Rocky View County

sonnevera
international corp.

Waste-to-Energy Review

Report - June 2021

Table of Contents

1 Introduction to Waste to Energy 1

2 WtE Technology Solutions Overview 1

2.1 Mass-Burn Incineration 5
2.2 Thermal Conversion Technologies 5
2.2.1 Pyrolysis 6
2.2.2 Gasification 7
2.3 Refuse Derived Fuel (RDF) 8
2.4 Catalytic Thermal Depolymerization 9
2.5 Biological WtE 9
2.6 Biomass Combustion 9

3 Economic Cost and Benefits 10

4 Environmental impacts 11

5 Summary 12

6 References 13

1 Introduction to Waste to Energy

When efforts to reduce, reuse, recycle and compost have been exhausted, waste-to-energy (WtE) technology offers a final opportunity to recover energy from residual waste before waste is deposited in a landfill. WtE fits into the waste management hierarchy as shown below, with WtE falling into the "recover" category:

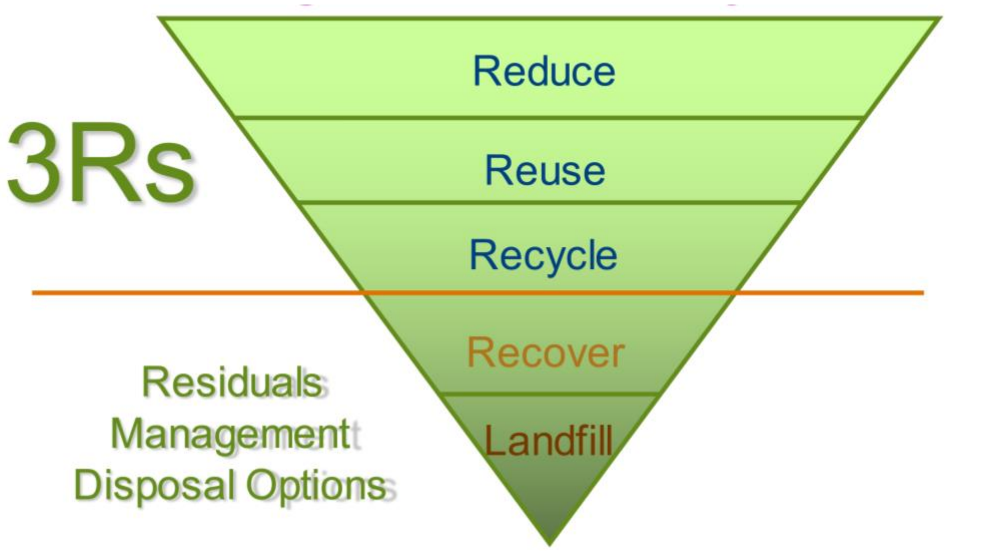


Figure 1: Waste Management Hierarchy (RCA)

The hierarchy implies the imperative of maximizing the 3Rs (reduction, reuse, recycling) before recovery is employed. This approach is based on research that validates the decreased negative environmental impacts of reuse and recycling compared to recovery and landfill.

This prioritization is consistent with RVC's goals outlined in the 2021 Servicing Strategy, stating residential and ICI (industrial, commercial, institutional) waste will be managed in accordance with the 3Rs Hierarchy. The strategy also shows a desire to promote WtE as the go to for waste disposal and liaise with regional partners on WtE updates and opportunities.

As RVC does not own any disposal infrastructure, instead contracting out disposal services, it has limited ability to incorporate WtE within its waste management system, particularly since no viable WtE options currently are available in Alberta.

2 WtE Technology Solutions Overview

Any materials that contain carbon atoms (i.e., materials that are not a metal, mineral or water) have value as an energy source. This means that materials ranging from plastics, to paper, to food scraps, and yard waste all contain energy which can be captured and used for a wide range of energy applications.

There are a variety of terms that are used to describe groups of processes that convert waste materials as fuel sources to produce energy. These descriptors include waste-to-energy (WtE), energy from waste (EfW), thermal treatment (TT), waste conversion technologies (WCT) or advanced thermal treatment (ATT).

