Biogas and RNG

Biogas stems from the degradation of organic material in the absence of oxygen, hence the term anaerobic digestion. In digesters, anaerobic bacteria convert organic biomass into valuable fertilizers and environmentally friendly biogas.

Biogas mainly consists of methane (CH4) and carbon dioxide (CO2). Examples of biomasses are livestock manure and organic residues such as waste from food industries, ethanol facilities and other similar industries. When using wastes as feedstock, biogas will have a net negative carbon footprint, not just net zero. Thus, biogas is very environmentally friendly compared to almost any other fuel, and certainly compared to fossil fuels.

Biogas is inadvisably sustainable, if produced correctly. Carbon intensity from sustainable biogas production is strongly negative, based especially on:

- Avoided use of natural gas, or other fossil fuel, for instance when biomethane (purified biogas) is utilized in transport sector via compressing or cryo-technologies
- Avoided emissions from landfilling or incineration
- Reduced use of chemical fertilizer
- Increased production and minimized emissions from farming

Recirculating food wastes not only reduces GHG's it also aids in:

- Transforming waste handling to avoid landfilling
- Soil improvements and recirculation of nutrients
- Crowding out chemical fertilizers
- Security of supply in both energy and domestic food production
- Paving the way for industrial and efficient bioenergy facilities for instance to ethanol and methanol
- Increasing awareness of the need for waste separation and circulation.

On the CO2 in biogas

The amount of CO2 absorbed when the biomass was created is the same as the amount of CO2 released into the atmosphere when the biogas is produced and used, and as such complete neutral.

However, there are other loops that should be accounted for also; avoided emissions from chemical fertilizer production, avoided emissions from landfilling of food waste, the total net impact is far more than just the CO2 that is part of a closed circuit.

Organic fertilizer

The digestate is a valuable fertilizer and sent back to the farmers it will yield up to 10% extra produce for the farmers compared to using animal wastes directly.

Usage of biogas

The biogas can be used several manners. The simplest and most common is in a co-generation plant where it is combusted and used for producing electrical power and heat to the existing grid and district heating. Alternatively, the biogas can be upgraded to natural gas quality and distributed to the natural gas grid, commonly known as biomethane or renewable natural gas (RNG) or used at transportation fuel in compressed from (C-RNG) or as liquified biomethane (LBG).

The nutrients of the degassed biomass can be further concentrated in advanced nutrient recovery processes and sold to farmers or greenhouses for specific applications and securing that as little water as possible will have to be transported. This sort of solution also opens op for high yield (in terms of gas) input, as water from the process may be recirculated to the process if refined well enough, changing the dynamics, economics, and increasing the GHG emission reductions of anaerobic digestion even further.

Specific nutrient recovery technology is a further development of the traditional biogas plant. In the anaerobic digestion process, bacteria convert organic waste into energy and produce a significantly improved residual product. Organic bound fertilizers are converted into inorganic fertilizers more accessible for plant uptake. In the separation technology, the degassed biomass will be refined to clean process water, nitrogen fertilizers such as ammonia sulfate, compost with high phosphorous content, and potassium concentrate.

The CO2 from the biogas may also be captured and utilized since by default its purity once cleaned for H2S is by default close to food grade quality and going the last steps to ensure this utilization is a possible step to increase sustainability and value drivers of a biomethane project.

Food waste as a resource

Food waste globally contributes roughly 10% of our global greenhouse gas emissions, equivalent to nearly twice the annual emissions produced by all the cars driven in the US and Europe.

Instead of disposing inedible foods and beverages in landfills or incineration facilities, they may be recycled sustainably in biogas and biomethane digestion facilities. In such a manner, there is no such thing as food waste - only wasted recycling opportunities.

Food waste, whether from households, restaurants, retailers, or wholesalers is an often-overlooked source of sustainability which is both abundant and available. Food loss and waste is estimated to be roughly one third of the food intended for human consumption in the US.

The energy potential of food wastes can be fully harnessed in an anaerobic digestion process in a biogas facility – potentially co-digested with other societal wastes such as industrial waste streams, animal wastes and similar.

RHODE ISLAND ACT ON CLIMATE

INVESTIGATION INTO THE FUTURE OF THE REGULATED GAS DISTRIBUTION BUSINESS (Docket No. 22-01-NG)

"Future of Gas" docket in Rhode Island

Biogas is a necessary supplement to the clean energy mix of Rhode Island and is a sustainable renewable energy resource. RNG supply can be stored as opposed to wind and solar which are dependent on either that the wind is blowing, or the sun is shining. Carbon intensity from sustainable biogas production is negative, and with many residual benefits. Rhode Island has the capacity to build a strong biogas supply, harvest many of those benefits and reducing impact from the other climate pending Rhode Island environmental challenges, and therefore an important positive contributor in the Rhode Island Act on Climate if done correctly.

As a new and ambitious Rhode Island company, RIGrows would like to take this docket opportunity to bring the biogas opportunity into serious consideration in the future of gas distribution in the State of Rhode Island.

RIGrows will continue to explore the opportunity by seeking to build partnerships with both public and private stakeholders locally as we believe that there is a significant opportunity in front of us. At this time we have engaged with stakeholders in the State, such as RI Energy, RI Commerce, NBC, RI DEM, Compost Plant, RI Food Policy Council and others.

An idea gets on its way

RIGrows LLC will in connection with the construction of its 25 acres greenhouse, 1 Arnold Pl, Exeter, RI, install 4 x Jenbacher CHP engines to meet the company's cyclical energy needs. The engines are powered by natural gas. At RIGrows we envision a future where our power is renewable. RIGrows will by itself have to handle bio debris from the greenhouse once in production of produce, and on the Schartner Farm location composting is already taking place under one of two Rhode Island State licenses. However, to justify investment in to the consistent production of biogas significantly more organic waste streams than RIGrows can contribute with is needed. In a previous study (feed screen study March 2022), and we have determined that there is ample organic matter from RI industries such as the fisheries, breweries, and industrial food waste alone. Enough to justify a Anerobic Digestion and a Biogas/RNG facility which can contribute to the RI gas supply of the future.

Rhode Island State of Affairs

Studying with various public and private stakeholders there is a strong consensus around taking advantage of the bio waste to gas energy opportunity in RI. Several small and larger scale initiatives have been taken over the recent years, but with limited success. Yet, the solutions are fractional and still needs better coordination and stronger structure. It is a pressing problem as the State only operates one landfill which will soon reach capacity. A now dated report, "Solid Waste 2038", May 14th., 2015 (Comprehensive Solid Waste Management Plan 2015 Optimized.pdf (rirrc.org)), and an update to a previous 2007 report, lays out an initiative to advise and guide solutions and plan for a better waste management future. To our knowledge there is no newer revision or update to the plan, but there are several part reports and surveys planned for the following years after 2015.

Biogas and RNG advantages – Overview from Renew Energy A/S

Appendix 1, Contribution to the scope of the gas regulated distribution discussion in Rhode Island.

Anaerobic Biodigester & bio energy facility feasibility Study

Currently, in corporation, Global biogas engineering leader, Danish Renew energy (Home - Renew Energy) and Rhode Island company, RIGrows LLC, is conducting a full feasibility study of an anaerobic digester and biogas/RNG project. The study is expected to be completed in Q1, 2023.

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Appendix 1 (2 pages also attached as PDF)

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