other waste management capacity to support long-term waste forecasts, as illustrated below in Figure 3. With approximately 10 million¹⁸ tonnes per year now requiring disposal, even assuming diversion rates across the province increase sufficiently to partly offset the growth in population and households, Ontario's expanded landfill capacity could be depleted in less than 15 years.¹⁹

Figure 3: Ontario's Projected Landfill Capacity Deficit



(Source: Ontario Waste Management Association, "Setting the Stage - Ontario's Waste Management Crisis")

In the United States, the closure and depletion of local landfills has resulted in regional solutions, particularly in the northeastern states, with several major cities and large-scale operations utilizing rail based transfer stations and tipping facilities. In the mid 1990's a private consortium proposed a rail based haulage and disposal system for the City of Toronto's MSW to be disposed of at the abandoned Adams Mine. The EA was approved by the MOE in August 1998 however community opposition forced Toronto to vote down the proposal in 2000. Rail transport was also considered in a 2007 study conducted by the Region of Halton as a potential solution to its waste management needs. In this case however, because of the proposed location of the rail transfer station, it was decided that the environmental impact of transporting the waste by tractor trailer to the rail station outweighed any benefits the solution may have provided.

Rail and other current and emerging technologies remain considerations for waste management solutions. In the short to medium term however, the issue of supply outstripping demand for landfill capacity is a problem that will remain, and tipping fees will continue to reflect this.

¹⁷ The Regional Municipality of Durham, Report 2007-J-24, June 12, 2007, presented by Commissioners of Works and Finance.

¹⁸ Ministry of Environment, "How Ontario Manages its Waste: The Basic Facts and Figures," <http://www.ene.gov.on.ca/envision/news/2006/083101.htm>.

¹⁹The Regional Municipality of Durham, Report 2007-J-24, June 12, 2007, presented by Commissioners of Works and Finance.

3.3 Competitiveness of Ontario’s Waste Management Market²⁰

It is difficult to get accessible information on the North American waste management industry. Generally, the waste management market in North America is defined by a few large-scale providers, with high barriers to market entry and a shrinking public sector presence. In Canada, BFI, Waste Management, and Walker Brothers are amongst the largest providers in the industry. The market is now dominated by these large players due, for-the-most-part, to industry consolidation that occurred during the 1980s and 1990s. This consolidation was largely in response to increasing environmental regulation of the industry and the scale required to compete in this new strictly regulated competitive environment. What this has meant is a waste management market that has few competitors and static to rising costs, which will be heightened once the Michigan border closes to MSW.

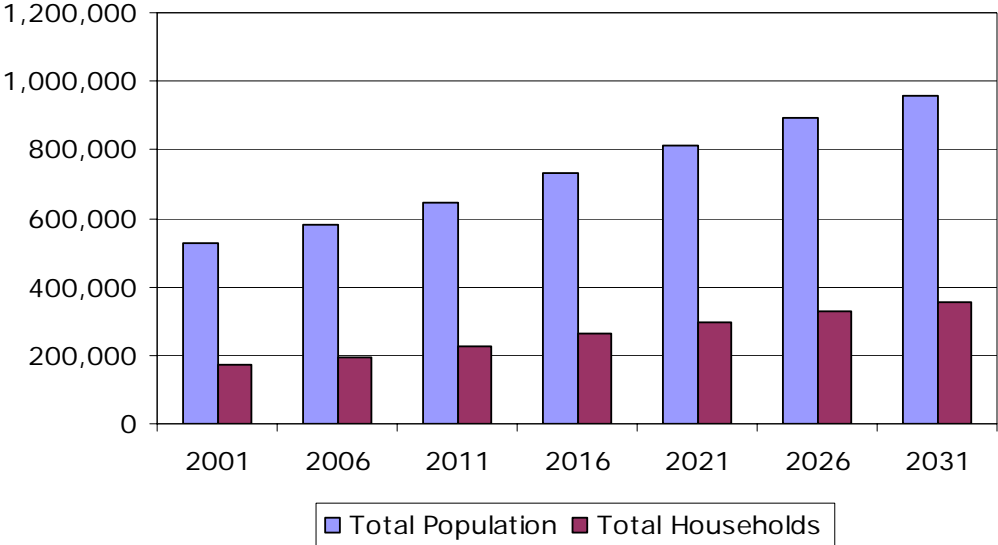
3.4 Economic

The Region of Durham faces a number of micro- and macro-economic challenges and opportunities. Chief among the micro-economic challenges and opportunities is population growth. The macro-economic challenges facing Durham include the general health of the Ontario and Canadian economies (which affect municipal revenues) and the inflation in key inputs such as energy prices.

Population and Household Growth

The Region is forecasted to experience consistent and strong population growth over the next 10 to 30 years as more and more people settle in the GTA, spurring economic and social development throughout the Golden Horseshoe. Statistics Canada and Durham’s Planning Department expect Durham to grow by 25 percent over the next 10 years alone to nearly 750,000 people and surpassing one million people by the year 2034.

Figure 4: Durham Population and Household Growth Forecasts



Source: Statistics Canada, Durham Region Planning Dept.

The number of households in Durham is forecast to increase at a slightly higher rate of approximately 34 percent over the same 10-year period. As Table 2 demonstrates, this population and household growth will drive economic development and present Durham

²⁰ Peter Anderson, “Industry Executives Offer their Sage Opinions About the Industry & Its Future,” Solid Waste Digest, Volume 13, Number 12 and “Endgame! Consolidation and Competition in the Solid Waste Industry,” The Center for a Competitive Waste Industry, <http://www.competitivewaste.org/reports/CCWEndgamet.PDF>.

with higher volumes of waste to manage—further underscoring the need to find a near-term sustainable local waste management solution.

Table 2: Waste Forecast

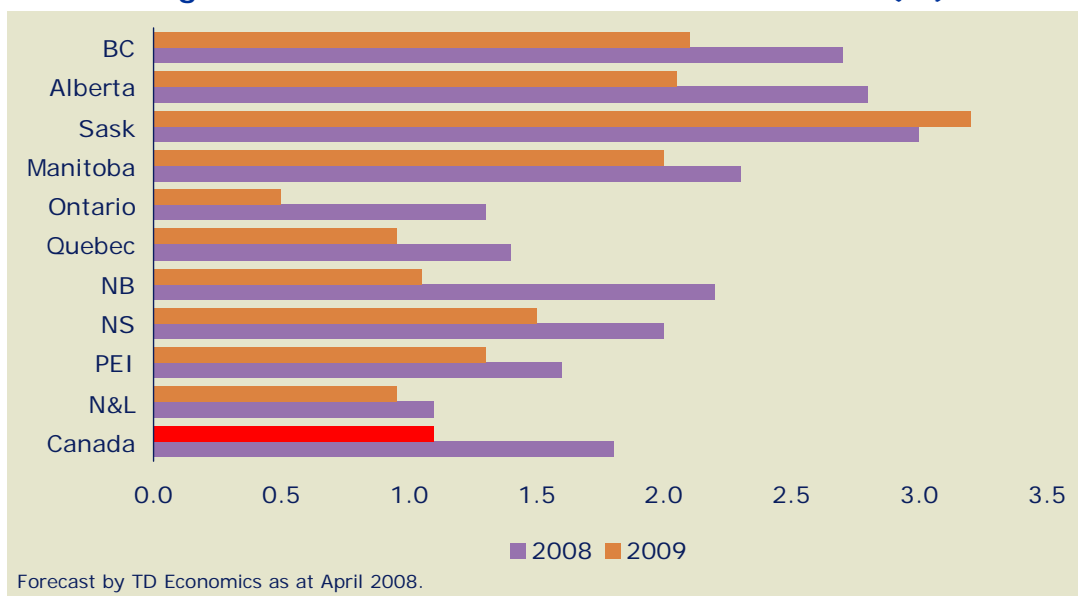
Tonnage Forecast at 60% Diversion in 2011, 70% in 2020						
	2012	2017	2022	2027	2032	2037
Curbside landfill	85,444	83,136	85,391	94,082	101,439	109,279
WMF landfill	21,124	22,202	23,334	24,525	25,776	27,090
Total	106,568	105,338	108,725	118,607	127,215	136,369

Table 2 presents the basis upon which the waste forecast used in this business case was derived. It should be noted that Durham has set a 70 percent diversion target by the end of 2010. However, the figures presented in Table 2 represent 60 percent diversion beginning in 2011 with 70 percent phased in over time. A full 70 percent diversion was used as a sensitivity analysis.

National and Provincial Economic Growth

The slowing US economy is expected to be a drag on national and provincial Gross Domestic Product (GDP) growth. In a recent update published by TD Economics, the short-term growth forecast (2008 and 2009) for Canada is projected to be in the neighbourhood of a modest two percent. Ontario’s prospects are less rosy with growth in both years hovering around one percent.

Figure 5: Forecasted Economic GDP Real Growth (%)



Ontario is also expected to see an increase in its unemployment rate which will put pressure on governments to increase their economic development efforts to create opportunities for workers affected by an economic slowdown.

Figure 6: Unemployment Rate Forecast (annual average, percent)

	98-07	2005	2006	2007	2008F	2009F
Canada	7.1	6.8	6.3	6.0	6.0	6.3
N&L	16.0	15.2	14.8	13.6	11.9	11.4
PEI	11.9	10.9	11.1	10.3	9.8	9.7
NS	9.1	8.5	7.9	8.1	7.1	7.1
NB	10.0	9.7	8.7	7.6	8.0	7.8
Quebec	8.7	8.3	8.0	7.2	7.2	7.6
Ontario	6.6	6.6	6.3	6.4	6.6	7.0
Manitoba	5.0	4.8	4.3	4.4	3.7	4.1
Sask.	5.3	5.1	4.6	4.2	3.6	3.9
Alberta	4.7	3.9	3.4	3.5	3.3	3.6
BC	7.1	5.9	4.8	4.2	4.2	4.9

F: Forecast by TD Economics as at April 2008

Source: Statistics Canada

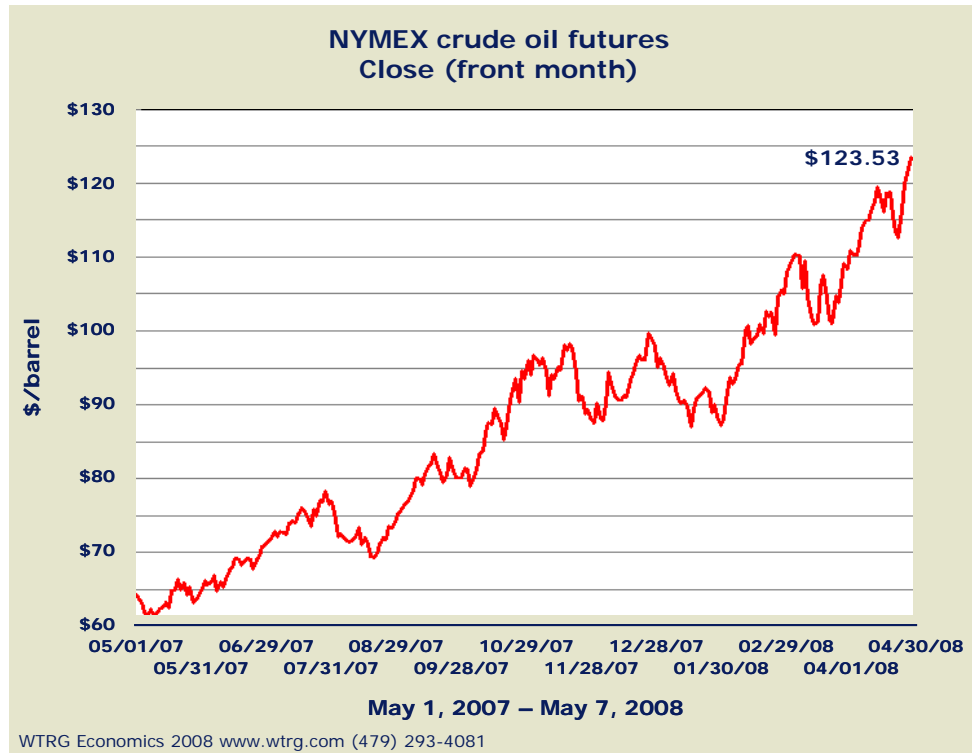
The relevance of the state of the economy to the waste management choices facing Durham is twofold. First, a slowing economy will increase the importance of undertaking waste management projects that stimulate short and long-term employment opportunities. Second, it will limit the appetite of the province to provide funding support to municipal waste management projects outside of existing capital transfers. This will require municipalities to reallocate existing planned spending to fund projects or to examine funding and financing options outside of traditional government expenditures.

Waste management options that leverage existing government funding and provide an economic development opportunity may be prudent for municipalities to pursue.

Inflation

Generally speaking, inflation in the Canadian economy is modest. However, rising energy costs—particularly oil prices—leave few individuals or governments unaffected. The rising price of oil, gasoline and diesel is of particular importance when it comes to waste management because of the significant transportation costs involved in hauling waste.