Technologies offer different ways of utilizing the energy in waste materials. Conventional WtE systems are essentially power plants using waste as fuel instead of natural gas, coal, oil or biomass (e.g., wood). However, the evolution of WtE has shifted somewhat from the traditional combustion of waste to alternative technologies that output synthetic gases, chemicals and liquid fuels. These emerging and developing technologies are progressing towards commercialization, but lack the operating record in North America to be commercially viable.

With any of the technologies, a fraction of the total waste stream will not be suitable for processing by WtE technologies, and will still require landfilling. It is expected that a landfill will still be required, both for unsuitable waste fractions, as well as for residuals generated by the WtE facility. Waste reduction to landfill in the best case would be 75 per cent by weight and 90 per cent by volume.

It is important to remember that WtE's primary goal is to process waste. The energy component, while a bonus, is secondary.

GLOBAL CONTEXT: There are 86 commercialized processing technology WtE facilities, across 25 states, in the United States of America, according to the EPA, and many others operating throughout the world. In many instances, smaller U.S. facilities struggle to remain economically competitive with cheaper landfill disposal options. Many of these smaller facilities have had to be retrofitted with air emission controls in the last two decades, which has significantly increased overall costs.

The categories of WtE technology solutions are summarized in the following table, with more detailed descriptions following.

	Brief Description	Advantages / Disadvantages
Mass-Burn Incineration (combustion)	Waste directly combusted	**Technical:** • Proven technology • Requires large feedstock amounts **Environmental:** • Capability to comply with air, water, and waste emission standards • Volume reduction up to 85-95% **Economic:** • Most efficient WtE technology if feedstock volumes high enough • Normally lower cost per tonne than thermal conversion technologies such as pyrolysis and gasification

	Brief Description	Advantages / Disadvantages
Pyrolysis	Thermal decomposition of carbon-based materials using an indirect source of heat to produce syngas that can be used as a fuel	**Technical:** • Emerging technology • Can produce high-quality by-products with a homogeneous feedstock **Environmental:** • Capability to comply with air, water, and waste emission standards • 15 to 20 percent by weight of feedstock throughput becomes char/ash • Char/ash may require disposal in a hazardous waste landfill **Economic:** • Operating cost higher than mass-burn • Not considered as commercially efficient as standard combustion
Gasification	Thermal conversion of carbon-based materials using a limited amount of air or oxygen to produce syngas that can be used as a combustible fuel or for the downstream production of chemicals	**Technical:** • Emerging technology • Long history with homogenous feedstocks such as coal and biomass • Use with MSW not proven **Environmental:** • Capability to comply with a wide range of emission standards • Typically lower air emissions than mass-burn facilities • Produces slag or ash - 15 to 20% of original feedstock • Slag non-leachable so can be landfilled **Economic:** • Operating cost higher than mass-burn

	Brief Description	Advantages / Disadvantages
Plasma Arc Gasification	Uses an electrical discharge to heat a gas to high temperatures to be used to thermally convert carbon-based feedstocks to syngas	**Technical:** • Emerging technology • Pre-processing of waste materials important to create a consistent feedstock; potential to convert MSW to electricity more efficiently than conventional pyrolysis and gasification systems **Environmental:** • Capability to comply with a wide range of emission standards • Produces slag or ash - 15 to 20% of original feedstock **Economic:** • Due to the state of development of this technology, it is still considered to be technically and financially risky
Refuse Derived Fuel	Waste is processed into a consistent feedstock (fluff, bricks, pellets) that improves combustibility	**Technical:** • Proven technology • Creates a fuel that can be combusted in smaller-scale WtE units (e.g., furnace). • Involves pre-processing to enhance the heating value of the MSW • More appropriate choice for smaller communities • Consistent feedstock improves combustibility **Environmental:** • Pollution controls are a necessary part of the combustion system as the RDF will produce both ash (which typically can be landfilled) and fly ash (which may require a secure landfill) • Emissions occur at end-use facility **Economic:** • Can make economic sense where long-term markets of RDF can be secured (e.g., waste wood)
Catalytic thermal depolymerization	Breaks down long-chain plastics and other organics at fairly low temperatures into a mix of hydrocarbon oils and gases that are distilled at much higher temperatures to separate them into purer product streams, such as diesel	**Technical:** • Emerging technology • Yet to be locally proven for MSW at a large scale

