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The Potential Size of the Anaerobic Digestion Industry in Ireland by the Year 2030

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Identification sheet

Document name: **The Potential Size of the Anaerobic Digestion Industry in Ireland by the Year 2030**

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Processed by: Dr. Anna Pazera, Dr. Jan Stambasky

Approved by: Dr. Jan Stambasky

In Prague on:

Version 1: 17th May 2016
Version 2: 18th June 2016
Version 3: 5th July 2016
Version 4: 19th September 2016 (biowaste emissions added)

Number of pages: 6

1. Executive Summary

This report assesses that potential size of the anaerobic digestion industry by the year 2030, based on potentially available feedstocks.

In Ireland several small scale AD plants are operating and these primarily process agricultural and/or industrial sector organic residues. There are no medium or large scale AD plants in operation dedicated to processing the organic fraction of domestic and commercial waste.

Ireland is forecast to fail to meet RES targets by 2020, which would result in a substantial financial burden of 100 million Euros a year per each 1% Ireland is off the target. However, Ireland is still lagging behind its European counterparts with regard to anaerobic digestion deployment, ranking 20th position among the EU28 countries. This is largely due to inadequate policy and support, despite all the cross-sectoral benefits. This may well result in a major missed opportunity, should the current political trend prevail.

A stimulating regulatory and financial framework will have a big influence on the successful and widespread development of AD facilities in Ireland. The most significant development constraint in Ireland has been an ongoing lack of economic viability to developers and investors.

This report recommends improved fiscal incentives are urgently required to enhance the attractiveness of AD in Ireland for investment.

The potential size of the AD industry in 2030 based on three feedstock streams has been calculated in the Table below.

Table: Realistic Size of AD in Ireland in 2030

Feedstock	Quantity 1000× [tpa]	Biogas [mil. m³/a]	Energy [TJ]
OFMSW	492	65	2,322
Slurries, manures	4,438[b]	1,758	34,643
Grass	11,529	2,187	42,340

OFMSW is the smallest feedstock stream, which can readily be available for AD.

Over 13 million tonnes of slurries and manures comes from animal husbandry in Ireland every year. It is foreseen that only 1/3 of slurries and manures will be treated by AD by 2030 in Europe. The same figure is assumed in the case of Ireland.

The optimal ratio of grass feedstocks in combination with slurry and manure feedstocks has been investigated. An equivalent ratio (50/50) of both feedstocks, based on organic dry matter, proved to be optimal both for process biology and technology design. The corresponding share of needed grassland is relatively small (<10%), compare to grassland acreage in Ireland.

The large-scale deployment of AD (Anaerobic Digestion) in Ireland represents a versatile tool to decarbonise the agricultural and waste sectors with multiple cross-sectoral benefits.

2. Introduction

This report examines the potential for growth in biogas production in Ireland by the year 2030, assuming adequate supports are put in place.

Compared to most EU countries, the anaerobic digestion (AD) sector is severely under-developed in Ireland. Only several small scale AD plants are operating and these primarily process agricultural and/or industrial sector organic residues. There are no medium or large scale AD plants in operation dedicated to processing the organic fraction of domestic and commercial waste.

AD is a complex GHG mitigation technology, with further benefits which cannot be easily quantified, nor economically assessed. Among these benefits is flexible use of the natural gas grid for heating, cooling and transport, rural development, sustainable agriculture and improved air quality related to alternative waste treatment pathways. This range of further benefits is not complete since research of this subject is still on-going.

3. Potential Anaerobic Digestion Industry Size in Ireland by 2030

3.1 The anaerobic digestion industry in Ireland today

In Ireland 28 biogas plants (approx. 30MW) were in operation in 2014[i]. This figure includes 11 facilities recovering landfill gas, and 17 biogas plants, the majority of which are integrated into wastewater treatment facilities. The relatively low number of facilities ranks Ireland in 20th place among EU28 countries.

In contrast to this a stimulating regulatory and financial framework has had a big influence on the successful and widespread development of AD facilities in many other European countries. The most significant development constraint in the Ireland has been an ongoing lack of economic viability to developers and investors. Improved fiscal incentives are urgently required to enhance the attractiveness of AD in Ireland for investment.

As a result of the tariff being too low in Ireland, there have been few applications for support under REFIT 3 by AD plant developers. Consequently, the Department of Communications, Energy and Natural Resources (DCENR) reduced the allowance under REFIT 3 for AD from 50MW to 15MW, reallocating the budget for 35MW to biomass instead. The REFIT 3 scheme closed on 31st December 2015 and there is currently no replacement scheme in place to support electricity generation from biogas beyond the end of this year which has exacerbated uncertainty in the market and further destabilised investor confidence.

3.2 Feedstocks Pool Inventory

The AD industry market size is defined by the quantity and availability of feedstock. Various input feedstocks can successfully be employed in the AD process. The market core will always utilise the most readily available feedstocks, together with feedstocks where AD treatment yields significant environmental benefits.

Three different feedstock streams, possessing optimal characteristics for AD treatment, have been identified in Ireland:

- Organic fraction of municipal solid waste and food waste (OFMSW) (brown bin);
- Manures and slurries from animal husbandry production; and
- Grass from permanent grassland.

There are other potential sources of feedstocks from industrial processes, but due to a lack of recent waste generation data, an assessment on this type of feedstock was not included within the scope of this report. Organic waste streams from industrial sources are ideal material for the AD process as the material tends to be free of contamination and has the potential to create high gas yields.

