Incineration of Municipal Solid Waste
Understanding the Costs and Financial Risks
Fact Sheet 4

Across Canada municipalities are faced with the challenges associated with financing waste diversion and disposal. As we look to the future, municipalities should be cautious when entering into long-term commitments for their waste, especially if they require substantial investments.

The following fact sheet is intended assist municipal decision makers better comprehend the costs, terms and risks associated with incineration for municipal solid waste.

What does incineration of municipal solid waste actually cost?

Incineration facilities for municipal solid waste come in many different sizes and varieties, from low-tech mass-burn plants, to newer technologies like gasification, plasma arc and pyrolysis, which are still unproven in terms of their success.

Given the range of technologies, costs can vary dramatically. Variables such as capacity, the amount of up-front sorting required, emission testing and monitoring technologies, operator training, ash management, and the incineration process (technology) all impact the project costs. Today, most new projects will range in price from about $102 to over $168 per tonne (net costs) including ash management, amortized capital and energy revenue.[1] The World Bank estimates that the cost of incineration is "an order of magnitude greater than" landfilling.[2]

Don't energy revenues off-set the operating costs substantially?

The revival of incineration as a disposal option in Canada is very much linked to the promise of substantial revenues from the sale of energy. In fact, budgeting for incineration facilities always incorporates revenues from the sale of electricity (kwh) or heat (GJ), or combined electricity of heat.[3] These revenues usually off-set per tonne operating costs by as much as 30%-45%. In spite of these large revenue projections, the net costs range from about $102 - $168 per tonne.

However, several very real changes can occur over a 20-year period[4] which will impact the energy output and electricity revenue. For example, if the net calorific[5] value of a tonne of waste is reduced, due to increased recycling, less energy will be produced. This may necessitate additional import of energy (usually natural gas) to maintain thermal heat within the combustion chamber, which will increase fuel costs. Finally, given the instability of electricity buyers for energy from incineration of municipal solid waste, there are no guarantees that energy revenues will continue to flow throughout the life of the facility.[6]

What are the financing options for municipalities?

In general, there are two financing models for incineration facilities. Privately owned and operated projects require a guaranteed flow of waste and set tip fee. The owner is guaranteed revenue to cover capital and operating costs and profits, with a fixed amount of waste or a cash penalty. "Put or pay" contracts involve communities supplying waste or paying a penalty for the life of the thermal facility - about 20 years or more.

Public ownership is when a municipality or a group of municipalities raise the funds to finance the capital investment. Governments may issue bonds for low-cost financing, or can increase taxes to generate project financing. Public ownership does not involve put-or-pay commitments, but it still requires that the facility receive waste with reasonable energy content on a consistent basis for a 20-year term. The municipality is also accountable for financing on-going operations, imported natural gas for start-up and shut-downs, as well as annual capital costs and paying off debt on upfront capital costs.

What are the risks to municipalities?

For "optimal" operations, incineration facilities must combust waste around the clock to maintain consistent electricity output, and reduced pollution. In contrast to landfills, these facilities require a steady stream of mixed waste with the right composition of burnables like plastics and paper-based products for the entire life span of the facility. Put-or-pay provisions for incineration projects can be risky agreements for communities, as it requires the community to guess the amount of waste generation in their community for the next 5, 10, 15 and 20 years from now. Most forecasting factors in a degree of higher diversion, along with population growth and status quo waste generation.

But this approach is short-cited, because it does not take into account the impact of new and less expensive diversion technologies, alternative cheaper disposal options, new regulatory requirements, changes in the composition of the waste, and the impact the state of the economy has on waste generation[7].

There are countless case studies[8] of communities around the world whose incineration projects have landed them into significant debt, as a result of insufficient waste generation, insufficient calorific content in the waste, surpassing allowable emission limits, and unplanned mechanical failures, which required additional cost investments from the community.

Are there other costs associated with incineration of municipal solid waste?

As municipalities determine the costs associated with their disposal options, it is important that they consider the social costs associated with the pollution from incineration facilities. More specifically, these costs would include the cost of global warming, acidification, and eutrophication associated with emissions of certain pollutants to the atmosphere and to waterways. The increased likelihood of adverse impacts on human health associated with air pollution emissions and the release of toxic substances to the environment also carry a cost.

Several studies[9] have calculated the total social cost of incineration and landfill, and their findings show that most of the time incineration costs are much higher than landfill. One independent study writes[10]:

> *"The net private cost of WTE (waste-to-energy) plants is so much higher than for landfilling that it is hard to understand the rational behind the current hierarchical approach towards final waste disposal methods in the EU (European Union). Landfilling with energy recovery is much cheaper, even though its energy efficiency is considerable lower than that of a WTE plant."*

In Summary

As we plan for the future – where energy conservation and environmental protection are crucial - we must be aware that this future is unsure about what new diversion technologies will emerge, the amount of waste available for disposal and the composition (i.e., calorific value) of waste. This is why plans for waste disposal require flexibility – the kind of flexibility that the economics of incineration will not bear.

Instead, municipal finances should support the 3Rs and composting, with the remaining residual waste managed in a manner which has the lowest risk, lowest environmental impact, and allows for diminished quantities over time.

ENDNOTES

[1] This price range is based on several Canadian on-going and planned projects: Specifically, Algonquin Power in Peel Region, and the cost range provided in the Environmental Assessment done for Region of Niagara and City of Hamilton. In addition, similar price ranges were attained from John Chandler, A.J. Chandler and Associates presentation at AMRC Feb 2007 workshop. http://www.amrc.ca/proceedings/page9.html

[2] Georgieva, 2000; and Cointreau-Levine, 1996.

[3] Most facilities in North America produce and sell electricity only

[4] 20-years is usually the estimated life-span of a incineration facility. Capital costs are generally amortized over 20-years.

[5] "Calorific" refers to the amount of heat released when all of the combustible material is burnt. Plastic and paper materials have the highest calorific content of the waste stream respectively.

[6] Currently the Ontario Power Authority (OPA) will not procure biomass energy from municipal solid waste. As per Startdard Offer Program rules – page 30. However, a incineration project can negotiate with private company to purchase Kwh and/or heat over short-term or long term. Responsibility of the Incineration owner/operator, and may be subject to fluctuating prices/unstable revenues.

[7] Generally, the state of the economy has a direct relationship to waste generation – the healthier the economy the greater the generation of waste per capita.

[8] Case Studies can be found at:

1) *Waste Incineration – A Dying Technology*, July 2003, Global Anti-Incinerator Alliance;
2) *Waste-to-energy and recycling: Tango or tangle?,* Apotheker, Steve, Resource Recycling, September 1994, p72.;
3) *Competition Between Recycling and Incineration*, Jeffrey Morris, Ph.D. - Economics Sound Resource Management Sept 1996;
4) *Incinerators in Disguise, Case Studies of Gasification, Pyrolysis, and Plasma in Europe, Asia and the United States.*, April 2006, Greenaction for Health and Environmental Justice

[9] These studies include:

1) Eunomia, A Changing Climate for Energy from Waste?, Final report for Friends of the Earth, 03/05/2006. Page 24, table 4.
2) HM Customs & Excise (2004) *Combining the Government's Two Health and Environmental Studies to Calculate Estimates for the External Costs of Landfill and Incineration*, December 2004.
3) Presentation of research findings, *r. Jeffery Morris, Sound Resource Management – Recycling Council of Ontario, Energy from Waste Policy Forum, November 3, 2006.www.rco.on.ca*

[10] *Burn or bury? A social cost comparison of final waste disposal methods*, E. Dijkgraaf, H. Vollebergh, Feb 2003.