	Brief Description	Advantages / Disadvantages
Anaerobic Digestion	Biological process that utilizes bacteria to convert the compostable organic fraction of biomass in the absence of oxygen to biogas	**Technical:** • More applicable for the treatment of food waste, Animal manures and biosolids • Not well proven for MSW at a commercial scale
Biomass combustion	Burns biomass/wood waste to produce heat that can then be used to generate steam in a boiler and/or electricity in a steam turbine generator	**Technical:** • Not proven for MSW at a commercial scale

2.1 Mass-Burn Incineration

The most prevalent technology used for WtE is mass-burn incineration. In this technology, raw unprocessed MSW is fed into a boiler, where it is directly combusted in an oxygen-rich environment, typically at temperatures of 700°C to 1,350°C, producing an exhaust gas composed primarily of CO_2 and water, with inorganic materials converted to bottom ash and fly ash. The hot exhaust gases flow through a boiler, producing steam which drives a steam turbine-generator, generating electricity that can be used onsite or sold offsite for industrial use. District heating options are also an option with incineration WtE technologies. The cooled exhaust gases flow through an emission control system. The amount of char/ash produced (likely requiring landfill disposal) will be approximately 15 to 20 percent by weight of the fuel input. Ash can contain hazardous materials and is often disposed of in specific landfills or hazardous waste treatment plants as necessary.

Canadian Context: There are currently four large-scale (>100,000 tonnes annually) mass burn incineration facilities operating in Canada. The facilities are located in Quebec City, QC; Burnaby, BC; Brampton, ON; and the Regions of Durham/York, ON.

Regional Context: A variation of mass burn technology is controlled air combustion, using two or three stages where air and fuel are added. This technology was installed and operated in Wainwright, Alberta for over 20 years, primarily to burn biomedical waste, although it did also burn municipal waste. The facility was closed in 2015 due to the cost required to bring it up to emission standards. This experience confirms that the recovery of energy from municipal waste is technically achievable, but is not financially feasible at the scale of the waste volumes communities the size of Wainwright generate without supplementary revenues.

Economic Implications: Studies have shown that mass-burn incineration normally has a lower cost per tonne than thermal conversion technologies such as pyrolysis and gasification. However, based on cost curves from existing facilities in other jurisdictions, it can be expected that the net cost of treating waste using conventional combustion, after revenues from the sale of energy, would be considerably higher than the cost of landfill.

2.2 Thermal Conversion Technologies

Thermal conversion technologies convert the carbon content of the MSW into a synthesis gas (syngas), which can then be used to produce liquid fuels, chemicals or fertilizers, or can be combusted to generate electricity. Thermal conversion technologies work best when using homogeneous, low-moisture, high heating value feedstocks with low inorganic portions (ash and moisture). Therefore, many thermal conversion technologies require (or benefit from) up-front pre-processing to remove metals, glass, and construction debris.

GLOBAL CONTEXT: While thermal conversion technologies have a long history with feedstocks such as coal, petroleum coke, and biomass, their use with MSW is still somewhat limited worldwide. However, there are many suppliers of pyrolysis and gasification technologies that state that they can process MSW. At the same time, only a handful have real commercial-scale operating experience. Many potential suppliers have basic or conceptual designs, or only bench scale experience with their technologies. While these emerging technologies may warrant further evaluation in the future, real-world operational experience is necessary to increase the opportunities for the technical and financial success of a technology that would be considered for treating a MSW stream.

ECONOMIC IMPLICATIONS: The conclusion on emerging technologies (pyrolysis, gasification, plasma arc gasification) is that they hold promise for the future, but carry a technology risk and come with a price tag that is even higher than conventional mass-burn incineration technologies.

2.2.1 Pyrolysis

Pyrolysis can be simply defined as the thermal decomposition of carbon-based materials using an indirect source of heat to produce a synthesis gas (syngas). Basically, the organic materials are "cooked" in an oven, at temperatures of 400 to 900°C, with no air or oxygen present. The feedstock is not burned directly during the process; instead the bonds between the compounds are "cracked", breaking larger molecules into smaller ones including hydrogen and hydrocarbon gases (such as methane and carbon dioxide) and liquids (water).

