



## **APPENDIX B**

Methodology for grossing survey results,  
to account for non-participating sites

## Overview

The methodology described here is provided to allow the reader to understand how the data for the survey has been developed and presented. A slightly different approach has been used for each of the four AD sectors covered in the survey:

- Farm
- Merchant
- Industrial
- Waste water treatment

To recap, the following is a summary of how data for the AD sector in Scotland, in 2017, has been developed.

**Table A1.** Overview of participation levels by sector for data generation

Sector	No. of organisations in sector	No. of surveys completed	Data derived from assumptions & estimates
Farm	27	20	7
Merchant	9	8	1
Industrial	7	3 <sup>a</sup>	4 <sup>a</sup>
Waste water treatment	6	6	0 <sup>b</sup>
Total	49	35	14

*Table notes:*

*a. One of the industrial sites indicated that data on electricity generated from the AD plant could be obtained from publicly available information, which was used (Ofgem).*

*b. Data on the digestate output tonnages from two of the sites was based on assumptions, using averages from the other four surveyed sites*

Gas to grid injection volumes associated with specified numbers of sites (no individual companies named) were obtained from SGN<sup>1</sup>. This data was used as a baseline to inform assumptions in terms of biogas generation levels per tonne of feedstock and are also the volumes quoted in this report in terms of gas injection to grid (converted from biomethane to biogas). This has assisted with making the estimation/grossing process for the sectors more robust.

In 2017 data from SGN is that a total of 50,942,351 million m<sup>3</sup> of gas was injected from AD sites to the grid<sup>2</sup>. On the basis of survey responses this is estimated to have been generated from 89,903,845 m<sup>3</sup> of biogas – representing 41% of the total biogas produced across all of the sectors.

**It should be noted that the conversion of biogas to biomethane is based on a 57% conversion rate, provided from seven sites surveyed (four farm and three merchant).**

<sup>1</sup> SGN manages the gas network across Scotland and the North of England (<https://www.sgn.co.uk/>)

<sup>2</sup> Circa 4% of gas injected to grid may be propane, by volume, to increase the calorific value to natural gas levels. Source: WRAP, 2014, "Propane blending system for biomethane to grid applications."



## Farm-based AD

Data is presented in the report for the 27 sites identified to be operational in 2017, with surveys completed for 20 of these. Of the 20 surveyed sites, 16 used biogas for CHP/boiler heating only. Of the surveyed sites, 4 were set up to inject gas to the grid, however, one of these was only going through the commissioning phase in 2017 and hence had no significant levels of gas generation and was excluded from the averaging methodology.

Assumptions and estimates to produce data for farm-based AD sites not engaging with the survey were derived using the approach below:

- The sixteen sites producing biogas for use in CHP units or boilers only were grouped together and an average taken of their inputs and outputs e.g. feedstock, digestate, electricity and heat generated.
- The three (another not operational) sites injecting biomethane to the grid were similarly grouped together and averages made of their inputs and outputs.
- Of the seven sites not surveyed data from the ADBA website indicated that four of these were CHP only, and three were gas injection to the grid (plus CHP). The average for each category was then used and multiplied by four in the case of CHP-only sites, and three for the latter.
- ADBA data for the above sites was expressed in terms of tonnage throughput, electricity gas flowrates to the grid.

The throughput total used for the non-participating sites in the farm-based AD total is 137,000 tonnes, on the basis of the above approach. This amounts to 26% of the total for farms. If this estimate is inaccurate by 50% the throughput change associated with this is 68,900 tonnes, or 13% of the total farm-based AD throughput. When this is considered in terms of other feedstocks in the survey, the following is the case:

- Farm + merchant: the throughput used for non-participating farm-based AD sites represents 17.2% of this combined feedstock.
- Total, all sectors: the throughput used for the non-participating sites above represents 1.4% of the total.

## Merchant AD

One of the nine AD sites did not take part in the survey. Information on this site, associated with the year 2017, was found from various online publications, in terms of its throughput, electrical capacity and other parameters. These were used to develop an estimate of data for the site that was incorporated into the survey – to provide a fuller picture. In terms of the influence of the assumptions used, on the survey as a whole, this is summarised below.