Figure 7: Increasing Price of Oil



As Figure 7 above shows, the price of a barrel of oil recently exceeded US\$120, and investment bank Goldman Sachs recently opined that the price of oil could reach US\$200 a barrel within the next two years²¹.

The rising price of a barrel of oil is having a direct impact on the price of gas at the pump, with unleaded prices exceeding \$1.20 per litre²² and diesel prices approaching \$1.30 per litre²³. The price of diesel affects the bottom line as these price increases drive up the cost of hauling waste to landfill. One way for municipalities to mitigate the increasing fuel price is to have local waste solutions that reduce overall transportation costs.

Supply of Electricity²⁴

The following information is quoted directly from the Ontario Ministry of Energy's website as noted in footnote 24.

"Ontarians have become familiar with the challenges facing the province's supply of electricity. The Ontario government has launched a multi-pronged strategy for securing the province's electricity supply that includes conservation and the sourcing of new supply from a mix of technologies. Currently, Ontario has generating facilities (capacity) capable of generating over 31,000 megawatts of electricity, including nuclear, fossil fuel, hydro-electric and other renewable facilities. The actual energy generated by these facilities is shown below (generation mix).

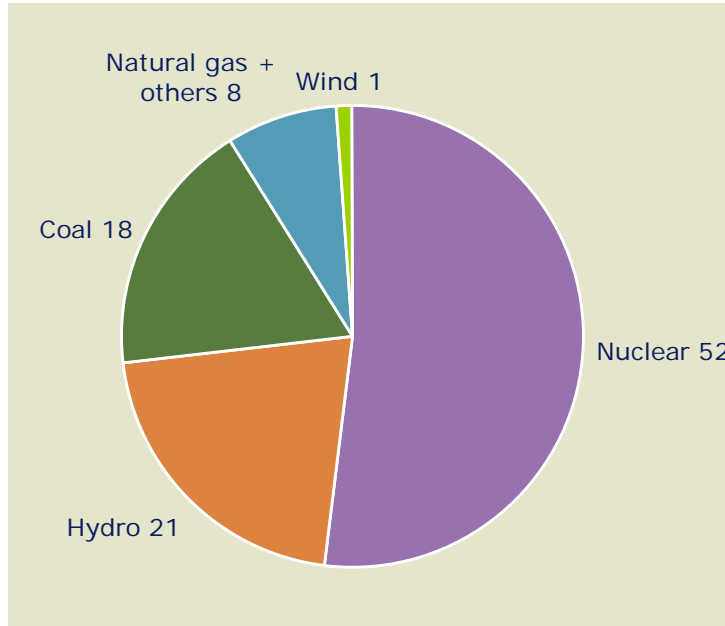
²¹ Yahoo! News, "Oil prices hit record peaks above 123 dollars," May 7, 2008.

²² Ontario Ministry of Energy, Gasoline Report, <http://www.energy.gov.on.ca/index.cfm?fuseaction=oilandgas.gasreport>, accessed May 8, 2008.

²³ Ontario Ministry of Energy, Fuel Prices, <http://www.energy.gov.on.ca/index.cfm?fuseaction=oilandgas.fuelprices>, accessed May 8, 2008.

²⁴ Ontario Ministry of Energy, Ontario's Electricity Supply, http://www.energy.gov.on.ca/index.cfm?fuseaction=electricity.nuclear_supply, accessed May 8, 2008.

Figure 8: 2007 Ontario Energy Mix (% of total)

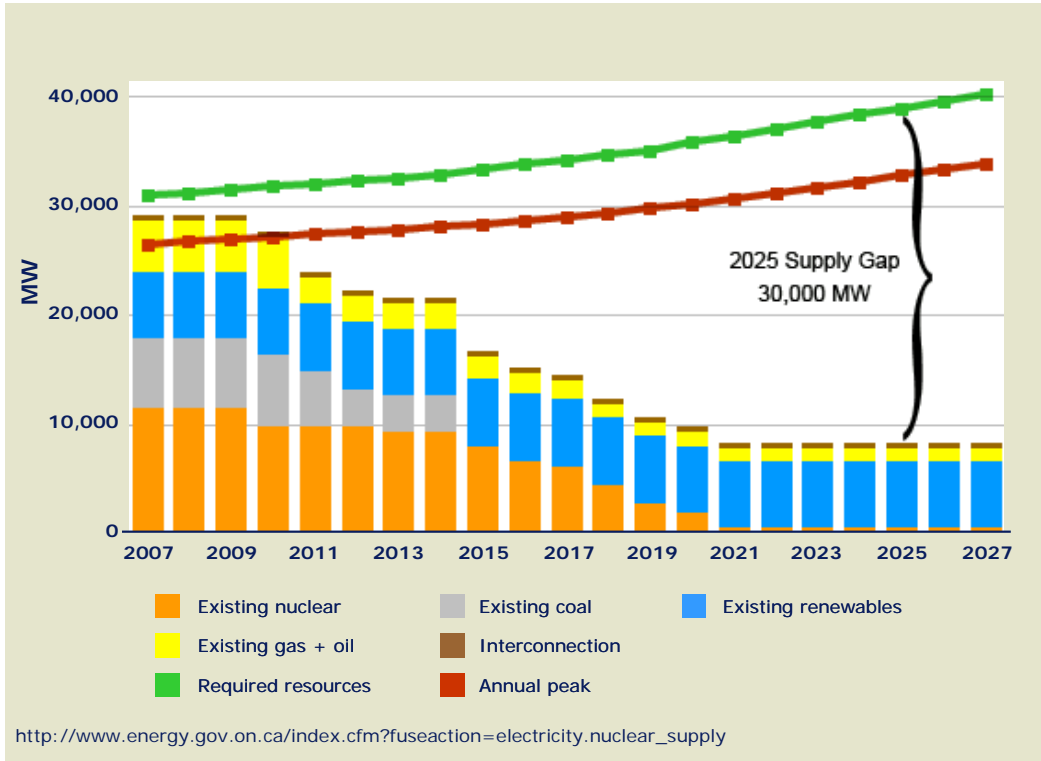


Source: Ontario Ministry of Energy

While Ontario has more than 31,000 megawatts of electricity generating capacity, many existing power facilities are reaching the end of their operating lives, and as much as 80 percent will need to be refurbished or replaced over the next 20 years.

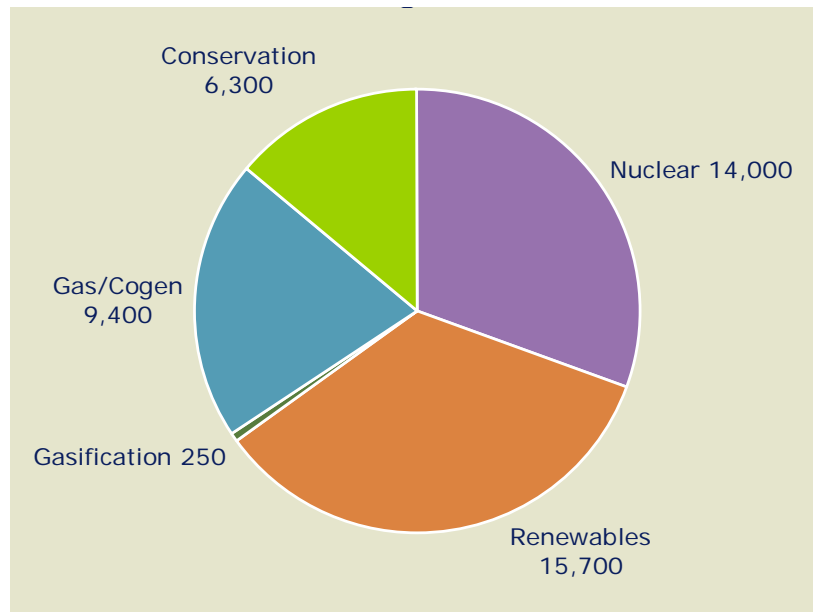
In a review of Ontario's electricity system carried out as part of its preparation of the Integrated Power System Plan (IPSP), the Ontario Power Authority (OPA) estimated that if no new facilities are built and existing ones are retired as they reach the end of their operating lives, there will likely be a 30,000 MW gap between available and required capacity by 2025.

Figure 9: Ontario's Electricity Supply Gap



The OPA has developed an IPSP that sets out a road map of generation, conservation and transmission decisions and opportunities to ensure Ontario has the power it needs into the future. That plan has been submitted to the Ontario Energy Board for its review. The plan follows on a supply mix directive issued by the Minister of Energy in June 2006.”

Figure 10: Ontario Target Supply Mix in 2025 (MW)



(Based on the Supply Mix Directive, June 2006)

The IPSP presents an opportunity for municipalities to examine waste management technologies that could assist in meeting Ontario's electricity needs, or at the very least, reduces reliance on grid electricity.

Carbon Market

The EA Study has noted that the EFW option will provide a benefit from a GHG perspective.²⁵ The purpose of this section is to provide an overview of how the GHG market may evolve.

The creation of carbon markets is in its infancy though with each passing day the drive to create these markets gets stronger and stronger. The creation of carbon markets may create additional revenue opportunities for municipalities that choose to pursue EFW solutions for their waste management challenges. Numerous governments across North America are either developing or are proposing cap-and-trade initiatives as the primary mechanisms for meeting emission reduction targets. Below is a brief overview of these initiatives.

Canada

In 2007 the federal government released a plan called "Turning the Corner" that outlines its regulatory framework for reducing Canada's greenhouse gas emissions by 20 percent from 2006 levels by 2020. The targets for GHG emissions will set an initial required reduction of 18 percent from 2006 emission-intensity levels in 2010 for existing facilities. Every year thereafter, a 2 percent continuous improvement in emission intensity would be required. By 2015 an emission-intensity reduction of 26 percent from 2006 levels would be required, with a further reduction of 33 percent by 2020.

The proposed regulations would cover: electricity generation produced by combustion, oil, gas, pulp, paper, iron, steel, smelting, refining, cement, lime, potash, chemicals and fertilizer sectors within Canada. The government has stipulated that offsets developed within Canada will be a compliance mechanism available to regulated entities however the specific rules around offset eligibility are currently under development. The finalized regulations are expected to be released in the fall of 2009 and would come into force in 2010.

Based on Environment Canada's modeling of the proposed policy structure outlined in the federal government plan, the price of carbon per tonne is forecasted to be approximately \$25 by 2010, \$51 by 2016 and \$65 by 2018.

Alberta

In January 2008, the Alberta government released a plan to address climate change that set a target to reduce emissions by 50 percent by 2050 compared to business as usual, or a 14 percent reduction below 2005 levels. GHG emission regulations have been in effect since July 1, 2007, and require Alberta facilities (including energy, chemical and electricity sectors) that emit more than 100,000 tonnes of GHG a year to reduce emissions intensity by 12 percent. Industries can meet the reduction requirement by purchasing credits from other sectors that have voluntarily reduced their emissions, however, only emission reduction projects within the province are eligible. Fines for emitters unable to meet their targets are set a \$15 per tonne, thereby ensuring that any offset used for compliance will not exceed this price cap.

²⁵ Regional Municipality of Durham, "Greenhouse Gas Implications of the Solid Waste Management Alternatives, Thermal Treatment and Remote Landfill," Commissioner of Public Works, Report 2008-WR-3, January 9, 2008

United States

Although there is uncertainty as to which of the several bills that are proposed in the US Senate may eventually become law, it is expected that a federal cap-and-trade bill will be passed in 2009 with compliance required by 2011 or 2012. Of the proposed bills, the Lieberman-Warner – “America’s Climate and Energy Security Act” is widely held as the most likely to be adopted.

The Lieberman-Warner bill is targeted to bring emissions to 2004 levels by 2012, to 1990 levels by 2020, to 22 percent below 1990 levels by 2030, and to 60 percent below 1990 levels by 2050. The bill covers all sources that emit more than 10,000 tonnes of CO₂ equivalent per year from the use of coal, all CO₂ emissions from the use of petroleum fuels (covered at the refinery), and all emissions from the use of natural gas in the United States. The bill includes provision for domestic offsets and for clean development mechanisms through which US companies gain credits for emission reductions they sponsor in developing countries. A preliminary draft of the proposed legislation had set a limit stating that only 15 percent of domestic and 15 percent of international offsets can be used to meet compliance obligations.

A recent Massachusetts Institute of Technology (MIT) study on the forecasted price of carbon under the Lieberman-Warner bill lists the range between \$48 - \$56 by 2015, \$58 - \$68 by 2020 and \$86 - \$101 by 2030.

Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative (RGGI) is a regional cap-and-trade program that aims to reduce CO₂ emissions from power plants in 10 participating northeastern and mid-Atlantic states. Under RGGI, fossil-fired generating units larger than 25 MW are regulated, and the program has set targets to initially stabilize CO₂ levels between 2009 and 2014 and then reduce them by 10 percent by 2018 (2.5 percent every year from 2015 to 2018). RGGI rules stipulate that only offsets within participating states are eligible, unless the price of carbon rises over a set threshold, in which case the geographic scope of eligible projects widens, as does the amount of offsets regulated entities can use to meet compliance obligations. Emission trading is set to begin in 2009 and the state operated allowance auctions begin in September 2008 with a minimum bid price set at \$1.86. On March 19, 2008, the first early compliance bilateral forward trade of Regional GHG allowances was completed at \$7 per short tonne.

California - AB32

The Global Warming Solutions Act of 2006 is a California law that establishes a statewide GHG emissions cap for 2020, based on 1990 emission levels. A plan indicating how emission reductions will be achieved from significant GHG sources via regulations, market mechanisms and other actions is currently being developed and is scheduled to be adopted by January 2009. Regulations to achieve these reductions are to be in place by January 2011. While the existing law makes a provision for a cap and trade market, it is not yet required. The process of developing carbon market rules is underway with the expectation of a market opening within the next several years.

The Western Climate Initiative

The Western Climate Initiative includes seven western US states and three Canadian provinces (British Columbia, Manitoba and Quebec). The objective of the WCI is to identify, evaluate and implement means to bring about an aggregated reduction of 15 percent below 2005 levels by 2020 of GHG emissions in the region. Individual participating states and provinces have their own respective targets. The target date for the design of a market-based carbon trading program is scheduled for August 2008.

Chicago Climate Exchange and Unregulated Voluntary Markets

Launched in 2003, the Chicago Climate Exchange (CCX) is a voluntary, but legally binding trading program that allows market participants to use worldwide offset projects as a mechanism to reduce emissions. As a voluntary market, the CCX has standard rules for issuing and transacting credits for offset projects, including those related to landfill gas projects. Members who volunteer to be a part of the CCX commit to a schedule that requires their 2010 emission to be 6 percent below their 2000 baseline year. The price for CCX credits as of May 9, 2008 was \$6.20.

Unregulated voluntary markets

There is also considerable market activity in the voluntary non regulated market, as companies, municipal governments, non-governmental organizations and individuals are increasingly buying carbon offsets to voluntarily reduce their carbon footprint. The price range of offset credits in the non regulated voluntary market varies greatly and is highly tied to the standards used to verify the associated offset project.

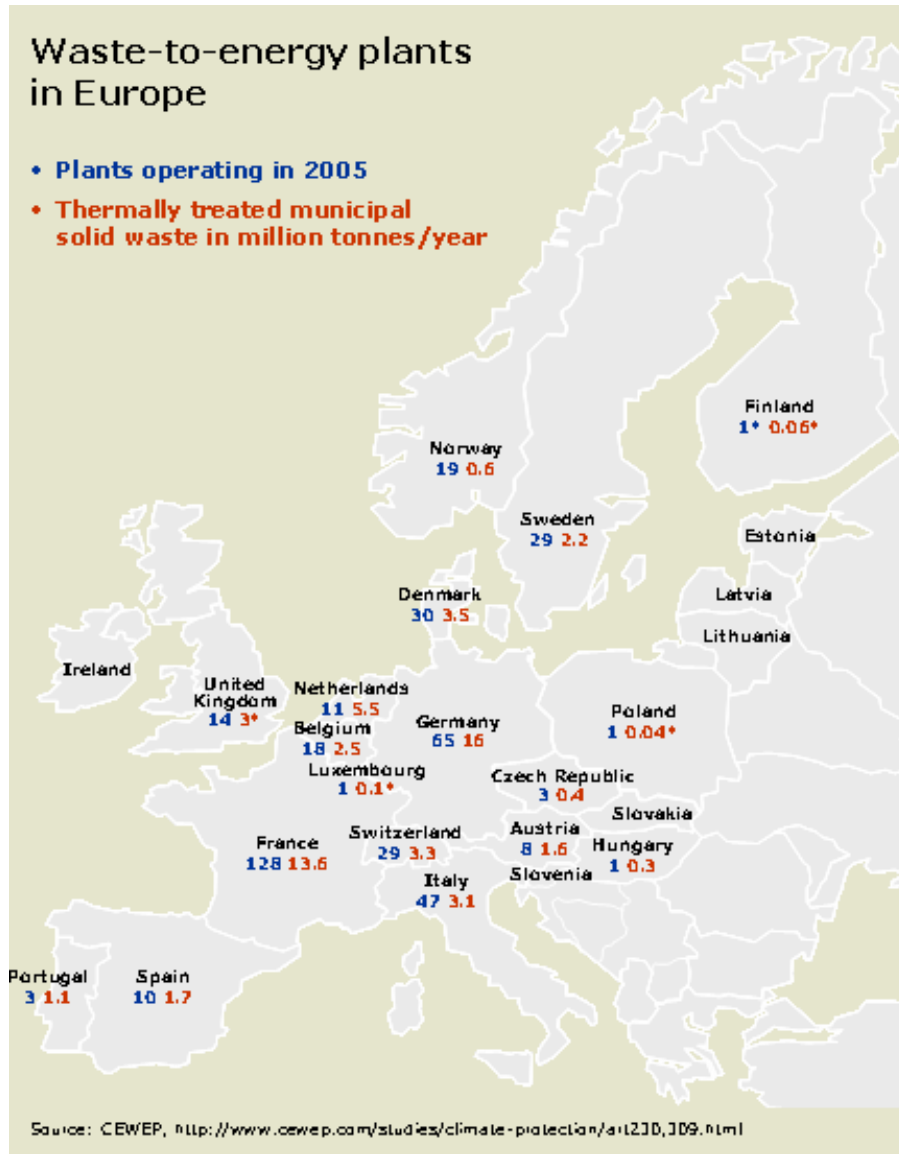
What impact these markets may have for Durham is beyond the scope of this business case. However, Durham should review the need to track how the different regulations and cap-and-trade programs across North America develop in order to understand potential exposure and opportunities for selling emission reductions from the thermal treatment of waste in the voluntary carbon market.

3.5 Other Jurisdictions

An important context for municipal management considerations is the waste management trends in other Canadian and international jurisdictions. In Canada, most jurisdictions rely almost exclusively on landfill solutions for their residual MSW. Few municipalities have EFW facilities. The impending closure of the Michigan border to MSW has caused municipalities across southern Ontario to seek other waste management solutions. As noted earlier, in 2006, the City of Toronto made the decision to purchase the Green Lane Landfill for \$220M.²⁶ The Region of Halton, Region of Niagara and the City of Hamilton have explored EFW solutions for their residual MSW, with Halton deciding against an EFW and Niagara and Hamilton deferring their EFW considerations in light of landfill expansions granted by the MOE. Outside of Canada, the EU is also progressive in implementing waste reduction and diversion policies and programs.

²⁶ Carter-Whitney, p. 8.

Figure 11: EFW Facilities in Europe



Throughout Europe, 50 million tonnes of MSW is thermally treated in 420 EFW facilities²⁷. This represents 24 percent²⁸ of the residual MSW processed annually. Germany, Denmark, Sweden, France and Belgium are the largest users of EFW facilities for their MSW.²⁹ This high usage of EFW is the result of strict EU legislation that limits the use of landfills for waste. The EU has the world's highest health and environmental standards for EFW. The Canadian Institute for Environmental Law and Policy points out that the European use of EFW is defined within a comprehensive policy framework that promotes high levels of diversion, regulates product packaging and sets out a waste hierarchy (illustrated in Figure 12 below).³⁰

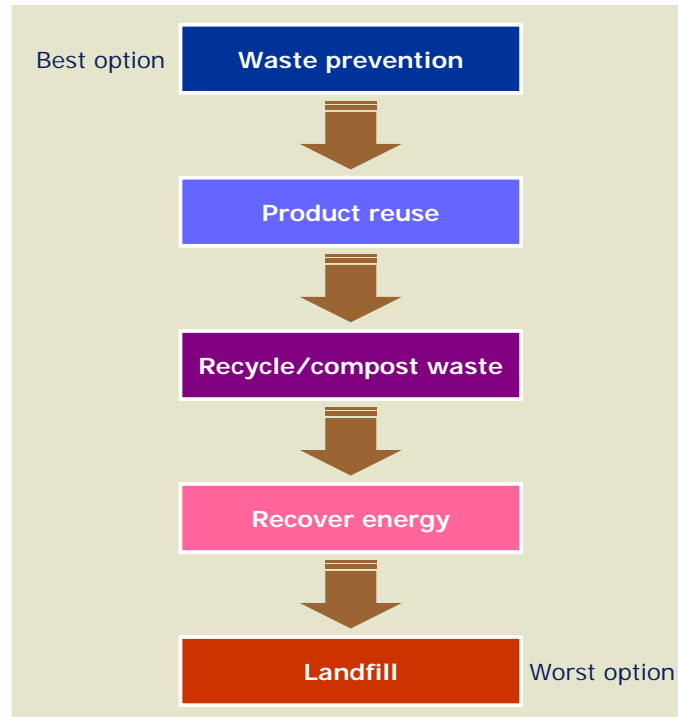
²⁷ Ibid., p. 33.

²⁸ Ibid., p. 33.

²⁹ Ibid., p. 33.

³⁰ Ibid., pp. 33-37.

Figure 12: EU Waste Hierarchy



The EU standard is the standard that Durham Regional Council has expressed a desire to follow.

3.6 Technology

Jurisdictions across the globe are looking at new and emerging technological solutions to the management of MSW. A simple Google search of “municipal solid waste management technologies” yields more than 2.2 million records with technical information on available alternatives along with research, commentary and opinion on the sustainability of each one. In Durham’s case, three basic solutions are at play—landfill, stabilized landfill and advanced thermal treatment (or EFW). The following table provides a descriptive overview of the stabilized landfill and thermal treatment technologies used in other jurisdictions.

Table 3: Waste management technologies used in other jurisdictions³¹

	Description	Jurisdictions
Landfill		
Stabilized Landfill	A stabilized landfill accepts waste materials that have been pre-processed, or stabilized, mainly to reduce the readily biodegradable organic fraction of the waste prior to landfilling, so that the potential for landfill gas generation is diminished and leachate strength is reduced. Stabilization of the waste stream occurs through a group of processes known as mechanical/biological treatment (MBT), which can include removal of recyclables, shredding, removal of refuse-derived fuel (RDF), aerobic or anaerobic composting, and desiccation.	Halifax Germany Italy Austria

³¹ Table was constructed using information from the Department for Environment, Food and Rural Affairs, Advanced Thermal Treatment of Municipal Solid Waste, www.defra.gov.uk, Government of the United Kingdom.

	Description	Jurisdictions
Advanced Thermal Treatment		
Incineration	Incineration usually involves the combustion of unprepared (raw or residual) MSW. Waste is converted into carbon dioxide and water. Any noncombustible materials (e.g. metals, glass) remain as a solid, known as Bottom Ash, which contains a small amount of residual carbon.	United States France Germany
Pyrolysis	In contrast to combustion, pyrolysis is the thermal degradation of a substance in the absence of oxygen. The products produced from pyrolysing materials are a solid residue and a synthetic gas (syngas).	UK Japan Germany
Gasification	Gasification can be seen as between pyrolysis and combustion in that it involves the partial oxidation of a substance. The main product is a syngas, which contains carbon monoxide, hydrogen and methane.	USA UK Spain Norway Germany

In Ontario, a small number of projects involving waste management technologies that are not traditional to the Ontario market are being undertaken by municipalities and the private sector:

- In York, the Dongara project is taking MSW and turning it into pellets that can be used for fuel in such things as kilns.³²
- In Ottawa, the Plasco Energy Group has entered into a partnership with the municipal government and developed a pilot project to turn gasified MSW into energy. The facility received waste from Ottawa for the first time in January 2008 and will produce 4 MW of electricity.³³
- In Thunder Bay, an environmental assessment is underway on a proposed gasification plant to be built by Canadian Thermal Waste Conversion Ltd. The facility, if approved, will have the capacity to process 5,000 tonnes of waste a day and generate up to 100 MW of electricity.³⁴

These projects in other Ontario communities show that there is municipal interest in non-traditional waste management approaches that generate value out waste.

³² Phinjo Gombo, "Who will buy York's waste pellets?" Toronto Star, May 3, 2007, www.thestar.com.

³³ Plasco Energy Group, <http://www.plascoenergygroup.com>.

³⁴ Canada Thermal Waste Conversion Ltd., <http://www.ctwc.ca/index.php?page=thunderbay>.

4. Options Screen and Analytical Framework

4.1 Options Summary

As a result of discussions with Durham, five waste management options were selected for analysis.

