ANAEROBIC DIGESTION MARKET REPORT

July 2015

ADBA

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WELCOME TO ADBA'S FIRST DETAILED MARKET REPORT

Our report shows how far the industry has come, and how much potential we still have to realise. This baseline information will support our policy and regulatory work, and we hope it will also provide members, funders and anyone else interested in the AD market with the data they need.

Last year was a record-breaker for the UK AD industry – and although we are not projecting as many plants to open in 2015, there will still be more new plants than in any year other than 2014. The biomethane market is continuing to develop strongly, with more plants coming online. The market for biomethane certificates is growing, too – with Reading Buses recently making its world record using biomethane fuelled by ADBA members and certificated under the Biomethane Certification Scheme.

Despite the demand for biomethane, there is a high degree of uncertainty about the future for gas to grid developers which is reflected in our projections. The Renewable Heat Incentive remains crucial to new project development, and the industry cannot expect any certainty about future budgets until the Chancellor's spending review in the autumn. This could cause a real hiatus in gas to grid project development.

The exceptional demand from transport markets, especially for use in Heavy Goods Vehicles, demonstrates that the future for biomethane is not just for heat. However transport policy is not providing sufficient direct support. Before the election, the DfT was actively considering what support would be required to ensure the supply of biomethane for the Heavy Goods Vehicle market, and we and others will be pushing them to continue that work.

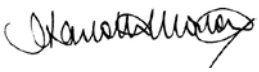
With a forthcoming consultation on the Feed-in Tariff, our projections for the future of electricity plants are also highly uncertain. DECC will be considering tariff levels based on capital and operational cost evidence, and the new government has also been clear about the need to cut carbon in the most cost effective way. AD has a particular role to play as a dispatchable technology offering a low-carbon option to balance intermittent renewables – which should be taken into account in comparing the value for money offered by different renewables. But with the scheme as a whole already overspending its budget, it is going to be very challenging to make the case for significant changes. ADBA is therefore also gathering data and considering arguments for how the non-energy benefits of anaerobic digestion, for example slurry management on farms and greenhouse gas savings for onsite AD in general, could better be recognised. The potential here is huge – we calculate that the industry could save 4% of the UK's total greenhouse gas emissions.

Of course, our growth depends on feedstock availability as well as financial incentives. The WRAP data presented in chapter five of this report shows that less than half of English households have access to a food waste collection. Improving that will only be possible with more ambitious central government policy, which recognises that separate food waste collections are essential if we are to meet the UK's recycling targets. Future growth in farming markets needs clear bioenergy policy. Crops for AD offer real carbon savings and wider benefits to farming, but bioenergy sustainability criteria need to reflect real farming systems and encourage best practice.

Looking to the future of the industry, investment in new research and development within the industry and in the academic community is vital and has already been delivering significant returns. With limited scope for capital cost reduction, process improvements and the development of higher value bioproducts offer the greatest opportunities to reduce the impact of degressing incentives and improve returns to investors. They are also important for increasing the overall potential of the industry to contribute to government targets, for example by making more feedstocks available for digestion, improving gas yield, or increasing the value of the organic fraction.

The data we collect about the market, and present in this report, also supports that work. As the industry develops, we will continue to expand the data we collect, and are very open to your views on what information you would also find useful. We will develop our data on performance, investment and exports, working particularly closely with our operator groups.

ADBA will publish updated reports for members each quarter, to coincide with our Members' Meetings and National Conference in December and alongside UK AD & Biogas.



Charlotte Morton,
Chief Executive, ADBA

2. Summary

This market update is our first comprehensive anaerobic digestion market update. We will produce these updates quarterly. The update is intended for those with existing knowledge of the industry with an interest in the progress of the AD industry.

Key points highlighted in the report are:

- Now over 400 plants operating in the sector;
- 60-100 new plants to be commissioned in 2015, following a year of huge growth in 2014 (102 plants commissioned);
- Surge in biomethane projects continuing – but uncertainty from April 2016;
- Significant fall in sub-500 kWe FIT plants in 2015 compared to 2014 - but still more than in 2013 or any year before that;
- 1.6 million tonnes of food waste now being recycled through AD compared to 0.3-0.4 million tonnes in 2010, but Government policy in England holding up investment compared to Scotland, Wales and Northern Ireland;
- Sector faces real challenges from 2016, but with reasonable policy changes the sector could still deliver at least 500 more plants by 2020;
- Sector already exports at least £50m-£100m and employs 4,500 people.

See the following snapshot of where the sector currently stands:

OPERATIONAL PLANTS BROKEN DOWN BY ELECTRICITY/CHP, HEAT-ONLY AND BIOMETHANE

Electricity/ heat/ biomethane	Number of operational plants	Capacity of operational plants
Outside of water sector		
Electricity/ CHP plants	215	210 MWe
Heat-only plants	6	0.1 MWth
Biomethane plants	25	17,266 m^3/ hr
Total	246	282 MWe-equivalent
Water sector		
Sewage electricity plants	155	177 MWe
Biomethane sewage plants	4	4,200 m^3/ hr
Total	159	195 MWe-equivalent
Total		
Electricity/ CHP	370	388 MWe
Heat-only	6	0.1 MWth
Biomethane	29	21,466 m^3/ hr
Total	405	477 MWe-equivalent

And of what is in the planning pipeline:

PROPOSED AD PLANTS

	Number of electricity/ CHP plants	Potential installed capacity, MWe	Number of biomethane plants	Potential installed biomethane capacity, m^3/hr	Total number of plants
With planning application approved (not including extensions to existing schemes)	306	328	27	16,415	333
With planning application submitted (not including extensions to existing schemes)	134	168	2	1200	136
Total proposed	**440**	**496**	**29**	**17,615**	**469**
Operational non-sewage plants potentially converting to biomethane	N/A	N/A	2	1,500	N/A
Operational sewage plants potentially converting to biomethane	N/A	N/A	2	1,250	N/A

ADBA members can access all the latest market information, including all of the figures in this report and the raw data behind the numbers, on the Market Analysis page of the ADBA website (adbioresources.org/members-area/market-analysis). We inform members through our weekly email updates each time we update the information on the market analysis page.

3. Market growth to date

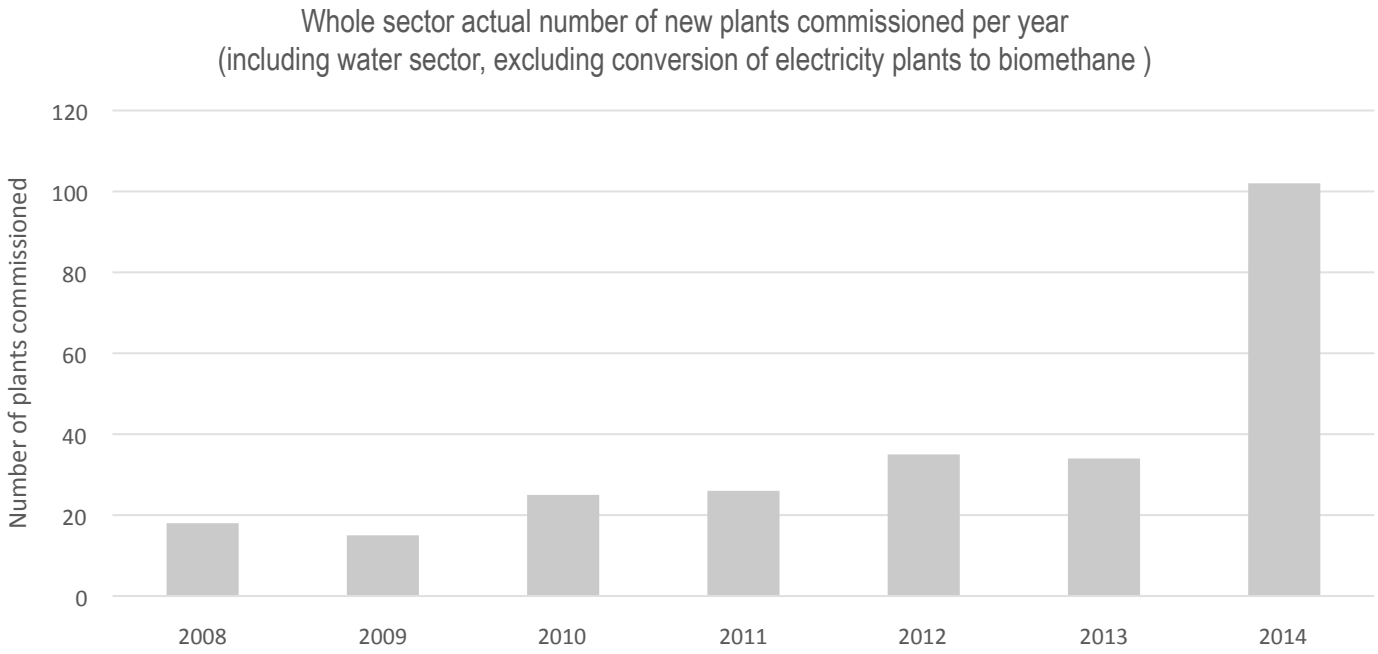
3.1. Whole AD industry

In 2014 the sector saw its biggest growth to date, partly due to the rush to commission plants to receive higher Feed-in Tariffs and Renewable Heat Incentive tariffs, with 102 plants being commissioned. Growth in 2015 is looking a little slower, due primarily to lower tariffs, restricted feedstock availability and policy uncertainty (e.g. tariff reviews and sustainability criteria uncertainty). However, we still expect 2015 to be the second biggest year for the industry, with growth in terms of new plants commissioned being greater than all years except 2014.

Chart 1 shows the number of plants across the water and non-water[1] sectors that have been commissioned each year, demonstrating the huge uptake in 2014 compared to previous years. See chapter four for data for 2015 and future years.

Note on charts used in this document
In this document we include charts showing **plant numbers** and electrical/ biomethane **capacity**, both **by year** and **cumulatively**. We state in the chart title which of these the chart relates to. Plant numbers are shown in block charts, while capacity is shown in line charts.

Chart 1



[1]Non-water sectors include food waste, crop and farm waste plants. See full descriptions in Appendix 2.

Chart 2 below shows this growth over the longer-term. It shows the early growth of the industry in the 2000s – this was largely in the water sector following the introduction of the Renewables Obligation in 2002. Some early pioneers in the farm and food waste sectors also built in the 2000s. In 2010 and 2011 respectively, the Feed-in Tariff and then Renewable Heat Incentive were introduced, spurring the agricultural and food waste sectors across both electricity and biomethane-to-grid.

Chart 2

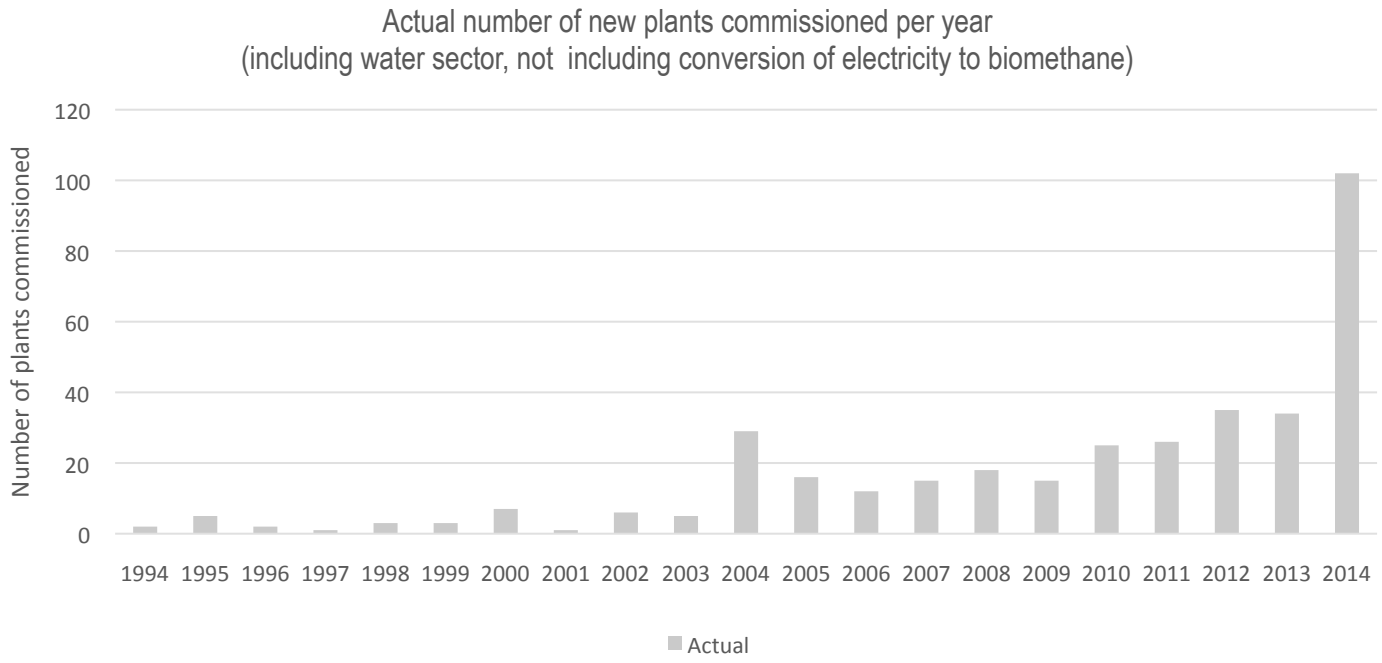
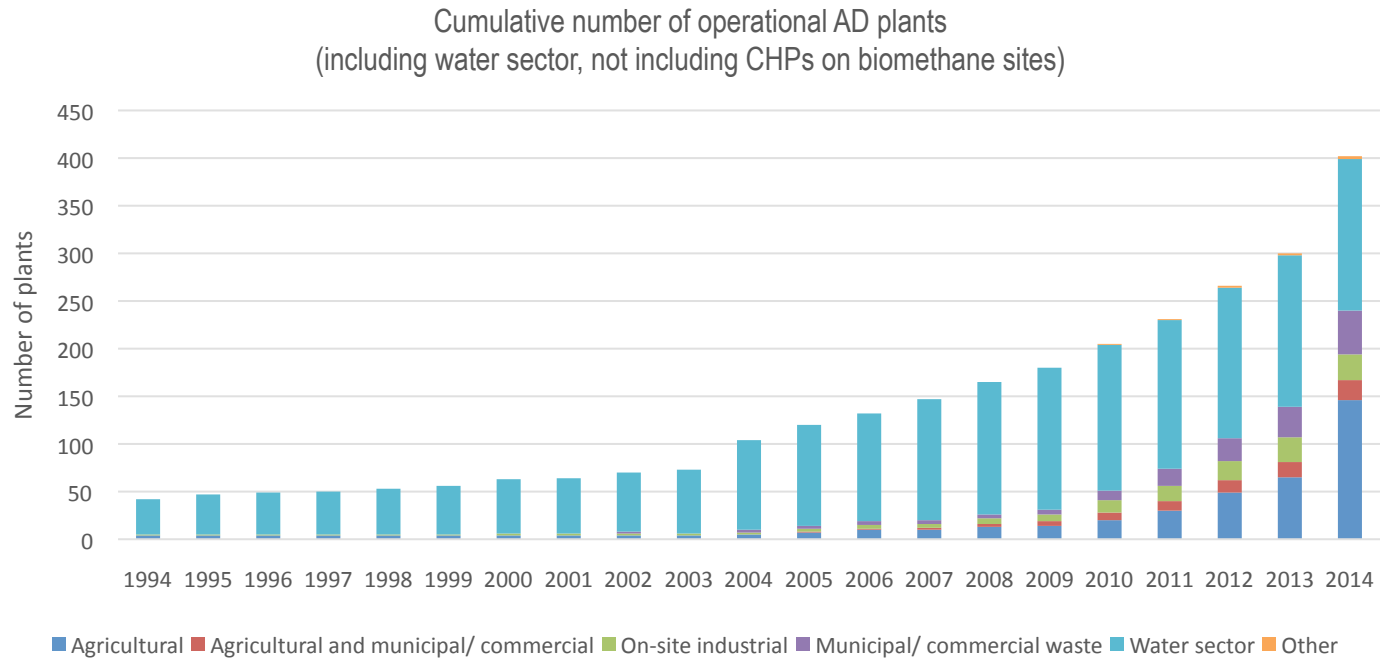


Chart 3 shows the longer-term **cumulative** number of plants in operation across all sectors. Further detail on the growth of each feedstock sector is presented in chapter five.

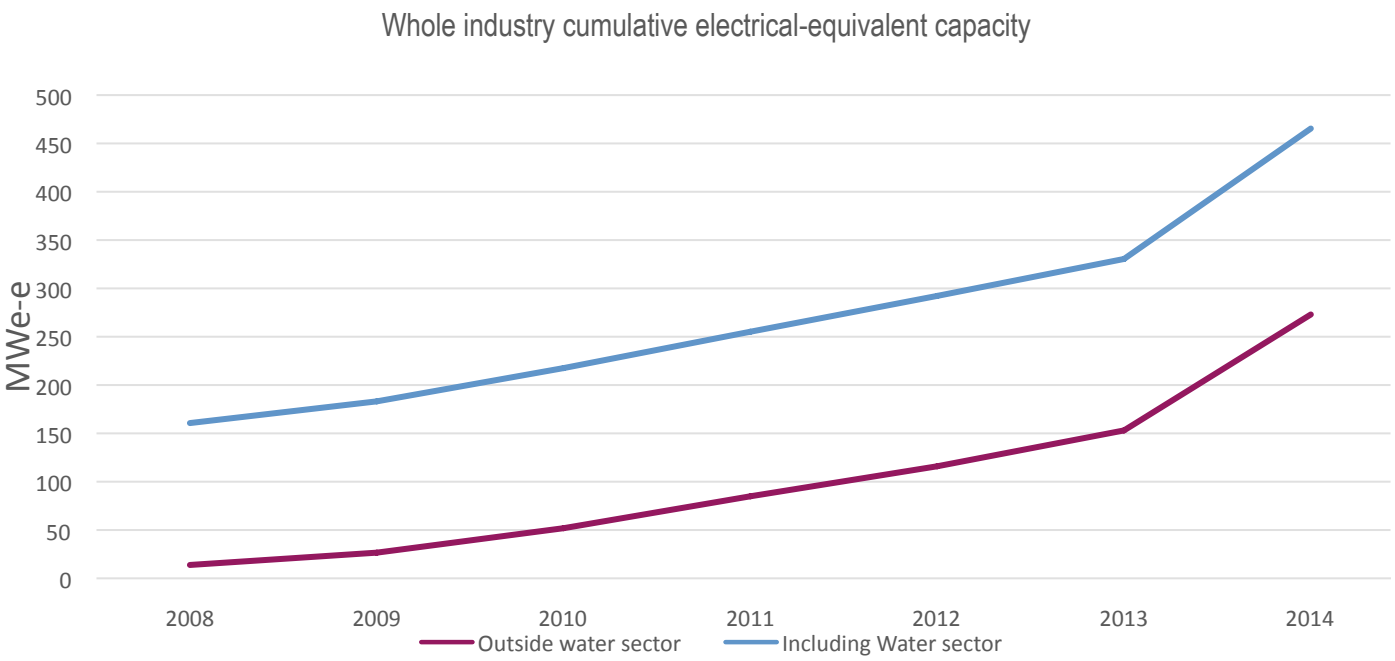
Chart 3



3. Market growth to date

Chart 4 shows the **recent** history in **cumulative capacity** terms. We use megawatts of electrical-equivalent capacity for the sector – i.e. converting the biomethane capacities to electrical to give a single measure of capacity for the sector. Recent growth has been outside the water sector.

