eunomia

Residual Waste Infrastructure Review

Issue 8

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About Eunomia

Eunomia has significant experience of assessing the need for new infrastructure development in the energy and waste sectors on behalf of both public and private sector clients. Accordingly, we have provided market and technical due diligence services to a range of lenders and equity funds. Eunomia is also recognised as a leader in understanding the direction and trajectory of waste policy. We have advised Defra, Scottish Government, Welsh Government, Government of Ireland, the Environment Agency, OECD, UNEP, European Investment Bank and the European Commission on a range of waste-related issues since our incorporation in 2001. On behalf of our private sector clients, therefore, we have been able to second guess the trends in legislation and wider developments that drive change in the market. This enables us to identify more secure, but high-yield investment opportunities.

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Disclaimer

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1.0 Introduction

Eunomia Research & Consulting ('Eunomia') publishes this bi-annual review of residual waste treatment capacity, which we believe is useful for a range of organisations including:

1) Financial institutions, including lenders and private equity funds;
2) Technology providers, based both in the UK and overseas;
3) Project developers, including land-owners and property development companies;
4) Waste management companies offering collection, treatment and disposal services;
5) Utility companies;
6) Local authorities; and
7) Policy makers.

In addition to information on treatment capacity, we present an estimate of the current national residual waste treatment 'capacity gap'. This relates to the tonnage of residual waste which is potentially 'available' to operators or developers of new treatment facilities relative to the capacity potentially available in future.

The data presented throughout this 8th Issue of the report draws upon information held within Eunomia's internal database, which is updated by our consultants on an ongoing basis. Our database holds information on every residual treatment facility in the United Kingdom (UK), including data on facility capacity, electrical output, current feedstocks and municipal contracts held.

2.0 Developments since 7th Issue

In July 2014, the European Commission ('the Commission') published a 'Circular Economy' package, which contained a proposal for a 70% recycling target for municipal waste by 2030. This package was withdrawn by the new Environment Commissioner, with a view to making it more 'ambitious'. In May 2015, a new consultation was launched by the Commission to seek views from stakeholders. The Commission aims to present the revised package by the end of 2015.

The development of residual waste treatment infrastructure appears to be moving into a new era with a small number of new Energy from Waste (EfW) facilities reaching financial close without the support of long-term local authority contracts. To meet investment criteria, these projects have instead secured long-term waste supply contracts with private waste collection contractors. Most of these are advanced conversion technology (ACT) facilities, albeit one incineration plant also appears to have reached financial close in this way.

In the results from the first auction as part of the new Contract for Difference (CfD) regime, the Department of Energy and Climate Change (DECC) announced, in February 2015, that five EfW facilities were successful in securing support. Three of these were ACT plant, at a strike price of £114-120/MWh and two incineration (with combined heat and power) plant, at a strike price of £80/MWh. It remains to be seen, however, how many of these plant will reach financial close.

The export of residual waste from the UK as refuse derived fuel (RDF) or solid recovered fuel (SRF) continues to increase. Exports from the UK exceeded 2.6 million tonnes in the calendar year of 2014, and data for the first quarter of 2015 shows a continued upward trend.[1]

[1] Data from the Environment Agency, (EA), Scottish Environmental Protection Agency (SEPA), Natural Resources Wales (NRW), and Department of Environment Northern Ireland (DOENI)