Table 4: Overview of Options Analyzed

Option 1 Continue to ship to Michigan:	The Region has been shipping MSW to Michigan since the closure of the Keele Valley Landfill. This option has involved the shipment of waste using truck transportation down the Highway 401. This option will be closed off to Durham in 2010 as a result of a 2006 agreement between the Province of Ontario and the State of Michigan.
Option 2 Maximize Brock Township landfill:	The Region owns a small landfill in Brock Township. At the beginning of 2008, the Brock landfill had a capacity of approximately 850,000 tonnes and with the implementation of a proposed remediation plan it will be able to safely continue operating until it has reached capacity. This option contemplates using the Brock Landfill until it reaches full capacity.
Option 3 Contracted capacity at Other Ontario Landfill site:	As of August 2006, the MOE reported that the province had a total of 91 million tonnes of approved landfill capacity available. This capacity could rise to as much as 140 million tonnes if requested expansion projects are approved by the MOE. This option assumes that Durham's waste is disposed of at an existing landfill site in Ontario within one day's return drive of Durham (approx. 10 hrs).
Option 4 Stabilized landfill:	A Stabilized Landfill is one that accepts residue that has been "stabilized" through a Mechanical and Biological Treatment (MBT) process. The mechanical portion of the process removes recyclable and non-landfillable materials from the waste arriving at the facility. The remaining portion of the waste is then biologically treated via anaerobic digestion to breakdown any organic materials present, with the biogas produced (primarily methane and carbon dioxide) in turn used to produce a relatively small amount of energy for in-plant consumption and sale of excess into the electricity market. The residual materials result in reduced gas and leachate production when sent to landfill. The Region would have to purchase a site (not within Durham) under this option.
Option 5 Municipally owned EFW facility	This option assumes Durham develops an EFW facility that it owns jointly with York. This would involve the thermal treatment of post diversion MSW with electricity sold back into the power grid.

4.2 Screening Analysis

Screening Criteria

The five options outlined in Table 4 were analyzed and screened against the following criteria developed in consultation with Durham. The purpose in screening the options was to refine the more detailed stage of business case analysis down to the most viable options available to Durham. The screening criteria are summarized in Table 5.

Table 5: Summary of the Screening Criteria

1. No new or expanded local landfill	The community and Regional Council have clearly expressed their desire to not pursue a local landfill solution. A waste management option that cannot satisfy this criterion will be automatically eliminated from consideration.
2. Long-term, viable technological solution	The Region's waste management needs require a proven technological solution that is used in other jurisdictions and provides a level of cost and operational certainty over the life of its use. Options that provide a technological solution viable for a period of 25-years or greater will satisfy this criterion.
3. Local solution	A local solution is most prudent to ensure appropriate local control over waste management needs and to support local waste reduction/diversion targets. Therefore, options that do provide a local solution (local being defined as within the municipal boundaries of Durham) will satisfy this criterion.
4. Subject to cost-sharing	Waste management is an expensive proposition for municipalities from an operating and capital perspective. Options that can leverage partnerships and/or funding from other governments will satisfy this criterion.
5. Timeliness of implementation	The Michigan option will be closed to Durham in 2010 and therefore time is of the essence for finding a solution to Durham's long-term waste management needs. Therefore, a viable, long-term solution will need to be operational close to the end of 2010. Options that cannot be implemented within this timeframe will not satisfy this criterion.

Screening Results

When the options are evaluated against the screening criteria, two clear options prevail: (i) Other Ontario Landfills; and (ii) EFW.

Table 6: Screen of Options

Option	Criteria					
	No Local Landfill	Long-Term Sol'n	Local Sol'n	Provincial Policy	Cost-Sharing	Timeliness
Michigan	○					
Brock Landfill						○
Other Ontario Landfills	○	○		○		○
Stabilized Landfill	○	○		○		
EFW	○	○	○	○	○	○

Legend: ○ 100% Meets ○ 75% Meets ○ 50% Meets

In terms of the options that did not pass the screen, the Michigan option is not viable because of the agreement between Ontario and Michigan. The Brock landfill is disqualified because the community has made it clear that a local landfill is not an option. The Stabilized

Landfill option is not viable because: (i) the technology is not proven in the Canadian market (the only precedent exists in Halifax, Nova Scotia)³⁵; (ii) the time to completion would exceed Durham's time horizon because of the time it would take to undertake the EA, obtain provincial approval, execute procurement and finish construction; and (iii) while it could be a non-local landfill, Durham would have to purchase a site, complete an EA process, construct the facility and work to mitigate any local opposition to the site in the community in which the facility would reside.

The rest of this business case will analyze the remaining two viable options.

³⁵ In an October 16th 2007 presentation titled "Stabilized Landfills" presented to the Air & Waste Management Association, it was noted that while there are about 200 MBT facilities around the world, there is only one in North America – The Otter Lake facility in Nova Scotia.

5. Analysis of Most Viable Options

5.1 Methodology and Approach

The two remaining viable options will be analyzed from both a risk and cost perspective.

Risk Assessment Framework

As Table 7 demonstrates, the risk assessment developed for Durham examines each option from a public policy, management/control, fiscal, economic, environmental, partnership opportunity and long-term viability perspective.

Table 7: Risk assessment

Description of Risk	Factors for Consideration	Risk
Public Policy: The risk that the option will not meet long-term policy needs of the local and provincial governments.	• How does the option affect the corporate social responsibility of Durham?	High 
	• Is there legislative/regulatory/policy framework in place to support the option?	Medium 
	• Is the option consistent with current government policy or anticipated future directions?	
Management/Control: The risk that Durham will not be able to control its MSW disposal over the long-term.	• Does the option provide Durham with sufficient management and/or control over its waste management needs?	Low 
	• Is Durham dependent on the goodwill or permission of other governments to fulfill its waste management needs?	
Fiscal Considerations: The risk that the option is not financially viable over the long-term.	• Does the option provide Durham with enough certainty to prudently manage waste management needs in its fiscal plan?	
	• Does the option provide any fiscal benefit to Durham or lower-tier governments?	
Economic: The risk that the option does not maximize economic benefits to Durham.	• Does the option provide opportunities for short and long-term job creation?	
	• Does the option provide for economic development opportunities for Durham?	
	• Is the option scalable to meet future waste management needs associated with Regional population and economic growth?	
Environmental: The risk that the option does not minimize environmental impacts.	• Does the option present significant environmental impacts?	
	• Does the option sufficiently mitigate potential negative environmental impacts?	
	• Is the option recognized and used in other jurisdictions?	
Partnership: The risk that the option does not build on partnerships to mitigate long-term risk exposure.	• Does option lend itself to partnership opportunities with other governments and/or the private sector?	

Description of Risk	Factors for Consideration	Risk
Long-term viability: The risk that the option will not provide a solution that will be viable for 25 to 50 years.	<ul style="list-style-type: none"> Is the option viable and secure for a minimum of 25 years from both a technological and capacity perspective? 	

As illustrated in the last column of the table, the level of risk that the option is exposed to will be denoted by the use of “traffic lights”:

- A red light denotes a high likelihood and high impact of occurrence;
- A yellow denotes a moderate likelihood and moderate impact of occurrence; and
- A green denotes a low likelihood and low impact of occurrence.

Analysis of Costs

The costing analysis for the options is supported by general assumptions common to both. Principle general assumptions common to both options include the annual waste stream, diversion rate general inflation, operating horizon, fuel and tipping fee inflation. Details for each assumption are provided in the Appendix of this report. Each option also has its own set of unique assumptions which are laid out in the Appendix. For the Other Ontario Landfill option, unique assumptions are provided for haulage costs, transfer fees and disposal costs. For the EFW option, unique assumptions include key output specifications for the facility, capital and operating costs, revenue projects from energy production, residual haulage and disposal costs, insurance, taxes and currency exposures.

The next two sections of this report examine each option independently.

5.2 Analysis of Other Ontario Landfill Option

Overview

As noted above, this option assumes that Durham’s waste is disposed of at an existing landfill site in Ontario within one day’s return drive of Durham (approx. 10 hrs).

Market and Environmental Context

As of August 2006, the MOE reported that the province had a total of 91 million tonnes of approved landfill capacity available. This capacity could rise to as much as 140 million tonnes if requested expansion projects are approved by the Ministry. Ontario generates approximately 13.8 million tonnes of waste per year.³⁶ With an average province wide diversion rate of 32 percent, the remaining 9.4 million tonnes requires disposal. Even if Ontario’s landfill capacity is expanded, the market will still be tight and long-term supply of available landfill capacity will not be assured.

From an environmental impact perspective, landfills produce large volumes of methane gas and contaminants that can leach into ground water. With respect to climate change, a recent staff report to Region council noted that shipping waste to a remote landfill produces 58,600 tonnes of Carbon Dioxide each and every year.³⁷ For every tonne of waste landfilled GHG emissions increase by at least 1.3 tonnes.³⁸ Landfill options have significant environmental impacts, particularly for climate change, that are inconsistent with public attitudes and policies towards greater environmental sustainability practices.

³⁶ Ontario Waste Management Association Presentation, “Setting the Stage - Ontario’s Waste Management Crisis”








³⁷ Commissioner of Works, Report 2008-WR-3, January 9, 2008.

³⁸ Nickolas J. Themelis, “An overview of the global waste-to-energy industry,” Waste Management World, 2003-04 Review Issue, July-August 2003.

Risk Assessment

Table 8 presents the key risk assessment related to this option.

Table 8: Risk assessment

Risk	Analysis	Level
Public policy	<ul style="list-style-type: none"> Exporting waste to other Ontario communities shifts risk and impacts from Region to others. This practice creates a moral hazard situation that enables Durham to defer finding a local solution to a local problem. Option would also likely create ill-will between Region and other Ontario communities. Toronto's purchase of Green Lane Landfill drew heavy criticism from London and St. Thomas leaders and communities.³⁹ No willing community has been identified to accept Durham's waste. 	
Management/control	<ul style="list-style-type: none"> The Region would be reliant on the goodwill of other communities to manage its waste. Limited management and control exists under this option. This option is also exposed to capacity issues in the landfill market that will likely mean a new solution will have to be found within the medium term (10-15 years). 	
Fiscal considerations	<ul style="list-style-type: none"> This option is transportation intensive and subject to rising fuel costs. Given limited competition and capacity in Ontario's waste management market, Durham is exposed to vendor increases in tipping and other fees. 	
Economic	<ul style="list-style-type: none"> Provides in the order of 12 local trucking jobs. Likely no net new jobs created under this option. Option has limited scalability. 	
Environmental	<ul style="list-style-type: none"> Increased risk of environmental contamination due to accident associated with long distance haulage to other Ontario jurisdictions (about 1.4 million more highway truck kilometers per year). Environmental risks and impacts would be transferred from Durham to another community. Risks are not mitigated, only transferred. Landfills also release the greenhouse gas methane from decomposing waste. Carbon emissions result from the transportation methods used in the long-distance shipping of waste to open sites. Many communities are currently dealing with leakage from closed landfills, and high levels of methane emissions often make landfills dangerous and difficult places to redevelop.⁴⁰ Transportation combined with landfill increases the carbon footprint of this option. 	
Partnership	<ul style="list-style-type: none"> This option is contingent on local goodwill and tolerance. Community dynamics could change at any time and increase risk around security of channel. 	
Long-term viability	<ul style="list-style-type: none"> Finding sufficient capacity to establish a long-term solution likely limited given pressures on Ontario's existing landfills. 	

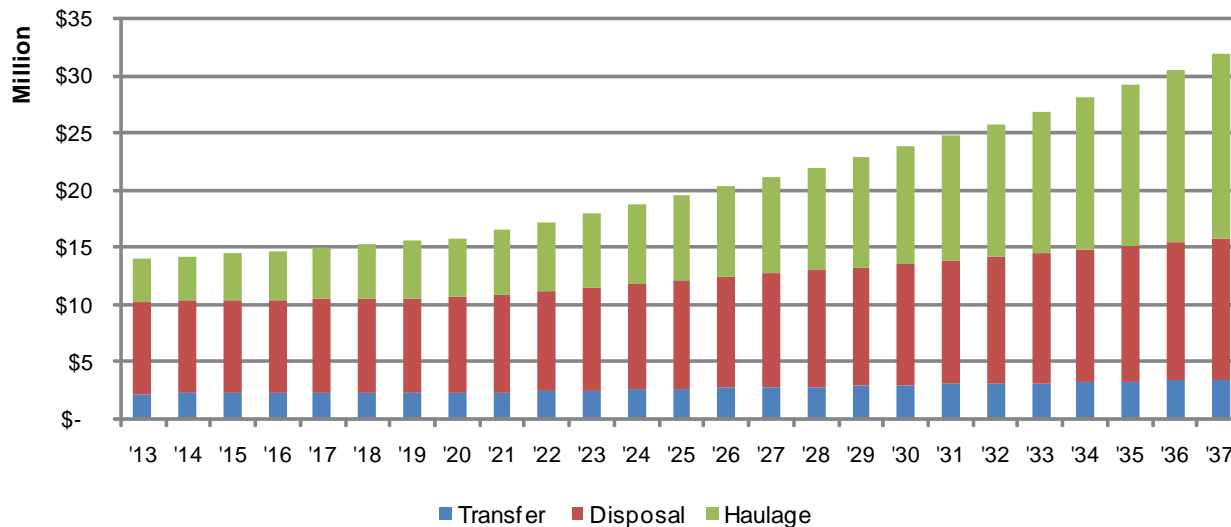
³⁹ Chip Martin, "TORONTO BUYS GREEN LANE LANDFILL: Trash this deal," London Free Press, September 27, 2006, <http://www.fyilondon.com/cgi-bin/publish.cgi?p=156475&x=articles&s=societe>.