Chart 4



The **average** capacity of new plants commissioned in the sector has ranged between 0.6–1.4 MWe-e since 2010 (with no particular trends noticeable in this). The average AD plant capacity across all operational plants is now 1.2 MWe-e.

3.2. Sub-sectors

In AD, growth rates will often vary between the biomethane and electricity sectors, between the ≤250 kWe, 250≤500 kWe and 500-5000 kWe sectors, and between the agricultural and commercial/ municipal sectors and on-site industrial sectors[2]. These divisions help demonstrate some general trends in the industry. In this chapter we show the growth in each sub-sector in turn and explain why each sub-sector has grown differently.

3.3. Biomethane

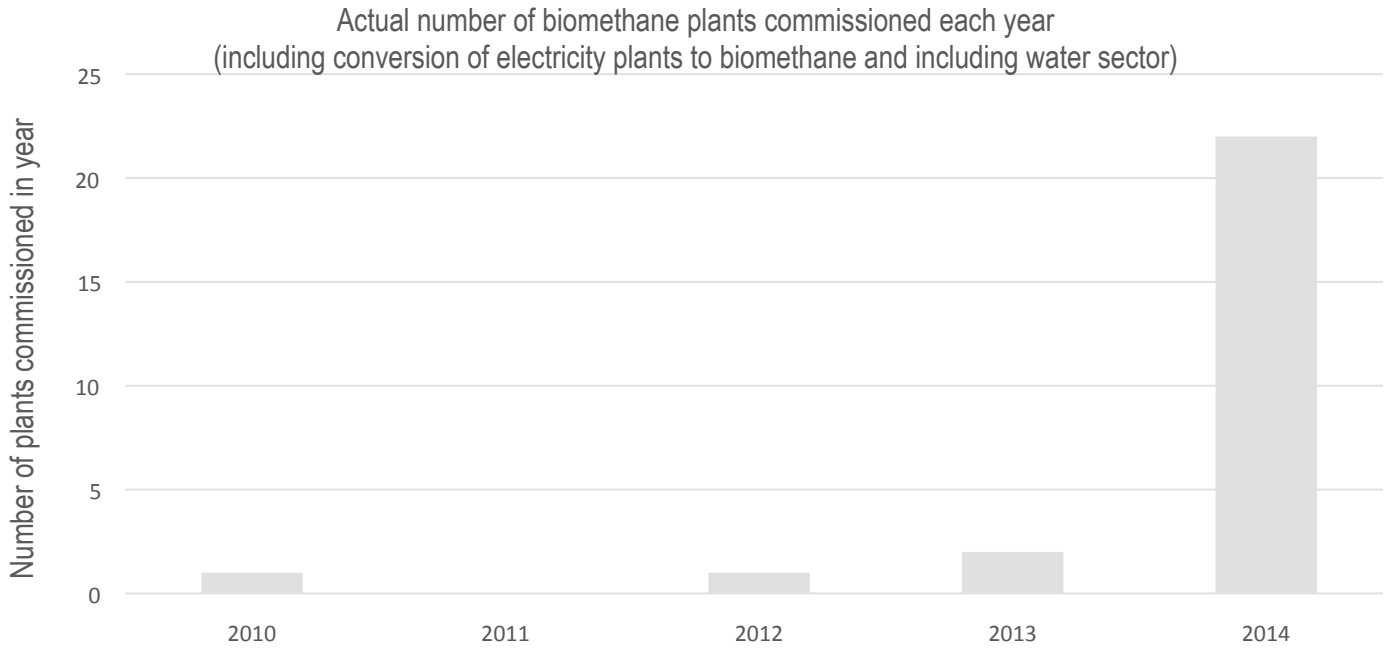
2014 was the year that biomethane-to-grid plants were first built and commissioned in the UK in significant numbers.

The key driver for this has been the introduction of the RHI in 2011, and the length of time taken to develop projects under the scheme is instructive for future policy development: it can take several years for the market to adapt to new or changed incentives. Biomethane has also benefited from the successful demonstration of the technology, and the resolution of some of the regulatory issues such as increasing the maximum permitted levels of oxygen in biomethane for injection.

Chart 5 shows this clearly.

[2] We take the Ofgem interpretation of commissioning for FIT purposes as the date of commissioning for consistency of figures with FIT data. This generally refers to the issuing of a G59 certificate, among other criteria.

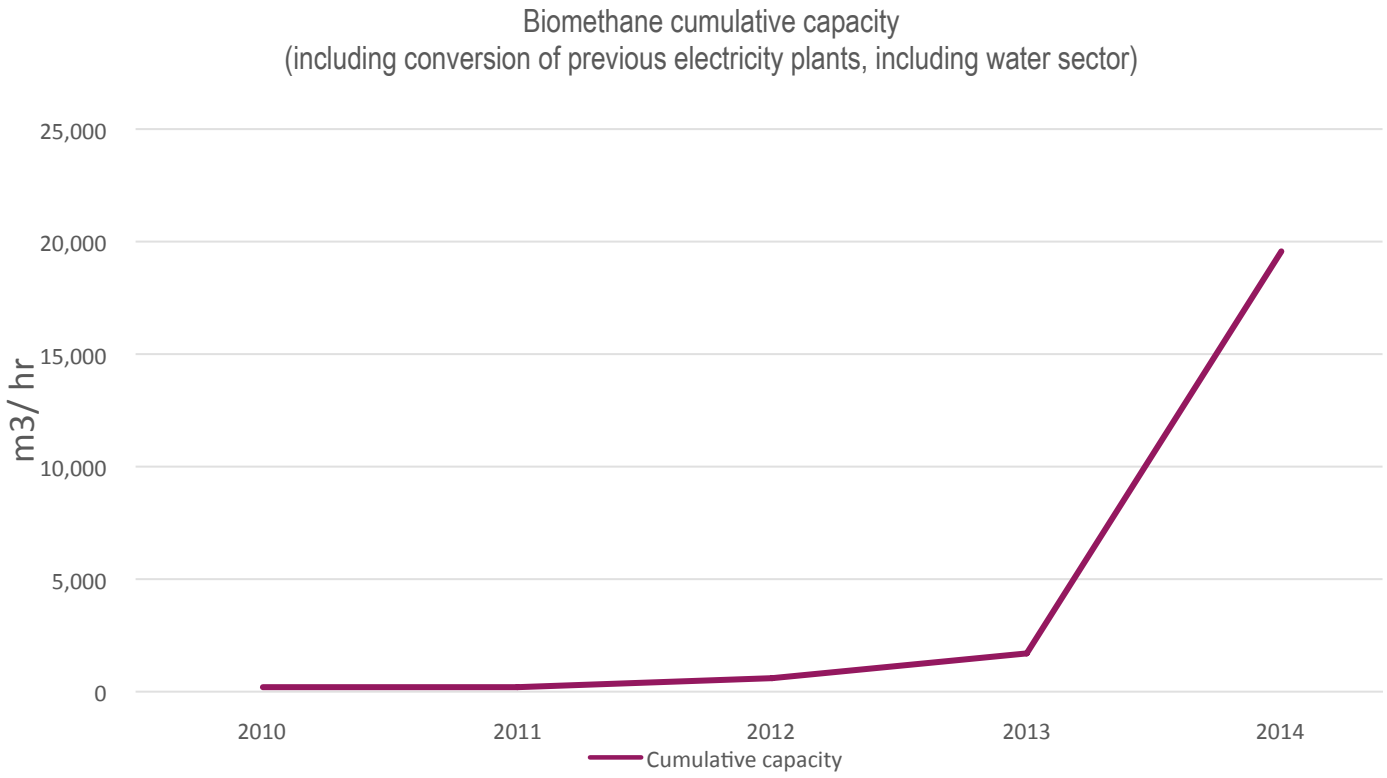
Chart 5



Many developers aimed to commission by the end of the year, following a DECC announcement that any lower tariffs following the review of the RHI could apply to newly-commissioned plants from December 2014. This phasing drove a great deal of activity and commissioning in the last quarter of 2014, with over two thirds of the 22 plants commissioned in 2014 doing so in the final quarter. Developers and AD plant and equipment suppliers have started focussing on new projects following the completion of the last phase of projects at the end of 2014 – these new projects are being completed in another phase primarily in the second half of 2015 (see more on 2015 uptake in chapter four below).

Chart 6 shows the growth to 2014 in terms of cumulative biomethane capacity.

Chart 6



3. Market growth to date

3.4. Electricity ≤250 kWe

The sub-250 kWe scale had a successful year in 2014, with the higher Feed-in Tariff (FIT) put in place in late 2011 (today's equivalent of 15.82 pence/kWh) encouraging the market to build new AD plants. This success took the form of plants firstly pre-accrediting in December 2013 at the tariff rate set in 2011, and then commissioning by the end of 2014.

The first half of 2015 has therefore been much slower in terms of plants commissioning, partly because the tariff rate has now been reduced and partly because developers and AD plant suppliers have been focussing on the completion of commissioning plants. See the Feed-in Tariff data below for more information on the impact of tariff reductions.

Chart 7 shows the increase in plants commissioned in 2014 compared to all previous years (see more on 2015 uptake in chapter four below). Although an improvement on previous years, this level of uptake is still low compared to the 100+ plants per year that the industry could comfortably achieve with more ambitious policies. Only four of these plants were of 100 kWe or under, which demonstrates that the 15.82 pence/ kWh was not sufficient to drive deployment at this scale.

Chart 7

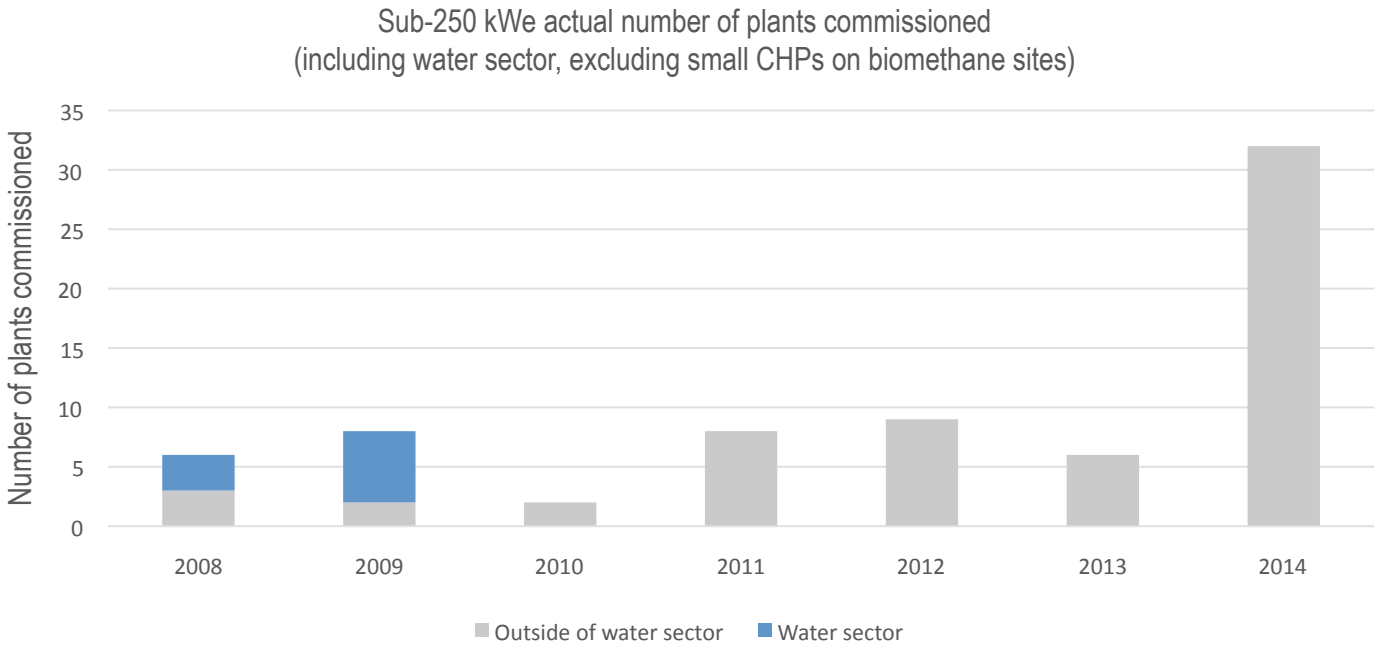
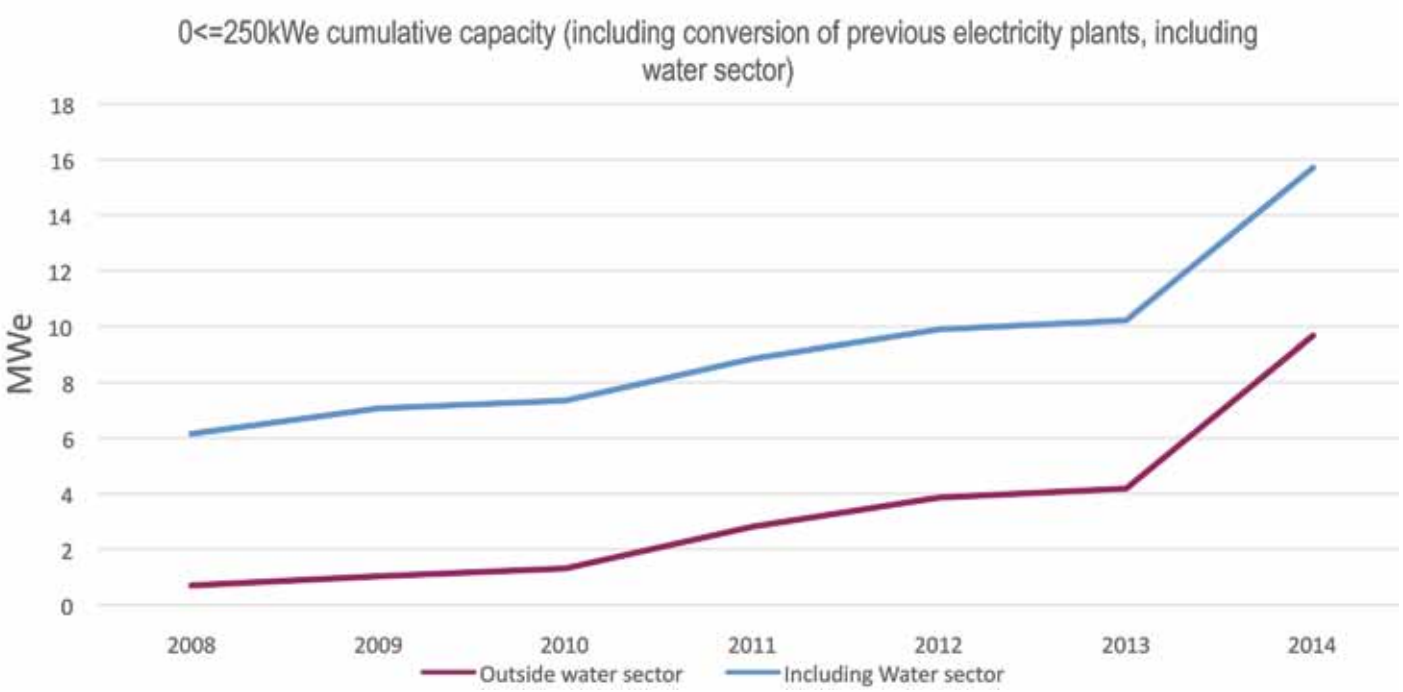


Chart 8 shows this in terms of **cumulative** capacity.

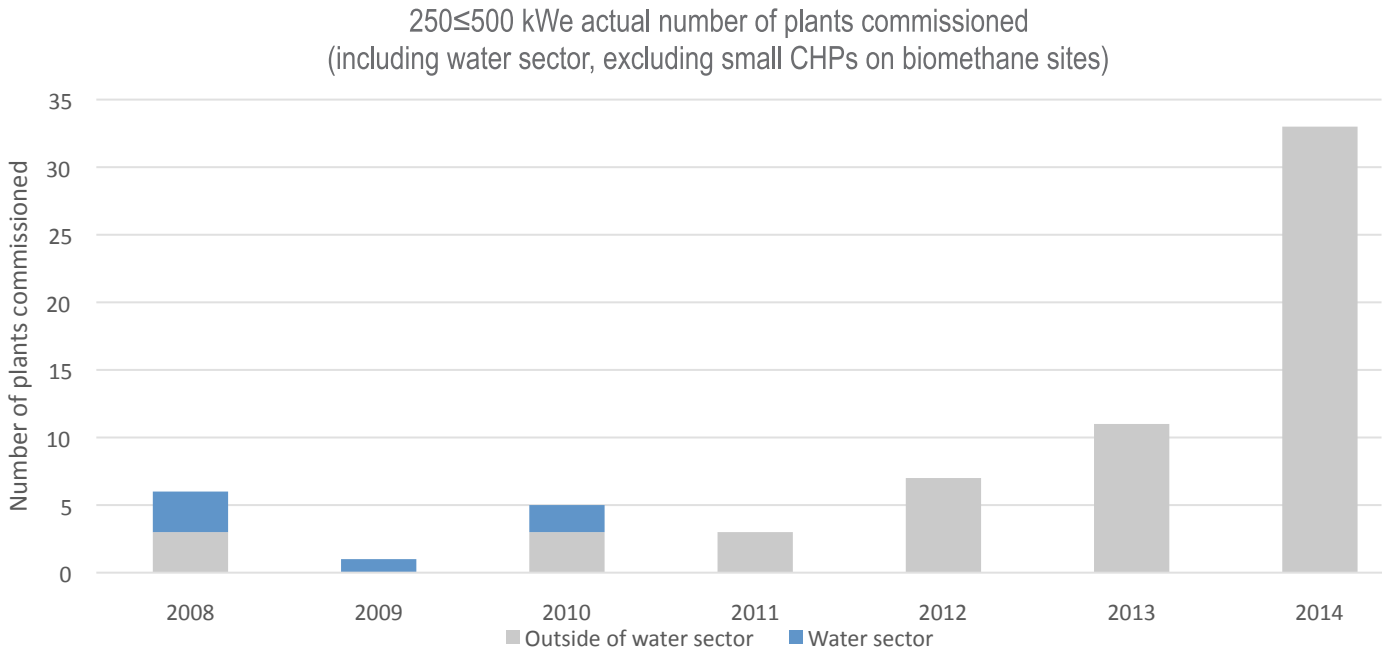
Chart 8



3.5. Electricity >250≤500 kWe

The 250≤500 kWe scale followed a similar pattern to the sub-250 kWe scale. The tariff leading to the higher uptake on previous years was 14.63 pence/kWh (adjusted to today's prices).