3.0 Summary of Current Infrastructure

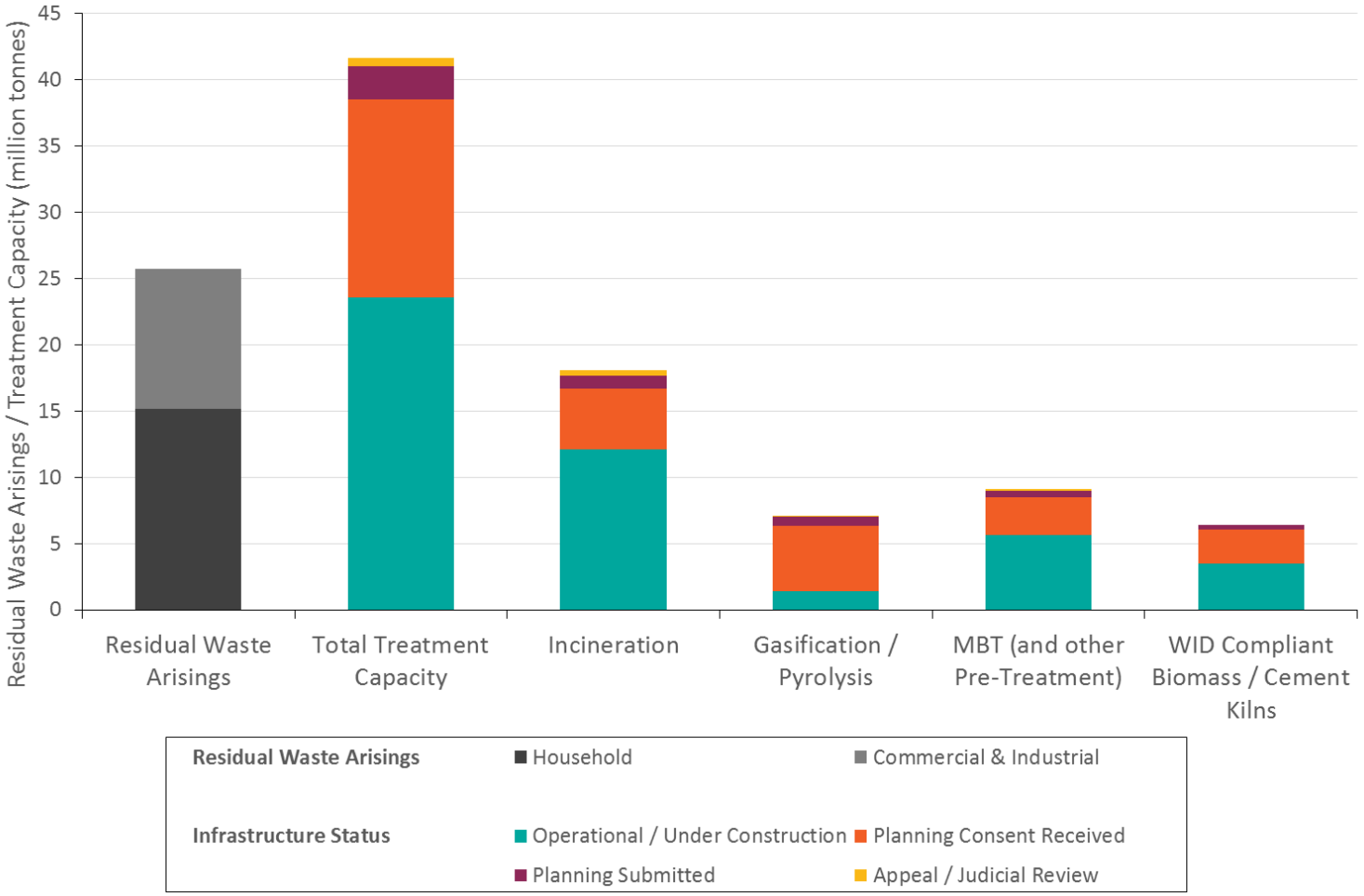
As shown in Figure 3-1, the key data for the UK can be summarised as follows:

- Currently, the UK has around 23.6 million tpa of residual waste treatment capacity either 'operating', 'under construction', or which is 'committed', i.e. has reached financial close;[2]
- As shown spatially in Figure 3-2, this capacity is made up of:
    - 50 dedicated incineration facilities;
    - 15 gasification facilities;
    - 36 pre-treatment facilities (using either mechanical-biological treatment (MBT) or autoclave technologies);
    - 11 Waste Incineration Directive (WID) compliant biomass facilities; and
    - 8 cement kilns processing solid recovered fuels (SRF).
- 14.9 million tpa of waste treatment capacity has been granted planning consent;[3]
- Planning consent is being sought for a further 2.5 million tpa of waste treatment capacity; and
- A further 0.9 million tpa of residual waste treatment capacity is currently in appeal following refusal of planning permission or is subject to judicial review.