The main constituents of syngas produced by pyrolysis are carbon monoxide (CO), hydrogen (H_2), and methane (CH_4), all of which are combustible gases. Pyrolysis systems also produce oxidized compounds (carbon dioxide [CO_2] and water [H_2O]), which have no heating value and dilute the syngas. Pyrolysis typically results in a large unreacted portion of the feedstock remaining in the form of carbon char that requires disposal.

If a homogeneous feedstock is processed by pyrolysis, it can produce high-quality by-products. However, MSW is not a homogenous waste stream. As the makeup of MSW is not consistent, it must be pre-treated to create a feedstock with as predictable an energy value as possible. Pre-processing may include sorting, separation, size reduction, densification and drying. The ideal feedstock has a moisture content of less than 25 per cent. Most waste streams with a high content of organic materials, such as food and yard waste, will be well over 25 per cent moisture.

The syngas can be utilized to heat boilers for electricity or steam, or cooled and cleaned for reciprocating engines or turbines for power generation. Overall, pyrolysis technologies have the capability to comply with a wide range of air, water, and waste emission standards, although the char/ash may require disposal in a hazardous waste landfill. The amount of char/ash produced will be approximately 15 to 20 percent by weight of the feedstock throughput.

GLOBAL CONTEXT: Pyrolysis has been used to thermally treat MSW for over 25 years at a few facilities worldwide, mainly in Europe and Japan.

REGIONAL CONTEXT: Most organic compounds can be broken down to basic components using the pyrolysis process. As a result, many experimental and pilot plant programs have been done using pyrolysis to process products such as animal offal, used tires, agricultural field residue, and manure. Commercial pyrolysis units are typically used for smaller applications as they can be used in modular installations.

ECONOMIC IMPLICATIONS: Commercially, when compared to combustion, pyrolysis is not considered as efficient as standard combustion.

2.2.2 Gasification

Conventional gasification can be defined as the thermal conversion of carbon-based materials using a limited amount of air or oxygen to produce syngas that can be used as a combustible fuel or for the downstream production of chemicals. As with pyrolysis, no direct burning of the feedstock takes place.

Unlike pyrolysis, that uses an indirect heat source, gasification requires a direct heat source. In the gasifier, the addition of air or oxygen for gasification of the feedstock results in partial oxidation of a small portion of the feedstock, forming some CO_2 and releasing heat to begin to thermally degrade the organic compounds in the feedstock, forming pyrolysis gases, oils, liquids, and char. These products react with limited amounts of air, oxygen, and/or steam, that are injected to initiate the gasification reactions to produce the desired syngas, which is composed primarily of CO and H_2.

Global Context: The use of commercial gasification technologies to treat MSW began in the 1980s in the U.S., Europe, and Japan. In these initial units, the use of unprocessed, heterogeneous, MSW resulted in many technical problems. Many of these facilities were shut down for technical and/or economic reasons. There are many operating MSW gasification facilities worldwide, mostly in Europe and Asia primarily using blends of MSW and other feedstocks such as sewage sludge and industrial wastes.

Regional Context: The most current example of gasification is Enerkem's MSW gasification to alcohols facility in Edmonton.

Based on a wide range of commercial experience, a minimum throughput for gasification is about 60 tonnes/day (18,600 tonnes/year). This compares to estimated total waste disposal amounts for RVC of 27,000 tonnes/year, although this includes all sectors and fractions that are not suitable for gasification. The higher the throughput level, the lower the cost per tonne for gasification facilities.

The general conclusion is that gasification is not feasible for regions with smaller population at the current state of technology due to the small feedstock throughput rates and the lack of reference gasification facilities and gasification technology suppliers in North America. Furthermore, although these technologies show promise for a higher recovery of energy than conventional mass-burn incineration systems, they are also substantially more costly to build and operate, therefore offering little net benefit.

Economic Implications: Due to the heterogeneous nature of MSW, significant pre-processing is often required. While some MSW gasification technology suppliers state that they can operate with little or no pre-processing, most include manual picking for large items like appliances. This may be followed by primary and secondary systems to remove glass and metals and reduce the feedstock size. To increase efficiency, many systems also incorporate drying to 10 to 20 percent moisture content. Depending on the technology supplier, typically about one third of the raw MSW stream (including recyclables and moisture) is removed prior to being fed into the gasifier. Therefore, post-diversion MSW provides better feedstock than raw MSW due to the removal of metals and glass.

