2011 Briefing Report:

UK Waste Exports: Opportunity or Threat?

June 2011

TOLVIK CONSULTING

Issue Number	1			
Author	APJ			
Checked	NJC/VM			

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Profu is an independent Swedish research and consultancy company focussing on energy, environment and waste management. The company started in 1987 as an offspring of research conducted at the Energy Systems Technology Division, Chalmers University of Technology. Profu's clients are energy companies, waste companies, municipalities and authorities such as the Swedish Energy Agency and the Swedish EPA. Profu publish annual reports on the waste incineration, waste wood and biomass markets in Sweden.

Founded in Basel in 1959, Prognos is a multi-disciplinary consultancy based in Berlin providing independent market research and analysis to the public authorities and private industry across a range of sectors including energy and waste management markets. Prognos are well known for their projections of the capacity/feedstock balance in the German waste market.

IMPORTANT NOTICE:

This report has been prepared by Tolvik Consulting Ltd on an independent basis using our knowledge of the current UK waste market and with reference, inter alia, to various published reports and studies and to our own in-house analysis. This knowledge has been built up over time and in the context of our prior work in the waste industry.

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EXECUTIVE SUMMARY

- Over the last year interest in the export to northern Europe of Refuse Derived Fuel (RDF) generated from mixed Residual Waste has increased significantly.
- Of the estimated 33.5Mt of mixed Residual Waste in the UK (i.e. excluding Waste Wood and other specialist waste streams), only about 15% is thermally processed (in cement kilns, EfWs etc). The remaining **28.5Mt is currently landfilled**.
- Whilst rising landfill tax is putting further economic pressure to decrease this reliance on landfill, the rate at which the new treatment capacity planned in the UK is actually being developed is relatively slow.
- By contrast, the **north European waste market** is characterised by one in which there is currently **significant over-capacity** in the thermal treatment market – with an estimated 6.9Mt of spare capacity. As a result 'spot' gate fees for mixed Residual Waste have fallen to as low as €30 and there is the potential in some countries, particularly Sweden, for it to fall still further in the short term.
- Consistent with European legislation, the **Environment Agency will object to the export of untreated mixed Residual Waste**. However it has issued a Position Statement which confirms that whilst there is insufficient UK thermal treatment capacity **it will not object to the export of Refuse Derived Fuel** (RDF) prepared from mixed Residual Waste. There are no clear guidelines as to what constitutes RDF and it is understood that each potential consignment is treated on a case by case basis.
- With the cost of UK currently £64-£80/t (including landfill tax) gate fee differentials are now becoming sufficient for UK operators to economically process mixed Residual Waste into a low quality RDF and export it to northern Europe. In 2010, such **exports were just 38ktpa**; but by March 2011 notifications to the EA for 2011 had risen to **240ktpa** and if current trends continue annual exports could reach **500ktpa.**
- With modest investment at existing waste management facilities, it is estimated that there is the potential for the production of between **2.3Mt** and **4.8Mt** of RDF in the UK.
- High levels of export may **impact on investor confidence in UK waste treatment infrastructure** – particularly for those facilities with a large merchant element - leading to further delays in the development of UK capacity.
- The extent to which this risk materialises is, in large part, a function of the future feedstock supply/thermal treatment capacity balance in northern Europe and if and how the EA's policy position with respect to waste exports develops.
- Some will argue that exporting RDF is simply a **'market' solution** delivering economic benefits to local authorities and UK plc. Some may use the availability of export markets as an argument **to support objections** to the development of UK waste treatment capacity. Others may question the **sustainability** of transporting RDF to northern Europe, point to the need for self sufficiency and the loss of a **potential energy feedstock**.
- Tolvik has identified four potential scenarios with very differing outcomes. It is suggested that **now is the time for waste export policy in the UK to be debated** more fully by the various stakeholders so as to help ensure that the **long term solution for the treatment of mixed Residual Waste in the UK** is optimised from an environmental, political and economic perspective.

1. INTRODUCTION

1.1. Background

Until recently, if waste exports were discussed in the UK it was either in the context of the export of 'recyclables' to the Far East (and the adverse publicity surrounding contamination levels), or with respect to the illegal export of electronic wastes to non-OECD countries.