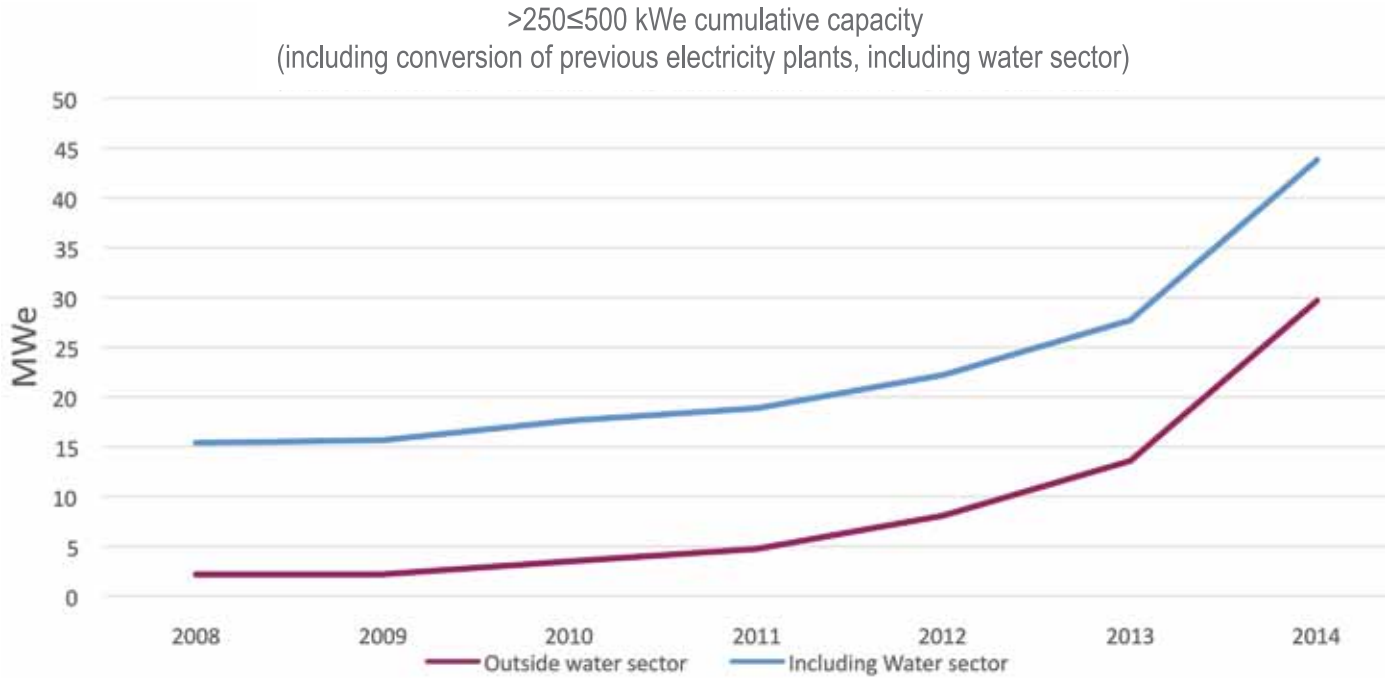
Chart 9



3. Market growth to date

Chart 10 shows this in cumulative capacity terms.

Chart 10



3.6. Electricity ≤500 kWe ≤5 MWe

The market at this scale, unlike at the lower capacity levels, did not grow considerably in 2014 compared to previous years. The growth had already taken place in 2010 at the launch of the Feed-in Tariff. Plants in this scale are typically 2 MWe food waste plants and 1 MWe agricultural plants. The lack of growth in 2014 compared to previous years reflects the lack of new food waste collections/feedstock availability, fewer contracts for new plants, and falling tariffs.

In 2013 the Peacehaven sewage treatment works was the last new sewage treatment works we are aware of in the water sector that introduced new anaerobic digestion capacity to generate electricity.

Chart 11

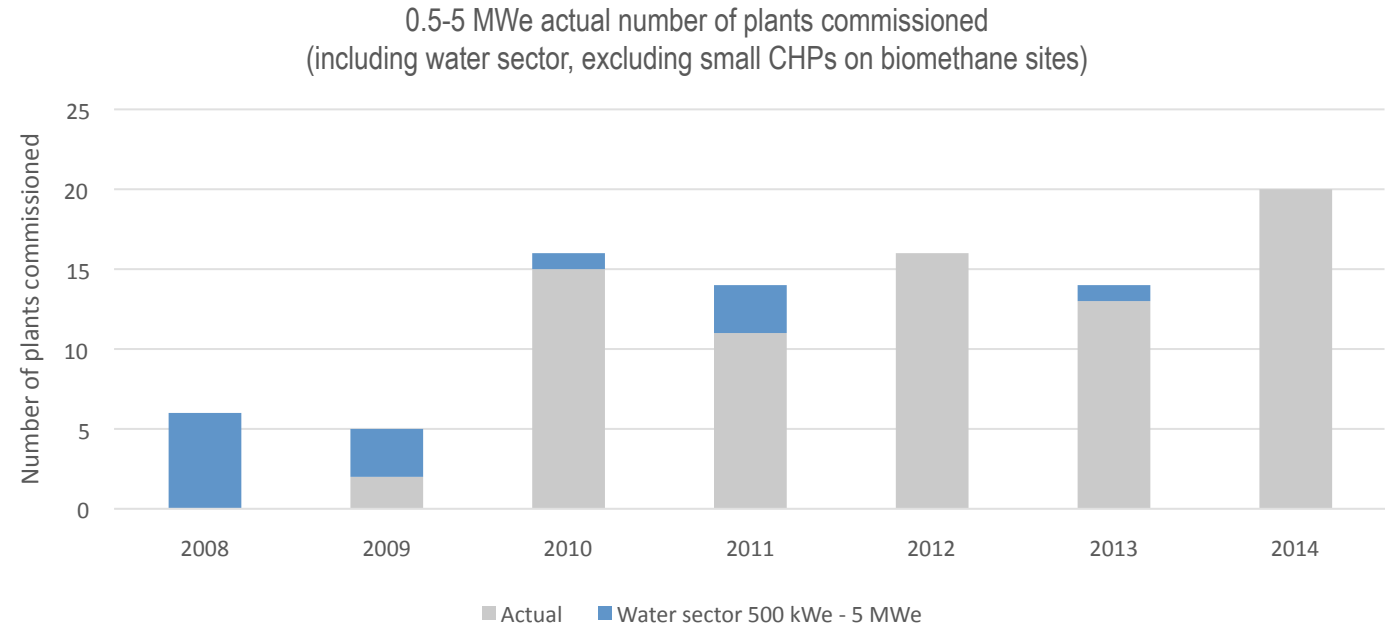
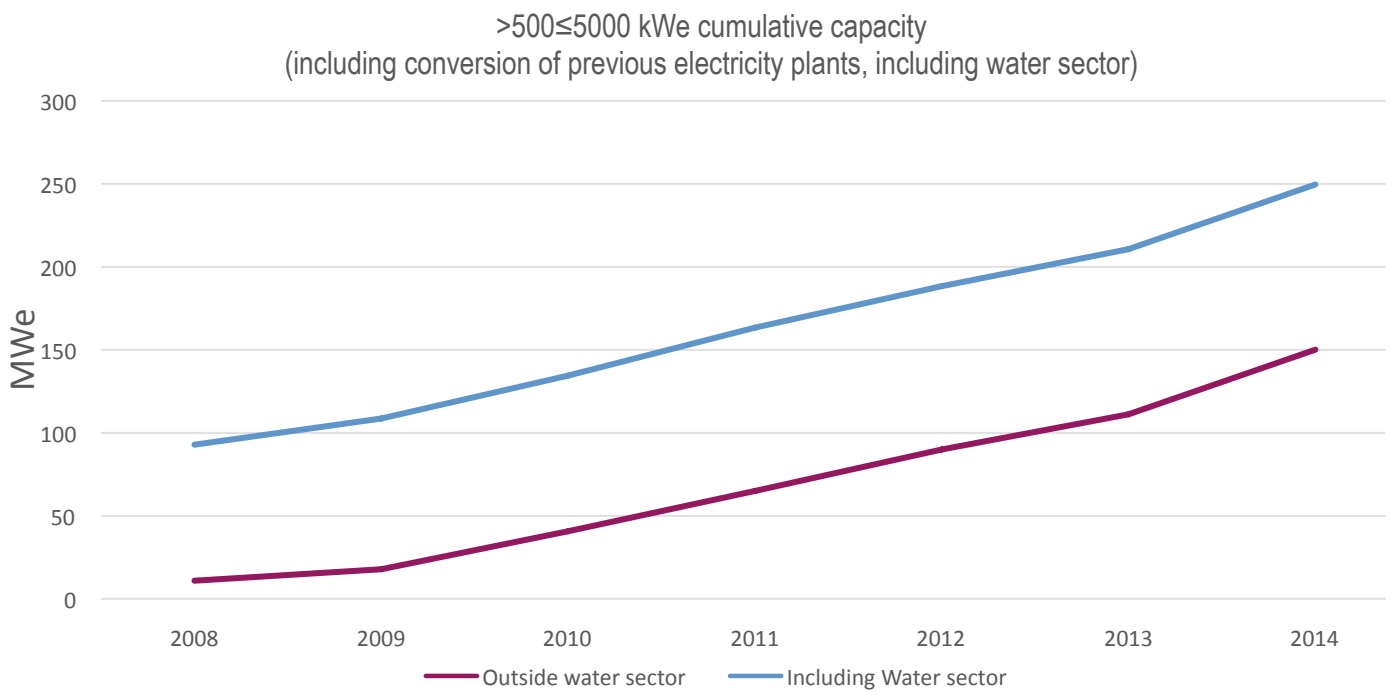


Chart 12 shows this in cumulative capacity terms.

Chart 12



3.7. Electricity >5 MWe

Just 11 AD electricity plants at this scale have ever been built (including eight in the water sector).

Plants above this category require hundreds of thousands of tonnes of feedstock and, outside the water and on-site industrial sectors, the complexity of feedstock sourcing and finding markets for digestate can start to outweigh the capital and operational cost savings from the economies of scale of larger plants. A much lower number of plants at this scale has, therefore, been developed.

Some of these plants are now being incentivised to add gas grid connections to claim the RHI: one outside the water sector, and three in the water sector to date (with more to come – see the planning information in chapter four). They may keep the existing electricity generating equipment until the end of their lifetime to provide different options to operators, with the choice of using electricity for on-site demand or exporting gas or electricity depending on market conditions. This demonstrates the flexibility of anaerobic digestion and methane as a source of energy – and the impact that government policy has on the actions of developers and operators.

4. Market projections

4.1. Whole AD industry

In 2015 we are expecting the number of operational plants to increase by approximately 79, to 481[3] (based on our 'Mid-point' scenario – see descriptions of scenarios below), and a further 48 in 2016. The ranges for these estimates in these years are ±20. This compares to an increase in 2014 of 102 plants, which was an exceptional year due to the reasons outlined below.

The policy environment has become more difficult for developers in 2015, with key factors including:

- Degression of the Feed-in Tariff rates, particularly below 500kW;
- Lower biomethane RHI tariffs for larger plants following the 2014 biomethane tariff review and 2015 degression;
- Tightening availability of food waste in the absence of policy favouring segregated collections in England (84% of the UK population);
- Uncertainty over the RHI budget from April 2016; and
- Uncertainty over the future implementation of sustainability criteria, particularly under the RHI.

In 2015 and 2016 these factors will impact deployment. In 2017 the effects of policy decisions taken in the winter of 2015/16 will have a real impact, so the sector could see higher growth, or decline to levels not seen since before the launch of the Feed-in Tariff in 2010.

Projection scenarios

Chart 13 illustrates this potential divergence in deployment. It includes 'High' and 'Low' forecasts for deployment. Under a 'High' scenario Government policy and other factors (financing, planning, feedstock availability etc.) encourage deployment, while under a 'Low' scenario these factors discourage investment. We also calculate the 'Mid-point' scenario, which is simply the halfway point between the 'High' and 'Low'.

We make the projections for five different category of plants (the same capacity categories and electricity/biomethane as outlined above), taking into account a number of different factors:

- Growth in previous years and change in policy/technology compared to those years;
- How many developers are submitting planning applications within the category;
- How many planning applications have been approved;
- DECC pre-accreditation data;
- Ofgem 'pending' FIT applications data;
- Which developers have received funding for construction, or are already constructing (based on what members are telling us and what announcements are being made);
- What impact changes in tariffs will have on deployment; and
- The impact of other Government policy such as on food waste collections and sustainability criteria.

Chart 13

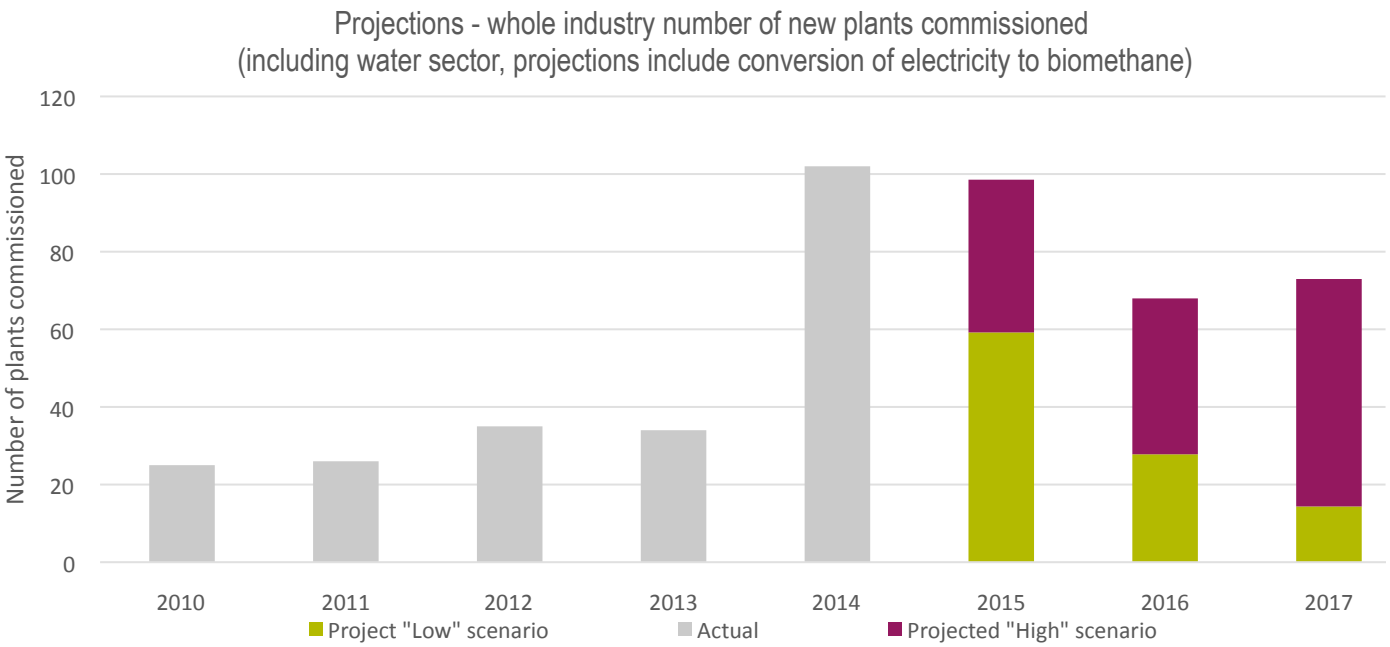


Chart 14 shows how the projections would impact on the **cumulative** number of plants in 2015. Here we take the "Mid-point" forecast between the "High" and "Low" scenarios outlined above. This shows a continued steady growth in the industry since 2010, continuing in 2015.

Chart 14

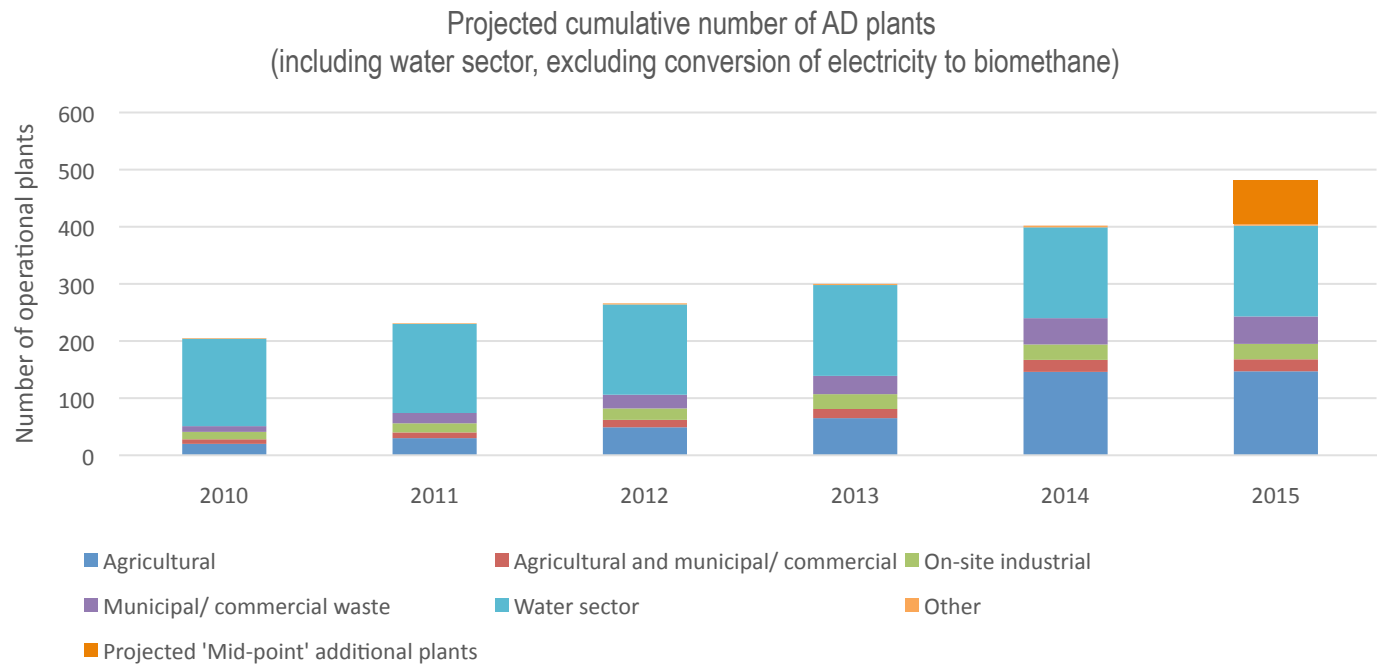
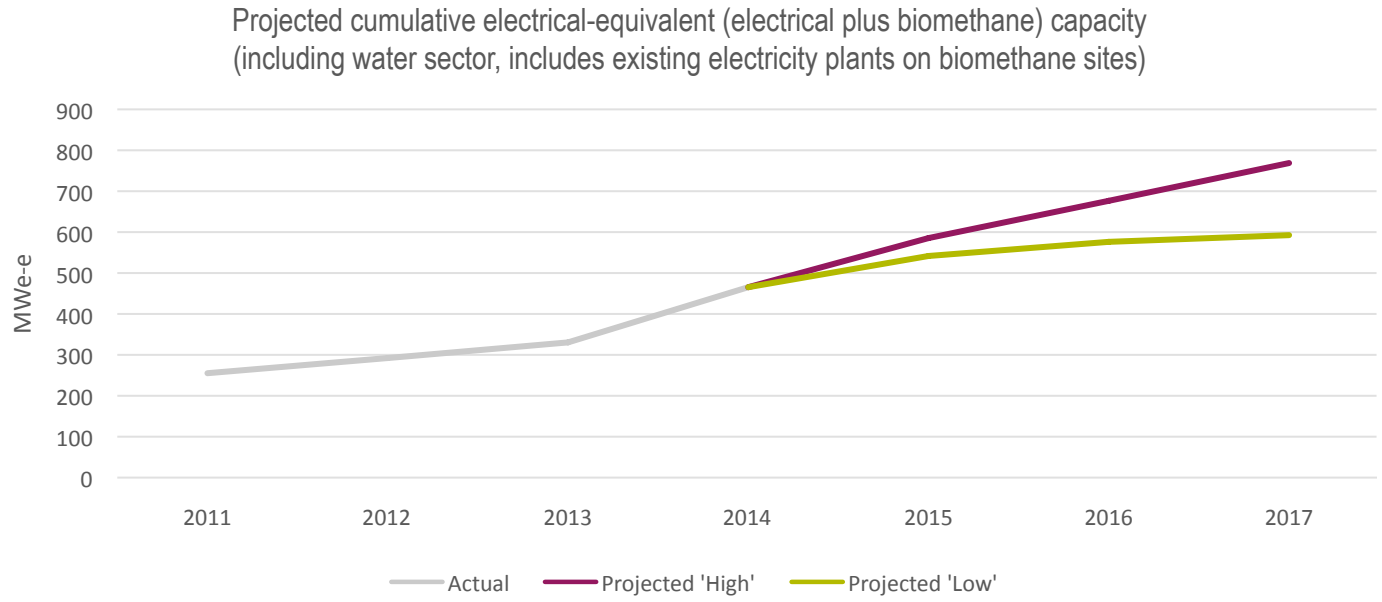


Chart 15 shows the whole sector projections in cumulative capacity terms: comparing the 'High' and 'Low' scenarios.