[2] This figure does not take into consideration the double-counting effect of pre-treatment capacity. This effect is, however, fully taken into consideration within our capacity gap model in Section 4.0

[3] Some capacity has been confirmed as no longer being developed, as such this capacity is no longer counted as having been granted consent

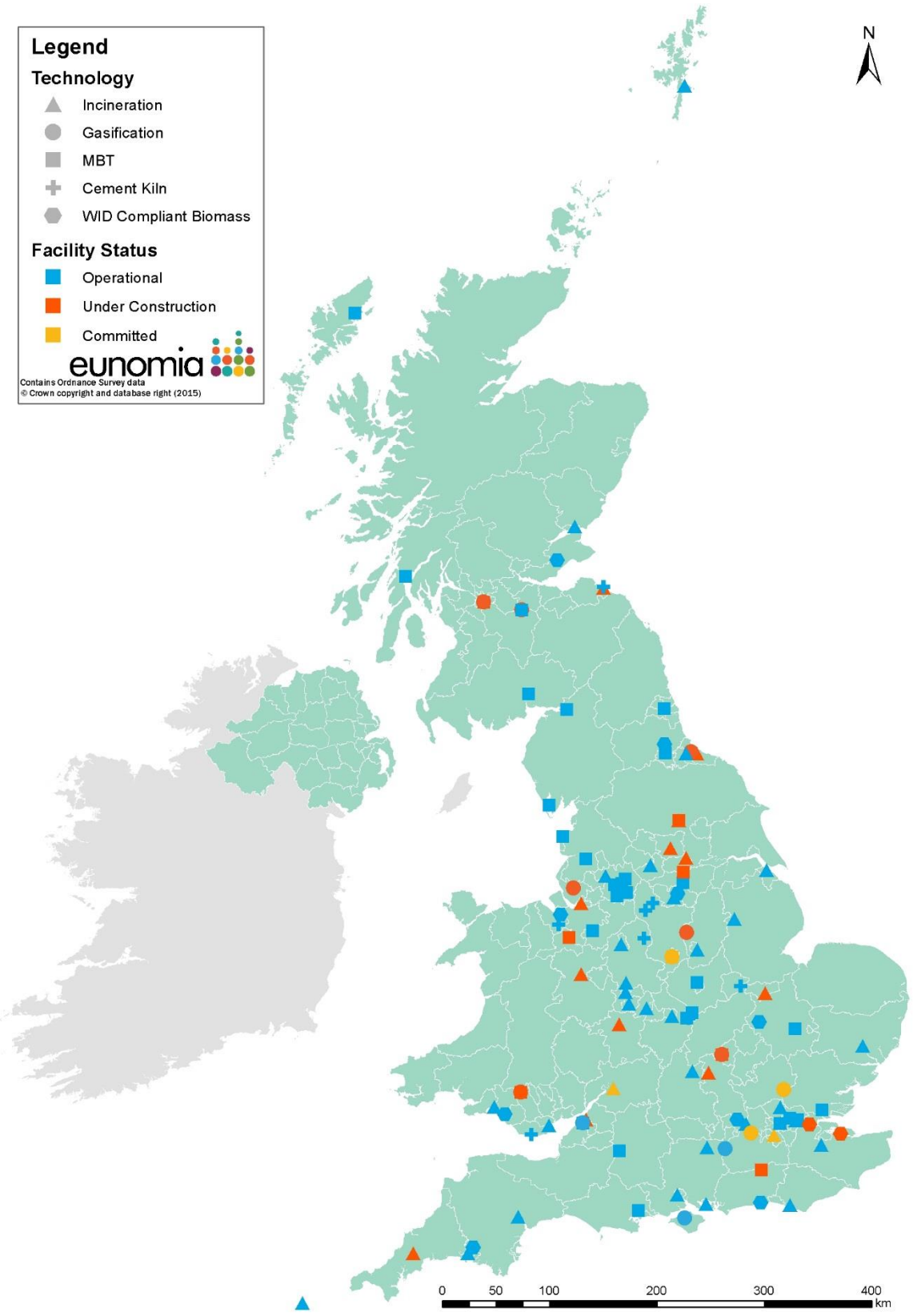
Figure 3-1: Residual Waste Arisings and Treatment Capacity – UK*



Note: This figure is presented without allowing for the fact that outputs from some facilities may be inputs to others. As such, the capacity in this figure is not simply 'additive'

**'Operational / Under Construction' capacity includes other capacity that has reached financial close.*

Figure 3-2: Location of Residual Waste Facilities across the UK



4.0 Forecasting the UK's Future Capacity Requirements

As presented in Section 3.0, there is potentially a significant amount of residual waste treatment capacity which could come into operation, in addition to that which is already operating (under construction, or has reached financial close). This suggests it is important to undertake analysis of how the 'capacity gap' in future might be affected by changes in the quantity of residual waste.