Figure 1: Illegal Waste Exports

But 2010 saw the beginnings of a new trend - the export of processed mixed, non-hazardous Residual Waste for thermal treatment in northern Europe. In December 2010 it was reported in letsrecycle.com that 180,000 tonnes of Refuse Derived Fuel (RDF) had been approved for export by the Environment Agency.

In recent months interest in UK waste exports has increased rapidly and with a maturing logistics chain, 2011 is likely, for the first time, to see material volumes of these wastes being exported from the UK.

Over the last few months Tolvik, working with Prognos (in Germany) and Profu (in Sweden), has been monitoring these trends and researching the north European waste incineration markets.

This Briefing Report summarises our research, considers the opportunities it presents for the UK waste industry, analyses the drivers behind the trend, and assesses the potential threats it presents for the development of waste treatment infrastructure capacity in the UK.

1.2. Scope

The focus of this Briefing Report is the export of (processed) mixed Residual Waste (generically described as Refuse Derived Fuel "RDF") to northern Europe for thermal treatment. In this Briefing Report, RDF is used as a generic term and includes for completeness Solid Recovered Fuels ("SRF") - the description typically given to a refuse derived fuel processed to an agreed quality standard.

The Report does not consider the export of Green List wastes, biomass (including Waste Wood) nor those specialist waste streams for which there is no UK treatment capacity and for which a long established export market exists.

1.3. Approach

Section 2 provides a high level assessment of the legislative and regulatory context for the export of waste from the UK.

Section 3 sets the context of the UK and northern European market and the opportunity RDF exports presents. **Section 4** looks at current export activity and the potential for RDF production from existing and planned facilities together with UK RDF demand.

Section 5 briefly considers the export opportunities country by country.

Section 6 then develops scenarios and considers the extent to which the findings of this Briefing Report represent an opportunity or a threat to the development of UK Residual Waste Treatment Capacity.

1.4. About Tolvik Consulting

Tolvik Consulting is a specialist provider of independent, market analysis and commercial advisory services across the waste sector. Our clients include the UK's leading waste companies, project finance lenders, independent developers and equity finance providers.

As a specialist consultancy, we have a unique understanding of waste markets and monitor them closely, maintaining regular dialogue with the major players in the sector – from waste companies, developers and local authorities, through to regulators, funders and policy makers.

2. EXPORTS – LEGISLATIVE AND REGULATORY CONTEXT

An understanding of the legislative and regulatory context both in the UK and in Europe is critical to an assessment of the RDF export market. The situation is relatively complex and a number of interlinked elements of European legislation are relevant. These are set out below.

2.1. EU Waste Shipment Regulations 1013/2006

The principal legislation is the EU Waste Shipment Regulations (WSR). In practice under WSR the export (and import) of wastes from and to UK within the EU fall into one of three categories:

- **Green List** – for wastes considered low risk to the environment falling within the defined 'Green List' (largely recyclables), there are lower level controls with no requirement for prior approval or notification by the relevant authorities;
- **Recovery** – for other forms of waste (i.e. not on the Green List) which are to be 'recovered', there is a requirement for prior notification (generally on an annual basis) to the relevant authorities supported by documentation to validate the recovery route – e.g. guarantees, evidence of contract. Technically the relevant authorities do not approve such exports, rather they 'will not object'.
- **Disposal** – export is generally not permitted other than in specific, exceptional circumstances in accordance with the relevant Waste Management Plan for each member state.

RDF is not on the Green List, nor is its export within the UK in accordance with the "UK Plan for the Shipments of Waste". Therefore its export is only possible if it is 'recovered'.

2.2. Waste Framework Directive and R1 Classification

Annex 2 of the Waste Framework Directive (WFD) 2006/12/EC provides the definition for 'recovery' relevant to the WSR. This includes the full range of activities which would generally be regarded in the UK as 'recycling' operations together with the processing of waste at identified thermal treatment facilities which meet the classification "*R1 - Use principally as a fuel or other means to generate energy*".

Whilst there has been much debate with respect to the R1 classification, the intention is that the classification identifies the most efficient thermal treatment facilities and that waste sent to these facilities is therefore regarded as 'recovered' rather than 'disposed'. Subject to prior notification to the relevant authorities, **exports of waste which are not on the Green List and for which thermal treatment is the identified option will only be permitted if sent to an R1 facility**.

