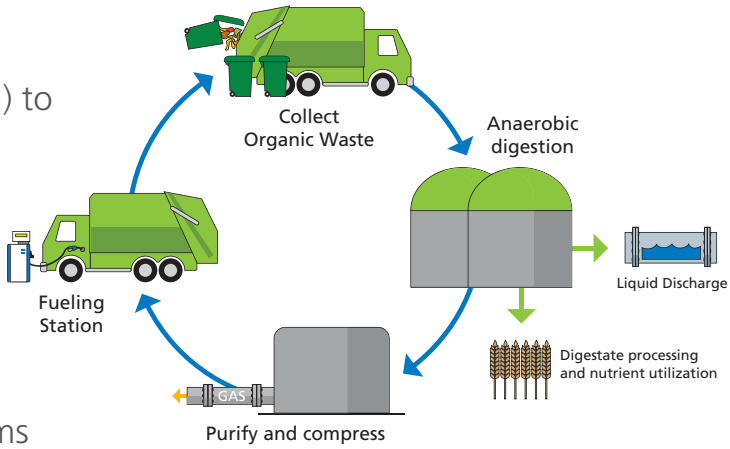
RNG FOR MUNICIPALITIES

Introductory Information & Checklist

Canadian Biogas Association

Introduction



Upgrading biogas to renewable natural gas (RNG) to replace natural gas (NG), which can also be used to replace other fossil fuels such as diesel, is one potential option for utilization of the biogas generated from an anaerobic digestion facility that treats organic wastes. RNG generated from municipal residential organic wastes can be an attractive option for NG utilities looking to "green" their grids because municipal programs can be a reliable long-term supply of organics and thus RNG.

There is a renewed interest in RNG nationally with the Government of Canada's recent announcement of pan-Canadian pricing on carbon pollution. A number of provinces have or are in the process of implementing some form of carbon tax or cap and trade program, including Ontario's recently announced cap and trade program. What these programs will all have in common will be incentives or regulations to replace fossil fuels with renewable fuels. This is a revenue opportunity for anaerobic digestion facilities.

In addition, there is a strong case to be made for municipalities to consider anaerobic digestion as an option for diverting organic wastes from landfills. The case for anaerobic digestion is made in our *Municipal Guide to Biogas*. One of the more compelling arguments for anaerobic digestion is that it is relatively easy to manage and mitigate odours because it requires a relatively small enclosed space and little to no process air and thus has minimal air volumes that require treatment for odour. This makes anaerobic digestion an attractive option for processing the organic wastes where they are generated; also minimizing transportation. The City of Toronto has successfully operated a residential organics anaerobic digestion facility in the City for over a decade with no significant odour issues.

Organic wastes are concentrated in the same urban centres where the NG demand is centered. This is one of the benefits of RNG derived from residential organic wastes; the supply matches the demand geographically.

Following is a checklist to help you plan to investigate the opportunity. Your municipality will likely want to engage the services of an engineering firm with experience in biogas and RNG to assist in budgeting for and planning your anaerobic digestion (AD) and biogas upgrading facility.

☑ Know your feedstock tonnage and type

Organic waste quantities and composition are needed to estimate the volume of RNG that can be produced. The bulk of the biogas is generated from the digestion of readily biodegradable food wastes. Organics from disposable diapers and pet waste can also contribute to biogas generation, however may require special management or processing.

Optimistic organics projections have resulted in an organics processing facility that is too large or a processing contract with a guaranteed minimum tonnage that is above the actual tonnage collected; resulting in municipalities in Ontario having to pay for processing for material that they do not yet generate. Be realistic about projections, particularly from the multi-residential sector where organics participation rates have historically been low and the IC&I organics sector that is very competitive.

The experience in Ontario to date suggests that one tonne of source separated organics (SSO) generates roughly 110 cubic metres of biogas with 60% methane. The biogas upgrading system to produce pipeline quality RNG can convert approximately 90% of the methane to RNG.