As with our last Issue of this report, we continue with our analysis out to 2030/31 to examine the impact of the Commission's previously proposed recycling target of 70% municipal waste by 2030, as described in Section 2.0. It should be noted that our model does not include potential future capacity which has not yet entered the planning system, but does include capacity that is at various stages of development, to which we have applied likelihoods of each proposed facility successfully reaching operational applied. The model also includes assumptions relating to export of refuse derived fuel (RDF) for treatment in other EU Member States.

All assumptions which underpin the model, including those relating to waste arisings and levels of recycling, are described in Appendix A.1.0, whilst a list of data sources is included in Appendix A.2.0.

The results from the model suggest that the capacity gap between residual waste arisings and available treatment capacity will fall over time. This gap will decrease from the current (based on 2013/14 arisings data) level of 13.2 million tonnes, and move to a situation of potential overcapacity in the UK in 2019/20 (or in 2018/19 if the export of RDF is included in this analysis). To provide further context to these potential changes, it should be noted that 6.5 million tpa of capacity is currently under construction or committed (i.e. financial close has been reached). The level of overcapacity then rises to 15.0 million tonnes in 2030/31 (or 18.0 million tonnes if the export of RDF is included in this analysis), as shown in Figure 4-1.

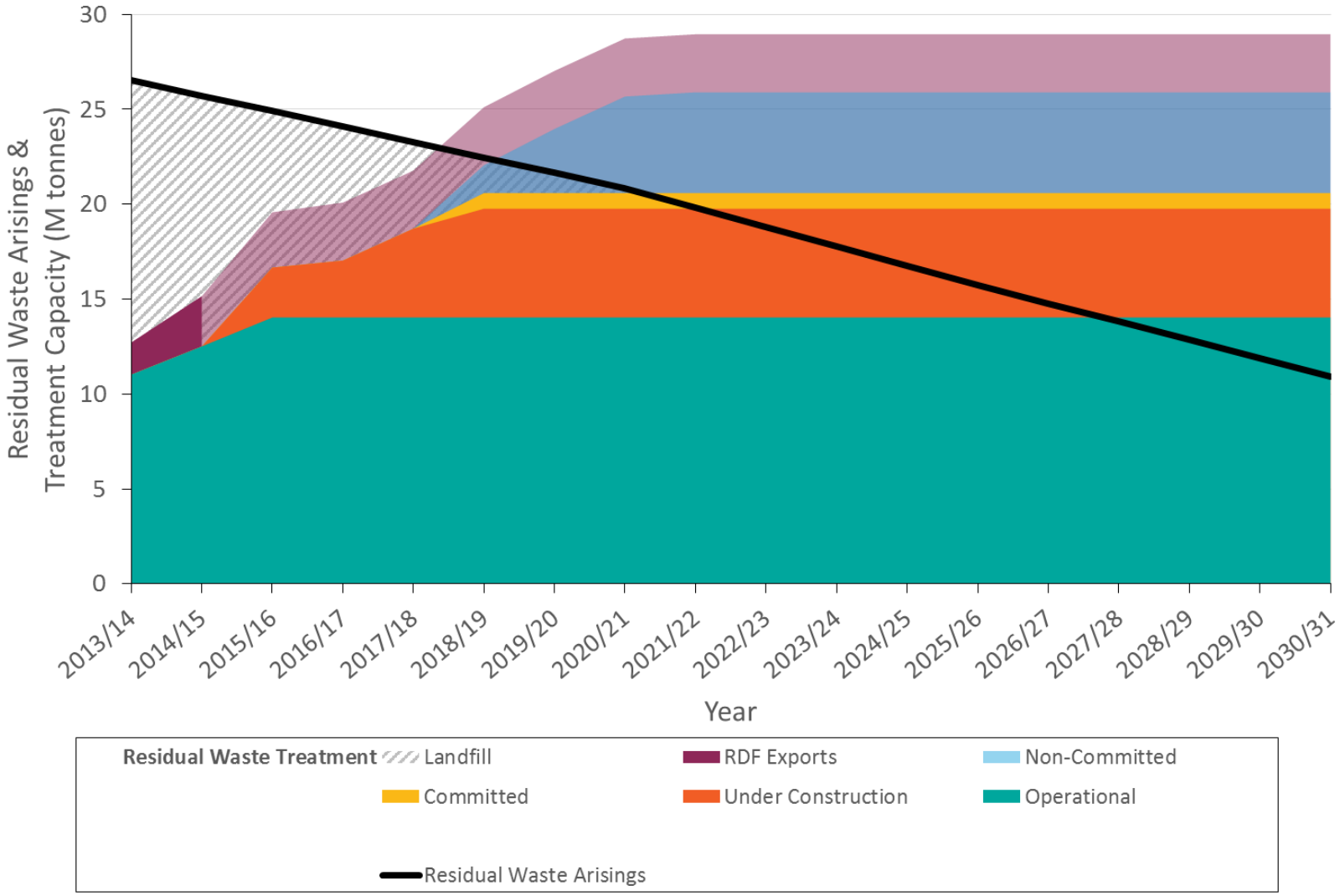
In reality, it seems reasonable to state that it is unlikely that the UK would ever reach such a level of overcapacity, as each time a facility begins construction in a given locale, the likelihood of nearby facilities reaching financial close falls. At the same time, the lead-times involved in the development process, and the level of inertia in the system associated with this, imply that the pace at which the system responds to the emergence of over-capacity is unlikely to be rapid. Furthermore, it should be noted that some new facilities may be expecting to operate successfully at lower gate fees than some existing facilities. As such, developers of a given facility may not be discouraged by capacity