Chart 15



We now explain the forecasts for each category.

4. Market projections

4.2. Biomethane

A similar number of new biomethane plants are being built in 2015 as 2014, but as a result of changes to the tariff they are generally smaller. The overall increase in capacity will therefore be lower. Eight >1,000 m^3/hr plants were commissioned in 2014, compared to an expected three in 2015.

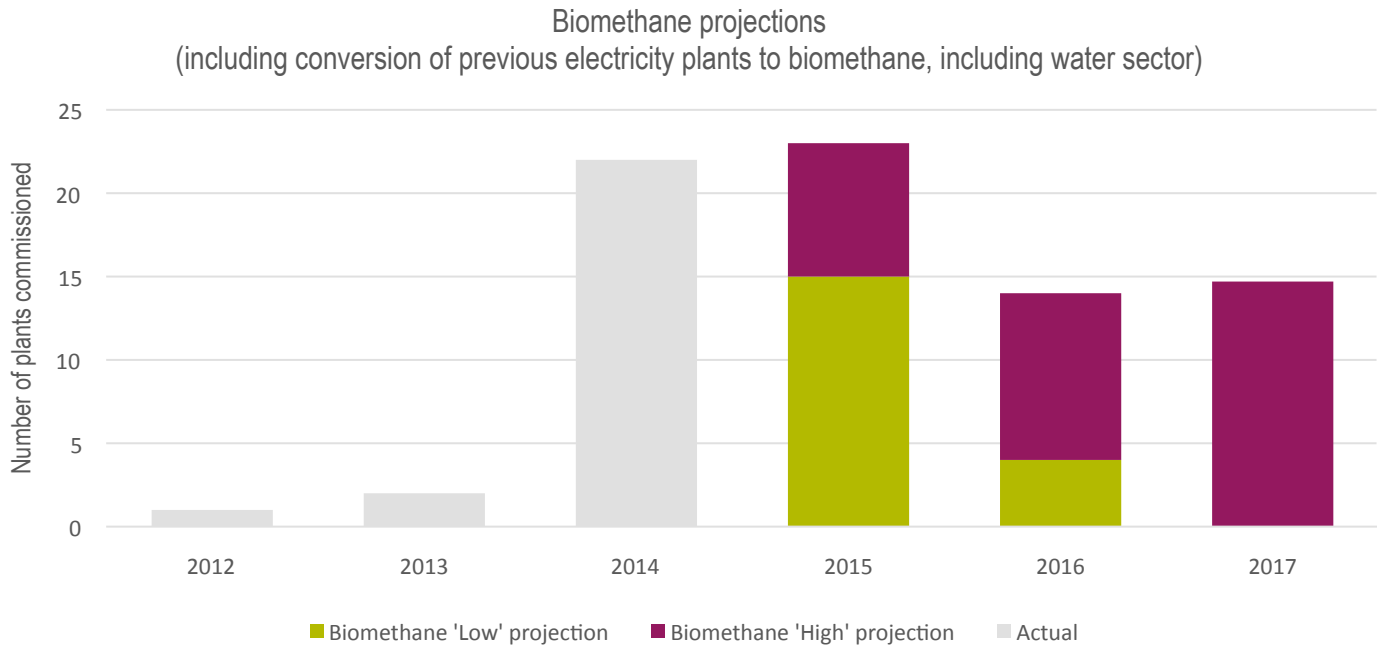
Growth this year could have been higher without the uncertainty created during the DECC biomethane tariff review held over the course of 2014. Although this has made some significant improvements to the scheme – in particular reflecting economies of scale for larger plants – it discouraged new investment until the outcome of the review was announced in December 2014. Government was also unclear for much of 2014 on what the maximum lifecycle greenhouse gas emission target was for complying with sustainability criteria, and how the criteria could be complied with. Uncertainty around the implementation of RHI sustainability criteria, and the absence of grandfathering for individual sites, continues to affect this market.

Since the start of 2015 there has also been uncertainty over the likelihood and scale of RHI tariff degressions. A degression took place on 1 January 2015, but was then effectively reversed by the implementation of the government response to the 2014 RHI biomethane tariff review. A degression of 5% took place on 1 July 2015 in line with expectations. A degression of 5-10% is likely on 1 October 2015 (ADBA's weekly email updates to members have our latest estimates on the likelihood of degression – in particular for 1 January 2016). It has been difficult for many developers to finance projects in this environment, as development times typically cover multiple degression points and therefore expose projects to the risk of much reduced tariffs.

The industry has maintained its growth in 2014 despite these challenges because the technology has been proven at all scales and using all suitable feedstocks. Industry, Government, funders and grid companies have also gained considerable expertise as a result of the growth in 2014.

In 2016 we expect up to six new biomethane plants to commission before 1 April. For plants expected to commission after that date developers and investors will be waiting to hear from the government what form, if any, the RHI will take, before making investment decisions. Government decisions will be made late this year (or even early 2016). So even if policy decisions are supportive, developers will only have 10-15 months to respond in order to turn decisions into new plants. Even in a 'High' scenario, therefore, we expect 2016 to be a difficult year for biomethane. 2017 will depend to an even greater extent on the decisions made, with no plants commissioning without an RHI tariff.

Chart 16



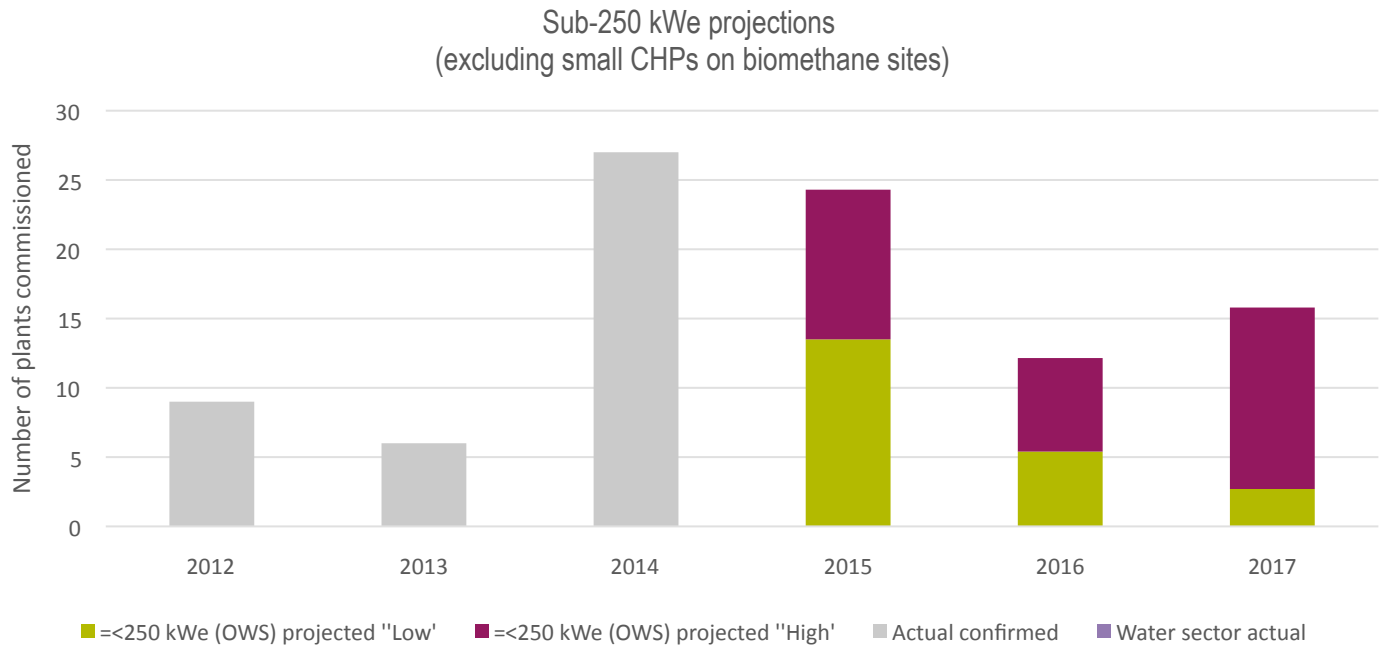
4.3. Electricity ≤250 kWe

The Feed-in Tariff degressions are having a significant impact on the number of plants commissioning at this scale in 2015, with the number of new plants commissioning falling by 10-50% compared to 2014 (see Feed-in Tariff data section below). The tariff rate for those pre-accrediting in September 2014 (meaning they need to commission within 12 months) is 12.66 p/ kWhe, and for those pre-accrediting in December 2014 11.39 p/ kWhe. This is 20% and 30% lower than the equivalent tariff for pre-accrediting in 2013 and commissioning in 2014.

The full effect of the degressions, however, will come in 2016 when tariffs will be 10.13 p/kWhe for those that pre-accredited by 30 September 2015. If no change is made to the tariffs for plants pre-accrediting beyond 30 September this year (a 10% degression on the 10.13 p/kWhe has already been confirmed for plants pre-accrediting after 1 October) then it is unlikely the industry will be able to deliver more than 5 plants per year from 1 October 2016 onwards.

2017 is therefore very much dependant on Government policy, as Chart 17 shows.

Chart 17



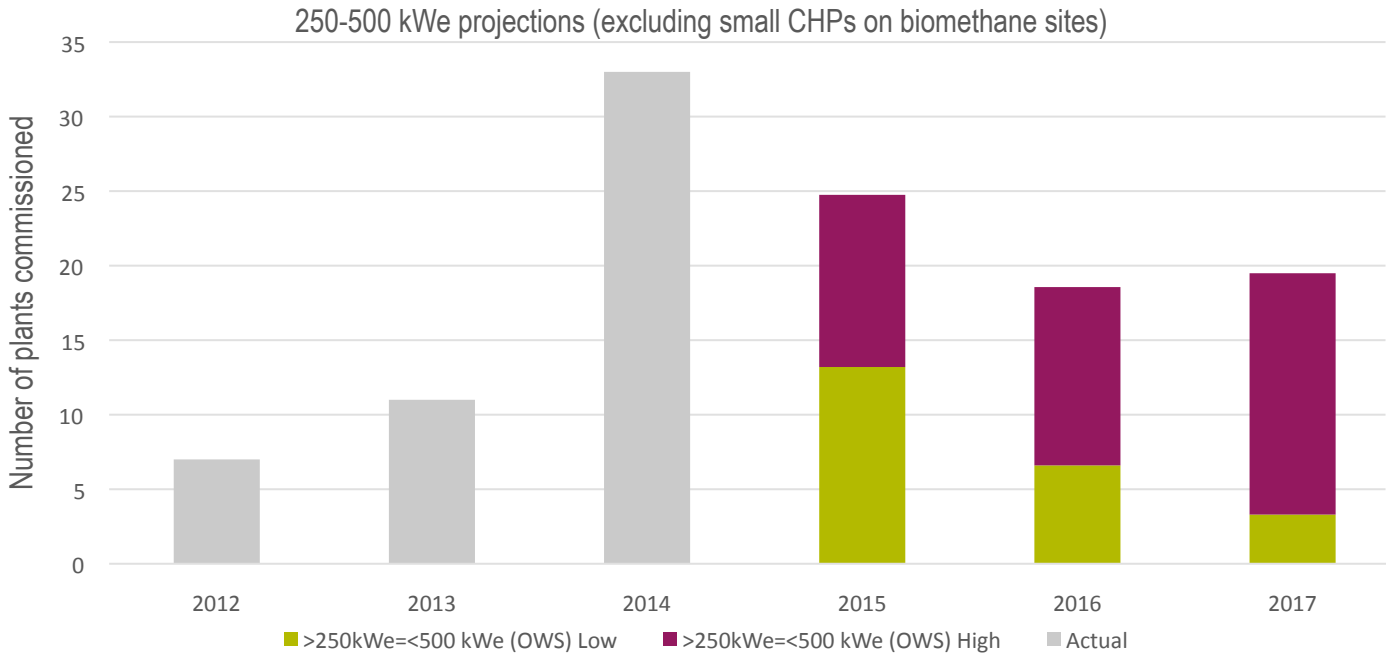
4. Market projections

4.4. Electricity >250≤500 kWe

This category is performing similarly to the under-250 kWe level[4]. Plants at both these scales are primarily agricultural (see chapter five). The benefits of the larger scale agricultural plants are the economies of scale that can be reached, with comparatively lower capital and operational costs per kWe installed and kWh generated. The challenges then become the complexity of feedstock sourcing, digestate management and planning applications that may need to be considered at this scale.

Chart 18 shows ADBA projections for this scale. Further detail can be found in the Feed-in Tariff section below.

Chart 18



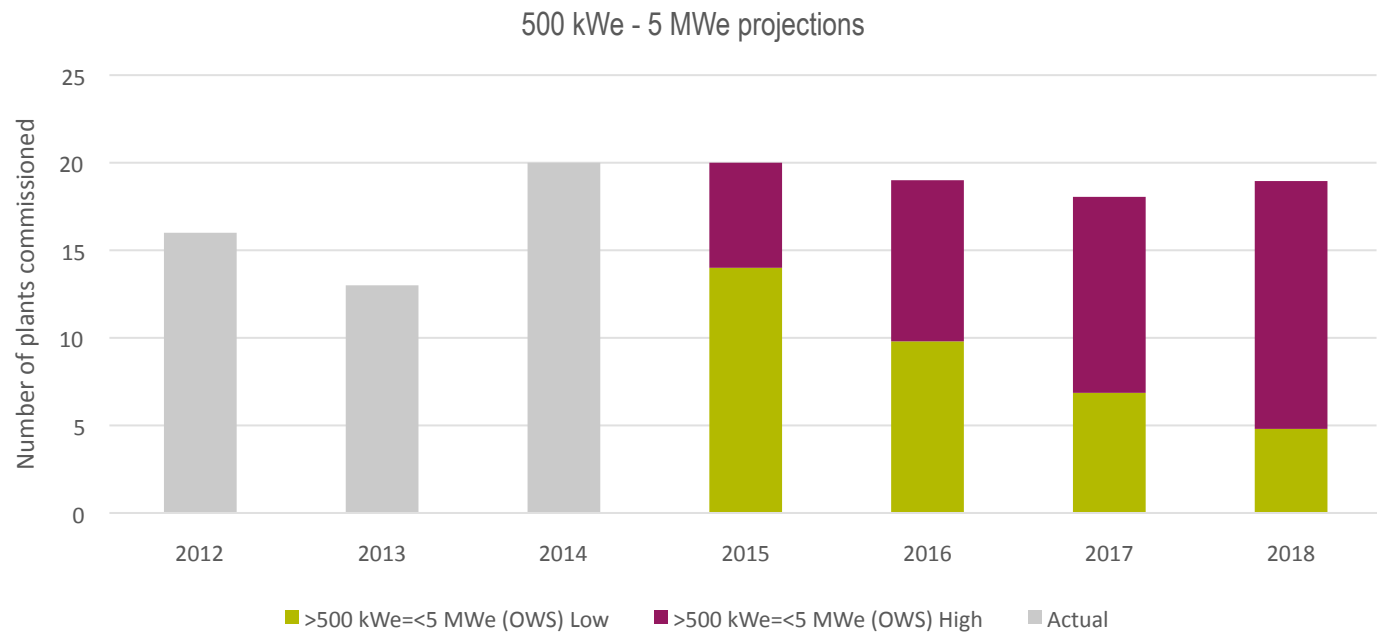
[4] It should be noted that some plants initially commissioning as 500kWe plants may increase their capacity at a later date and therefore move into a different category. Ofgem accreditations data indicates that 20 extensions to existing FITs installations have been made (of a total of 170 AD accreditations in total), of which 16 were across tariff boundaries.

4.5. Electricity >500 kWe ≤5 MWe

We have seen 12-20 plants in this category built each year since 2010, and we again expect a similar number in 2015. In 2016 and 2017 we expect this to start to fall due to low growth in the collection of food waste and the declining Feed-in Tariff. Even if a tariff trigger at this scale is not reached, the 500 kWe – 5 MWe tariff can be no higher than the 250-500 kWe tariff, which would effectively mean the larger scale tariff falling to 8.4 p/ kWhe on 1 October 2015 and following the lower tariff (degressing 20% per year/ ~10% every six months) from then.

