

Anaerobic digestion infrastructure in the UK: September 2011



This document reports the baseline of the anaerobic digestion infrastructure in the UK and explains the categories and the figures in detail.

Executive summary

This document reports the baseline of the infrastructure for anaerobic digestion (AD) in the UK. It was established by research carried out by WRAP and the NNFCC, the UK's National Centre for BioRenewable Fuel, Energy and Materials, in response to the government's AD strategy and action plan published in June 2011.

Authoritative knowledge of the current state of the infrastructure for AD helps to enable better investment decisions. In addition, it will improve the understanding of the current size of the AD industry in the UK and, going forward, it will facilitate enhanced monitoring of growth in the industry.

The current AD infrastructure in the UK is summarised as follows:

- There are currently 214¹ facilities, with:
 - an overall capacity to process more than 5 million tonnes of material per annum, and
 - a total installed generating capacity of over 170MW of electricity.

The Official Anaerobic Digestion Information Portal (the AD Portal) was established in 2009 to fulfil a recommendation from the AD task group to develop a web-based portal to act as a gateway to information about AD for a wide range of stakeholders.

The information on the infrastructure of the AD industry produced by WRAP and NNFCC is accessible via the AD portal (www.biogas-info.co.uk).

¹ Please note that all figures in this document are correct as of 30th September 2011

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We work with businesses, individuals and communities to help them reap the benefits of reducing waste, developing sustainable products and using resources in an efficient way.

Find out more at www.wrap.org.uk

NNFCC, the UK's National Centre for Biorenewable Fuel, Energy and Materials host and manage the Official AD Information Portal on behalf of the Government and the AD community.

Visit the Portal at www.biogas-info.co.uk



Front cover photography: The flares and tanks at ORAL's Cassington facility in Oxfordshire.

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Acknowledgements

WRAP would like to thank NNFCC for helping to establish the baseline infrastructure for the anaerobic digestion industry in the UK. WRAP would also like to thank Water UK for providing information on the water treatment industry.

Key facts

There are 214² AD plants in the UK, with:

- an overall capacity to process more than 5 million tonnes of material per annum, and
- a total installed generating capacity of over 170MW of electricity.

² Please note that all figures in this document are correct as of the 30th September 2011

The baseline for AD infrastructure in the UK

The baseline infrastructure for AD in the UK was established in response to Action 1 of the AD Strategy & Action Plan which was published in June 2011. WRAP and the NNFCC worked together to deliver the requirements of this action through research to construct and verify the baseline for the AD industry in the UK. It provides an authoritative benchmark against which to measure the growth of the AD industry.

Action 1

Action 1 of the AD Strategy & Action Plan was to:

‘Agree & publish on the existing AD portal a robust baseline that accurately describes the status of the AD Industry’.

To enable government to understand the UK’s AD industry and how to manage and encourage its growth, it is important to establish a comprehensive and authoritative baseline against which to measure growth of the AD industry as future capacity comes on stream. It also enables a more robust approach to monitoring and predicting growth of the industry.

Action 1 was completed on schedule by the 30th September 2011.

The UK's anaerobic digestion infrastructure

The baseline infrastructure covers the whole of the UK AD industry including the water industry and sites accepting food waste and farm-based waste processors. It provides a full and clear statement of the energy potential of AD and a comprehensive picture of the industry's infrastructure as it is today.

To establish the baseline a desk-based review was undertaken to better understand the size and scale of the UK AD industry in the UK. The databases maintained by WRAP and the NNFCC were consolidated, and a verification process followed, using source contacts, press releases and information from trade associations.

AD infrastructure in the UK

- There are 214 AD plants in the UK accepting a variety of feedstock types: Food Waste, Farm Wastes, Purpose Grown Crops and Waste Water & Sewage with:
 - an overall capacity to process more than 5 million tonnes of material per annum
 - a total installed generating capacity of over 170MWe
- Two of these plants inject biogas directly into the gas grid

The headline figures for the AD industry provide a very positive reflection of the industry's development compared to 2005 when there were just two AD plants operating outside of the water industry in the UK.

To provide a more in depth understanding of the treatment options within the current infrastructure, we present the details beneath our headline information organised under the following sub categories (these are defined further elsewhere in the report);

- Waste Fed plants;
- Farm fed plants; and,
- Sewage Treatment Facilities

AD plants that are waste-fed

Waste-fed AD plants are those which accept feedstock which, in whole or in part, comprises of food waste from commercial & industrial sources and/or municipal source segregated waste. Note that, as described below, some of these waste-fed plants will not be importing waste feedstock in to their facility.