figures alone given that their model may be based on undercutting other facilities already in the market.

As a result of limitations in the ability of waste to be moved significant distances at low cost, and the fact that capacity is unevenly spread across the UK, the situation of overcapacity may occur earlier in some geographical regions than in others.[4]

[4] That said, it is acknowledged that both the Merseyside and West London contracts which have recently been procured involve moving significant tonnages of waste across most of the breadth (albeit not the length) of England

Figure 4-1: Potential Future Residual Waste Capacity Gap in the United Kingdom



APPENDICES

A.1.0 Appendix 1 – Modelling Methodology

The key assumptions which underpin our methodology for modelling of a potential capacity gap in Section 4.0 are summarised in Sections A.1.1 to A.1.4.

A.1.1 Assumptions for Modelling of Total Waste Arisings

Defra's 2011 Waste Review puts significant emphasis on waste minimisation and prevention across all sectors.[5] Taking this, and actual data (where available) into consideration, along with other factors such as economic and population growth, we have assumed for the UK that:

- Household waste arisings have the following profile:
  - 0.5% rise year-on-year.

  In the context of this assumption, it should be noted that over the last three years the growth profile for household waste has been:
  - 2.8% fall (2011/12);
  - 1.4% fall (2012/13);
  - 1.7% growth (2013/14);
- Commercial waste arisings will grow 0.5% year-on-year from our baseline year of 2012, when the last set of relevant data is available;
- Industrial waste arisings will fall 1% year-on-year. It should be noted that data suggests that rates of decline have been much faster than this over the past ten years. Our assumption therefore reflects a view that further gains in waste prevention may become more difficult over time, whilst one of the key economic drivers (apart from raw material prices), the Landfill Tax, is currently planned to increase only by the rate of annual inflation in future years.[6]

The result of these assumptions is that total waste arisings are assumed to be 1.2 million tonnes higher in 2030/31 than in 2013/14. These projections depend critically upon what happens to the economy (both in terms of structure, and in terms of growth), the effects

[5] Defra, *Government Review of Waste Policy 2011*, June 2011, http://www.defra.gov.uk/environment/waste/review/

[6] Until April 2014, Landfill Tax had been rising at an annual rate of £8/tonne for the last 5 years

of drivers such as the Landfill Tax in incentivising further waste prevention efforts, and the effects of ongoing efforts to reduce resource use in manufacturing, itself influenced by commodity prices (amongst other things).