⁴⁰ http://www.covantaholding.com/big_waste.shtml

Costing Analysis

The figure below shows the annual nominal costs that would be incurred by Durham for disposing its residual MSW to a remote landfill in Ontario.

Figure 13: Annual Nominal Cash Flows for Other Ontario Landfill Option



The operating costs associated with this option more than double over a twenty year period. They represent a straight cash outflow from Durham to third party providers of waste management services. These costs are conservative and could escalate more significantly if the Ontario landfill market reaches a critical point in terms of the price of fuel, capacity and competition amongst the largest firms in the industry.

With respect to considerations other than costs, the Other Ontario Landfill option does not create any new jobs within Durham and the indirect benefits that come with new job creation. Overall, there is not a net economic benefit to Durham from this option.

5.3 Analysis of the Energy from Waste Option

Overview

Under this option, Durham would develop an EFW facility that it owns jointly with York. The facility would thermally treat post diversion MSW and generate electricity to be sold back into the grid. The EFW facility would be located in the Municipality of Clarington (Clarington 01 site), accessed by service roads immediately south of Highway 401 at the Courtice Road exit.

Market and Environmental Context

The EFW market is limited in Canada. Facilities exist in Nova Scotia, British Columbia and Brampton, Ontario. While the EFW market is fairly immature in Canada, it is well developed in Europe and to a lesser extent in the United States. As it was noted earlier in this business case, every major European nation has EFW facilities that process residual MSW and generate electricity and power district energy initiatives. The European experience with EFW shows that "...countries where recycling levels are amongst the highest in Europe are also the countries with high levels of Waste from Energy, and low dependence on landfills."⁴¹ The

⁴¹ CEWEP, "Don't waste it – it is a resource," January 2007, http://www.cewep.com/storage/med/media/statements/176_Communication_Paper_Jan_2008_CZ.pdf?fCMS=c8935235e2b704d6eb48dc479960b182.

adoption of EFW technology may assist Durham in meeting its own waste diversion target by keeping the management of waste a local, top of mind priority.

In terms of the environmental effects of EFW, the technology has evolved considerably since the late-1980s and early 1990s. In the late-1980s, EFW facilities were "...listed by the US Environmental Protection Agency (EPA) as major sources of mercury and dioxin/furan emissions."⁴² During the course of the late-1990s, EFW technology progressed to the point where emissions were reduced to close to zero and electricity produced by EFW facilities is cleaner than almost any other source of electricity.⁴³ In Europe, the European Environment Agency sees EFW playing an important role along with increased recycling in significantly reducing the greenhouse gases produced by MSW.⁴⁴ Base on this research, on balance, EFW facilities, if they adhere to high emission standards such as those in Europe, are a relatively cleaner and more environmentally sustainable form of waste management for municipalities.

Risk Assessment

Table 9 below presents the key risk considerations related to this option.

Table 9: Risk assessment

Risk	Analysis	Level
Public policy	<ul style="list-style-type: none"> This option eliminates the moral hazard associated with exporting waste to outside jurisdictions (whether in Ontario or Michigan). Only one other Ontario jurisdiction—Peel Region--employs this kind of technology. Therefore its use is limited in Ontario. The technology is accepted and common in the United States and more particularly, Europe. Currently, EFW facilities in Europe can supply 7 million households with electricity and 13.4 million households with heat.⁴⁵ 	
Management/control	<ul style="list-style-type: none"> The Region would retain management and control over its waste management needs, and would have flexibility to increase the scale of the facility to accommodate needs from population and/or economic growth. 	
Fiscal considerations	<ul style="list-style-type: none"> Option reduces exposure to rising fuel costs by limiting transportation distance. Capital investment required to develop facility offset by access to Federal Gas Tax revenues. 	
Economic	<ul style="list-style-type: none"> Based on an analysis conducted of the future of the Ontario landfill market, it is expected that tipping fees will increase steadily, if not significantly, over time due to an inevitable landfill supply shortage given the level of landfill expansion that has been approved and is seeking approval in the province. This option is projected to create 1,000⁴⁶ direct and indirect jobs and 33 skilled jobs to operate the facility. 	




⁴² Themelis, 2003.

⁴³ Themelis, 2003.

⁴⁴ European Environment Agency, "Better management of municipal waste will reduce greenhouse gas emissions," EEA Briefing 2008-01, http://reports.eea.europa.eu/briefing_2008_1/en/EN_Briefing_01-2008.pdf.

⁴⁵ Confederation of European Waste-to-Energy Plants, "Heating and Lighting the Way to A Sustainable Future," http://www.cewep.com/storage/med/media/general/170_Brochure2007Final.pdf?fCMS=44412cc70d23d3ccf9834847e18890fd.

⁴⁶ Figure is based on Ontario Ministry of Finance employment multiplier for a similar project where 10 jobs are created for every \$1 million in capital investment. It is assumed that because \$100 million of the investment is to be sourced locally that 5 out of the 10 jobs will be local.

Risk	Analysis	Level
Environmental	<ul style="list-style-type: none"> According to the Waste to Energy Research and Technology Council at Columbia University, it has been estimated that one tonne of MSW combusted rather than landfilled reduces GHG emissions by 1.2 tonnes. As EFW technologies advance, the GHG emissions gap will continue to widen. The 2004 United States Conference of Mayors recognized the significant contribution provided by waste-to-energy in avoiding the release of greenhouse gases into the atmosphere. Other benefits of EFW include avoiding the increasingly difficult and frequent necessity of building landfills near large population centers and reducing primary fossil fuel use and associated GHG emissions by providing energy from EFW facilities.⁴⁷ Council has committed to EU standards for facility. As part of the EA Study conducted by Durham, the supplement to Annex E-5 titled: Comparative Analysis of Thermal Treatment and Remote Landfill on a Lifecycle Basis found the net GHG emissions from the proposed thermal treatment facility to be 44 percent lower than those from disposal of MSW in a landfill. 	
Partnership	<ul style="list-style-type: none"> York is a partner in the project. Federal Gas Tax revenues can be used to help finance the facility. Electricity will help meet the province's electricity supply gap. 	
Long-term viability	<ul style="list-style-type: none"> EFW is would be designed, built and operated through a long-term agreement with a reputable private vendor. The operating agreement would have maintenance provisions that would ensure that the EFW can last more that 50-years. 	

Costing Analysis

The table below shows the net annual operating costs (costs net of revenue generated through the sale of electricity) for Durham associated with an EFW facility. The net operating costs are higher in the first few years of operation because of the financing costs involved to develop the project but as these financing costs are paid off using Federal gas tax revenues, the net annual operating costs of the facility become considerably lower than the Other Ontario Landfill option. Further, in contrast with the Other Ontario Landfill option, these costs are more certain over time thereby providing Durham of Durham with a level of fiscal certainty and flexibility it can use to invest in and manage other local priorities.

Table 10: Net Annual EFW Costs

Year	2013	2014	2015	2016	2017	2018	2019	...	2037
Revenue	(7.5)	(7.5)	(7.5)	(7.5)	(7.6)	(7.6)	(7.6)	...	(7.1)
EFW Operating Cost	14.7	15.0	15.3	15.6	16.1	16.4	16.7	...	26.3
Durham Haulage to EFW	1.3	1.4	1.4	1.4	1.5	1.5	1.6	...	3.0
Financing Cost									
-Interest	6.6	5.4	4.3	3.1	2.0	0.9	-	...	-
-Principal	3.2	2.8	2.4	1.9	1.3	0.7	-	...	-
Net Annual Cost	18.3	17.1	15.9	14.5	13.3	11.9	10.7	...	22.2

In addition to the lower operating costs over time, the EFW option generates additional value through job creation, and the potential for increased revenues as carbon and other

⁴⁷Potential for Reducing Global Methane Emissions from Landfills 2000-2030, Eleventh Annual Waste Management and Landfill Symposium

markets develop. With respect to job creation, it is estimated that the \$200 million capital investment will create approximately 1,000 direct and indirect jobs. Once the facility is in operation, 33 new, highly skilled positions will be created. The EFW facility also positions Durham to capitalize on revenue opportunities associated with the creation of carbon markets through the sale of carbon credits and revenues to be realized from a district heating initiative for the Energy Park. These revenue opportunities are beyond the scope of this report and therefore have not been factored into the economic and financial analysis of the project. Also, the estimated revenue from recyclables produced by the facility is very conservative with revenues flat lined over time. As a result, future operating costs could be driven down even further if Durham is able to capitalize on new revenue opportunities.

The EFW option also results in a new asset for Durham that will have an estimated residual value after 25-years of \$80 million on a present value basis. It is also anticipated that the underlying value of the land will appreciate over the life of the project which gives the region flexibility in terms of future fiscal and/or capital needs. Fiscal flexibility is also preserved by the fact that capacity is not an issue with the EFW, whereas the Other Ontario Landfill option exposes Durham to capacity risks that could lead to new, unanticipated costs.

The next section of this business case compares and contrasts the Other Ontario Landfill and EFW options in more detail.

6. Comparison of Waste Management Options

6.1 Evaluation Framework

Major investment decisions undertaken by governments are made on a range of qualitative and quantitative factors. Qualitative factors can include: (i) public and stakeholder sentiment; (ii) economic, social, and environmental considerations; (iii) Contractual relationships/obligations; and (iv) public policy, legislative, regulatory requirements or trends. Quantitative factors can include: (i) fiscal and financial considerations; (ii) technical economic and environmental considerations; (iii) value for money; and (iv) service level performance management.

The following evaluation framework was developed in consultation with the Region and will be used to assess the waste management options against a range of qualitative and quantitative considerations of interest to political decision-makers and the public.

Principles

The evaluation framework for Durham's waste management options is guided by the following principles.

1. A local solution that is realistic, long-term and not a local landfill

The community and Regional Council have expressed a sincere desire to find a local solution to Durham's waste management needs. There is recognition that transporting waste to Michigan or other locations exposes Durham to significant public policy and stakeholder risks that simply means that waste management issues are deferred and not solved for the long-term. Also, other jurisdictions, particularly the European Union, have established a "proximity" principle for MSW that favours waste management solutions that ensure that wastes are disposed of as close as possible to the source of origination.⁴⁸ A proximity principle for Durham's waste management challenges would ensure a certain level of control over its waste management challenges.

2. Protect and promote environmental sustainability and environmentally sensitive behaviour

Residents and governments increasingly recognize the importance of enshrining environmental sustainability as a key principle for activities undertaken by government. Local actions by residents and government are required to deal with such environmental challenges as climate change. Waste management options need to be considered in the context of sustainability with those options that mitigate or eliminate environmental harm being made a priority. Also, waste management options should also ideally incent local residents and others to engage in more environmentally sensitive behaviour that reduces the amount of waste produced and increases diversion activities. Locally based waste management solutions can encourage the adoption of more environmentally sustainable technologies and behaviours.

3. Foster multi-government partnership and cooperation

While waste is produced locally, it is not exclusively a local problem. In Ontario, waste management activities are regulated by the province with municipalities managing day-to-day matters. If other jurisdictions are involved, as is the case with Michigan, then waste issues take on a national and international significance. That is why it is important to ensure

⁴⁸ Jennifer Clapp and Thomas Princen, "Out of sight, out of mind: cross-border traffic in waste obscures the problem of consumption," *Alternative Journal*, June 22, 2004.

that any waste management option considered by local governments lends itself to multi-government partnerships, whether those partnerships are regulatory, policy or financial in nature. For Durham, support and cooperation from its York Region municipal partner will be critical to the success of the preferred waste management option. The cooperation of the Province of Ontario will also be critical to ensuring that regulatory and policy approvals are in place to enable the execution of Durham's preferred waste management solution, and the purchase of electricity.

4. Achieve value for money

Public expectations for government accountability are higher than ever before. For any large-scale project, it is incumbent upon government to assess options to ensure that they achieve value for taxpayers' investment. The Region of Durham's preferred waste management solution must show that value for money will be achieved because of the long-term nature of the investment that will be required. Value for money can also be demonstrated in terms other than costs, including value generated from job creation, economic development and mitigated or transferred risks. Waste management options that lend themselves to new job creation, economic development support and/or risk mitigation/transfer should be given priority.

5. Advance the productive reuse of waste materials

The key to reducing the environmental impact of the waste generated by consumption is to find creative solutions for the productive reuse of waste (e.g., recycling). Recycling results in the productive reuse of waste. Durham Region's preferred waste management solution should enable the productive, environmentally sustainable reuse of waste—whether it is for meeting the energy needs of the community or creating materials that can be used in public works projects.