In 2018 the downward trend could continue, although if central government gave a clear message on separate food waste collections for local councils then this could be towards the upper end of our projections below, which would see a continuation of the current numbers.

Chart 19



4.6. Electricity > 5 MWe

As outlined in chapter three, growth in the capacity above 5 MWe has been slow.

We are not expecting many plants to come forward under the Contract for Differences (CfD) policy the Government is offering for plants at this scale, although we have had two enquiries from members so this is certainly a consideration. Most, if not all, of the larger sewage sludge-based plants have also already installed energy generation equipment so there is limited potential there.

We, therefore, do not expect more than one plant at this scale being built each year. This may include some plants that have already been built at 3-4 MWe increasing their capacity if there is the opportunity to do so. There are 11 plants above 5 MWe with planning permission to build, but some of these have had planning permission for some years so may have taken the decision not to build.

4. Market projections

4.7. Planning data

Planning data (the number of plants submitting planning applications, and the numbers receiving approval) gives an excellent indication of how the industry will develop over the next couple of years.

469 plants are in the planning process. The following table breaks these down between those with planning approval and those that have submitted applications, and by capacity category[5]:

PROPOSED AD PLANTS					
	Number of electricity/ CHP plants	Potential installed capacity, MWe	Number of biomethane plants	Potential installed biomethane capacity, m^3/hr	Total number of plants
With planning application approved (not including extensions to existing schemes)	306	328	27	16,415	333
With planning application submitted (not including extensions to existing schemes)	134	168	2	1200	136
Total proposed	**440**	**496**	**29**	**17,615**	**469**
Operational non-sewage plants potentially converting to biomethane	N/A	N/A	2	1,500	N/A
Operational sewage plants potentially converting to biomethane	N/A	N/A	2	1,250	N/A

The following table shows this by feedstock sector:

PLANTS IN PLANNING BY FEEDSTOCK SECTORS				
Type of plant	Number of plants	Percentage of total	Number of plants	Percentage of total
Agricultural	241	72%	103	76%
Agricultural and municipal/ commercial	11	3%	2	1%
On-site industrial	16	5%	5	4%
Municipal/ commercial waste (includes residual waste MBT)	64	19%	26	19%
Water sector (none/ unknown)	0	0%	0	0%
Other	1	0%	0	0%
Total	333		136	

4.8. Feed-in Tariff data

Chart 20 shows Ofgem data on the number of plants in the Feed-in Tariff that had applied for, but not yet received, accreditation 31 December 2014. It is useful because it shows the number of plants at different scales that may receive accreditation (including preliminary accreditation) over the coming year(s), indicating market health and the likelihood of future tariff degression. For example, 27 plants in the 250-500 kWe range were in the process of pre-accrediting. They would then have 12 months (from the eligibility date) to commission their plants. It is a good indicator that the sector is still bringing plants forward. However, it is only part of the picture: Ofgem say the data is not fully reliable and may contain duplicates; many of these will be pre-accreditations for biomethane plants (so would not count in our definition of being small electricity plants scale because they are really smaller parts of larger installations); and, many will not go on to receive their preliminary or full accreditations. So we use the report as only one aspect when making projections.

[5] At least 84 sites have had planning permission to build since before 2013, of which 32 were before 2012. A significant number of these will not now be built. A significant further number have been abandoned altogether and have been removed from our database.

[6] www.gov.uk/government/statistics/roo-fit-pending-data-applications Ofgem highlight the caveats on this data.

Chart 20

Anaerobic Digestion	≤250kW		>250-500kW		>500kW-5MW		TOTAL		Extensions	
	Number	Capacity (MW)	Number	Capacity (MW)	Number	Capacity (MW)	Number	Capacity (MW)	Number	Capacity (MW)
Full applications received (not yet accredited	3	0.206	0	0	1	1.489	4	1.695	5	4.304
Preliminary applications received (not yet accredited)	25	4.916	27	13.284	9	18.128	61	36.328		
Preliminary applications converting to full (not counted against degression)	29	5.282	37	18.328	4	6.911	70	30.521		

The data can also shows trends from one year to the next. The number of preliminary applications made to Ofgem (and in the queue to be accredited) is an indication of the strength of the sector (although not all applications are made at the key deadlines each year and Ofgem may not take a similar amount of time to process the average application).

Chart 21 shows the number of preliminary applications 'with Ofgem' on 31 December 2014 as opposed to the equivalent date in 2013[7]. There are reductions at all scales: clearly the Feed-in Tariff degressions are having a significant impact on deployment: a reduction of 40% at the sub-250 kWe and 60% at the 250-500 kWe scale are indicated. This indicator does not account for the fact that in 2014 many pre-accreditation applications would have been made in September 2014. DECC and Ofgem do not publish this data so it is difficult to get the full picture of the trends.

Chart 21

Preliminary applications received (not yet accredited)	31/12/2013	31/12/2014
≤250kW	42	25
>250≤500kW	66	27
>500kW-5MW	18	9

A further item of DECC data also indicates a fall in deployment: the number of plants that have received preliminary or full accreditation in the first four months of 2015 has fallen 52% on the same period last year. Again, this does not account for the fact that many preliminary applications would have been made in September 2014 (and gaining pre-accreditation perhaps three months later). Therefore it does not show a full year-on-year comparison. If DECC and Ofgem showed the dates that all applications were made (other than when they are included in the FIT installations report – which only includes full applications) then the picture would be much clearer.

Chart 22

	2014				2015				2014	2015	
Number of Installations	January	February	March	April	January	February	March	April	Jan-Apr.	Jan-Apr.	% change
≤≤500 kW	7	17	23	16	8	16	6	0	63	30	-52%
Of which, is pre-accredited	6	16	18	15	8	16	6	0	55	30	-45%

4.9. Renewable Heat Incentive data

Although DECC (www.gov.uk/government/statistics/rhi-deployment-data-april-2015) and Ofgem (https://rhi.ofgem.gov.uk/Public/ExternalReportDetail.aspx?RP=RHIPublicReport) do publish data on the deployment on the RHI, the lack of a preliminary accreditation system that guarantees a tariff means that there is less incentive for developers to pre-accredit their plant to the RHI. This means the data does not provide much indication of what will commission over the coming years (e.g. just two biomethane plants are currently listed on DECC's data, a very low figure compared to the numbers we expect to come online).

[7] Government has removed past figures from the website but ADBA still hold these.

5. Feedstocks

5.1. Plants by feedstock category

Charts 23 and 24 show the number of operational plants in each of a number of different feedstock 'categories'[8]. The water industry has been the largest single sector of the market since the 1990s and continues to be so. However, as Chart 23 illustrates, over the last two years the agricultural sector has nearly trebled in size, making it the second largest sub-sector in terms of number of plants commissioned.

Chart 23

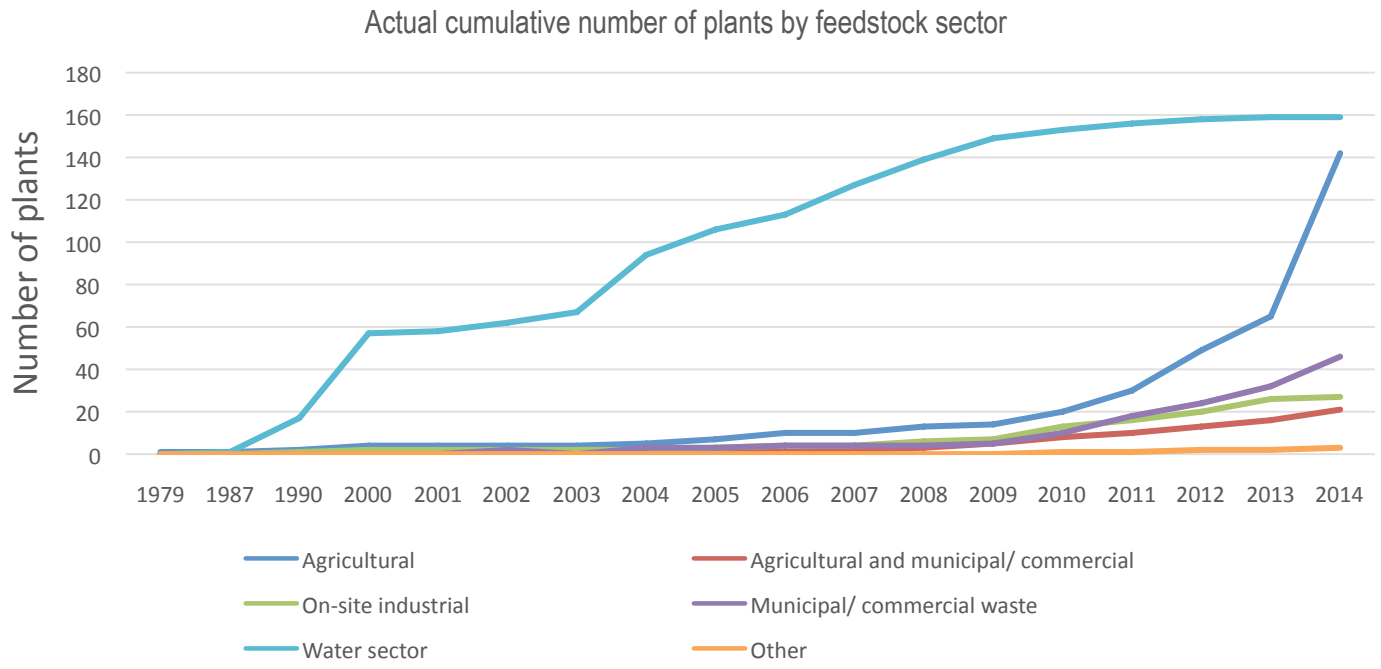
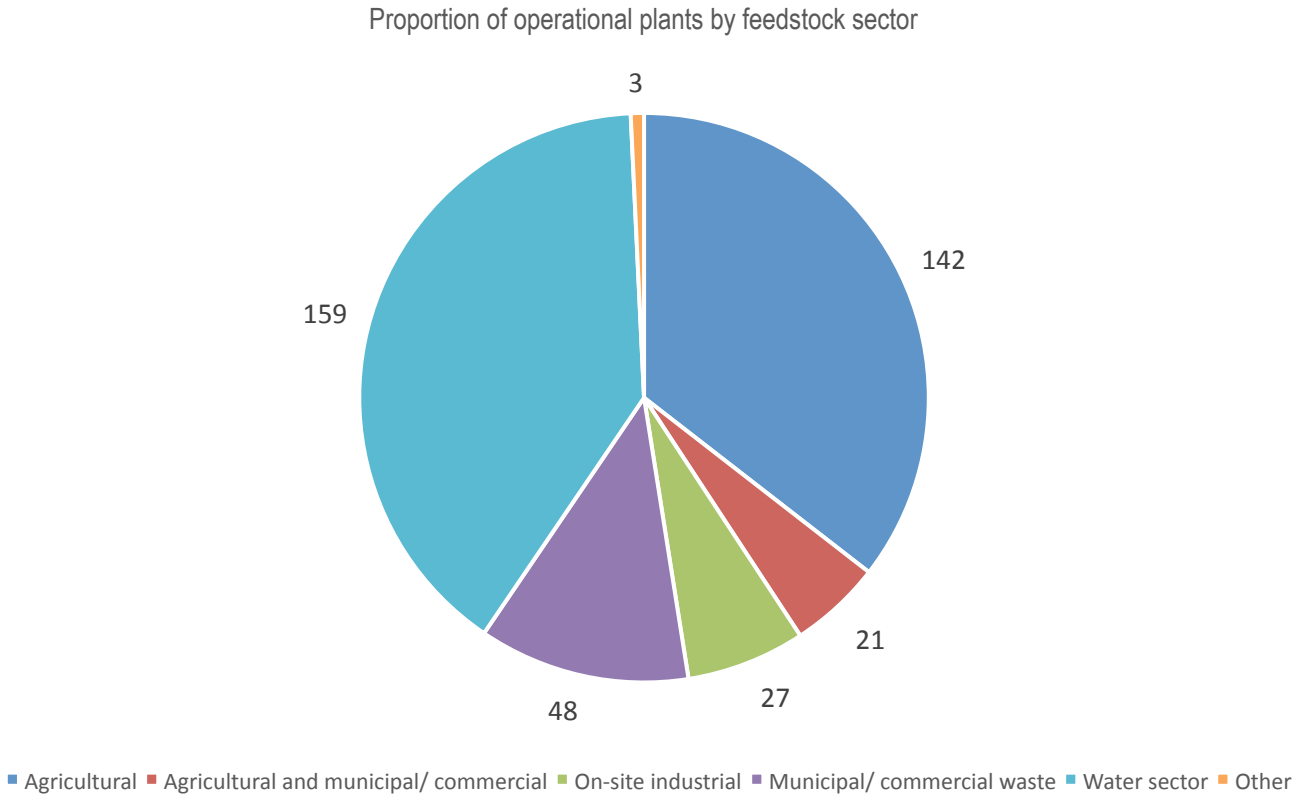


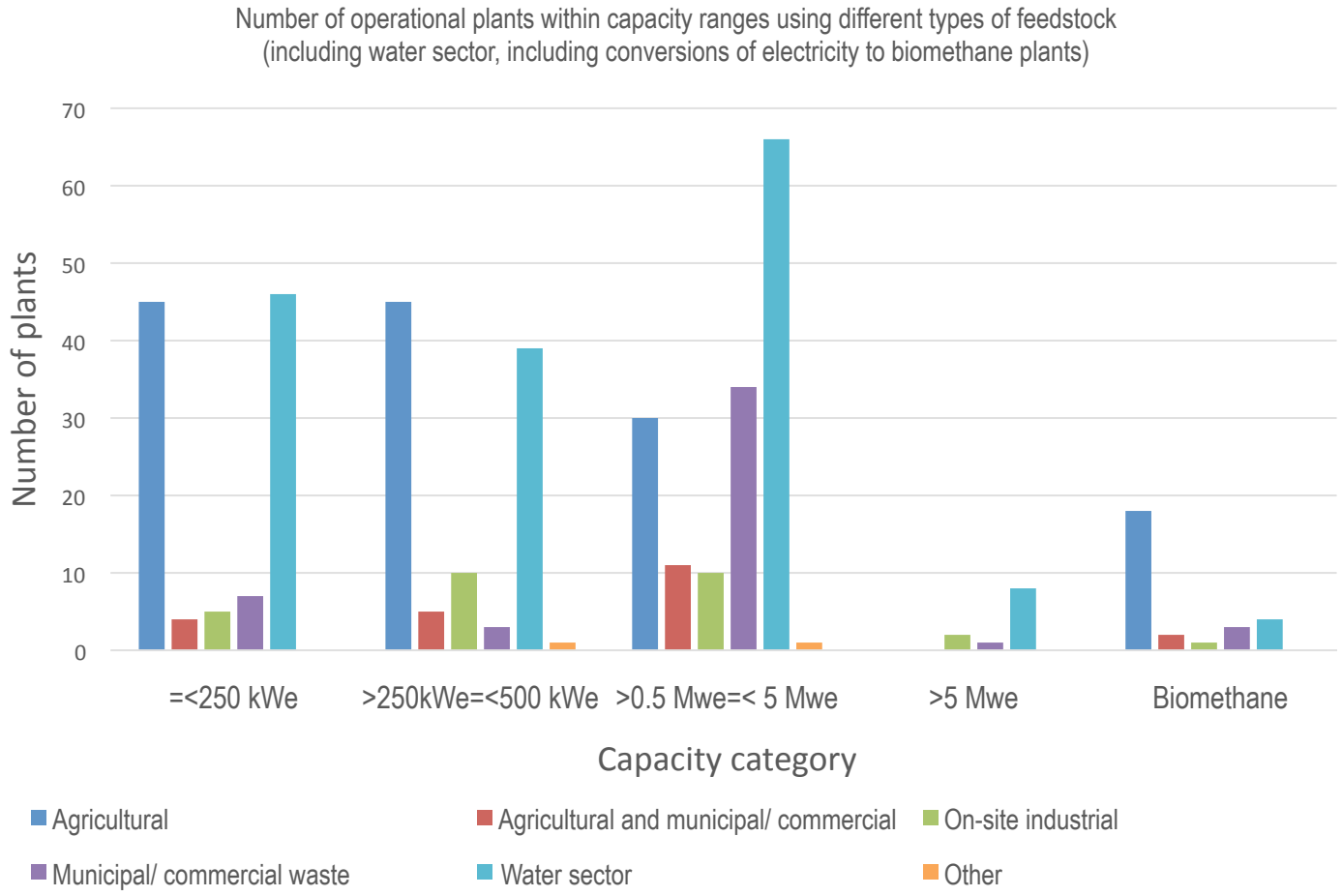
Chart 24



[8] Appendix 2 lists these categories.

The large growth in the number of agricultural plants reflects the performance of the sub-500 kWe sector discussed in chapter four, and the growth of biomethane plants. Municipal and commercial plants continued on a steady trend, doubling in numbers between the end of 2012 and today. Chart 25 shows the number of plants that have been commissioned in each capacity category by feedstock type. The smaller scale plants tend to be agricultural, and it is notable that biomethane plants (which are larger on average than electricity plants) are also primarily agricultural.

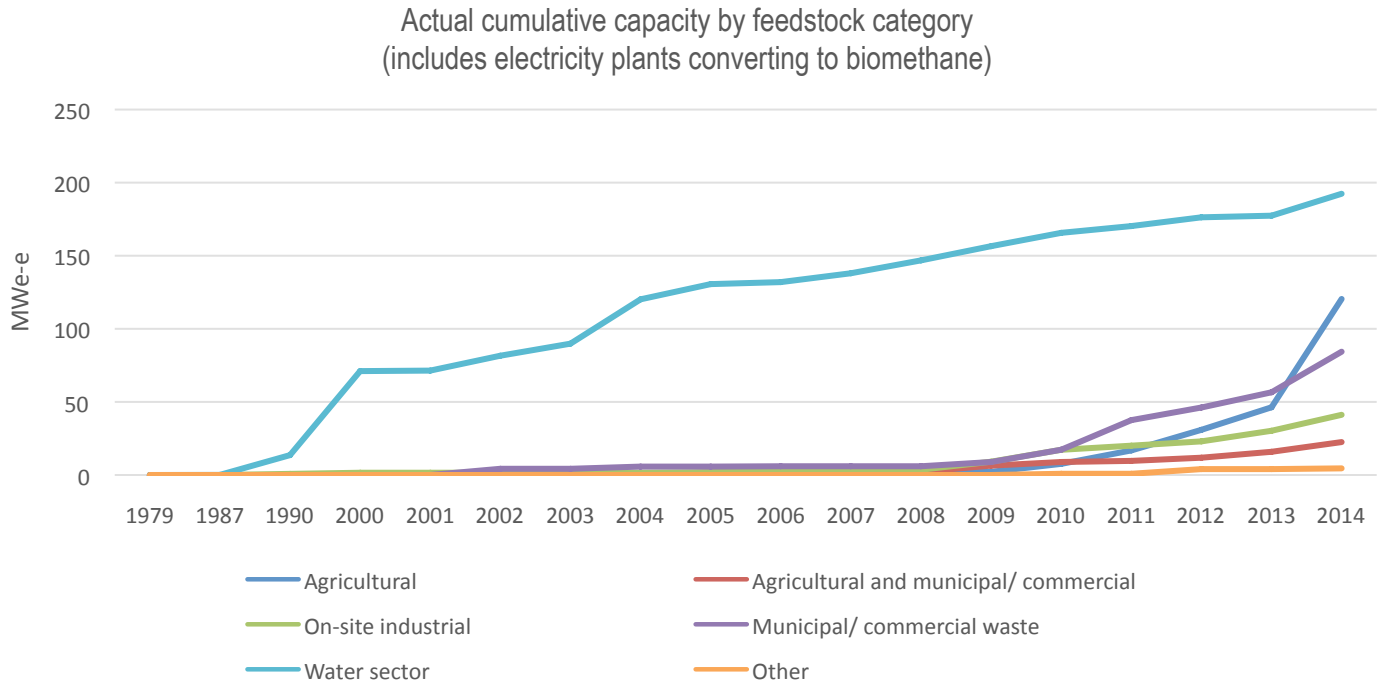
Chart 25



5. Feedstocks

As Chart 26 shows, the larger-scale agricultural (farm waste and crop) biomethane plants commissioning mean that agricultural-based plants now have a higher electrical-equivalent capacity than other sectors (except the water sector) as well as the larger number of plants.