Waste materials with high moisture content such as food and yard waste are not good candidates for using gasification technology. As stated previously, gasification reactions require external heat to start the process. Once the thermal reaction process has stabilized the syngas may be used as the source of heat. The higher the heat value of the feedstock the more likely the process will be self-sufficient. Startups and shutdowns usually result in inefficient gasification and will require the use of more supplemental fuel and potentially create more contaminants to be removed.

The benefits of gasification are considered to be increased efficiency, greater variety of end products, and fewer back-end pollution control requirements. Commercially, gasification has not achieved as high a level of acceptance as traditional combustion because of its relative high complexity and capital costs. This technology is best suited to processing pre-shredded medium to high energy material. This technology is more complex and more expensive than other thermo-chemical technologies, and has limited commercially viability and is not proven at a full scale.

2.2.2.1 Plasma Arc Gasification

Plasma technology is a subset of gasification that uses an electrical discharge to heat a gas, typically air, oxygen, nitrogen, hydrogen, argon, or a combination of these gases, to temperatures above 3,800°C. The hot ionized gas, or plasma, can then be used to thermally convert organic feedstocks to syngas and a non-hazardous glassy slag.

Like other thermal treatment options, pre-processing of the waste materials before plasma arc gasification is important to create a consistent feedstock. The feedstock then comes into contact with the plasma, in an atmosphere that is controlled for air or oxygen, to create a gasification reaction. The extreme temperatures allow for (waste) materials to be deconstructed down to their elemental gaseous forms. Plasma arc gasification usually occurs in a closed, pressurized reactor and depending on the feedstock the materials are either gasified to create a syngas or melted (in the case of non-carbon based materials) creating an inert slag. The use of the resulting syngas is similar to a conventional gasification system.

Global Context: Plasma arcs have been used for years to treat hazardous or medical wastes and incinerator ash, converting them to a non-hazardous, glassy slag. While application to MSW is still new, it has great potential to convert MSW to electricity more efficiently than conventional pyrolysis and gasification systems due to its high heat density, high temperature, almost complete conversion of carbon-based materials to syngas, and conversion of inorganic materials to a glassy, non-hazardous slag. The amount of char/ash produced (potentially requiring landfill disposal) will be approximately 15 to 20 percent by weight of the feedstock throughput.

Regional Context: The Red Deer Central Waste Management Commission had partnered with Plasco in 2012 to develop a plasma arc gasification facility in central Alberta, but ultimately decided it could not guarantee enough garbage to feed the proposed 200 tonnes per day (73,000 tonnes per year) plant that was to use plasma technology to convert garbage into a syngas that could be used to generate electricity.

Economic Implications: As with conventional gasification, the larger the system, the better the economics on a per-tonne basis. Turndown is difficult with this technology, and plasma arc control of the gasification process becomes less efficient during start ups and shutdowns, when throughput is decreased. With only a few commercial-scale plants in service, much has still to be learned about the operating profile of this technology. Due to the state of development of this technology, it is still considered to be financially risky.

2.3 Refuse Derived Fuel (RDF)

A third WtE technology option is to make refuse derived fuel (RDF), in the form of fluff, bricks or pellets, from MSW in order to recover the energy.

The RDF produced creates a consistent feedstock which, in turn, improves combustibility for the end user. The users of RDF are often larger facilities such as mass-burn incinerators, cement kilns, coal fired power plants, or industrial boilers that are looking for a supplementary alternate fuel to coal, oil, or gas. The actual processing or making of RDF can take place in smaller communities with lower waste volumes and equipment can be sized appropriately.

As with mass-burn technology, pre-processing of waste is expected to remove all non-combustible and bulky materials. RDF is often a favoured technology because it can produce a fuel with a higher heating value than unprocessed feedstocks and produces less ash at the end of the thermal process than mass-burn facilities. It is possible for the MSW feedstock to be stored for longer periods of time and to be co-fired with other feedstocks such as wood, coal oil or natural gas.

Regional Context: RDF technologies could be a more appropriate choice for smaller communities, since the most expensive part of the WtE process, namely the combustion, heat recovery and air emission controls, may be handled by an off-site user of the RDF. A couple of companies have been trying to establish RDF facilities in Alberta communities (e.g., Drayton Valley) for several years.