2.3. Mixed Municipal Waste

However there is one significant exclusion within the WSR:

> *"Article 3 (5) Shipments of mixed municipal waste (waste entry 20 03 01) collected from private households, including where such collection also covers such waste from other producers, to recovery or disposal facilities shall, in accordance with this Regulation, be subject to the same provisions as shipments of waste destined for disposal"*

In this context the European definition of municipal waste applies ("*waste from households, as well as other waste, which, because of its nature or composition, is similar to waste from households*)[1] – i.e.

this exclusion covers not just Local Authority Collected Waste (LACW) but also some Commercial and Industrial (C&I) Waste.

Given that the UK Plan for the Shipments of Waste does not make any specific exceptions for municipal waste, **the export of 'mixed municipal waste' from the UK will therefore not be permitted**.

So, when is a waste not 'mixed municipal waste' or, perhaps more correctly, when will a waste cease to be 'mixed municipal waste' and the EA not object to its export?

2.4. The Definition of RDF

The answer to the question above is "when it is RDF".

The EA has the following Position Statement in relation to RDF on its website[2]:

> *"RDF production is forecast to increase significantly over the next few years, however, there is currently not enough suitably authorised capacity to make use of additional RDF. We have been asked to give a view on storing, importing and exporting RDF whilst the market develops additional capacity.*
>
> *We will not object to import or export of RDF as a short-term market solution when this is for legitimate recovery purposes. In addition to compliance with shipment rules and facility permits we would expect the importer/exporter to use Best Available Techniques (BAT) in transport, handling and energy recovery processes"*

Given the potential market significance (i.e. the ability to export a waste), it is perhaps surprising that there is no clear definition for RDF in the Position Statement and it is understood from talking to exporters that the onus is upon exporters to demonstrate that they are generating an RDF.

This would suggest that mixed Residual Waste could be subject to very limited treatment in order to bypass the Article 3 (5) constraint described above. The EA is mindful of this and in correspondence with Tolvik has referred to the European Waste Catalogue definition of RDF as a benchmark – i.e. that mixed municipal waste needs to have *"undergone some **sort of mechanical or physical treatment** such as shredding, sorting and compaction*".

The European legal position is potentially slightly different. In Recital 33 of the revised Waste Framework Directive (2008/98/EC) it states:

> *"For the purposes of applying Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste (4), mixed municipal waste as referred to in Article 3(5) of that Regulation remains mixed municipal waste even when it has been subject to a waste treatment operation that has not substantially altered its properties."*

This sets the requirement that mixed municipal waste only ceases to be regarded as such if it is "**substantially altered**". This said, the evidence would suggest a 'light touch' is currently being applied in Europe.

Tolvik understands that the EA are currently reviewing its position in the light of the potentially different interpretation. The standard currently set by the EA could, in extremis, suggest that simply shredding mixed waste is sufficient for it to be classified as RDF.

2.5. Handling RDF for Export

Whilst RDF remains a waste (and so needs to be transported in the UK by the holder of a Waste Carriers Licence), RDF storage operations at English ports are regarded by the Environment Agency as a 'low waste risk' activity.

As a result, recent EA guidance[3] is such that an Environmental permit is not required for "*the storage prior to export or after import of up to 10,000 tonnes at any one time of Refuse Derived Fuel (RDF) at a dockside in wrapped bales to prevent water ingress, in a secure container or secure building for the purposes of recovery"* provided that the RDF is stored for no longer than 3 months. This significantly reduces the regulatory burden on RDF exporters and should allow the export of RDF through most UK ports (potentially alongside non-waste exports).

3. OVERVIEW OF THE CURRENT OPPORTUNITY

3.1. The UK Market

In the UK it is estimated that in 2009/10 total LACW (previously MSW) arisings were 31.2Mt, with there being a further 57.7Mt of C&I Waste arisings.

Whilst recent years have seen significant improvements in landfill diversion, of this combined 88.9Mt, circa 28.5Mt (or 32%) was solid non-hazardous Residual Waste sent to landfill. A further circa 5.0 Mt was sent for thermal treatment.

Mt	Waste Arisings	Residual Waste to Landfill	Residual Waste to EfW inc cement kilns
LACW	31.2	16.0	3.8
C&I Waste	57.7	12.5	1.2
Total	88.9	28.5	5.0

Table 2: UK Waste Market Overview – 2009/10 Source: Tolvik Analysis

With landfill tax currently at £56/t but rising to £80/t by 2014/15, the economic pressure (as well as political/environmental pressure) to decrease the reliance on landfill remains.