A.1.2 Assumptions for Modelling Residual Waste Arisings

The majority of residual waste of interest to the treatment facilities included in this report is material which is, or would otherwise be, subject to the standard rate of Landfill Tax, although some additional tonnages might be available from further sorting of wastes sent to landfill at the lower rate of Tax.[7]

If one assumes that data on local authority collected (LAC) waste is reasonably accurate, then the Landfill Tax return data is not readily comparable with data from the Defra C&I waste survey.[8] In order to reconcile these datasets in a manner which renders them meaningful for the purposes of this report, for our baseline year, 2009/10, we adjusted the proportions of C&I waste attributed by Defra as essentially being 'residual' and 'other'. Included as part of this adjustment, was an estimate of C&I waste sent for residual waste treatment. This was based on data published by the Environment Agency (EA) relating to throughput of such facilities, and our knowledge of household wastes being processed at these plant.[9] This adjustment had the effect of reducing the quantity of residual C&I waste while increasing the quantity of waste attributed to the category 'other'.[10]

A.1.3 Assumptions for Modelling Future Recycling

The recycling and composting rate for household waste in England was 43.5% in 2013/14. Wales reached 52.4% in 2013/14 with the intention to reach the equivalent of 70% by 2024/25, whilst in Scotland household waste recycling reached 42.2% in 2013

[7] Although as the level of the tax increases, it seems reasonable to assume that the proportion of waste landfilled without prior sorting will diminish

[8] Defra (2010) *Survey of Commercial and Industrial Waste Arisings 2010 – Final Results*, December 2010 http://archive.defra.gov.uk/evidence/statistics/environment/waste/documents/stats-release101216.pdf

[9] Environment Agency (2012) *Waste management 2011*, 2011 http://www.environment-agency.gov.uk/research/library/data/142511.aspx

[10] Our view of the Defra C&I waste survey is that it probably underestimated total waste quantities, but also underestimated the extent to which C&I waste was being recycled. The net effect of these changes is that the quantities sent to landfill appear to have been over-estimated. Since the publication of this dataset, Eunomia has made several concerted attempts to 'triangulate' it with other data sources, which despite our efforts, has not been possible. We believe our approach estimating the tonnage sent to landfill using landfill tax return data, combined with data from the EA on quantities treated at non-landfill facilities, is probably the best approach given the inconsistencies across the datasets

with plans to achieve a 70% rate by 2025. Data relating to commercial and industrial (C&I) wastes is less reliable, but we have assumed that for the UK as a whole:

- Commercial waste recycling (incl. reuse, composting, AD, etc.) will rise from 57% in 2012 to around 65% in 2020, and then to 75% in 2030; and
- Industrial waste recycling (incl. reuse, composting, AD, etc.) will rise from 61% to 2012 to 70% in 2020, and then to 80% in 2030.

Alongside recycling and composting, a relatively large tonnage of C&I waste is managed by a combination of low-cost routes (e.g. such as direct land-spreading) and specialist facilities for managing industrial residues. Such routes account for 20% of C&I wastes (13% of total wastes), which are therefore not considered as 'residual' within our model. The fate of such wastes could be strongly influenced by regulatory decisions in future.

A.1.4 Assumptions for Modelling Future Treatment Capacity

It is essential in this type of analysis to avoid double-counting of available capacity. Over the past number of years we have noticed a growing trend of pre-treatment and thermal treatment facilities, which are contractually linked together, coming through the development process. These might either be co-located on the same site, or on separate sites, but ultimately, long-term contracts will exist for transfer of SRF to facilities within the UK. As a result, inclusion of both types of capacity would effectively be double-counting.