Economic Implications: An important consideration and pre-requisite for the establishment of a financially viable RDF facility is that long-term markets for the RDF product need to be secured. These markets will then determine the quantity and quality of product that is required, and the equipment can be specified accordingly. It is important that the business case includes a long-term supply of waste as feedstock, a long-term contract for the sale of RDF product, and vendor guarantees of product quality and equipment reliability.

2.4 Catalytic Thermal Depolymerization

This process breaks down the long-chain plastics and other organics, at relatively low temperatures (250°C) into a mix of hydrocarbon oils and gases, with methane and CO_2 also being produced. The oils are then distilled at much higher temperatures to separate them into purer product streams (e.g., diesel).

This is all done at much lower temperatures than any of the thermal treatment technologies like mass-burn incineration, pyrolysis and gasification. It is still a form of WtE converting solids into liquids. It is yet to be locally proven at a large scale.

2.5 Biological WtE

Anaerobic digestion (AD) is an effective biological process that utilizes bacteria to convert the compostable organic fraction of biomass in the absence of oxygen to biogas. The biogas is a mixture of methane (CH_4), carbon dioxide (CO_2), water, and other impurities. Biogas has a medium heat value gas suitable for use as a fuel.

Global/Canadian/Regional Context: AD is a common conversion or WtE technology used for the organic fraction of MSW, agricultural waste, and wastewater treatment.

Economic Implications: AD is more applicable for the treatment of food waste and wastewater treatment plant sludge and biosolids. There have been few MSW-based AD technologies, leaving it not well-proven at a commercial scale.

2.6 Biomass Combustion

Biomass combustion technology or “advanced burner” burns biomass/wood waste to produce heat that can then be used to generate steam in a boiler and/or electricity in a steam turbine generator.

Regional Context: This technology is well proven for biomass feedstock (e.g., wood) at locations such as the Francis Cooke Regional Landfill, where waste wood is used to heat buildings at the facility, and Eco-Growth Environmental who dehydrate organic waste for boiler fuel in facilities in the Calgary region.

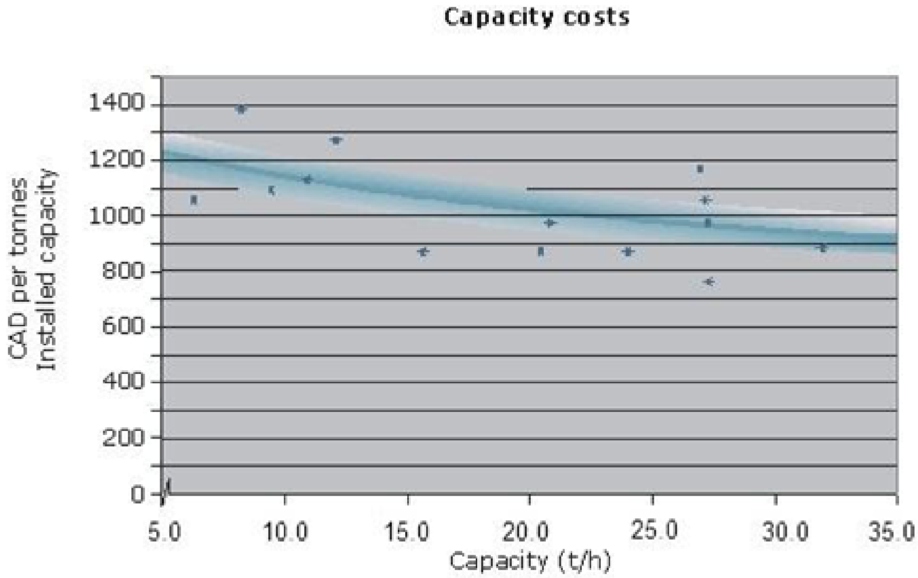
Some companies are attempting to branch out to co-fire biomass burners incorporating plastics and paper/cardboard, or even MSW, such as the pilot facility in the Peace Region, but this approach is not proven at a commercial scale.