Waste-fed AD plants

- There are 44 Waste-fed AD plants in the UK with:
 - a processing capacity of around 3.7 million tonnes per annum
 - a potential to generate around 54MW of electricity
- Of these, one plant injects biogas directly into the gas grid

The Waste-fed category has been further divided into, *Industrial* and *Non-Industrial* facilities, these are defined as follows.

- **Waste-fed - Industrial** - These are AD facilities which accept wastes arising from their own 'on-site' activities. They tend to have a significant throughput of material because they process high volumes of low solid effluents. It is therefore important to be able to consider them separately within the overall infrastructure as these large tonnages may distort the overall picture.
- **Waste-fed - Non Industrial** - These are AD plants which accept food waste from commercial and municipal sources. They are predominantly commercial large-scale, standalone facilities. This category also includes integrated waste management facilities which incorporate AD as part of a range of waste management processes and demonstrator plants accepting food waste in low volumes.

Examples of waste-fed facilities in each of these categories are described in more detail below.

Waste-fed – Industrial

Industrial plants are sites which process their own waste from their own on-site activities. However, note that this category includes one farm-based AD plant which accepts feedstock in addition to onsite manures/slurries and/or purpose grown crops.

Waste-fed – Industrial

- There are 13 waste-fed industrial AD plants in the UK with:
 - a capacity to process around 2.5 million tonnes per annum of high liquid content feedstock
 - a potential to generate approx. 12 MW of electricity

Case Study: McCains, Whittlesey

The McCains plant in Whittlesey, Peterborough. Here they have installed a lagoon style plant which is used to process between 900,000m³ and 1,000,000m³ of liquid washings from their manufacturing plant.

Waste-fed - Non-industrial

AD facilities in this category are commercial scale 'large volume' operations accepting food waste from commercial/industrial and municipal sources. In addition, this category includes integrated waste management facilities which include AD treatment processes as part of a range of on-site waste treatment options and 'very small scale' demonstration plants which are only able to accept and process low volumes of waste per annum.

Waste-fed – Non-industrial

- There are 31 waste-fed non-industrial AD plants in the UK with:
 - a capacity to process around 1.2 million tonnes per annum and
 - a potential to generate approx. 42 MW of electricity

Waste-fed – non industrial - commercial

AD facilities in this category are large scale plants accepting large volumes of source segregated food wastes from commercial/industrial and municipal sources.

Waste-fed – non-industrial - commercial

- There are 26 food waste-fed non industrial AD facilities which operate on a commercial basis in the UK, with:
 - a capacity to process around 1 million tonnes per annum and
 - a potential to generate 38 MW of electricity

These plants may also use a combination of feedstock from various sources to enable them to operate with a commercially viable throughput. These include:

- Purpose grown crops (eg. grass or maize silage),
- Slurries and manures,
- Garden waste (dry AD only),
- Fish waste,
- Manufacturing waste liquors & washings; and,
- Out of specification fruit and vegetables.

Case Study: Oxford Renewable Energy (ORE)

ORE's plant at Cassington, generates 2.1 MW of electricity for the Grid, enough to power around 4,200 homes. The plant processes up to 45,000 tonnes of feedstock per annum.

Integrated waste management facilities

Integrated waste management facilities are large waste processing sites which use various processing technologies to process other wastes as well as integrating food waste AD into the facility.

Integrated waste management facilities

- There are two AD plants in the UK which form part of larger integrated waste management facilities with:
 - a capacity to process up to 210,000 tonnes of feedstock per annum.

Demonstrator plants (food waste)

These are small scale plants which process minimal amounts of food waste throughout the year. The purpose of these plants is as test sites for different feedstocks and combinations of feedstocks to be used to help to improve the efficiency of AD in the UK

Demonstrator plants (food waste)

- There are three demonstration-size Food Waste AD plants in the UK with:
 - a capacity to process up to 7,825 tonnes per annum

NB: One of these demonstrator plants accepting food waste is recorded as processing zero tonnes of food waste.

Farm-fed

Farm-fed sites are defined in accordance with the definition used by the Environment Agency. They are on-farm AD plants which process manure/slurries and purpose-grown crops. Of the 24 farm-fed plants, two are demonstrator scale plants which process farm derived feed stocks. The majority process a combination of the following feedstock types:

- Cattle slurries & manures;
- Poultry litter;
- Pig slurries & manures;
- Maize silage;
- Grass silage;
- Whole crop silage; and,
- Fodder beet.