Our model therefore makes the following adjustments:

- In situations whereby an MBT or autoclave facility is sending SRF to a thermal treatment plant, to avoid double-counting, we have not considered the capacity of the thermal plant within our model; and
- In situations whereby a Residual-MRF (R-MRF) is sending SRF to a thermal treatment plant, to avoid double-counting, we have not considered the capacity of the R-MRF within our model.[11]

Based on our forecasts of future spare capacity at 'R1' facilities in other EU Member States, we anticipate that export levels of low-grade SRF will continue to grow over the coming years as the gate fees offer an attractive alternative to some UK domestic treatment infrastructure.

While it is difficult to forecast the growth in this market given the recent rapid changes experienced, in our core model for this study, we have assumed that the export of SRF will increase at a lower rate (than that which we are currently seeing) until 2016/17

[11] Residual MRFs are otherwise known as 'dirty' MRFs

before ‘flat-lining’ for the remainder of the period to 2030/31. The annual growth rates modelled in Table A1-1, however, do not reflect the reality that much more SRF than is being suggested here could be exported to facilities in other EU Member States. These estimates are intentionally conservative, partly so as not to detract from the discussion regarding the capacity available within the UK relative to the amount of residual waste that might be available in future. As a result, as further evidence emerges, they may be updated in future versions of this Review.

Table A1-1: Assumed Growth Rate for Export for SRF

	2015/16	2016/17	2017-2031
Assumed Export Growth Rate	10%	5%	0%

Facilities which have been designed to process automotive shredder residue (ASR) have the capability to process SRF from LAC and C&I wastes. For the purposes of this analysis we have not included any associated capacity within our estimation of capacity gaps. This is because our market intelligence suggests such plant are currently fully contracted to process ASR, and therefore do not have spare capacity for LAC and C&I wastes, which are the sole wastes included within the scope of our model. Should this situation change in the future, however, we will update future Issues of this report accordingly.

Thermal treatment facilities which have been designed to process woody biomass (which may or may not be classified as waste) as their primary fuel, but which are compliant with the EU Waste Incineration Directive (WID) are relevant to our capacity modelling. 50% of the capacity of this type of ‘WID-compliant’ plant has been included within our model because they could in theory process SRF in the future.

Cement kilns are capable of processing a variety of waste derived fuels, including SRF. Where a cement kiln has been permitted to accept SRF, we have included the full amount of capacity permitted. It should be noted, however, that at present the actual quantities of SRF being processed by such facilities is lower than their permitted capacity.

Perhaps the most challenging assumptions to make in this type of capacity modelling are those relating to the likelihood of facilities reaching financial close prior to construction. Our approach is focused on ascribing a series of weightings at the individual plant level, which are summed to give an overall probability of the potential facility reaching financial close.

This approach incorporates two steps, as set out in Table A1-2, and subsequently in Table A1-3. Table A1-3 focuses upon the proposed treatment technology and the phase of development within which each plant currently sits. They also include specific assumptions with regard to facilities which are currently undergoing applicant appeal or judicial review (JR). As shown in Table A1-3 it is also important to distinguish between the nature of such appeals and JRs.

It should also be noted that we have not included either sites which have not yet formally entered the planning process, or those which are yet to be announced.[12]

Table A1-2: Weightings to Determine a Facility's Likelihood of Reaching Financial Close

Parameter	Max-Weighting	Sub-Parameter	Central
Credibility of Lead Developer	15	Large waste management company	12
		Previous successful UK residual treatment facility development and operation	10
		Previous successful overseas residual treatment facility development and operation	5
		No previous successful facility development or operation	0
Contractor Status	45	Contract in place (or preferred bidder)	42
		In procurement (alongside other bidders)	15
		No contract	0
Financial Risk of Technology	15	Incineration	12
		MBT	10
		Autoclave	5
		Gasification	0
		WID-compliant biomass	12
Planning Status	25	See subsequent tables	Table 3

[12] It should be noted that, in future Issues of this Review, we are hoping to use historic data to further inform these estimates, and that this data is already informing our view

Table A1-3: Likelihood of Gaining Planning Consent - Central Scenario

Development Status	Incineration	MBT	Autoclave	Gasification	WID-C Biomass
Planning	15	23	23	20	15
Planning Inquiry [1]	3	13	13	10	9
Appeal (Refusal in line with OR) [2]	5	10	10	8	6
Appeal (Refusal against OR) [2]	10	15	15	13	11
Judicial Review by Applicant	3	3	3	3	3
Judicial Review by 3rd Party	15	15	15	15	15

Notes:

1. Planning consent granted but then subsequently called in by the Secretary of State
2. OR = Planning Officer's Recommendation

Where relevant data is available, the year we have modelled facilities as becoming operational is based on published information. Where such information is not available, we have derived the operational year via consideration of two factors:

- The time required to reach consent (and consequently construction); and
- The time required for actual construction, which often depends upon the size of the facility.