6. Promote the public interest through transparency and evidence based decision-making

Decisions on how to manage a community's waste are contentious and high profile in nature. Community support is critical to successfully implementing any preferred solutions, especially when that preferred solution is predicated on increased waste diversion activities. That is why it is essential that the waste management options considered by Durham of Durham are fully publicly reviewed and vetted and that relevant information is disclosed to the public to enable public participation and comment on the preferred course of action. An engaged and informed public will be key to finding a sustainable local solution to Durham's waste management challenges.

7. Ensure appropriate public ownership/control

It is important for Durham to maintain appropriate public ownership and control over any waste management option they choose to pursue to ensure that it can make future waste management decisions consistent with the interests of Durham's residents. The preferred waste management solution should ensure that Durham maintains appropriate ownership and control.

Criteria

The following table articulates the criteria under each principle against which the waste management options will be evaluated.

Table 11: Evaluation Criteria

	Principle						
	1	2	3	4	5	6	7
Criteria	Reduced reliance on waste disposal solutions outside of Region's control.	Transparency with respect to the study and disclosure of potential impacts on local natural environment and ecology.	Support from government partners from a policy, regulatory and/or funding perspective.	Value for money achieved through some or all of the following: <ul style="list-style-type: none"> •Funding from other partners; 	Technical solution provides for the productive reuse of waste materials.	Transparency with respect to the study and disclosure of potential impacts on public health and safety.	Reduced reliance on decisions and acceptance of other governments and communities.
	Technical viability for a period equal to, or greater than, 25 years.	Opportunity to incent households and commercial entities to increase waste diversion efforts/activities.	Partnerships or support from governments likely to be sustained over the long-term (i.e., 20+ years).	<ul style="list-style-type: none"> •Risk transfer to private sector partner; •Inclusion of private sector expertise; •Local jobs and skills expertise; •Reduced transportation and/or management costs; and/or •Increased competition within waste management sector. 	Productive reuse of waste materials results in some or all of the following: <ul style="list-style-type: none"> • Fiscal flexibility; • economic development; • Job creation; or • quality of life improvement 	Mitigation strategies for potential impacts on public health and safety.	Region maintains appropriate oversight and regulation over service. Region retains ownership of asset.
	Capacity viability for a period equal to, or greater than, 25 years.	Reduced carbon footprint of Region's waste management activities, including carbon footprint of facilities and transportation channels.					
	Community and senior level government support is achievable in the near term and sustainable over the long-term.	Mitigation of moral hazard associated with transferring waste management risks to other jurisdictions.					
	Risk to safety, security and stability of Region's waste management channels (all delivery points along the management channel) is mitigated/reduced.	Ethical environmental practice consistent with domestic legislative, regulatory, and policy standards					

Evaluation Methodology

The evaluation framework is defined by guiding principles with specific criteria to be satisfied under each principle. The evaluation is to be done on a “net effect” basis with options being scored on a relative basis using qualitative and quantitative evidence presented in this business case. Descriptive scores to be used:

- Major advantage (option that best meets objective of the criterion)
- Advantage (option substantially meets the objective of the criterion)
- Neutral (option has no advantage or disadvantage over other options)
- Disadvantage (option substantially does not meet the objective of the criterion)

- Major disadvantage (option that least meets the objective of the criterion)

Figure 14 - Evaluation Framework

The diagram shows a sample evaluation matrix with the following structure:

Principle	Criteria	Option A	Option B
Local solution that is realistic and long-term.			
	Reduced reliance on waste disposal solutions outside of Region's boundaries.	Neutral	Advantage

Annotations in the diagram include:

- Guiding principle:** An arrow points to the 'Principle' header.
- Criterion to be satisfied:** An arrow points to the 'Criteria' column.
- Scores:** Arrows point to the 'Neutral' and 'Advantage' cells in the bottom row.

To arrive at an overall score for each option, the following guidelines will be applied:

- An advantaged criteria would offset a disadvantaged criteria within the same category;
- The combining of a major disadvantage with an advantage typically results in an overall disadvantage; and
- Multiple advantages or disadvantages within a category do not constitute an overall major advantage or major disadvantage for the category.

6.2 Options Comparison

The options are compared and contrasted in the following matrix.

Table 12: Evaluation of Options

Principle	Criteria	Option- Other Ontario Landfills	Option – EFW	Rationale
Local solution that is realistic, long-term and not a local landfill.	Reduced reliance on waste disposal solutions outside of Region’s control.	Major Disadvantage	Major Advantage	<ul style="list-style-type: none"> • EFW project would be owned by Durham and York and subject to local control. • Other Ontario Landfill option would be outside of Durham Region.
	Technical viability for a period equal to, or greater than, 25 years.	Advantage	Major Advantage	<ul style="list-style-type: none"> • EFW technology viable for a long-term period. Project estimates give EFW facility 50 year life-span if properly maintained.
	Capacity viability for a period equal to, or greater than, 25 years.	Advantage	Major Advantage	<ul style="list-style-type: none"> • EFW facility is scalable which mitigates capacity risks. • Other Ontario Landfill option subject to physical capacity limits imposed by geography and/or approval. • Capacity of Other Ontario Landfill option would be subject to waste pressures from other Ontario communities; Durham may not have exclusive right to capacity.
	Community and senior level government support is achievable in the near term and sustainable over the long-term.	Neutral	Advantage	<ul style="list-style-type: none"> • York partnership in place for EFW. Senior level government support likely given recent policy decisions to support EFW pilot projects in Ontario. • Site for EFW has been approved indicating level of local support for project. • Other Ontario Landfill option could be subject to local opposition.
	Risk to safety, security and stability of Region’s waste management channels (all delivery points along the management channel) is mitigated/reduced.	Disadvantage	Major Advantage	<ul style="list-style-type: none"> • EFW is controlled by Region with access secured and assured. • Other Ontario Landfill option subject to local opposition or change in public policies of local and/or provincial government.
Interim Assessment		Disadvantage	Major Advantage	

Principle	Criteria	Option- Other Ontario Landfills	Option – EFW	Rationale
Promote environmental sustainability and environmentally sensitive behaviour.	Transparency with respect to the study and disclosure of potential impacts on local natural environment and ecology.	Neutral	Advantage	<ul style="list-style-type: none"> • Full EA process has been conducted for EFW option with project specific EA to follow. • Durham has shared key EA and project documents with community via website, public meetings and Council reports. • Other Ontario Landfill option likely has not been subject to a recent environmental assessment. Local residents would not have benefit of full scale public review related to accepting Durham Region's waste.
	Opportunity to incent households and commercial entities to increase waste diversion efforts/activities.	Disadvantage	Major Advantage	<ul style="list-style-type: none"> • Other Ontario Landfill option transfers waste challenges to other communities—gives rise to moral hazard. • EFW will cap annual waste levels at 110,000 tonnes, thereby providing a local incentive to reduce and divert waste. Failure to reduce and/or meet waste diversion targets would necessitate an increase in scale of the EFW facility.
	Reduced carbon footprint of Region's waste management activities, including carbon footprint of facilities and transportation channels.	Disadvantage	Major Advantage	<ul style="list-style-type: none"> • EFW reduces distance to transport waste. • Based on analysis conducted by Region of Durham, EFW produces less GHG than traditional landfill.⁴⁹

⁴⁹ Regional Municipality of Durham, "Greenhouse Gas Implications of the Solid Waste Management Alternatives, Thermal Treatment and Remote Landfill," Commissioner of Public Works, Report 2008-WR-3, January 9, 2008.

Principle	Criteria	Option- Other Ontario Landfills	Option – EFW	Rationale
	Mitigation of moral hazard associated with transferring waste management risks to other jurisdictions.	Major Disadvantage	Advantage	<ul style="list-style-type: none"> • EFW is a local solution that reduces moral hazard by keeping waste management a local priority. • Other Ontario Landfill option perpetuates moral hazard leading to a situation where the waste is “out of sight and out of mind.”
	Ethical environmental practice consistent with domestic legislative, regulatory, and policy standards	Neutral	Neutral	<ul style="list-style-type: none"> • Both options reside in Ontario, therefore subject to provincial standards.
Interim Assessment		Disadvantage	Advantage	
Foster multi-government partnership and cooperation.	Support from government partners from a policy, regulatory and/or funding perspective.	Neutral	Advantage	<ul style="list-style-type: none"> • Partnering with York Region on EFW solution. • EFW an eligible project under Federal Gas Tax transfer.
	Partnerships or support from governments likely to be sustained over the long-term (i.e., 20+ years).	Disadvantage	Advantage	<ul style="list-style-type: none"> • Other Ontario Landfill option susceptible to public policy risk. • EFW partnership long-term in nature.
Interim Assessment		Disadvantage	Advantage	
Achieve value for money.	Value for money achieved through some or all of the following:	Major Disadvantage	Major Advantage	<ul style="list-style-type: none"> • York Region is funding part of the EFW project as a partner. Region to use Federal gas tax revenues to fund project. • Partnership funding does not apply to Other Ontario Landfill option.
	Funding from other partners;			
	Risk transfer to private sector partner;	Neutral	Advantage	<ul style="list-style-type: none"> • EFW option transfers design, build, operating and maintenance risk to a private sector partner. • There is no risk transfer with the Other Ontario Landfill option.

Principle	Criteria	Option- Other Ontario Landfills	Option – EFW	Rationale
	Inclusion of private sector expertise;	Neutral	Advantage	<ul style="list-style-type: none"> Private sector expertise will be used to operate and maintain the EFW facility. Private sector expertise may or may not be available for Other Ontario Landfill option.
	Local jobs and skills expertise;	Disadvantage	Major Advantage	<ul style="list-style-type: none"> Other Ontario Landfill option preserves trucking jobs associated with transporting waste. EFW option provides for direct and indirect jobs during construction and permanent positions at facility.
	Reduced transportation and/or management costs;	Disadvantage	Major Advantage	<ul style="list-style-type: none"> Transportation costs are significantly reduced with the EFW option because transportation is local. This is important because of the sensitivity of the both options to haulage costs. Management costs are certain with the EFW option because of long-term contract with private sector partner. No certainty on Other Ontario Landfill option with respect to haulage and tipping fees. Control over these fees resides with service provider.
	Increased competition within waste management sector.	Disadvantage	Advantage	<ul style="list-style-type: none"> EFW presents alternative to traditional landfills run by large waste management service providers. Introduces an additional element of competitive tension into environment. Other Ontario Landfill option is subject to status quo competitive environment.
Interim Assessment		Disadvantage	Advantage	

Principle	Criteria	Option- Other Ontario Landfills	Option – EFW	Rationale
Advance the productive reuse of waste materials.	Technical solution provides for the productive reuse of waste materials.	Major Disadvantage	Major Advantage	<ul style="list-style-type: none"> • EFW will produce electricity to be sold into the grid and energy to partially sustain the energy needs of the facility. Ash produced from the thermal process could be used for other purposes such as aggregate for public works projects. • Other Ontario Landfill option does not provide for the productive reuse of waste.
	Productive reuse of waste materials results in some or all of the following: Fiscal flexibility;	Disadvantage	Advantage	<ul style="list-style-type: none"> • Electricity produced by the EFW can be sold into grid to produce revenue for Durham. • Facility will result in approximately \$968,000 in property tax revenues for the Municipality of Clarington. • Cost related to the EFW will be more certain over time than the Other Ontario Landfill option. This will provide Durham with a cost certainty element in its fiscal plan.
	economic development;	Disadvantage	Major Advantage	<ul style="list-style-type: none"> • Energy from EFW facility could support a district heating/cooling for Energy Park. Electricity produced is enough to power 19,000 homes. • Other Ontario Landfill option does not provide any local economic development opportunities. Any opportunities are transferred to community for which the waste is to be shipped.
	Job creation; or	Neutral	Advantage	<ul style="list-style-type: none"> • Other Ontario Landfill option preserves existing shipping jobs but does not create any new jobs. • EFW project provides for 1,000 direct and indirect jobs during construction period and 33 permanent positions to run and manage the facility. Trucking jobs are preserved.

Principle	Criteria	Option- Other Ontario Landfills	Option – EFW	Rationale
	Quality of life improvement	Neutral	Advantage	<ul style="list-style-type: none"> • EFW could stimulate local efforts to reduce and divert waste which would contribute to overall environmental health and sustainability of Region. • Quality of life would be supported by the jobs created by the EFW option. • Other Ontario Landfill option is neutral to quality of life in Durham Region.
Interim Assessment		Disadvantage	Advantage	
Promote the public interest through transparency and evidence based decision-making.	Transparency with respect to the study and disclosure of potential impacts on public health and safety.	Major Disadvantage	Major Advantage	<ul style="list-style-type: none"> • EFW project has been subject to full EA process, public meetings and Council consideration. Health and Safety impacts have been fully considered and disclosed in EA reports. • Other Ontario Landfill option will not be subject to the same rigorous process as that undertaken for the EFW.
	Mitigation strategies for potential impacts on public health and safety.	Disadvantage	Major Advantage	<ul style="list-style-type: none"> • Region has determined that EFW facility to meet highest emissions standards based on EU precedent. • EU standards most rigorous because of strong waste management and diversion policies and maturity of the EFW sector in the European market. • Health impacts, if any, related to Other Ontario Landfill option will not be known to Durham community.
Interim Assessment		Disadvantage	Major Advantage	
Ensure appropriate public ownership/control.	Reduced reliance on decisions and acceptance of other governments and communities.	Disadvantage	Major Advantage	<ul style="list-style-type: none"> • Durham Region maintains full ownership and control over the EFW facility. • Region does not have ownership and control over another landfill in Ontario.