Some municipalities in Ontario permit diapers and pet waste to be collected with the food waste. Others permit plastic bin liners to make it more convenient for residents to participate in the program. Allowing these items has increased organics tonnages but it also increases the amount of physical contaminants that need to be separated from the organics stream before it can be digested. This requires specialized preprocessing equipment which must be selected based on the types of contaminants that need to be removed.

If a municipality is considering adding disposable diapers or pet waste to a SSO stream, its public and occupational health specialists should be consulted regarding the potential human health risks, and should be prepared to answer questions regarding worker safety and the impact of diapers on the suitability of the digestate for beneficial use. Additional pasteurization of the organics or digestate may be required.

Rule of Thumb:

1 tonne source separated residential organics
–
110 m3 biogas @ 60% methane
=
60 m3 RNG @ 95% methane

☑ End products

The end products of the AD process are digestate, biogas, residue and wastewater.

Residue is the contaminants such as any film plastic bags or grit that must be disposed of.

Digestate should be utilized in a beneficial way such as, but not limited to:

- a fertilizer under the federal Fertilizers Act administered by the Canadian Food Inspection Agency
- a compost that meets the Ontario Compost Quality Standards
- a non-agricultural source material (NASM) under the provincial Nutrient Management Act
- for the reclamation of disturbed sites

Verifying that the digestate generated is of the necessary quality to ensure that it can continue to access digestate or compost or NASM markets is critical to the overall financial viability of the project; much more so than the sale of biogas or RNG. Digestate products are primarily returned to the agricultural community as a beneficial use of nutrients and do not yet generate significant revenues, if any at all. As a starting assumption in planning an AD facility, you should assume that digestate marketing and beneficial use will be a cost to the project.

Storage of digestate over winter and between harvest periods is a significant potential cost to a digestate management program that targets agricultural producers. You should assume a minimum of 6 months of storage will be required. Alternatively, diverting dewatered digestate to a mine tailings reclamation project or a composting operation over the winter may be a cost effective alternative. This also provides multiple markets for the digestate; minimizing the risk of one of the markets being unavailable at some over the life of the AD facility.

Wastewater treatment can be a significant cost for an AD facility if required – roughly 10 percent of the total capital cost. The local wastewater department should be consulted to understand the sewer-use bylaw implications and surcharges to determine if existing sanitary sewer and wastewater treatment facilities have capacity to accept wastewater from the AD facility. This will simplify procurement and operations of the AD facility considerably and will likely be considerably less expensive.

Last but not least is the biogas, the commodity that would be upgraded to produce the biomethane or RNG. Options for use of the RNG include:

1. Sell to NG utility company and inject into the NG grid
2. Sell NG directly to a customer, for example a fleet compressed natural gas (CNG) fueling station and pay the NG utility for transport and storage of the RNG in their grid. In this option, the volume of RNG in is metered against the volume of gas utilized at the customer end. This option could be used to replace a municipalities own diesel or natural gas consumption.
3. Build a dedicated CNG fueling station at the anaerobic digestion facility. The suitability of this option will depend on the location of the anaerobic digestion facility, the size of the fleet the fueling station would service and the size of the anaerobic digestion facility.

It is important to negotiate a long-term RNG agreement with the local natural gas utility company to secure revenue for the project. If the RNG is to be injected into the grid, a suitable grid connection location must be included as one of the siting criteria for the project. The NG utility will need to be consulted to confirm grid connection locations and requirements, including the gas quality specification at that location. The procurement process, timeline and price are in development in Ontario, and therefore may, or may not, fit with your municipality's RNG production plans.

Your municipality may choose to produce and consume RNG for its own purposes, to help reach internal GHG reduction targets, create green jobs, and/or close the loop by using the organic material collected to fuel the waste collection fleet. Since the commodity value of natural gas is very low, a more attractive use of RNG within municipal operations may be to use the RNG to replace diesel as a vehicle fuel.