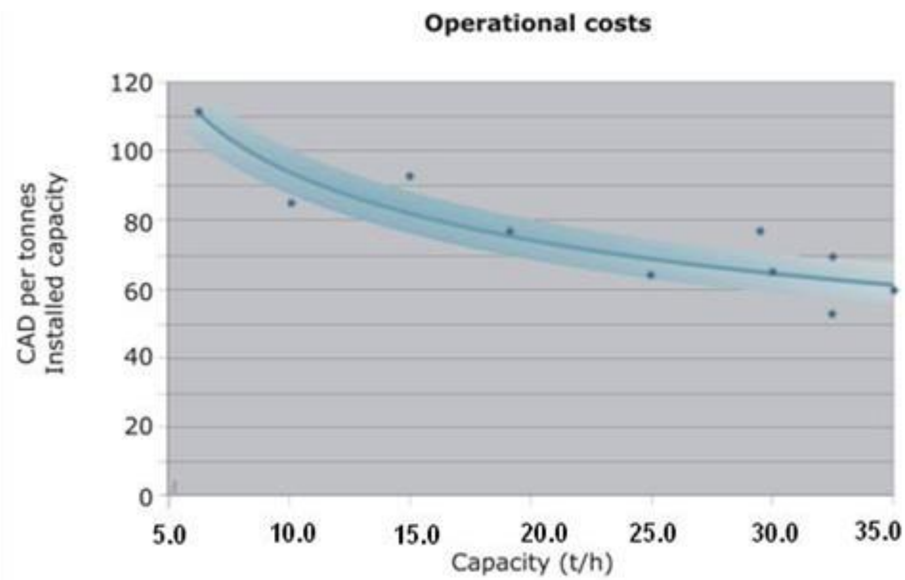
3 Economic Cost and Benefits

A detailed financial evaluation of operating a WtE facility is recommended to determine the true cost per tonne of any proposed system, which includes costs for hauling, ongoing landfill operations, facility capital costs, facility operations and maintenance costs, changes to waste collection and hauling, associated waste sorting, and pre-processing requirements.

Research into Canadian WtE facilities estimates capital costs may range between $100 million and $500 million, depending on facility size and technology chosen. Operating costs are also reliant on size and technology but could reach up to $15 million per year. Construction of a pre-treatment facility is often also required and can add an additional estimated $40 million to the project cost.

Capital and operating costs based on capacity are shown in the graphs below:





Source: Ramboll through Fichtner (developed for York – Durham)

The various sources of costing information have led to the following cost ranges for WtE technologies:

Costs ($/tonne):

Pyrolysis	Gasification	Mass Burn
Capital: $800 to $1000 per annual design tonne Operating: $50 to $110 per tonne	Capital: $900 to $1500 per annual design tonne Operating: $80 to $150 per tonne	Capital: $900 to $1200 per annual design tonne Operating: $80 to $130 per tonne

REGIONAL CONTEXT: The City of Calgary stated in a 2018 report to Council that, as WtE remains a higher cost approach to managing residual waste than landfill, and is not required to reach The City of Calgary's 70 per cent by 2025 waste diversion goal, the earliest estimated timeframe for the introduction of WtE technologies for the treatment of waste by The City is beyond 2025.

Considering costs associated with most WtE facilities, the cost of generating electricity can often be higher than current sources. This would especially be the case in places with relatively inexpensive electricity costs, such as Alberta.

Operating costs reduce with increased tonnages of feedstock as increased throughput creates system efficiencies. Yet, in most cases, research shows that maximizing waste reduction diversion programming, resulting in decreased landfilling, is less costly than the capital and operating costs of a WtE facility (if landfill capacity is available).

4 Environmental impacts

GLOBAL CONTEXT: Air emission standards for WtE facilities are very stringent. In Europe, with much more WtE application than North America, air emissions from WtE are considered minimal compared to industry and transportation.

WtE facilities also generate solid residues that require treatment/disposal. Bottom ash (or slag) is generally safe to dispose in landfill or use as landfill cover. Fly ash (representing ~ 5%) can be toxic, and needs to be stabilized before landfilling.

