Biogas to Bio-Refinery. Life Cycle Assessment of Advanced Utilisation options for Biogas from Wastes in Northern Ireland.

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The Project main ideas

1. Evidence-based RoadMap for a bioeconomy for Northern Ireland.

2. Technology evaluation and design, sustainability and economic analysis to identify optimum biogas utilisation pathways.

- Industry-academia collaboration involving the evaluation of operational biogas facilities.

LCA

Technique to assess environmental impacts associated with all the stages of a product's life from cradle-to-grave.

Biogas site studied

1) Feedstock: Dairy cow slurry

2) Biogas production: 15.2 m^3/tonne→ 85 kWh

3) CHP plant:

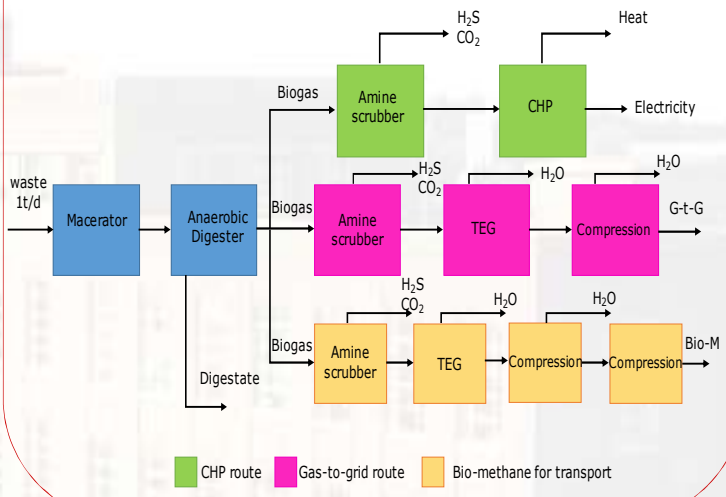
Electricity: 17.6 kWh/ Heat: 11 kWh (η = 75-90 %)

Options studied

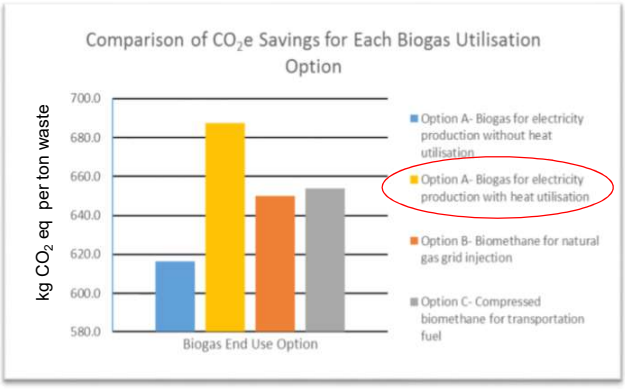
Option A- Production of biogas for CHP (electricity to grid) with/ without heat recovery

Option B- Production of biogas for injection into the natural gas grid

Option C- Production of biogas for use as a transport fuel



Results



Option A with heat recovery gives the best emission saving scenario. It is also the most developed option with readily available infrastructure.

Conclusions and Future Work

- ✓ The option that produced the most emission savings was biogas for electricity production with heat utilization (685 kg CO_2 eq compared to 617, 650 and 655 without heat recovery, GTG and use for fuel respectively).
- ✓ This is a small scale plant (50 kW) so the impact of post-processing is also a proportion of the overall system energy: GTG or bio-methane fuel should in fact provide the highest CO_2 eq savings.
- ✓ Future work includes the evaluation of the utilisation of biogas from a 500 kW plant located near Belfast.

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Acknowledgments

Kilmoyle Energy Ltd