Farm-fed

- There are 24 farm-fed AD plants operating in the UK with:
 - a capacity to process around 200k tonnes of feedstock per annum
- Two of these are demonstrator scale facilities with a combined processing capacity of no more than 13,000 tonnes per annum

Sewage treatment facilities

The water industry has used AD as a sewage treatment method for many years.

Sewage treatment plants are not captured on the *AD Map*, which only captures food and farm waste processing plants described further on page 15. However a summary of the capacity, provided by Water UK, is presented on the AD Portal

Sewage treatment facilities

- There are 146 sewage treatment AD plants in the UK, with:
 - a capacity to process up to 1.1 Million tonnes of feedstock per annum, and
 - the potential to generate up to 110MW of electricity per annum
- One of these plants injects biogas directly into the gas grid

Biomethane injection to the gas grid

Biomethane injection into the gas grid is not widespread at present in the UK. There are only two AD facilities currently in the UK which do so, the first of which is at Didcot sewage works, which became operational in October 2010 the other is at the Adnams Brewery in Suffolk.

The majority of AD sites in the UK use the biogas from the process to generate either heat only (via a gas fired boiler) or heat and electricity by using the biogas in a Combined Heat and Power (CHP) plant.

Biomethane can also be further processed so that it can be injected into the gas grid.

Case Study: Didcot Sewage Works

In a joint project between British Gas, Thames Water, and Scotia Gas, Didcot sewage works has been injecting gas from its AD plants directly into the grid since October 2010.

The site processes waste from 33,000 homes and captures the biomethane using an on-site AD plant. The site is able to provide gas to up to 200 homes.

AD Map

The AD map, available through the *Official Anaerobic Digestion Information Portal*, locates all of the AD sites which are currently operational in the UK. On the map, these sites are coded into the following categories, those using 'Farm Feedstock Only' (green) and those using 'Waste Feedstock'³ (red). In addition, the single yellow marker shows the biomethane injection plant located at a sewage treatment facility⁴.



The AD Map – 30th September 2011

The map is updated on a monthly basis after a review of the industry⁵ and planning data has been carried out. The map only provides details of those plants which are operational.

³ This category includes all commercial, industrial, non-industrial and demonstrator (food) sites

⁴ This is currently under review as to how to better represent the biomethane injection plants which also process either food or farm wastes. Work is being done with the AD portal stakeholders to find a solution for this so not to double count facilities but ensure that all categories are represented

⁵ A review of the trade press is carried out to identify any plants which have become operational. Site operators can also contact the NNFFCC and WRAP directly to update details for the map.

Planning

Every month WRAP receives a comprehensive list of waste processing sites in the UK which have applied for, or received, planning permission.

Planning information - September 2011

- There are currently 78 waste fed plants which have received planning consent in the UK;
- There are a further 27 farm fed plants which have received planning consent in the UK;
- Additionally there are another 80 plants within the planning system awaiting the outcome of their application.

This data gives an indication of a dynamic AD industry within the UK as it does show a large number of plants that are currently within the planning system. However, careful interpretation and caution is needed because there is uncertainty about the number of plants progressing from planning through to operation.

Forward look

WRAP and the NNFCC will continue to review (on a month-to-month basis) developments in the infrastructure of the AD industry in the UK. There are also actions to review and undertake research into new areas to expand the database which has already been constructed.

The continuation of this work forms part of further tasks identified in the AD Strategy & Action Plan.

These are:

- **Action 2:** To continue to update the AD landscape information that is accessible via the AD portal, including monitoring planned developments; and,
- **Action 3:** To add to information available on the AD portal through collating robust data on the broader economic benefits of AD, e.g. the number of jobs created or saved, the potential for renewable energy generation and the amount of GHG reduction achieved through the displacement of fossil based energy.

The NNFCC and WRAP will continue to update the AD infrastructure database on a monthly basis. WRAP will develop mechanisms to collect and collate additional data from established plants and the NNFCC will make this available via the AD Portal.

Input and consultation with industry partners will continue to build on the breadth and depth of information currently collected to enable the collection of better quality information.

Work on monitoring AD capacity is on-going and data on developments on AD infrastructure will continue to be captured and reported annually.