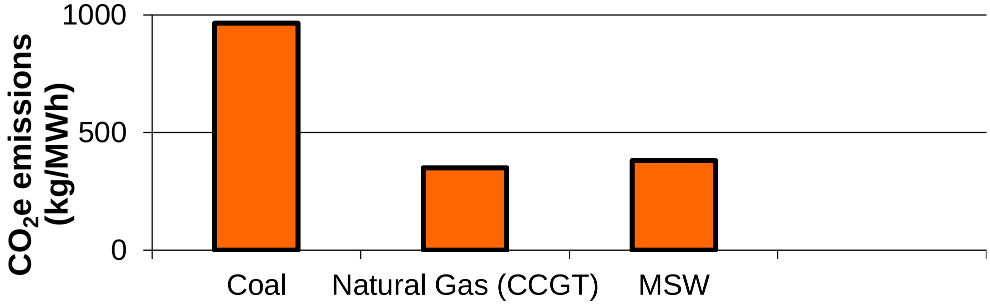
At the same time, an Imperial College (UK) study (2013) concluded that the modeled PM10 impacts of both facilities were "extremely low", in fact so low that it would not be possible to validate the modeling because the concentrations are below the limit of detection for ambient air measurements. *The authors focused on two WtE plants in the UK*

Long-term monitoring of dioxins and furans near a municipal solid waste incinerator near Tarragona, Spain showed that the facility "… does not produce additional health risks for the population living nearby.

CANADIAN CONTEXT: Conclusions from Durham's Extensive Human Health and Ecological Risk Assessments (published in 2013) include:

Extensive human health and ecological risk assessments (HHRA and ERA, respectively) were undertaken. Overall, the results of this ERA indicated that chemical emissions from the proposed EFW facility would not lead to any unacceptable risks to ecological receptors in the local risk assessment study area under either the initial operating design capacity of 140,000 tonnes per year or the maximum design capacity of 400,000 tonnes per year.

GHG emissions associated with WtE are outlined in the figure below:



Source: Fichtner, 2019

As shown, WtE has slightly higher CO_2 emissions than natural gas, but much lower than coal generation.

5 Summary

WtE technologies that treat MSW can be categorized as proven technologies, including mass-burn waste-to-energy and refuse-derived-fuel, or emerging technologies such as pyrolysis, gasification and plasma arc gasification.

However, the evolution of WtE has shifted somewhat from the traditional mass burn incineration of waste to alternative technologies that output synthetic gases, chemicals and liquid fuels.

WtE does not negate the need for landfill. Reduced landfill in the best case would be 75 per cent by weight and 90 per cent by volume.

RVC has limited ability to utilize WtE since it contracts out disposal services, and no commercially viable WtE options are currently available. In addition, RVC generates relatively small amounts of waste that are regionally dispersed. These realities limit WtE opportunities for RVC, but it could consider:

- offering to host a facility (pilot or permanent; micro, small or larger scale),
- attract WtE development in the jurisdiction,
- form partnerships with large commercial waste producers and energy users in technology solutions, and/or
- work with regional partners to compile amounts of waste required for economies of scale. For example, joining the Southern Alberta Energy from Waste Association, a 60-member municipal coalition exploring WtE options.

Finding a suitable location for a WtE facility would likely be challenging, considering stringent permitting requirements and potential stakeholder opposition to the operation of a WtE facility (as in the case of Beisker where a biomedical waste incinerator was rejected). This is the case despite the reality that modern WtE facilities easily meet emission standards.

The estimated cost to implement a WTE facility is between $100-500 million in capital investment, with operating costs that could reach up to $15 million per year, and would require a guaranteed volume of waste. Operating costs reduce with increased tonnages of feedstock as increased throughput creates system efficiencies. Yet, in most cases, research shows that maximizing waste reduction diversion programming, resulting in decreased landfilling, is less costly than the capital and operating costs of a WtE facility.

6 References

2019 Integrated Solid Waste Management Plan Update, City and County of Honolulu, Jacobs Engineering Group, 2019

Current Solid Waste Management System Report, Regional District of North Okanagan, Tetra Tech, March 2018

Mark Parker, Morrison Hershfield, personal communication, June 2021

Report on Waste to Energy, City of Calgary, 2018

Steve Jenkins, personal communication, June 2021

Town of Drayton Valley Integrated Waste Management Strategy, sonnevera international/Konrad Fichtner, 2013

Waste to Energy – An Overview, Presentation to the Recycling Council of Alberta, Konrad Fichtner, April 16, 2019

Waste to Energy Technology Review, City of Calgary, 2011

Waste-to-Energy Feasibility Study, MD of Bonnyville, Morrison Hershfield, 2020

Waste-to-Energy Review of Alternatives, Regional District of North Okanagan, CH2MHill, 2009