Another financially attractive option may be to inject the RNG into a local NG grid with a connection to the US market. The United States Environmental Protection Agency (USEPA) Renewable Fuel Standard Program set a national renewable fuel volume objective of 36 billion gallons of renewable fuel by 2022. In order to verify and track the volumes of renewable fuel, the program uses credits called Renewable Identification Numbers (RINs). The RINs are assigned to a volume of renewable fuel. RINs can then be bought and traded by obligated parties, the refiners or importers of fossil fuels, to meet their USEPA-specified Renewable Volume Obligation (RVO). RVOs are only specified until 2022. It is not yet known if the program will be extended past 2022. More information can be found at the USEPA Fuel Standard Program website: *https://www.epa.gov/renewable-fuel-standard-program*, or by contacting your local NG utility, who will be required to complete such a transaction.

☑ Siting

Siting an organic waste processing facility can be a challenge, particularly in larger urban centres, where AD projects are best situated to minimize overall cost of organics collection. Primary siting considerations include:

- Odour: while AD facilities and processes are completely enclosed under negative pressure with odour treatment systems, some buffer space to sensitive receptors will be required to comply with Ministry of Environment and Climate Change (MOECC) odour requirements. How much buffer will depend on the size of the facility.
- Traffic: after odour, additional traffic is the second biggest concern neighbours typically have with one of these facilities. Does the site have easy access to major traffic arteries?
- Zoning: sites may need industrial zoning designation with permitted uses to include waste processing. Rezoning a site adds time, money and risk to the project development schedule.
- RNG Injection Location: the site ideally should be within 100 m of a suitable injection location on the natural gas grid. If a suitable direct pipeline injection location is not available, it may be possible to compress and transport the RNG by truck to a suitable injection location, which adds costs to the RNG delivery system.
- CNG Fueling Station: a CNG fueling station located at the AD facility needs to be sized for the fleet it will service. The location of the AD facility relative to the operational area of the fleet will dictate the size of fleet that may be serviced. Fueling the waste collection vehicles or other municipal vehicles that end their day at the AD facility may be a good opportunity. CNG fueling is typically done on a slow-fill basis overnight, with one or two fast-fill lines. The AD facility will need to provide overnight parking for the vehicles that will be fueled; which will have a significant impact on the size of site required.

☑ Combining facilities

There may be an opportunity to integrate an organics processing facility with another component of the municipality's solid waste or wastewater infrastructure. Locating an AD facility at an existing waste management or wastewater treatment site could potentially save the municipality significant time and money in finding, procuring and permitting a new site for an organic waste processing facility.

Some municipalities co-digest food waste with biosolids. The food waste improves the volatile solids destruction efficiency and biogas generation from the biosolids. This requires careful study as the addition of food waste into a biosolids digester can impact the operation of the AD portion of the wastewater treatment facility, which may not be an acceptable risk to a municipality. Other considerations include available digestion capacity, can digesters be taken offline for retrofit, space for organics processing and digestate management and permitting. Modifications to a wastewater treatment facility may require a class Environmental Assessment. However, most AD facilities do require wastewater treatment and a source of clean water; both of which a municipal wastewater treatment plant could provide. A number of municipalities have successfully integrated some form of food waste processing into a wastewater treatment facility site.

Another example is siting the AD facility at a landfill facility. There may be opportunities to combine the biogas and landfill gas handling systems to realize some economies of scale in that respect.

☑ Procurement strategy

Municipalities must also consider how much of the operation they want to undertake themselves, versus outsourcing some or all of the design, building and operation.

- Will you design, build, operate, maintain, or outsource all or some or all of these elements?

There are many options available to a municipality, depending on the responsibility, cost and risk you wish to assume or outsource. Factors to consider include: available site options; available labour and human resources, including management; expertise in operation and maintenance; preference of elected representatives regarding risk management.