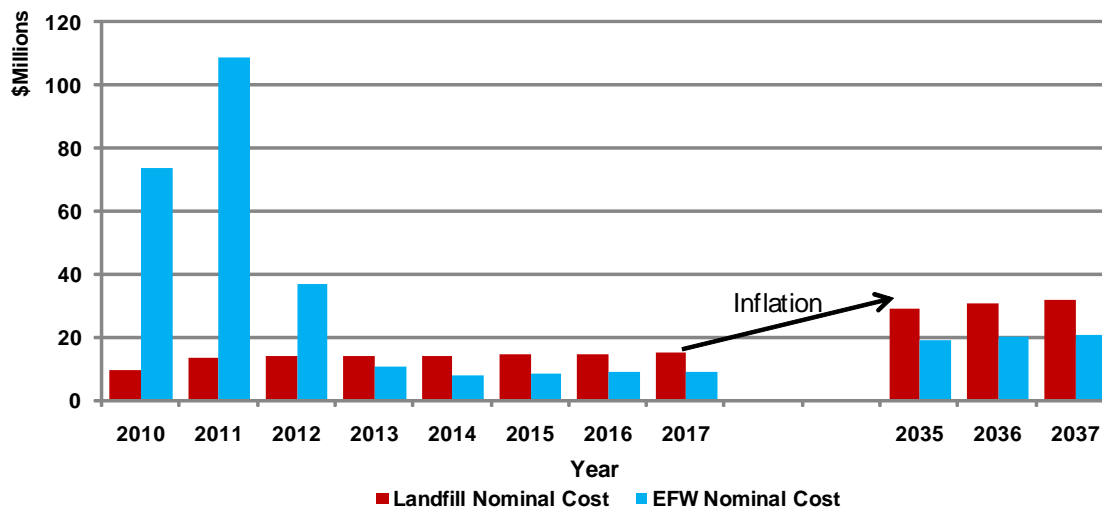
Principle	Criteria	Option- Other Ontario Landfills	Option – EFW	Rationale
	Region maintains appropriate oversight and regulation over service.	Disadvantage	Major Advantage	Security of Region's access to waste management solution dependent on decisions of other governments/communities.
	Region retains ownership of asset.	Disadvantage	Major Advantage	<ul style="list-style-type: none"> Region maintains regulatory oversight through contract with EFW operator and would have within its jurisdiction the authority to adopt higher service and environmental standards. Ownership and control provides Region will level of service and cost certainty not afforded by the Other Ontario Landfill option.
Interim Assessment		Disadvantage	Major Advantage	
On Balance		Disadvantage	Advantage	

6.3 Comparative Costing Analysis

Economic Assessment

The figure below contrasts the nominal costs associated with both options. As it was noted earlier, in the early years the EFW option is more expensive than the Other Ontario Landfill option, however, over time, the costs of the landfill option outstrip the costs of the EFW because: (i) inflation is expected to be higher for the Other Ontario Landfill option; (ii) EFW costs increase at a lower level of inflation; and (iii) EFW costs are partially offset from the revenues generated by the facility. The EFW is also an asset that will have a residual value at the end of 25 years, whereas no asset is involved with the Other Ontario Landfill option (it is just a straight annual operating cost). The EFW option is also less sensitive to increases in haulage costs because hauling distances are minimized. This is relevant because it demonstrates that the EFW option provides greater cost certainty than the Other Ontario Landfill option.

Figure 15: Nominal Economic Costs (Excluding Residual Value of EFW facility)



In terms of comparing costs on a present value basis, the table below shows that the cost differences between the two options are quite marginal. As at the time of the writing of this report, Durham's long-term borrowing rate was 5 percent. At a 5 percent discount rate, the EFW option is slightly (\$1.41 million or less than one percent) more expensive than the Other Ontario Landfill option.

The present value analysis is conservative for the EFW option and does not include potential revenues from the district heating/cooling for the Energy Park, the appreciation of land value related to the overall development of the Energy Park, and benefits from the sale of GHG credits. With respect to the sale of GHG credits, if you assume the sale of EFW GHG credits at Environment Canada estimates for the price of GHG credits, a present value benefit of \$6 million (at a 6 percent discount rate) is generated. If these revenues and value appreciation were factored into the present value analysis, the EFW option would be less costly to Durham than traditional landfill.

Table 13: Total NPV of Economic Costs and Benefits

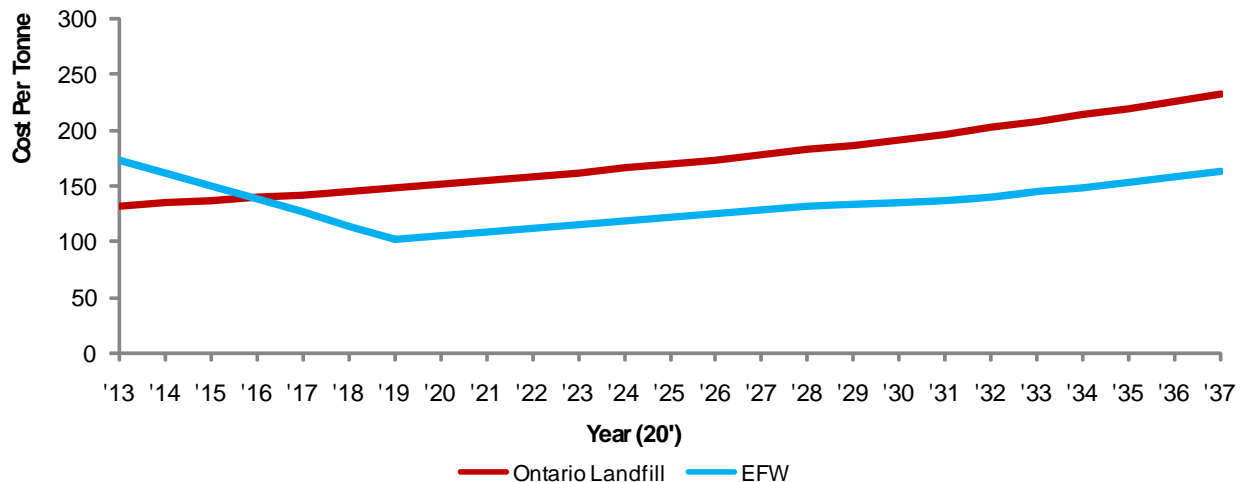
Yr	Other Ontario Landfill NPV's @ Varying Discount Rates					EFW NPV's @ Varying Discount Rates				
	Nominal					Nominal				
	0%	4.5%	5.0%	5.5%	6.0%	0%	4.5%	5.0%	5.5%	6.0%
2010	9.27	8.49	8.41	8.33	8.25	73.92	67.69	67.05	66.42	65.79
2011	13.53	11.85	11.69	11.52	11.36	108.72	95.27	93.91	92.59	91.28
2012	13.75	11.53	11.31	11.10	10.89	36.97	31.01	30.42	29.85	29.29
2013	13.97	11.21	10.95	10.69	10.44	10.33	8.29	8.09	7.90	7.72
2014	14.21	10.91	10.60	10.30	10.02	8.02	6.16	5.99	5.82	5.66
2015	14.45	10.62	10.27	9.94	9.61	8.35	6.14	5.93	5.74	5.55
2016	14.71	10.34	9.96	9.58	9.23	8.68	6.11	5.88	5.66	5.45
2017	14.98	10.08	9.65	9.25	8.86	9.03	6.08	5.82	5.58	5.35
	-	-	-	-	-	-	-	-	-	-
2035	29.19	8.89	7.82	6.88	6.05	19.03	5.80	5.10	4.48	3.95
2036	30.46	8.88	7.77	6.80	5.96	19.92	5.81	5.08	4.45	3.90
2037	31.80	8.87	7.73	6.73	5.87	20.84	5.82	5.06	4.41	3.85
NPV Subtotal (\$2008)	552.12	268.09	249.80	233.17	218.05	552.25	345.57	331.46	318.47	306.50
Residual Value (\$2008) ^{Note}						80.25	80.25	80.25	80.25	80.25
Total (\$2008)	552.12	268.09	249.80	233.17	218.05	472.00	265.32	251.21	238.22	226.25
Economic Benefit of EFW Compared to Other Ontario Landfill										
NPV						80.12	2.77	(1.41)	(5.05)	(8.20)
% Savings						14.5%	1.0%	-0.6%	-2.2%	-3.8%

Note: The residual value of the EFW was independently calculated by Deloitte in 2008 dollars considering land value, depreciation and life cycle, including recognition of significant annual maintenance and major repairs/replacement assumed within the cost streams over the initial 25 year term to support the good state of repair of the asset. Considering this separate calculation to establish the 2008 residual value, it was then applied by Deloitte to each of the results.

Financial Assessment

The Region of Durham is in the fortunate position of being able to use its annual Federal gas tax revenues to accelerate the retirement of the debt financing for the EFW facility. With the application of the Federal gas tax, Durham can pay off the mortgage on the facility within 8 years. With the application of energy revenues generated by the facility, the EFW option is a more cost effective option on a per tonne basis and it is not exposed to the public policy, competition, and capacity risks that the Other Ontario option is exposed to.

Figure 16: Financial Comparison of Options (with Gas Tax)



From both an economic and financial perspective, the EFW option is more beneficial to Durham and its residents.

Sensitivity Analysis

A sensitivity analysis was performed on both options to determine which of the input variables has the greatest influence over their respective economic performance.

Other Ontario Landfill Option

As the table below shows, for the Other Ontario Landfill option the variable with the greatest impact is haulage costs. This is important to consider because if the rate of inflation for haulage costs is significantly greater than those assumed for this business case—which is possible because of the increasing price of fuel-- Durham could be faced with significantly higher waste management costs if it chooses to pursue a landfill solution.

Table 14: Sensitivity Analysis of NPV of Economic Costs

		Base Case	
Tipping Fee Inflation	0.50%		2.00%
NPV	213.1		246.7
% Change From the Base Case	-2%		13%
Haulage Cost Inflation	2%		10%
NPV	189.7		306.5
% Change From the Base Case	-13%		41%

EFW Option

With respect to the EFW option, the table below shows that the variables with the greatest impact are haulage costs and the price for the electricity generated by the facility. Like the

Other Ontario Landfill option, haulage inflation has a significant impact; however, the impact is less for the EFW option because the haulage distance is minimized.

Table 15: Sensitivity Analysis of NPV of Economic Costs

		Base Case	
Construction Inflation	2%		8%
NPV	217.1		245.7
% Change From the Base Case	-4%		9%
Haulage Cost Inflation	2%		10%
NPV	212.2		268.5
% Change From the Base Case	-6%		19%
Currency (CND per USD)	0.90		1.10
NPV	221.2		233.2
% Change From the Base Case	-2%		3%
Durham Borrowing Rate	4.5%		7.0%
NPV	226.3		226.3
% Change From the Base Case	0%		0%
Durham Diversion Rate	70% Diversion		60% Diversion
NPV	220.1		242.7
% Change From the Base Case	-3%		7%
PPA Pricing (Cents)	11		5
NPV	184.0		234.4
% Change From the Base Case	-19%		4%
Capital Cost	-20%		20%
NPV	210.8		241.7
% Change From the Base Case	-7%		7%

The price of electricity achieved under a Power Purchase Agreement (PPA) also has an impact on the economic performance of the EFW option. The higher the price, the lower the cost of this option. Durham and York have requested 11 cent/kWh pricing available under the Renewable Energy Standard Offer Program and if it is achieved, it would reduce the present value cost of the EFW option. Consistent with the conservative nature of the economic modeling conducted for this report, an 8 cent/kWh price was used as the base case. This is important to consider because Durham could derive further benefits from the EFW option if the requested electricity price is achieved.

Results

On balance, the most sensitive parameter is the haulage cost due to its direct sensitivity to the rising cost of fuel. The Other Ontario Landfill option is more exposed to this parameter due to the greater travel distances inherent in the option. The EFW option will benefit significantly if Durham's request for Renewable Energy Standard Offer pricing is accepted by the Ontario government.