The throughput tonnage used accounts for 35% of the merchant total shown in the report. To understand how this potentially skews the data, if the assumed tonnage used was significantly inaccurate and the actual throughput was, for example 50% of the value used (very unlikely), the facility would then account for 18% of the throughput. i.e. rather than the merchant sector processing 338,783 tonnes in 2017, the total would be 278,783 tonnes – a reduction of 18%. To consider how this further impacts on the AD sector, it is considered below what this would mean in terms of (i) merchant plus farm-based AD and (ii) the total for the sector as a whole:

- Farm + merchant sector: tonnage would be reduced by 7.5%
- All sectors: 0.6% reduction.

The impacts in terms of biogas, energy and other parameters are broadly in line with the differences associated with tonnage throughput.



## Industrial AD

### Overview

Seven industrial AD sites were identified to be operational in 2017. Three participated fully in the survey, another (referred to as Site 4 below) indicated where key data could be secured and three sites did not want to take part (referred to as Sites 5 to 7). The gas injection data is based on Site 4 and Sites 5 to 7.

It has been assumed that the feedstocks and digestate volumes associated with gas to grid generation are separate to that used to make estimates for CHP/boiler use, and the resulting electricity and heat generated.

### Gas Injection to Grid

Gas to grid injection data for the sector as a whole was provided by SGN, aggregated from four unidentified sites which allowed a biogas estimate to be produced. The volume of gas injected to the grid in 2017 was 34,958,542m<sup>3</sup>, which is estimated to have been generated from 61,695,373 m<sup>3</sup> of biogas. Estimates of the feedstock used to generate this volume of biogas have been made, on the basis of published/research data, and the resulting digestate produced is assumed to be in line with the approaches and percentages made available from those sites completing the survey. It is recognised that in terms of the feedstock throughput and digestate output that the estimated numbers are therefore at risk of being significantly different to what actually took place in 2017 and are therefore presented on an indicative basis.

### Throughput and Biogas for CHP/Boiler Processing

An estimate of electricity generation has been made on the basis that six of the sites identified operate CHPs for this purpose, with another generating heat only. (For the three surveyed sites, two operated CHP units and one a boiler system only).

In terms of the potential significance of the above, the following can be considered:

- Data on throughput and electrical generation capacity for Sites 5 to 7 was obtained from a number of online documents, including sector publications and company case study documents.
- Information on renewable electricity generated by Site 4 was secured from a publicly available Ofgem database which provides data on the Renewable Obligation Certificates generated by named sites. The electricity generated by this site is 36% of the total estimated for the industrial sector. The total throughput tonnage for the site was based on NNFC data available online.

The potential impact of inaccuracies derived from the assumptions used for Sites 5 to 7, in terms of CHP/boiler processing only, is summarised below, for two of the parameters, throughput and biogas production:

- Tonnage throughput: 18.7% of the industrial AD sector feedstock throughput is associated with the three non-participating Sites 5 to 7 mentioned above i.e. 1,471,700 tonnes. If the assumptions used for these are inaccurate, for example by 50%, higher or lower, then the overall industrial sector throughput is 9.4% higher/lower than stated (137,339 tonnes).
- Biogas output: Sites 5 to 7 are estimated to produce a total of 14,971 m<sup>3</sup> of biogas, which accounts for 7% of the total Scottish AD sector (217,133,444 m<sup>3</sup>). An inaccuracy of 50% in the levels used for these sites in the survey therefore translates to an impact of 3.5% in the total for the AD industry.



## **Waste Water Treatment AD**

Six sites were identified as having anaerobic digestion capacity and infrastructure to use the gas generated. Four of these sites (1 to 4) provided detailed survey responses, and for the remaining two sites (5 & 6) a full dataset was provided, with the exception of digestate quantities, including separated fractions.

With detailed information provided on another four sites an average of the digestate tonnages, including separated fractions, was made allowing an estimate of the outputs to be produced for the remaining sites.