Chart 26



5.2. Tonnes of feedstock used and projections

AD currently processes the following quantities of feedstock[10,11], (all tonnages are million wet tonnes[12]):

Farm waste (FW)	Industrial residues (ILW and ISW)	Crops (C)	Food waste (FDW)	Residual waste (RW)	Sewage Sludge (SS) rounded to nearest million
1.0	6.1	1.3	1.6	0.5	22.0

High liquid feedstocks

The feedstock tonnages are highest for industrial liquid residues and sewage sludge. This is due to their high liquid content relative to other feedstocks.

The Government estimates that 75%[12] of the 24-34 million wet tonnes of sewage sludge[13] is now processed through AD, and still increasing as existing treatment processes are maximised and expanding.

Industrial process residues include the liquid effluents from food and drink manufacturing that are treated on-site (ISW are the solid fraction of the residues produced). Digesting these liquid feedstocks allows food manufacturers to reduce discharges to sewers and capture energy for use on site. Coca-Cola, Heineken, Nestle, BV Dairy and other brands are all now using AD, and GlaxoSmithKline has also now made a planning application for an AD plant.

[9] We assume, in line with WRAP's organics survey, that operators use approximately 80% of the feedstock they have the potential permitted 'capacity' to use. In reality this will vary between different plants and sectors but we have made this assumption for simplicity. www.wrap.org.uk/content/survey-uk-anaerobic-digestion-industry-2013. All figures quoted are estimates based on available data.

[10] See appendix 2 for information descriptions of what is included in each category.

[11] These are the figures for the sector as currently operating (based on commissioned plants on our database). They will therefore be lower figures than our 2015 estimates (which include plants we expect to commission).

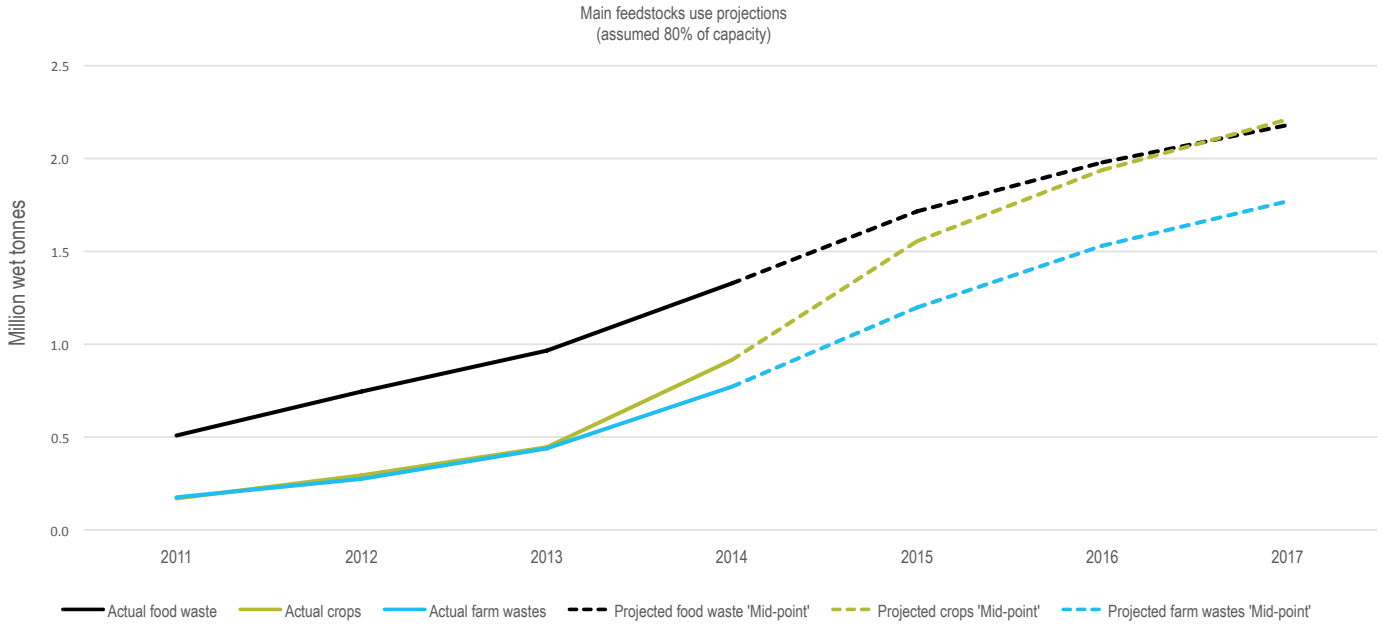
[12] www.gov.uk/government/uploads/system/uploads/attachment_data/file/69592/pb13811-waste-water-2012.pdf

[13] www.parliament.uk/documents/post/postpn387_anaerobic-digestion.pdf

Food waste

Food waste is the largest feedstock sector of the AD market (outside the high liquid feedstocks), with approximately 1.6 million tonnes of food waste being recycled by the sector. This grew strongly in 2014 as new capacity came on-line, and 2015 is also seeing an increase. Chart 27 shows this increase, but also shows our projections for 2016 and 2017, in which the use of food waste continues to increase slowly. This is based on our 'Mid-point' projection of plants (and their associated capacity and use) being constructed: between a 'High' scenario of England introducing more separate food waste collections and continued supportive RHI and FITs policies; and a 'Low' being the reverse of this.

Chart 27



Agricultural feedstocks

Crops are the second largest feedstock outside of the high liquids sector. As Chart 27 shows, the use of agricultural wastes and crops increased significantly in 2014. The use of farm waste and crops are complementary to each other, with just 20% (29) of the 147 agricultural plants operating using solely crop feedstock, and 80% using some combination of crop and farm waste/ farm waste only.

A number of agricultural biomethane plants came on-line in 2014. Average tariffs in the RHI have now come down for larger plants so we will not see as many larger agricultural-based biomethane plants as in 2014, which will limit growth in use of agricultural feedstocks. Potential FIT and RHI degressions, sustainability criteria and uncertainty over the RHI will all inhibit investment in the agricultural sector in 2016 and 2017.

Residual waste

The anaerobic digestion process is an important part of the mechanical biological treatment (MBT) of residual ('black bin bag') waste. The organic fraction is separated from general waste and used in an AD plant. Over 500,000 tonnes of the organic fraction is now processed through AD. The number of MBT plants depends more on the waste infrastructure planning and funding environment than on central Government renewables financial incentives. There are now seven plants using AD as part of an MBT and we expect one per year to be built for the next three years or so.

5. Feedstocks

5.3. WRAP survey of feedstocks

Each year WRAP undertakes a comprehensive survey of the industry (www.wrap.org.uk/content/ad-sees-significant-growth-says-latest-sector-survey) to capture the previous year's feedstock figures. This is an important survey for the industry and WRAP rely on the industry to participate to gather the maximum amount of data it can. We use this past WRAP feedstock data to sense check our own data. As outlined above, we also use data such as the proportion of feedstock capacity that is actually used for our own estimates.

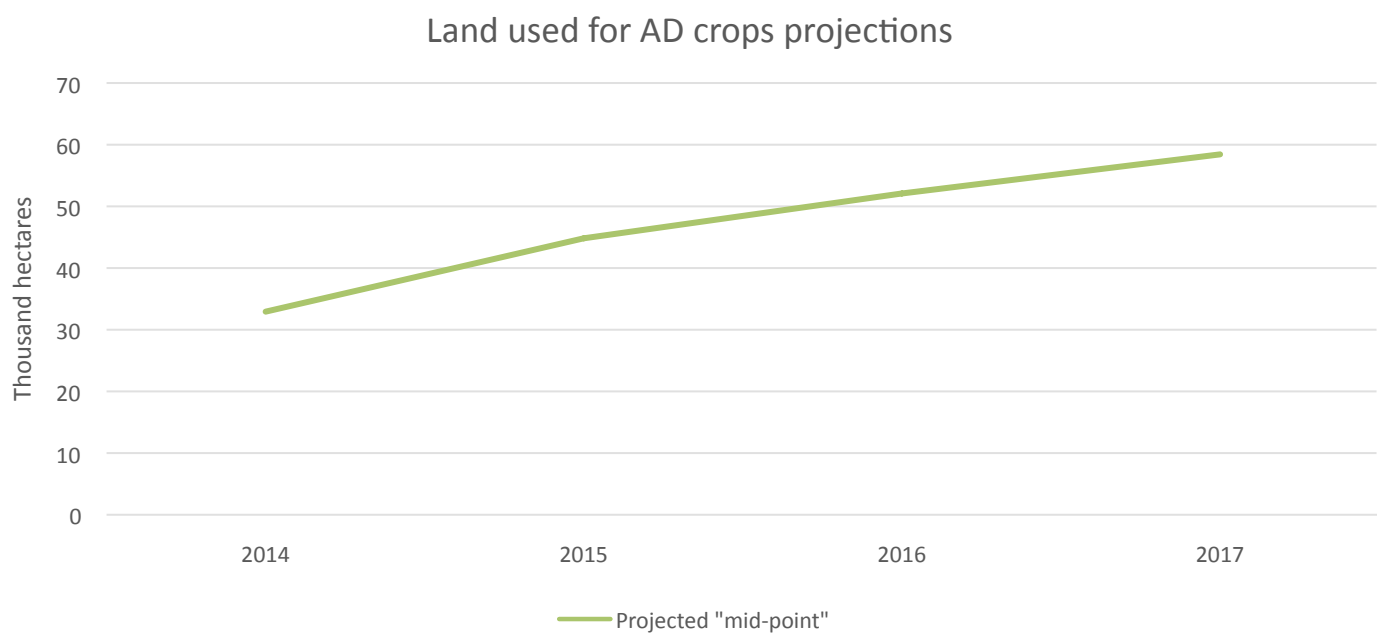
WRAP estimated that in 2013 1.1 million tonnes of food waste were used in AD, as well as 0.4 million tonnes of crop and 0.35 million tonnes of farm wastes. These align very closely to the ADBA data for 2013, which gives us confidence in our 2014 data.

5.4. Land use

As discussed in chapter four, we expect the recent growth in the agricultural sector to slow in 2016 and 2017. A "Mid-point" projection gives the hectares used to grow crops for AD outlined in Chart 28. The fields used to grow crops for AD change each year to integrate with food crop rotations designed to improve soil health and increase food crop yields. The crops include maize, grass, wheat and rye.

DEFRA publishes annually[14] a survey of areas of crops grown for bioenergy. The most recent of these stated that "At June 2014 maize being grown for AD accounted for 17% (29,373 hectares) of the total maize area in England….". The hectares figure correlates approximately with the ADBA numbers, although work is needed to collect data on the quantities of different crops used and the land used in Wales, Northern Ireland and Scotland.

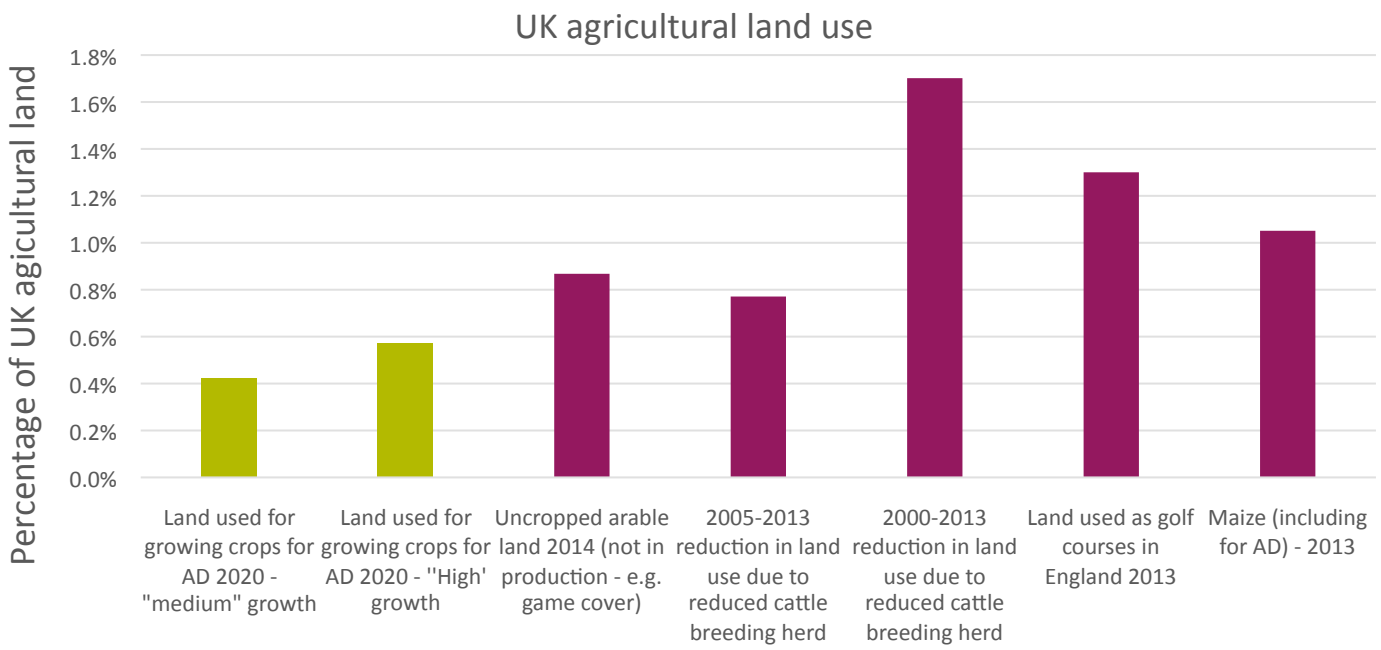
Chart 28



This 'High' ADBA projection continuing up to 2020 would result in land use for AD crops in 2020 of under 0.6% of the total UK agricultural land. Chart 29 compares this to other land uses.

[14] www.gov.uk/government/uploads/system/uploads/attachment_data/file/434098/nonfood-statsnotice2012-10jun15.pdf

Chart 29

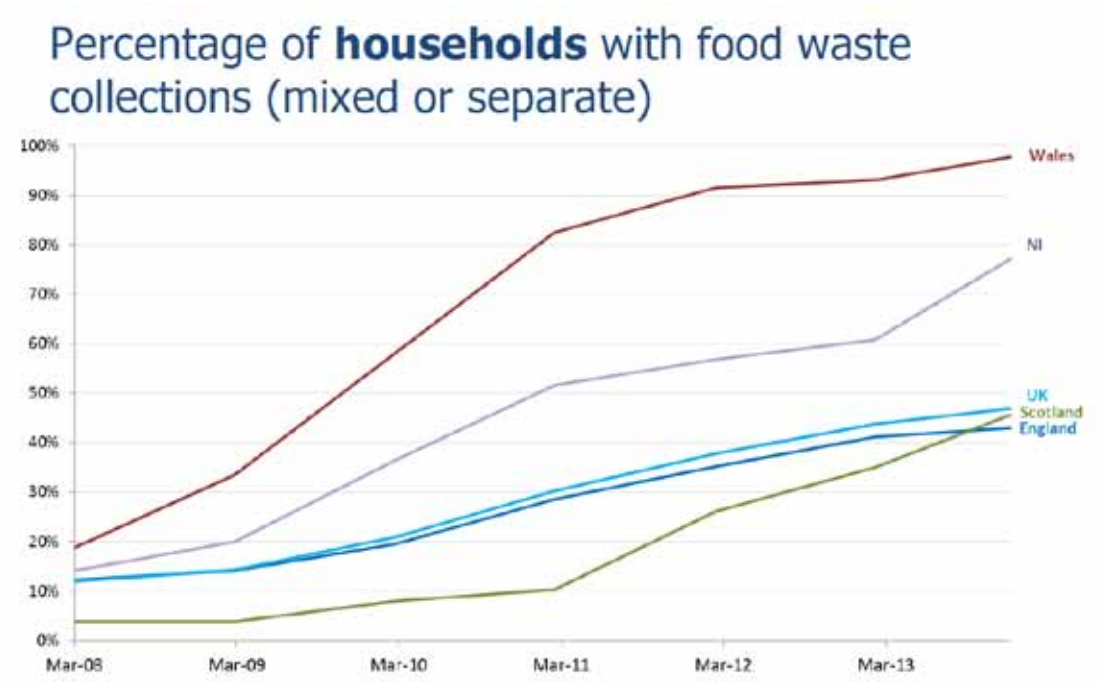


5.5. Separate food waste collections

The separate collection of food waste is key to enabling the AD industry to generate energy and return nutrients to farming. In Scotland, Northern Ireland and Wales separate collections of food waste have been increasing with new legislative requirements. In England that process has stalled, with 58% of households still not receiving any form of separate food waste collection (either on its own or mixed with garden waste).

Chart 30 from WRAP shows this lack of progress in England clearly – and does not take into account more recent roll-out of food waste collections in Scotland:

Chart 30



5. Feedstocks

5.6. Gate fees

Gate fees for receipt of packaged and unpackaged food waste have been falling in recent years. This is as a result of separate food waste collections not matching the increase in capacity of food waste AD plants. A huge range of gate fees exists in the industry, varying widely between regions, type of food waste, length of contract and the year in which the contract was signed.

In 2014 DECC assumed a gate fee of £15 per tonne of unpackaged food waste to calculate the tariff for new biomethane plants seeking to claim the RHI (using a levelised cost of generating energy model)[15]. This was assumed to be the average gate fee over the 20 year life of the plant. This £15 figure is lower than has previously been assumed by Government (the consultation was initially based on a £25 per tonne figure) and reflects the reduction in longer-term, council-led, fixed-term contracts that are being offered compared to 2-5 years ago. It was perhaps DECC's most difficult task for the tariff review to understand the industry's gate fees, reflecting the degree of sensitivity over the data and the rapidly-changing market conditions.