6.4 Results and Recommendation

On balance, the EFW option has an advantage over the Other Ontario Landfill option because it would:

1. Be a local solution that is technologically and environmentally sustainable and provides Durham and its residents with an incentive to reduce and divert its waste through more environmentally friendly practices and increased recycling;
2. Be supported by an inter-regional partnership between Durham and York where significant capital investment costs would be shared;
3. Have the capacity to manage Durham's post-diversion waste beyond a 25 year period;

4. Achieve value for money because it is less sensitive to increasing haulage costs, it transfers operating risks to the private sector, creates new jobs and has value at the end of its life-cycle;
5. Produce less GHG than landfill which would mitigate the carbon footprint of the facility and may create future revenue opportunities in developing carbon markets;
6. Have been subject to full study and consideration by the public through the EA process and Council proceedings with a higher level of environmental control added by Durham to achieve full EU compatibility;
7. Enable the productive reuse of waste to generate electricity to power more than 19,000⁵⁰ homes and to support district heating in the vicinity;
8. Provide Durham with service level and cost certainty over a long time horizon (i.e., 25 years);
9. Create new jobs for Durham Region (approximately 1,000 direct and indirect jobs) and facility operations (estimated 33 FTEs);
10. Be owned by Durham and involve a partnership with a private entity that would design, build and operate the facility over a 25-year contract. The long-term operating contract with the private entity would help ensure that the asset is properly maintained through appropriate investments and that service levels are constant over the facility's life cycle.

In contrast, the Other Ontario Landfill option's only real advantage is that it is technically proven and there appears to be sufficient, though diminishing, capacity elsewhere in Ontario to accommodate Durham's waste.

While the Other Ontario Landfill option would be convenient from a timing and availability perspective, it could expose Durham to a significant number of risks that create uncertainty with respect to service levels, costs and sustainability. Very few new or expanded landfills have been approved by MOE in recent years, which has meant that existing landfills are experiencing significant pressures on their capacities. The Region is exposed to the risk that tight landfill capacity will either result in having to find a new waste management option in the medium-term, or having to pay increased fees to maintain consistent service levels. Either of these impacts—new option or rising costs—reduces the level of certainty that Durham would have with respect to waste management costs and would expose its fiscal plan to inflation pressures in the waste management market. Also, this option would expose Durham to significant fuel cost risk.

Current best practice, based on the European example, is that a proximity principle ought to apply to waste management to reduce the environmental risks associated with shipping waste and to provide a local incentive to reduce and divert waste. This option could also place Durham in a difficult position with other municipalities. The City of Toronto's decision to purchase the Green Lane Landfill outside of London drew criticism from London and St. Thomas. Best practice has municipalities finding local solutions for their waste management challenges in order to avoid transferring the challenge to others and to ensure that waste management solutions remain top of mind for local residents, businesses and governments.

Therefore, based on this analysis, it is recommended that Durham pursue an EFW facility because it provides the best opportunity for a viable, long-term and environmentally sustainable local solution to Durham's waste management challenges.

⁵⁰ Based on metric published by Plasco for the gasification project in Ottawa where 1MW powers 1,600 homes. Maureen Carter-Whitney, "Ontario's Waste Management Challenge: Is Incineration an Option," Canadian Institute for Environmental Law and Policy, 2007, p. 8.

Appendix 1: Input Assumptions

This appendix contains assumptions that apply to both Other Ontario Landfills (Option 1) and the EFW (Option 2).

General Assumptions

Assumption/Input	Value	Source and Comments
Total Waste Stream	Varies over time	Long-term forecast prepared by Region based on estimated population and household growth as well as planned diversion targets
Diversion Rate (curbside only)	Base Scenario: 60% from 2011 to 2019, 70% from 2020 onward Sensitivity Scenario: of 70% diversion from 2011	Base scenario assumes 70% diversion phased in to 2020 Alternate scenario of 70% in 2011 established by Council Forecasts for waste management facility (WMF) is for post diversion waste
General Inflation	2%	Based on Bank of Canada target inflation rate
Operation Term	25 years	Based on length of proposed design-build-operate contract with Private Vendor
Base Year	2013 for financial analysis 2011 for economic analysis	Cost per tonne analysis based on first year of EFW operations as benchmark (2013) Economic analysis for all options will be conducted as of January 2011 based on planned closure of US border to Canadian waste at the end of 2010
Fuel Escalator	5.22%	Based on 20% entitlement of average Ontario diesel cost index (Stats Can) year over year increase for past 5 years, as per current contracts and Durham budget planning
Tipping Fee Escalator	0.75%	Based on 60% of Ontario all items CPI year over year increase for past 5 years, as per current contracts and Durham budget planning

Input Assumptions for Other Ontario Landfills (Option 1)

Haulage, Disposal and Transfer Costs

Assumption/Input	Value	Source and Comments
Haulage Costs	\$26.88/tonne	Increases at 5.22% per year Calculated using approximate distance from Pebblestone transfer station to Warwick landfill Both selected as proxy sites, Pebblestone because it is a centrally located transfer station in Durham and Warwick because of its mid-range distance and long-term capacity Based on method of calculating haulage from EA Study: Application of Short List Evaluation Criteria, Appendix A – Technical Memorandum on Haul Cost Analysis
Transfer Fees	\$20.66/tonne	Increases at 0.75% per year (Tipping Fee Escalator) Weighted average of Regions costs based on existing contracts.
Disposal Costs	\$72.57/tonne	Increases at 0.75% per year (Tipping Fee Escalator) Based on Southern Ontario landfill survey data provided by Durham and subsequent assessment of Ontario landfill sector

Input Assumptions for EFW (Option 2)

Summary of Key Design Components

The key design components of the EFW are summarized below.

Required Basic Items

- MACT Solution Surpassing A-7 (consistent with March 17,2008 letter to MOE)
- Single boiler- horizontal configuration
- Odour control measures
- Air-cooled condenser
- Electricity output only- 14MW capacity net of 15% parasitic load providing approximately 12 MW to the grid
- Operating capacity of 140,000 tonnes per year
- Building tipping floor with minimum capacity of 4 days at 250,000 tonnes per year
- Site infrastructure design for future capacity

Recommended Additional Items

- Allowance for District Heating compatibility
 - Full EU compatibility
 - Dioxin Sampling
 - Contingency odour control enhancement
 - Allowance for enhanced architectural features
 - Viewing gallery
 - Education centre
 - Contingency for site improvements
 - Differential costs for system redundancy (double boiler)
-

Shared Costs

All the costs noted within this section are shared on an 11/14 basis for Durham and 3/14 for York.

Capital Costs

Capital costs (\$2008) are summarized below.

Capital Cost Items	Total (\$2008)
Required Basic Items	
Hard Costs	
Site Development	7,136,000
Buildings	14,976,000
Processing Equipment	2,632,000
Ash Storage	2,210,000
Power Block Equipment	84,734,000
	<u>111,688,000</u>
Soft Costs	
Contingency	22,338,000
Engineering/Cont Observations	10,722,000
Permitting	804,000
Surveying and Soils Report (est)	67,000
Construction Management	5,361,000
	<u>39,292,000</u>
Subtotal	<u>150,980,000</u>
Recommended Optional Items	
Allowance for District Heating Capability	
Incremental Costs for Extraction Turbine	2,560,000
Heat Exchanger and Onsite Piping	1,229,000
Piping to Customers	650,000
	<u>4,439,000</u>
Subtotal for District Heating	
	<u>4,439,000</u>
Full EU Compatibility	1,536,000
Dioxin Sampling	180,000
Contingency Odour Control Enhancement	2,048,000
Allowance for Enhanced Architectural Features	9,000,000
Viewing Gallery	1,024,000
Education Center	512,000
Contingency for Site Improvements	10,200,000
Differential Costs for System Redundancy	17,699,000
	<u>46,638,000</u>
Subtotal	<u>46,638,000</u>
Recommended Base Case	<u>197,618,000</u>

Operating Costs

Operating costs (\$2008) are summarized below.

Operating and Maintenance Cost Items	Total (\$2008)
Required Basic Items	
Labour	2,941,000
Annual Maintenance & Repair	2,159,000
Major Repair and Replacement Cost	996,000
Utilities & Reagents	1,559,000
Rolling Stock O&M Cost	112,000
Miscellaneous Cost	787,000
	<u>8,554,000</u>
Property Tax to Clarington	968,000
Process Residual Haul & Disposal	4,264,000
Profit and Contingency	1,702,000
	<u>6,934,000</u>
Subtotal	15,488,000
Recommended Optional Items	
Allowance for District Heating Capability	
Incremental Costs for Extraction Turbine	92,000
Heat Exchanger and Onsite Piping	11,000
Piping to Customers	13,000
Subtotal for District Heating	<u>116,000</u>
Full EU Compatibility	472,000
Dioxin Sampling	81,000
Contingency Odour Control Enhancement	33,000
Allowance for Enhanced Architectural Features	187,000
Viewing Gallery	125,000
Education Center	13,000
Contingency for Site Improvements	-
Differential Costs for System Redundancy	400,000
Subtotal	1,427,000
Recommended Base Case	16,915,000

Revenue Assumptions

Electricity revenue is assumed to be \$0.08 / kWh and is based on pricing proposed in the draft Clean Energy Standard Offer Program.

Recyclable revenues are assumed as presented below. Please note that these revenues are not inflated and remain flat throughout the forecast period.

- Aluminium @ \$2700/tonne (.076% of waste); and
- Ferrous @ \$270/tonne (2.6% of waste).

No revenues have been assumed for GHG credits or from District Heating / Cooling customers.

Start of Construction and Operations

The timing of cash flow assumes a Construction Start in June 2010 and beginning of operations in April 2013. The operating term is 25 years. It should be noted that this schedule:

- Differs from the proposed EFW schedule as it presents a 'worst-case' scenario; and
- The actual start for construction and operating would be as provided by the Preferred Vendor.

Payments to Preferred Vendor During Construction

The payments during construction are assumed to occur at three milestones. It is assumed that the Private Vendor will finance its obligations between performance payments using an interest rate of 6.5%. The final number of milestone payments will be defined in the design-build-operating contract and are expected to be between 5 and 6; therefore, the assumptions noted above are conservative.

Waste Forecast

The Regions' waste forecast noted above is combined with 20,000 tonnes per year from York Region. The capacity of the EFW is 140,000 tonnes – in years where the forecasted waste is below this capacity, it is assumed that additional waste from other sources will be deposited at a disposal fee (tipping fee) of \$55 / tonne (\$2008) which is not inflated annually. This fee which is consistent with local commercial assumptions. In years where waste exceeds the capacity, diverted waste is disposed using Other Ontario Landfill assumptions.

Process Residual Haul and Disposal Costs

For rejects (0.8% of waste input), haulage costs are \$28.16 / tonne (EFW to Warwick, 32 tonne trailer) and disposal costs are consistent with Other Ontario Landfill options.

Bottom ash haul and disposal (23.4% of waste input) costs are assumed to be total of \$75.00 per tonne based on a split of \$23.47/tonne for Haulage (EFW to Warwick, 40 tonne trailer) and a disposal cost of \$51.53/tonne – this cost is based on similar commercial arrangements and reflects that this waste is cheaper than typical waste because it is more compact, does not leach and has uniform consistency.

Fly ash haul and disposal (4.03% of Waste Input) is classified as environmentally hazardous waste and is assumed to cost \$300.00 per tonne (\$100.00 for haulage + \$200.00 for disposal).

It should be noted that bottom ash may be used as a pavement aggregate in the future. York and Durham can explore establishing a program for possible use as a pavement aggregate (10 yrs +/- allowing some time for research and integration), which provides the opportunity for future cost savings.

Construction Inflation

Construction inflation has been assumed to be 4% per year over the construction period. It is based on an assessment of the Toronto construction material and labour market.

Currency Assumptions

For capital costs that originate in \$US, the value of the Canadian dollar to the US dollar is assumed to \$0.98, as of the date of the original cost estimate provided by HDR Engineering (March 28, 2008).

Commodity Taxes

PST is assumed to be covered in cost estimate, while GST is not included as it is a flow-through expense.

Annual Insurance Costs

Annual insurance costs are assumed to be \$350,000 (\$ 2008) per year to cover: comprehensive liability insurance, all risk insurance, business interruption insurance and environmental impairment insurance.

Durham Only Costs

The following costs are applied only to Durham.

Financing Assumptions:

Durham borrows capital obligations at 6% using 20-year amortization. Federal Gas Tax revenues are applied to these capital obligations only to reduce borrowing needs, as follows:

- \$46.9 M in 2010 and \$16.5 M annually thereafter only to principal on debt to fund construction costs (capital) until debt is retire.

Local Haulage and Transfer Costs to the EFW

Durham pays 100% of costs to haul / transfer to the EFW. It is assumed that these costs apply for Brock, Ajax, Pickering, Scugog and Oshawa as follows:

- Average of \$14.25 / tonne for haulage;
- Average of \$8.91 / tonne for transfer; and

It was assumed that all other communities would not incur these costs.

Role of Deloitte in Preparing this Business Case

The services provided by Deloitte in the preparation of this business case may have included advice and recommendations, but all decisions in connection with the implementation of such advice and recommendations shall be the responsibility of, and be made by, Durham. In connection with the business case services, Deloitte shall be entitled to rely on all decisions and approvals of Durham.

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