Residual Waste Infrastructure Review

Issue 11

Appendix – Modelling Methodology

December 2016

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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A.1.0 Modelling Methodology

This appendix summarises the key assumptions which underpin our methodology for modelling the potential residual waste treatment capacity gap, both for the UK and for the Northern Cluster, in Issue 11 of the Residual Waste Infrastructure Review.

A.1.1 Assumptions for Modelling of Total Waste Arisings

Each country's nationally published waste data statistics and relevant reports were analysed to determine the total waste arisings relevant for this study. We consider only the household, commercial and industrial waste streams, and exclude all other waste streams (such as agricultural, construction, mining and demolition wastes) on the basis that they are unlikely to be suitable for residual waste treatment.

A.1.2 Assumptions for Modelling Residual Waste Arisings

The majority of residual waste of interest to the treatment facilities included in this analysis is material classed as non-hazardous Municipal Solid Waste (MSW), i.e. that which is left over after the separate collection of recyclables and biological treatment of segregated organic wastes, as well as that of a similar nature from commercial and industrial sources.

The current baseline of residual waste arisings has been determined through analysis of nationally published waste datasets which report on the quantities of residual waste that is currently landfilled, pre-treated in Mechanical-Biological Treatment (MBT) facilities, or which is sent to thermal treatment facilities, including incineration, ACT, cement kilns, co-firing, etc.

A.1.3 Assumptions for Modelling Future Recycling

The current recycling (and biological treatment) rate for each waste steam in each country was determined through analysis of nationally published data. The definition of recycling currently differs across the countries examined, and due to the lack of suitable data we have not sought to standardise this. In future editions we may update the recycling rates used to reflect changes in how recycling rates are defined.

The Waste Framework Directive set a recycling target of 50% by 2020 for MSW. The exact calculation method used to determine compliance can vary between countries. We have assumed that for each country, a 50% recycling rate means that 50% of total household waste arisings will be recycled.

Beyond 2020, we have used the emerging European Circular Economy Package recycling targets as the target for each country's household waste arisings. Unlike the Waste

Framework Directive, the recycling target of 65% can only be met through one calculation method.

In achieving the 65% recycling rate target in the Circular Economy Package, Member States may be able to include outputs from residual waste treatment process (e.g. captured metals from incinerator bottom ash). However, we have not included the small recycling contribution from this form of recycling in our analysis.

Our analysis does not take into consideration any higher recycling targets that individual countries may have introduced. For example, within the UK, Scotland and Wales have introduced separate recycling targets of 70% by 2025.

Data relating to C&I wastes is less reliable than data on household and municipal waste across Europe. However, C&I recycling performance tends to be higher. We have assumed that across the selected countries:

- Commercial waste recycling (incl. reuse, composting, AD, etc.) will increase to 75% by 2030; and
- Industrial waste recycling (incl. reuse, composting, AD, etc.) will increase to 80% in 2030.

A.1.4 Assumptions for Modelling of ‘Other’ Wastes

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 can account for significant proportions of C&I waste streams. This type of waste is not considered ‘residual’ within our model. The fate of such wastes could be strongly influenced by regulatory decisions in future. Due to the lower reliability of data across Europe for C&I waste, it has not been possible to model this waste steam in detail for each country.

Other waste includes:

- Waste that can be ‘recovered to land’, for example, used as engineering material in landfills, or applied directly to land under a waste exemption; and
- Waste that requires more specialised treatment processes and is unsuitable for any kind of EfW, even when pre-treated.

As we model C&I recycling rates increasing over time, we assume that the additional waste recycled (reused, or composted) is taken out of both residual waste and ‘other waste’.

Our analysis does not take account of waste that is not managed through compliant waste systems (i.e. that which is managed through criminal activity).

A.1.5 Assumptions for Modelling Treatment Capacity

A.1.5.1 Availability and Throughput of Facilities

We assume 100% availability of a facility's design capacity in our analysis. In reality, whilst all operators strive to maximise revenue through gate fees, there will always be some unplanned downtime. Waste of a higher than forecast calorific value (CV) can also reduce the tonnage of waste a plant is able to process; conversely, lower than forecast CV waste can increase the throughput at some plant.

The issue of unplanned downtime is especially relevant in the context of ACT facilities, some of which are unproven at commercial scale. As the vast majority of committed ACT capacity is not yet operational (it is either under construction or has reached financial close) there is not currently sufficient evidence to 'downgrade' the design capacity of these plant to account for unplanned downtime. However, this is an issue we will consider carefully in the coming months and years as such plant move into commissioning and operation.

A.1.5.2 Pre-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 may either be co-located or on separate sites, but have long-term contracts for the pre-treatment plant to transfer of RDF/SRF to facilities. Inclusion of the whole capacity of both facilities would effectively result in double-counting.

Our model therefore makes the following adjustments:

- In situations whereby an MBT or autoclave facility is sending SRF to a linked thermal treatment plant, we include the full capacity of the MBT facility, but exclude the capacity of the linked thermal plant within our model;
- In situations whereby an MBT or autoclave facility is sending SRF to thermal treatment plants, but they are not linked via long-term contracts (or otherwise), we include only 40% of the pre-treatment capacity in our model. This reflects the material and moisture removed from the waste through the pre-treatment process; the remainder of the waste is assumed to remain available for processing in thermal treatment plants; and
- In situations whereby a Residual-MRF (R-MRF) sends SRF to a thermal treatment plant, we exclude the capacity of the R-MRF from our model.[1]

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

A.1.5.3 Export/Import of RDF/SRF in other EU Member States

Our analysis treats the Northern Cluster as a closed system, and we do not consider demand for residual waste or waste derived fuels from countries outside the area of study. In reality, a small amount of exports and imports do occur, but the current situation in each country is difficult to ascertain. We plan to broaden the scope of the report to take in other countries, which will reduce the impact of waste arisings and treatment capacity external to the area being studied.

A.1.5.4 Non-conventional Treatment Facilities

For the purposes of this analysis we have not included any facilities that do not currently accept residual waste, or that are being developed on the basis of accepting non-residual waste feedstocks (e.g. facilities that only accept automotive shredder residue).

Thermal treatment facilities that 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 Industrial Emissions Directive (IED), are relevant to our capacity modelling. 50% of the capacity of these 'IED-compliant' facilities has been included within our model because they could theoretically process RDF or SRF in the future. Indeed, our market intelligence suggests that some such plant are now exploring the opportunities associated with processing RDF and SRF and are actively making enquiries to holders and traders of such feedstocks.

Cement kilns are capable of processing a variety of waste derived fuels, including SRF. For the purpose of this analysis, we have included the theoretical capacity that can be used at technically capable cement kilns, at a fuel substation rate of 40% in energy terms. In some cases this will be an under-estimate of what certain cement kilns are already accepting.

A.1.6 Construction Timelines

Where possible, 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 the time required for actual construction, which often depends upon the size of the facility.

Our assumptions for the time of construction are set out in Table A1-1.

We recognise that there are also other factors which might be considered in the context of project development periods, such as the type of technology to be used. MBT facilities, for example, require far less time for construction than incinerators; however relatively simple assumptions are appropriate for a study of this nature.

We in any case assume that in its first year of operation a facility will function at only 50% of its design capacity. This is to account for facilities that commence operations part way through the year.

Table A1-1: 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. In practice, factors other than size (e.g. technology type) also impact upon the construction period		