WRAP conducts an annual gate fee review (see www.wrap.org.uk/content/wrap-gate-fees-report-2014-0) and the numbers in that report are every year higher than the average gate fees that most AD food waste operators can actually negotiate. This is because, as the report states, the review is focussed on the gate fees paid by local authorities with existing contracts – so will not account for AD plants using non-local authority waste or for new plants being built that have not yet received food waste under these contracts.

[15] http://bit.ly/1Gxtp6v

6. Geographical breakdown

Here we present the breakdown by nation and county of AD plant data. Note that tonnes per annum are provided in capacity terms, not use.

6.1. By nation

6.1.1. Operational

Outside the water sector

The uptake of AD to date has been largely in-line with population in terms of the number of plants commissioned (and associated energy and feedstock capacity[16]) within each of the four nations of the UK. England has the largest number of plants, followed by Scotland, Northern Ireland and Wales. Scotland processes a proportionately high quantity of industrial wastes, largely from its strong distilling industry. Chart 31 highlights these main points.

Chart 31

OPERATIONAL DATA BY NATION – OUTSIDE WATER SECTOR						
	Number of plants	MWe	m^3/ hr	Agricultural tonnes per annum (capacity)	Industrial tonnes per annum (capacity)	Municipal/ commercial tonnes per annum (capacity)
England outside the water sector	198	170	14,416	2,539,371	4,604,896	2,321,096
Scotland outside the water sector	23	27	2,850	128,730	2,958,500	235,500
Wales outside the water sector	11	5	-	58,080	18,000	79,000
Northern Ireland outside the water sector	14	9	-	183,403	-	62,500
Total	**246**	**210**	**17,266**	**2,909,583**	**7,581,396**	**2,698,096**

Water sector

As Chart 32 shows, the water sector is notable for the slow uptake of AD by the Northern Irish and Scottish water industries, whose focus has been more on the incineration of sewage sludge than AD.

Chart 32

OPERATIONAL DATA BY NATION – WATER SECTOR				
	Number of plants	MWe	m^3/ hr	Sewage sludge tonnes per annum (capacity and use)
England water sector	141	171	4,350	20,460,480
Scotland water sector	4	6	-	738,360
Wales water sector	14	12	600	1,804,520
Northern Ireland water sector	-	-	-	-
Total	**159**	**189**	**4,950**	**23,003,360**

The Government's Digest of UK Energy Statistics[17] has a capacity in 2013 of 198 MWe for sewage gas plants so this is a close match.

[16] Please note that 'capacity' here refers to the maximum feedstock throughput of the plant annually. This is not to be confused with feedstock 'use', which is used in the feedstock sector.

[17] www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes

6. Geographical breakdown

Chart 33 shows the aggregated water and non-water sectors.

Chart 33

OPERATIONAL DATA BY NATION – INCLUDING WATER SECTOR							
	Number of plants	MWe	m^3/ hr	Agricultural tonnes) per annum (capacity)	Industrial tonnes per annum (capacity)	Municipal/ commercial tonnes per annum (capacity)	Sewage sludge tonnes per annum (capacity and use)
England including water sector	339	341	18,766	2,539,371	4,604,896	2,321,096	20,460,480
Scotland including water sector	27	33	2,850	128,730	2,958,500	235,500	738,360
Wales including water sector	25	17	600	58,080	18,000	79,000	1,804,520
Northern Ireland including water sector	14	9	-	183,403	-	62,500	-
Total	**405**	**399**	**22,216**	**2,909,583**	**7,581,396**	**2,698,096**	**23,003,360**

6.1.2. With planning

England has the most plants with planning permission. However, as Chart 34 shows, Northern Ireland has a notably high number of plants with planning permission to build. The Renewables Obligation incentive regime for Northern Ireland remains favourable for AD: however, not as many plants have been commissioned to reflect this, partly due to the difficulty of connecting to the electricity grid.

As the vast majority of sewage sludge is already treated through AD, there is not currently a large number of planning applications to build AD plants on **new sites** in the sector. So there is no planning data on this sector to list here. There is a focus for the water sector to increase capacity on existing sites and maximise the energy outputs.

Note that the municipal/ commercial tonnes per annum include the organic fraction of residual waste used in mechanical biological treatment plants with AD, so inflate the tonnages. Disaggregated data is available and can be provided to members.

Chart 34

PLANTS WITH PLANNING PERMISSION BY NATION						
	Number of plants	MWe	m^3/ hr	Agricultural tonnes per annum (capacity	Industrial tonnes per annum (capacity)	Municipal/commercial tonnes per annum (capacity)
England outside the water sector	197	239	13,615	2,861,564	1,691,200	3,037,774
Scotland outside the water sector	43	44	2,800	513,196	275,000	1,023,000
Wales outside the water sector	12	8	-	152,997	-	125,500
Northern Ireland outside the water sector	81	36	-	985,936	41,900	-
Total	**333**	**328**	**16,415**	**4,513,694**	**2,008,100**	**4,186,274**

6.1.3. Plants with submitted planning applications

Chart 35 shows the data by nation for plants that have submitted planning applications.

Chart 35

6.1.3.	PLANTS WITH SUBMITTED PLANNING APPLICATIONS					
	Number of plants	MWe	m^3/ hr	Agricultural tonnes per annum (capacity	Industrial tonnes per annum (capacity)	Municipal/commercial tonnes per annum (capacity)
England outside the water sector	104	136	700	1,401,677	140,000	768,500
Scotland outside the water sector	12	12	500	202,602	-	-
Wales outside the water sector	7	10	-	12,500	-	132,000
Northern Ireland outside the water sector	13	10	-	117,400	-	100,000
Total	**136**	**168**	**1,200**	**1,734,179**	**140,000**	**1,000,500**

6. Geographical breakdown

6.2. County level

6.2.1. County level data

Here we show the data showing the county-by-county snapshot of plants and their characteristics. First, outside the water sector and then the water sector:

SCOTLAND OUTSIDE THE WATER SECTOR

	Operational							
	Number of plants	MWe	m^3/ hr	Tonnes per annum capacity			Number of plants	MWe
				Agricultural	Industrial	Municipal/ commercial		
Aberdeenshire	0	0	0	0	0	0	3	1
Angus	0	0	0	0	0	0	1	0
Ayrshire	4	6	2,500	1,150	730,000	0	1	1
Banffshire	1	1	0	0	365,000	0	0	0
Central Scotland	1	1	0	15,000	15,000	0	0	0
Dumfries and Galloway	4	0	0	43,580	0	0	15	15
Edinburgh	1	3	0	0	900,000	0	0	0
Falkirk	0	0	0	0	0	0	1	1
Fife	2	7	0	0	474,000	40,000	1	0
Glasgow	0	0	0	0	0	0	2	1
Grampian	1	0	0	7,500	0	7,500	2	1
Highlands	0	0	0	0	0	0	2	1
Lothian	0	0	0	0	0	0	2	2
Morayshire	1	2	0	0	474,500	0	3	2
Orkney Islands	0	0	0	0	0	0	0	0
Perth and Kinross	3	1	350	51,000	0	16,000	1	1
Scotland - county unknown	0	0	0	0	0	0	1	0
South Lanarkshire	0	0	0	0	0	0	1	1
Scottish Borders	1	0	0	10,500	0	0	3	6
Strathclyde	3	6	0	0	0	165,000	4	13
Western Isles	1	0	0	0	0	7,000	0	0
Total	**23**	**27**	**2,850**	**128,730**	**2,958,500**	**235,500**	**43**	**44**

With planning				Application submitted					
	Tonnes per annum capacity			Number			Tonnes per annum capacity		
m^3/ hr	Agricultural	Industrial	Municipal/ commercial	of plants	MWe	m^3/ hr	Agricultural	Industrial	Municipal/ commercial
500	85,000	0	10,000	2	3	500	80,000	0	0
0	8,000	0	0	2	3	0	28,000	0	0
0	20,000	0	0	1	1	0	20,000	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	241,750	0	0	2	1	0	18,102	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	100,000	0	0	0	0	0	0
500	30,000	0	0	2	1	0	26,500	0	0
600	0	0	73,000	0	0	0	0	0	0
700	9,424	50,000	0	0	0	0	0	0	0
0	25,000	0	50,000	0	0	0	0	0	0
0	0	25,000	30,000	1	2	0	15,000	0	0
0	20,000	0	150,000	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	9,500	0	0	0	0	0	0	0	0
0	5,228	0	0	1	0	0	10,000	0	0
0	0	0	25,000	0	0	0	0	0	0
500	59,295	0	0	1	0	0	5,000	0	0
0	0	200,000	585,000	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
2,800	**513,196**	**275,000**	**1,023,000**	**12**	**12**	**500**	**202,602**	**0**	**0**

6. Geographical breakdown

ENGLAND OUTSIDE THE WATER SECTOR

	Operational							
	Number of plants	MWe	m^3/ hr	Tonnes per annum capacity			Number of plants	MWe
				Agricultural	Industrial	Municipal/ commercial		
Bedfordshire	3	3	0	30,000	0	40,010	0	0
Berkshire	0	0	0	0	0	0	0	0
Buckinghamshire	2	3	0	0	475,000	48,000	5	4
Cambridgeshire	6	7	1,100	164,000	985,000	38,000	2	4
Cheshire	3	0	1,231	23,000	0	120,000	3	2
Cornwall	2	0	500	7,000	109,500	7,000	4	3
Cumbria	9	3	0	156,437	0	0	9	9
Derbyshire	1	0	0	14,600	0	0	1	0
Devon	6	5	0	60,365	0	90,000	8	7
Dorset	7	4	400	101,106	500,000	18,500	4	3
Durham	3	4	0	40,702	0	50,000	1	1
East Yorkshire	3	3	0	14,315	20,000	50,000	8	6
Essex	2	3	0	20,000	0	45,000	4	11
Gloucestershire	7	4	0	108,057	0	40,000	2	2
Greater London	3	1	550	0	0	86,010	4	9
Greater Manchester	6	7	150	0	250,000	345,000	2	1
Hampshire	5	2	1,000	61,774	0	20,092	6	8
Herefordshire	10	5	0	131,850	250,000	0	9	4
Hertfordshire	3	4	0	30,000	0	45,000	3	6
Isle of Wight	1	0	600	25,000	0	0	1	1
Kent	2	1	400	40,000	0	0	6	8
Lancashire	7	6	0	37,078	10,146	210,000	1	2
Leicestershire	2	4	0	43,000	0	83,000	1	2
Lincolnshire	18	17	1,200	283,355	1,010,000	30,000	17	17
Norfolk	8	8	400	180,000	0	0	6	12
North Yorkshire	10	4	0	79,945	500,000	11,885	15	12
Northamptonshire	8	6	0	24,646	20,000	114,000	11	15
Northumberland	2	1	0	23,000	0	0	1	5
Nottinghamshire	3	7	0	101,500	0	24,500	6	7
Oxfordshire	5	5	300	30,000	100,000	100,000	2	3
Shropshire	13	7	0	143,598	0	12,000	8	5
Somerset	8	10	1,250	140,150	0	148,825	14	21
South Yorkshire	3	9	600	33,000	0	222,000	1	0
Staffordshire	4	8	0	10,268	18,000	145,000	1	2
Suffolk	8	7	1,885	192,525	34,250	23,775	3	9
Surrey	1	2	0	0	0	50,000	2	4
Tyne and Wear	1	0	0	0	73,000	0	2	4
Warwickshire	1	3	0	0	0	48,500	4	5
West Midlands	0	0	0	0	0	0	1	2
West Sussex	2	2	1,000	53,000	0	0	3	5
West Yorkshire	3	1	750	41,000	250,000	5,000	5	11
Wiltshire	4	3	0	26,500	0	50,000	3	2
Worcestershire	3	0	1,100	68,600	0	0	0	0
England - county unknown	0	0	0	0	0	0	8	6
Total	**198**	**170**	**14,416**	**2,539,371**	**4,604,896**	**2,321,096**	**197**	**239**

6. Geographical breakdown

With planning				Application submitted					
	Tonnes per annum capacity			Number			Tonnes per annum capacity		
m^3/ hr	Agricultural	Industrial	Municipal/ commercial	of plants	MWe	m^3/ hr	Agricultural	Industrial	Municipal/ commercial
0	0	0	0	0	0	0	0	0	0
0	0	0	0	2	2	0	45,000	0	0
0	13,256	0	203,000	1	3	0	0	0	50,000
1,000	160,000	0	0	4	1	0	23,300	0	0
0	115,600	0	0	2	3	0	15,000	0	15,000
0	59,924	0	0	2	2	0	27,500	0	0
600	126,850	358,400	0	3	2	0	40,000	0	0
0	9,000	0	0	0	0	0	0	0	0
1,000	129,301	86,500	47,500	3	3	0	66,500	0	0
0	62,827	0	55,000	1	1	0	10,000	0	0
0	0	0	16,000	0	0	0	0	0	0
850	84,091	40,000	250,000	0	0	0	0	0	0
0	78,750	0	130,000	2	5	0	89,000	0	0
500	35,000	0	30,000	3	4	0	30,000	0	45,000
2,000	0	0	315,000	3	7	0	30,000	0	35,000
0	0	6,300	10,000	0	0	0	0	0	0
0	102,600	0	136,600	2	3	0	30,000	0	0
0	88,681	0	0	2	1	0	20,405	0	0
0	5,000	0	128,500	0	0	0	0	0	0
0	0	0	9,424	0	0	0	0	0	0
0	28,095	930,000	145,000	2	1	0	28,650	0	0
0	0	0	45,000	1	4	0	70,000	0	0
0	20,000	0	0	3	3	0	20,000	40,000	0
700	401,760	40,000	0	6	3	0	65,100	0	0
1,165	98,424	100,000	50,000	4	4	0	45,000	0	15,000
1,600	159,107	0	282,250	4	4	0	87,000	0	0
500	163,800	0	222,500	4	5	0	45,000	0	55,000
0	15,000	0	15,000	3	3	0	55,000	0	0
500	156,000	0	0	1	1	0	15,000	0	0
0	18,500	0	40,000	1	1	0	15,000	0	0
0	121,287	0	0	7	6	0	93,222	0	7,500
0	162,741	20,000	224,000	2	2	0	0	0	30,000
0	6,595	0	0	0	0	0	0	0	0
0	30,000	0	0	2	2	0	45,000	0	0
0	85,000	80,000	0	3	6	0	50,000	40,000	0
0	0	0	65,000	3	13	0	0	0	211,000
500	30,000	0	70,000	1	3	0	0	0	70,000
500	47,600	0	95,000	1	1	0	25,000	0	0
0	0	0	195,000	0	0	0	0	0	0
0	28,760	0	60,000	1	1	0	10,000	0	0
0	65,605	0	113,000	1	2	0	20,000	0	0
700	70,000	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
1,500	82,411	30,000	85,000	24	35	700	286,000	60,000	235,000
13,615	**2,861,564**	**1,691,200**	**3,037,774**	**104**	**136**	**700**	**1,401,677**	**140,000**	**768,500**

6. Geographical breakdown

WALES OUTSIDE THE WATER SECTOR

	Operational							
	Number of plants	MWe	m^3/ hr	Tonnes per annum capacity: Agricultural	Industrial	Municipal/ commercial	Number of plants	MWe
Clwyd	2	1	0	10,800	0	26,500	1	0
Dyfed	2	0	0	100	0	1,500	1	1
Gwent	1	0	0	0	18,000	0	0	0
Gwynedd	1	1	0	0	0	11,000	1	0
Glamorgan	2	2	0	12,000	0	22,500	2	2
Powys	2	1	0	20,180	0	17,500	2	1
Wales - county unknown	1	0	0	15,000	0	0	5	5
Total	**11**	**5**	**0**	**58,080**	**18,000**	**79,000**	**12**	**8**

NORTHERN IRELAND OUTSIDE THE WATER SECTOR

	Operational							
	Number of plants	MWe	m^3/ hr	Tonnes per annum capacity: Agricultural	Industrial	Municipal/ commercial	Number of plants	MWe
County Antrim	3	1	0	51,500	0	0	12	5
County Armagh	1	0	0	4,500	0	0	8	3
County Down	2	0	0	17,000	0	0	10	4
County Fermanagh	0	0	0	0	0	0	7	3
County Londonderry	1	1	0	18,800	0	0	16	7
County Tyrone	5	3	0	56,603	0	12,500	28	13
Northern Ireland - county unknown	2	4	0	35,000	0	50,000	0	0
Total	**14**	**9**	**0**	**183,403**	**0**	**62,500**	**81**	**36**

With planning				Application submitted					
	Tonnes per annum capacity			Number			Tonnes per annum capacity		
m^3/ hr	Agricultural	Industrial	Municipal/ commercial	of plants	MWe	m^3/ hr	Agricultural	Industrial	Municipal/ commercial
0	5,000	0	0	0	0	0	0	0	0
0	10,500	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	25,000	0	0	0	0	0	0
0	86,000	0	35,000	2	3	0	0	0	30,000
0	11,600	0	0	1	1	0	10,000	0	0
0	39,897	0	65,500	4	7	0	2,500	0	102,000
0	**152,997**	**0**	**125,500**	**7**	**10**	**0**	**12,500**	**0**	**132,000**

With planning				Application submitted					
	Tonnes per annum capacity			Number			Tonnes per annum capacity		
m^3/ hr	Agricultural	Industrial	Municipal/ commercial	of plants	MWe	m^3/ hr	Agricultural	Industrial	Municipal/ commercial
0	141,425	0	0	3	1	0	15,000	0	10,000
0	100,865	0	0	2	1	0	20,000	0	0
0	137,048	0	0	4	2	0	40,000	0	0
0	93,619	0	0	0	0	0	0	0	0
0	156,602	41,900	0	1	1	0	10,000	0	0
0	356,377	0	0	1	1	0	12,400	0	0
0	0	0	0	2	5	0	20,000	0	90,000
0	**985,936**	**41,900**	**0**	**13**	**10**	**0**	**117,400**	**0**	**100,000**

6. Geographical breakdown

SCOTLAND WATER SECTOR				
	Operational			
	Number of plants	MWe	m^3/ hr	Sewage sludge tonnes per annum (capacity)
Aberdeenshire	1	2	0	220,800
Angus	1	1	0	60,120
Ayrshire	0	0	0	0
Banffshire	0	0	0	0
Central Scotland	0	0	0	0
Dumfries and Galloway	0	0	0	0
Edinburgh	1	4	0	425,040
Falkirk	0	0	0	0
Fife	0	0	0	0
Glasgow	0	0	0	0
Grampian	0	0	0	0
Highlands	0	0	0	0
Lothian	0	0	0	0
Morayshire	1	0	0	32,400
Orkney Islands	0	0	0	0
Perth and Kinross	0	0	0	0
Scotland - county unknown	0	0	0	0
South Lanarkshire	0	0	0	0
Scottish Borders	0	0	0	0
Strathclyde	0	0	0	0
Western Isles	0	0	0	0
Total	**4**	**6**	**0**	**738,360**