Our assumptions for these periods are set out in Table A1-4 and Table A1-5. As an example, if a facility is currently in 'planning', we assume it requires a year to reach consent, then another year to pass through financial close to be under construction. If that facility is 250 ktpa, we assume a three year construction period such that a total of five years is assumed before the facility becomes operational.

We recognise that there are also other factors, which might be considered in the context of project development periods. These include the type of technology to be used, which can be a key determinant of the length of construction periods. MBT facilities, for example, require far less time for construction than incinerators. This is a factor we may take into consideration in future Issues of this Review.

Table A1-4: Assumed Project Development Periods

Development Stage	Years to Next Stage	Next Stage
Consented	1	Under Construction
Planning or Planning Inquiry	1	Consented
Appeal (Refusal in line w/OR)	1	Consented
Appeal (Refusal against OR)	1	Consented
Applicant JR	1	Consented
3rd Party JR	1	Consented

Table A1-5: Assumed Construction Periods

Capacity (tonnes)	Years to Next Stage	Next Stage
0-150,000	2	Operational
150,000-300,000	3	Operational
300,000-1,000,000	4	Operational

Notes:

1. We acknowledge that technology type also has a clear impact upon the required length of the construction period

A.2.0 Appendix 2 – Data Sources

The information on residual waste treatment sites presented within this report has been obtained from a variety of sources, including primary research interviewing both site operators, project developers and local planning authorities.

The information presented on waste arisings has been obtained from the following publicly available sources:

1) Defra, *Local Authority Collected Waste for England – Annual Statistics*, November 2014 http://www.defra.gov.uk/statistics/environment/waste/wrfg23-wrmsannual/
2) Defra, *Commercial and Industrial Waste Survey 2009*, May 2011 http://www.defra.gov.uk/statistics/files/ci-project-report.pdf
3) Defra, *New Methodology to Estimate Waste Generation by the Commercial and Industrial Sector in England*, August 2014 http://randd.defra.gov.uk/Document.aspx?Document=12262_FinalProjectReport120814.pdf
4) SEPA, *Household Waste Official Statistics 2013,* 2014 http://www.sepa.org.uk/waste/waste_data/waste_data_reports/lacw_reporting/household_waste_reporting.aspx
5) SEPA, *Scottish business waste generated by waste type and economic sector 2012*, 2014 http://www.sepa.org.uk/waste/waste_data/commercial__industrial_waste/business_waste_generated.aspx
6) Welsh Government, *Local Authority Municipal Waste Management 2013-14*, November 2014, http://wales.gov.uk/statistics-and-research/local-authority-municipal-waste-management/?lang=en
7) EA, *Survey of Industrial and Commercial Waste 2007*, May 2009 http://www.environment-agency.gov.uk/research/library/publications/107692.aspx
8) DOENI, *NI Municipal Waste Management Statistics Quarterly Reports for 2013-14*, http://www.doeni.gov.uk/niea/waste-home/municipal_data_reporting.htm
9) WRAP, *Northern Ireland Commercial & Industrial (C&I) Waste Estimates*, November 2011, http://www.doeni.gov.uk/niea/waste-home/waste-publications-2.htm
10) HMRC, *Landfill Tax Bulletin*, April 2015 http://data.gov.uk/dataset/landfill_tax_bulletin
11) EA, *Records of International Shipments of Refuse Derived Fuel (RDF)*, May 2015, http://www.geostore.com/environment-agency/WebStore?xml=environment-agency/xml/ogcExternalDataDownload.xml#

As a result of a reliance on these publicly available sources for data on waste arisings, our modelling of the current and future national capacity gaps is only as accurate as this information.