The OFMSW consists of both household brown bin and commercial brown bin material. The average production of OFMSW in Ireland currently is 178 kg·person^{-1}·year^{-1}.[ii] The current Landfill Directive[iii] allows for a maximum of 420,000 tonnes of OFMSW to be landfilled in 2016 (35% of 1995 quantity). This helps create a driver for source separation of OFMSW that could be used in AD plants.

Over 13 million tonnes of slurries and manures comes from animal husbandry in Ireland every year.[iv] Anaerobic digestion is a superior technology for organic waste and slurry treatment. Both European and national policies play an important role in the mobilization of these two sources.

Large areas of permanent grassland are a special and a characteristic feature of Ireland. Abundant grass can be well employed in combination with slurries and manures in the AD process.

The overall quantity of these AD feedstocks available in Ireland by 2030, and their biogas and energy potential, is shown in Table 1 below.

Table 1: AD Feedstock Pool Inventory in Ireland (2030)

Feedstock	Quantity 1000× [tpa]	ODM[a,5] 1000× [tpa]	Biogas [mil. m³/a]	Energy [TJ]	Reference
OFMSW	820	230	108	3,870	[vi]
Slurries, manures	13,315[b]	10,652	5,273	103,930	[vii, viii]
Grass	154,500	47,586	29,313	567,385	[ix]

[a]) ODM: Organic Dry Matter (dry matter minus ash).
[b]) Dry Matter.
tpa – tonnes per annum

3.3 Realistic AD Industry Potential in Ireland (2030)

The complete pool of feedstocks is not practically available to the AD industry however. Certain limitations arise where there is competition for feedstocks with other treatment technologies such as composting. The total amount of municipal biodegradable waste may increase in the future, due to economic growth. However, this study assumes that waste production and economic growth will decouple as a result of strong Circular Economy measures, and thus the total amount of biodegradable waste available will remain constant.

The near term (2030) potential for all three feedstock streams has been calculated, based on the assumptions outlined in Table 2.

Table 2: Realistic AD Feedstock available in Ireland in 2030

Feedstock	Share of total (Table 1) [%]	Quantity 1000× [tpa]	ODM[a] 1000× [tpa]	Biogas [mil. m^3/a]	Energy [TJ]	Energy[d] [ktoe]
OFMSW	60	492	138	65	2,322	55
Slurries, manures	33	4,438[b]	3,551	1,758	34,643	827
Grass	7.46	11,529	3,551[c]	2,187	42,340	1,011

[a]) ODM: Organic Dry Matter; equals to (dry matter minus ash)
[b]) Dry Matter
[c]) Optimal Slurry-Grass ratio has been investigated and evaluated in reference X.
[d]) 1 ktoe = 41.868 TJ
tpa – tonnes per annum

OFMSW is the smallest feedstock stream, which can readily be available for AD. A share of 60% of the available OFMSW stream is a modest assumption for a near term scenario (2030). Composting infrastructure is well established and a considerable quantity of OFMSW is processed by this treatment technology.

Over 13 million tonnes of slurries and manures comes from animal husbandry in Ireland every year.[x] The slurry and manure feedstock stream is theoretically available, but the lack of decentralised AD infrastructure and its large extent effectively limit the development of AD treatment in this stream. It is foreseen that only 1/3 of slurries and manures will be treated by AD by 2030 in Europe.[xi] The same figure is assumed in the case of Ireland.

The optimal ratio of grass feedstocks in combination with slurry and manure feedstocks has been investigated. An equivalent ratio (50/50) of both feedstocks, based on organic dry matter, proved to be optimal both for process biology and technology design. The corresponding share of needed grassland is relatively small (<10%), compare to grassland acreage in Ireland.

If all slurries and manures produced in the agricultural sector could be successfully treated together with grass, in this ratio, there would be a need for less than one quarter of the total grassland (22.4%) available in Ireland.

4. Conclusions

Ireland is forecast to fail to meet RES targets by 2020, which would result in a substantial financial burden of 100 million Euros a year per each 1% Ireland is off the target. However, Ireland is still lagging behind its European counterparts with regard to anaerobic digestion deployment, ranking 20th position among the EU28 countries. This is largely due to inadequate policy and support, despite all the above mentioned cross-sectorial benefits. This may well result in a major missed opportunity, should the current political trend prevail.

The potential size of the AD industry in 2030 based on three feedstock streams has been calculated, in the Table below.

Table: Realistic Size of AD in Ireland in 2030

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5. Recommendations

Stimulating regulatory and financial framework will have a big influence on the successful and widespread development of AD facilities in Ireland. The most significant development constraint in Ireland has been an ongoing lack of economic viability to developers and investors.

Improved fiscal incentives are urgently required to enhance the attractiveness of AD in Ireland for investment.

6. References

i Annual Statistical Report of European Biogas Association

ii Browne, J. D.; Murphy, J.D. *Applied Energy* 2013, *104*, 170.

iii EC, Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste. Official Journal of the European Union; 1999

iv Quantity of slurries and manures is expressed in tonnes of dry matter

v Standardised ODM values of feedstocks based on the following research database; http://daten.ktbl.de/biogas/showSubstrate.do?zustandReq=3#anwendung

vi Browne, J. D.; Murphy, J.D. *Applied Energy* 2013, *104*, 170.

vii ESTAT (2014): cattle and pigs

viii FAOSTAT (2013): horses, chicken, and other poultry

ix Wall, D.M.; O'Kiely, P.; Murphy, J. D. *Bioresource Technology* 2013, *149*, 425.

x Quantity of slurries and manures is expressed in tonnes of dry matter

xi European Biogas Association, internal communication