6. Geographical breakdown

ENGLAND WATER SECTOR	Operational			
	Number of plants	MWe	m^3/ hr	Sewage sludge tonnes per annum (capacity)
Bedfordshire	2	1	0	66,600
Berkshire	5	7	0	812,640
Buckinghamshire	1	2	0	295,440
Cambridgeshire	1	1	0	108,360
Cheshire	7	5	0	553,560
Cornwall	3	1	0	60,000
Cumbria	0	0	0	0
Derbyshire	4	4	0	423,840
Devon	5	1	0	144,000
Dorset	2	2	0	275,400
Durham	3	1	0	73,800
East Yorkshire	2	1	0	179,520
Essex	3	3	0	357,840
Gloucestershire	3	2	0	276,240
Greater London	3	21	0	2,550,000
Greater Manchester	0	0	0	0
Hampshire	4	4	0	447,720
Herefordshire	1	2	0	235,440
Hertfordshire	4	5	0	604,200
Isle of Wight	0	0	0	0
Kent	7	3	0	337,560
Lancashire	16	21	0	2,465,880
Leicestershire	4	4	0	495,600
Lincolnshire	3	1	0	173,760
Norfolk	2	5	0	580,320
North Yorkshire	5	6	0	666,000
Northamptonshire	1	4	0	499,680
Northumberland	1	0	0	9,600
Nottinghamshire	4	6	0	698,640
Oxfordshire	0	0	0	0
Shropshire	3	1	0	176,760
Somerset	2	7	1,750	789,600
South Yorkshire	6	2	0	202,080
Staffordshire	7	6	0	660,840
Suffolk	1	2	0	279,000
Surrey	3	2	0	299,760
Tyne and Wear	1	6	1,100	720,000
Warwickshire	6	14	750	1,644,720
West Midlands	0	0	0	0
West Sussex	0	0	0	0
West Yorkshire	4	3	0	329,400
Wiltshire	3	1	0	74,400
Worcestershire	3	2	0	247,560
England - county unknown	0	0	0	0
Total	**135**	**157**	**3,600**	**18,815,760**

6. Geographical breakdown

WALES WATER SECTOR	Operational			
	Number of plants	MWe	m^3/ hr	Sewage sludge tonnes per annum (capacity)
Clwyd	4	1	600	546,800
Dyfed	1	0	0	13,200
Gwent	0	0	0	0
Gwynedd	0	0	0	0
Glamorgan	7	10	0	1,210,080
Powys	2	0	0	34,440
Wales - county unknown	0	0	0	0
Total	**14**	**12**	**600**	**1,804,520**

NORTHERN IRELAND WATER SECTOR	Operational			
	Number of plants	MWe	m^3/ hr	Sewage sludge tonnes per annum (capacity)
County Antrim	0	0	0	0
County Armagh	0	0	0	0
County Down	0	0	0	0
County Fermanagh	0	0	0	0
County Londonderry	0	0	0	0
County Tyrone	0	0	0	0
Northern Ireland - county unknown	0	0	0	0
Total	**0**	**0**	**0**	**0**

7.1. Load factors

To estimate the amount of energy the industry is generating, and to help us assess the operational performance of the industry, we take the electrical and biomethane capacity of the industry (at the end of the previous year) and assume an average load factor across the industry to determine the likely generation.

The most recent Green Investment Bank (GIB) report on AD included an assessment of load factors[18]. It found that the non-water sector industry average was 71%, which is the load factor we assume for 2015. Plants built more recently, due to the improved experience of the sector, will generally have higher load factors than older plants. However, plants also take time to ramp-up to full capacity, meaning the load factors are initially low (especially when construction has taken place to meet a Government-set deadline). Therefore, we assume the 71% load factor for simplicity (except for sewage gas – see below).

DECC has made an assessment of load factors in the Feed-in Tariff scheme[19]. They suggest that the number of plants in the scheme is too low to give an accurate picture of the industry's load factors, but state that the median load factor in 2013 was 67%.

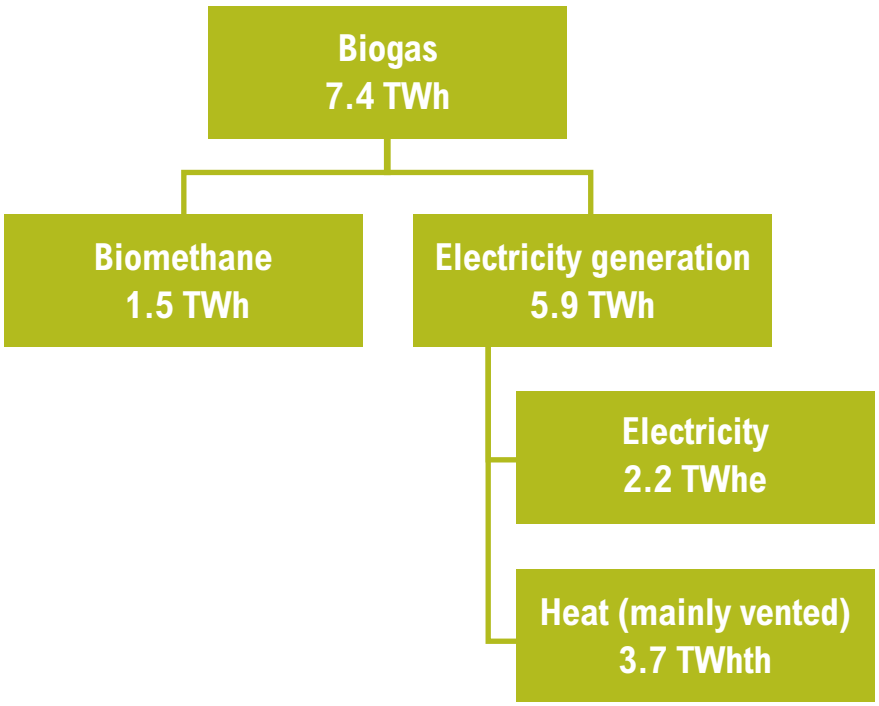
Government estimates sewage gas load factors at 51%[20], which we assume to be the best estimate available.

We believe that the industry can increase load factors over time, both with food waste plants accessing more food waste, and with improving operational performance across the sector. However, load factors are only one indicator of the performance of the industry.

7.2. Whole AD industry

Below we show a schematic of the methane the sector is producing and how it is being converted into its useable forms of energy[21]. 'Mid-point' 2015 projections are assumed.

Chart 36



[18] www.greeninvestmentbank.com/media/44758/gib-anaerobic-digestion-report-march-2015-final.pdf
[19] www.gov.uk/government/statistics/quarterly-and-annual-load-factors
[20] www.gov.uk/government/uploads/system/uploads/attachment_data/file/360517/ro.pdf
[21] An electrical-generating efficiency of 37% has been assumed.

7. Energy generation

7.3. Biomethane and electricity production/generation

Biomethane production in 2015 is ramping up as the plants commissioned at the end of 2014 reach full capacity. Using the capacities, load factors and high/low projections outlined previously in this document, biomethane injected in 2015 will be 1.3-1.7 TWh, rising to 1.9-2.6 TWh in 2016.

Electricity generation in 2015 is 2.1-2.3 TWh, rising to 2.3 -2.6 TWh in 2016. We expect this to increase not only in line with new plants coming online but also through improving load factors, efficiency and extensions to existing plants.

8.1. Current methane production

As outlined above, the industry is already producing approximately 7.4 TWh of methane, for use in both electricity generation and biomethane-to-grid.

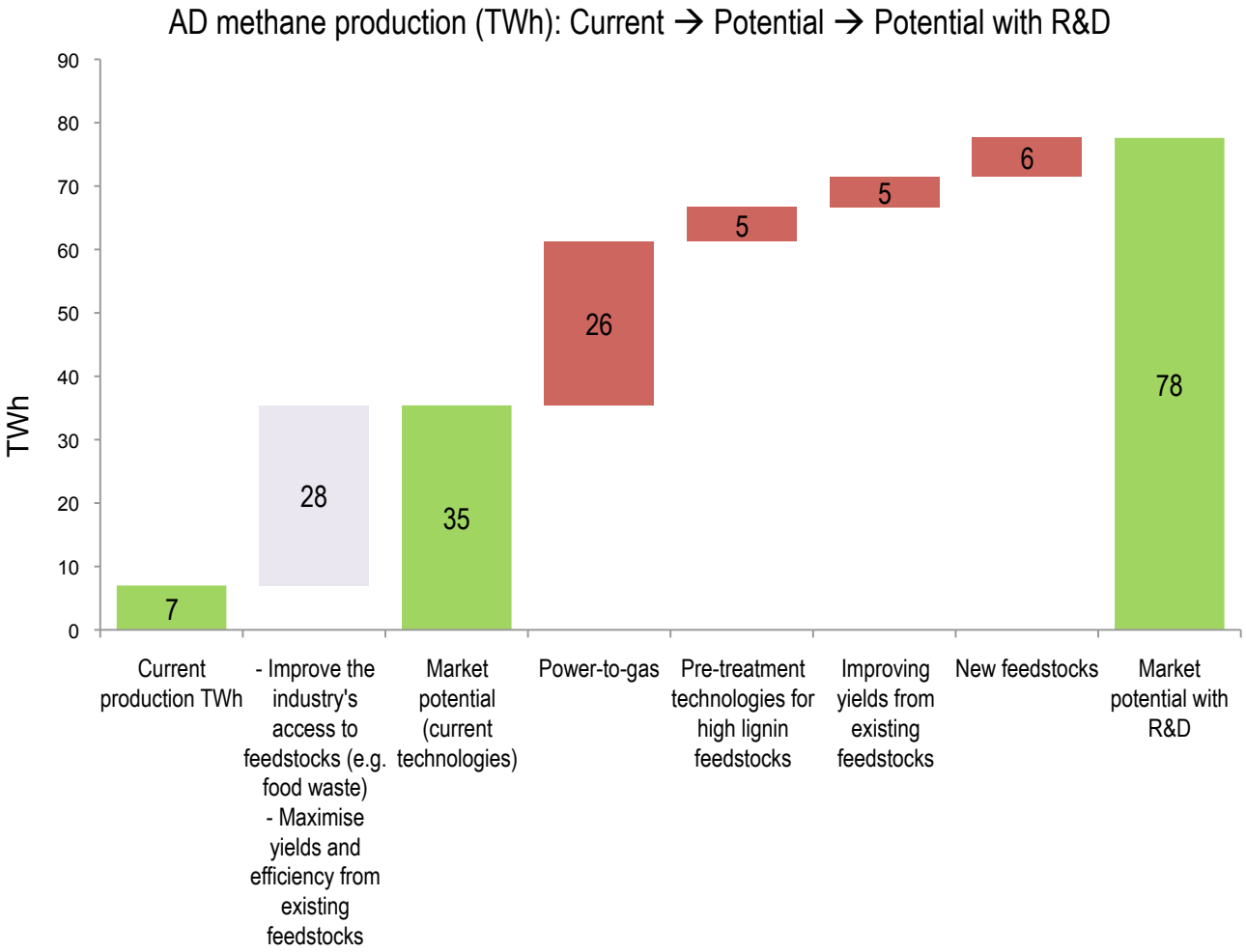
8.2. Potential production using existing technologies

We have previously estimated that the industry could, with supportive policies and a supportive broader environment (financing, public participation in food waste collections etc.), produce 35-40 TWh of methane[22].

8.3. Potential production with new technologies

At our R&D Forum held in April 2015 in association with the University of Southampton, the ADNetwork and the Knowledge Transfer Network (KTN), we asked leading academics to discuss, among other topics, how research and development could bring new feedstocks to the sector and how biogas yields could be improved for existing feedstocks. The event showed that current assumptions underestimate the potential when new technologies currently being commercialised are accounted for. Chart 37 shows how this potential with new technologies can be 'bridged' from the existing rate.

Chart 37



To achieve the 35-40 TWh by 2025 would require supportive and stable Government policy over the period in areas like financial incentives and food waste collections. Achieving the 78 TWh would require Government or private investment in research and development, particularly at the demonstration phase, to allow the gap to be bridged.

[22] See presentations from AD&Biogas 2014 http://bit.ly/1TNdivy

9. Investment, jobs and exports

9.1. Investment

Using capital cost data per MWe[23] (or biomethane equivalent) we have estimated the amount of investment that is taking place in the sector each year (most of which is invested in constructing new AD plants).

In 2015 this is between £330m-£520m, which is down on £580m in 2014. This reflects the lower projections for the number of plants built in the year, although in reality construction will of course run between years.

Expenditure on operations and maintenance is increasing each year, reaching approximately £160m-£180m in 2015[24]. We expect this expenditure to increase by £5m- £30m per year for the next five years, reaching £190m-£330m in 2020.

9.2. Exports

We have surveyed members to assess the amount of exports the UK AD sector is undertaking to other countries. We found a number of UK-based companies were exporting expertise and equipment (most respondents asked us to keep the information confidential). The value of these exports to the UK economy is already in the region of £50m-£100m at a minimum and growing.

It is hard to assess how this will change in future, but it is clear that the Government financial support that has been provided to the AD sector through schemes such as the Feed-in Tariff has led to UK companies using that base to become world leaders in their field, resulting in benefits to the UK economy.

We estimate, based on a simple calculation of: global population, the potential for certain regions to take up AD, the proportion of equipment and expertise likely to be provided locally, and the share of imports to those countries that the UK could provide, that the UK AD sector could export £0.6-£2.2bn per year. So £50m-£100m is only a small part of the potential. German companies are currently exporting more than this.

9.3. Market value

Adding the capital expenditure being undertaken to the operational expenditure and export value gives us the 'market value' of the AD sector. The overall value of the market will be approximately £700m in 2015. The size of the AD market could continue to be £500m per year in the coming years, assuming the industry contracts in terms of number of new plants built each year.

9.4. Jobs

Using a methodology developed by the NNFCC for the Government (http://bit.ly/1TNdzyE), and adjusting for some other parameters such as manufacturing, we track the number of full-time-equivalent jobs in the sector. This includes those jobs in construction and in operation of plants, as well as those in the manufacturing sector (e.g. producing tanks and CHP systems). We estimate there to be 4,500 jobs in the sector, which we expect to continue in the coming years (with fewer in the construction sector, but more in the ongoing maintenance sector).

The potential for the number of jobs in the sector is 35,000 over a 10 year period, followed by a lower number of longer-term permanent operational jobs. This assumes the sector grows at its higher possible rate rather than the current estimations.

[23] SeWe have assumed a capital cost of £4.3m per 1 MWe-e (based on cost data provided by members and publicly available). Cost data varies widely in the sector between different types of project (capacity, feedstock etc.). This approximate figure is used only for estimating overall market value and should not be used for other purposes.

[24] Assumes £300k/ MWe-e operating cost on average across all feedstocks (excluding feedstock costs/ gate fees).

Appendix 1: Disclaimer and notes on data

Plant database

ADBA holds a database of each AD plant operating and in the planning process. We collect the data from a number of sources, including planning information (e.g. the Government's Renewable Energy Planning Database), RO/FIT/ RHI/ REGOs databases, WRAP's online database, local online news articles and information provided by members.

This forms the basis of much of the information contained in this document, and is available to members.

Accuracy

While we have made every effort to check the accuracy of all the data in this document, we cannot guarantee its accuracy and are not responsible in any way for the way it is used by readers.

Estimates

Where a particular data item is unknown, we use other characteristics about the plant to estimate that item. For example, if we know the feedstock tonnages of a plant but not the electrical capacity, we will use standard data to estimate the capacity. This is to ensure that the overall industry figures are as realistic as possible and not underestimated. All estimates are highlighted red in the spreadsheet on the Market Analysis page of our website. Estimates account for approximately 20% of the data used.

Projections

We make projections on the possible number of plants that may commission each year (and other data that is calculated from this) depending on policy scenarios. Any projections of this kind are highly uncertain. They are a 'best guess' as to what may happen given the environment the industry is working in. Our projections change frequently (usually every three months) as the market develops. They are intended to give a guide as to what may happen under a number of different scenarios.

Appendix 2: Feedstock categories

We divide all feedstocks used into three 'primary' categories and 10 more 'detailed' categories. Please note that none of these are intended to relate in any way to categories for regulatory or other purposes. They are categorised solely for the basis of how data appears in the planning applications and so how easy this is to categorise.

Primary categories

Agricultural	Feedstocks originating from farms, including crops grown for the purpose of being used in an AD plant, manures and slurries from farm animals, waste crops with no market, vegetable outgrades where these have not left the farm (including from packhouses or greenhouses), vegetable waste and horticultural waste.
Municipal/ commercial wastes/ residues	Feedstocks originating from local council collections or collections from businesses. These include food waste collected from households, food wastes collected from businesses such as food processors or the hospitality industry (e.g. restaurants, schools, supermarkets), fruit and vegetable outgrades where these are generated at sites off farms, the organic fraction of general/residual household waste where this waste is processed at a Mechanical Biological Treatment (MBT) plant using anaerobic digestion in the process and garden waste (which might be used in a 'dry' AD plant).
On-site industrial	These are the food processing residues that are produced and treated on the same site. For example, a brewery may produce a by-product that is treated by AD at the brewery itself. We would categorise these as on-site industrial plants. They may not have as many contamination or waste collection or delivery complexities as commercial food waste plants. Where the by-products are liquid effluents, there may also be vast amounts of feedstocks (in the millions of tonnes) producing relatively small amounts of energy.
Sewage sludge	The separated solid fraction of waste water separated at water treatment works.

See below how these are broken down into more detailed categories and the keys used in tables throughout the document.

Feedstocks key (these do not indicate categories for regulatory purposes)

Code	Description	'Primary' category
FW	Farm waste/residues (e.g. manure, slurry, straw, mushroom waste, horticultural waste, waste from vegetable sorting and packing, outgrade vegetables pre-packed)	Agricultural
ILW	Industrial liquid waste/ residues (e.g. effluent)	Industrial
SS	Sewage waste	Sewage sludge
GW	Garden waste/residues (including park waste, local amenity waste, organic street sweepings, airport grass cuttings etc.)	Municipal/ commercial
C	Crop	Agricultural
FDW	Food waste (source segregated, packaged food waste, industrial organic waste taken off-site to AD etc.)	Municipal/ commercial
RW	Residual waste - organic fraction (mechanically separated)	Municipal/ commercial
G	Glycerol	Municipal/ commercial
ISW	Industrial on-site generated solid waste/ residues (e.g. brewery solid waste, food manufacturing organic wastes - potato skins cut at factory, carrot tops cut at factory, fish waste from fish processing etc.)	Industrial
TEST	Test facility - variety of feedstocks used by test laboratories etc.	Various

ADBA | Anaerobic Digestion and Bioresources Association | THE ENERGY BEHIND THE AD REVOLUTION adbioresources.org

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