However, whilst significant new treatment capacity is planned in the UK (*see Tolvik's 2010 Briefing Report: Residual Waste in England & Wales - July 2010, update to be issued in July 2011*), in practice the speed at which this capacity is actually being developed is relatively slow – with only about 1.3 Mt of capacity becoming operational in 2010/11 and further capacity of circa 2.1 Mt is due in 2011/12. At this rate sufficient capacity will not be in place until 2020.

In the absence of domestic capacity, the export of processed Residual Waste for thermal recovery therefore represents a potential alternative to landfill.

3.2. Northern Europe Market

By contrast with the UK, the northern European waste market is characterised as one in which there is currently significant over-capacity, particularly in the thermal waste treatment market. Tolvik's own country-by-country analysis estimates this to be at least 6.9Mt in 2010 – with much of the spare capacity in Germany. This figure excludes capacity still under construction.

	Current Incineration Capacity Mt	Estimated Available Combustible Waste Mt	Over-capacity	Over-capacity %	Estimated Spot Gate Fees including tax but excluding VAT /t
Belgium	2.7	2.5	0.2	5%	€95 - €115
Netherlands	7.4	6.3	1.1	15%	€40 - €50
Germany	24.4	20.2	4.2	17%	€50 - €70+
Denmark	3.5	3.0	0.5	14%	€65 - €90 inc €50 tax
Sweden	5.2	4.6	0.6	12%	€10 - €30
Norway	1.8	1.5	0.3	16%	€30 - €50
Totals	**45.0**	**38.1**	**6.9**	**15%**	**N/A**

Table 3: North Europe Overview 2010 Source: Tolvik/Prognos/Profu

Whilst there remains some ongoing uncertainty surrounding the R1 categorisation for incinerators, it is reasonable to assume that a significant portion of the identified 45Mt of capacity is or will be classified as R1 compliant and so capable of accepting exports. In Tolvik's opinion the R1 requirement will not materially influence the oversupply highlighted in Table 3 as less efficient facilities can if necessary target domestic waste.

The net effect of this feedstock/capacity imbalance in northern Europe has been one of rapidly falling gate fees as operators seek volumes to fill their plant. In one instance a gate fee as low as €30/t was reported for municipal waste in Netherlands on a medium term contract, whilst it is reported that for specific SRF streams, operators are now paying producers.

Competition for this waste is now very much trans-frontier. Whilst in mainland Europe this is not new – being driven in the past by simple transport cost considerations (particularly in border areas), macro market economics, differential tax rates (e.g. Norway to Sweden) and/or market failures e.g. Naples to Germany – the level of this European competition is now greater than ever.

3.3. The UK Market Response

Historically the Residual Waste market in the UK has been regionalised, with transport economics often having as material an impact on the selection of disposal/treatment facility as gate fee. With landfill remaining the principle outlet for mixed Residual Waste and given landfill tax is a fixed component of gate fee cost, the difference between the cheapest landfill operating on a marginal cost basis to secure volume and an 'average' priced landfill[4] is about £12-£15/t. In terms of road haulage costs, these differentials are the equivalent to **little more than 100 miles**.

However, the declining gate fees in northern Europe and rising landfill tax in the UK is now generating **a significant gate fee differential** which has the potential to open up the UK Residual Waste market from its regional base into international European market. The key being the extent to which the differential is sufficient to cover any transport, transfer and pre-treatment costs required for export.

Figure 5 sets out a simplified analysis of the estimated current (i.e. as at May 2011) and projected costs (factoring only UK landfill tax increases) for the various options available for mixed Residual Waste on a short term contract (less than 12 months consistent with the duration of export timescales).

Treatment Option	Description
Landfill	Landfill Tax rises to £80/t real and increases thereafter in line with inflation. £8/t low landfill gate fee based on marginal economics; high in England of £24/t (WRAP Gate Fees Report[5])
Existing EfW (limited capacity)	Current contracted LACW gate fees for existing EfWs reported with a median of £49/t. LACW represents over 90% of input to these existing EfWs and so limited spot market and therefore LACW gate fee used as benchmark.
MBT – Landfill	A low specification, merchant MBT focussing on high recycling and high 'loss to air' with remaining output to landfill
MBT – SRF to specification to Cement Kiln (limited capacity)	High specification MBT producing SRF for cement kilns at a gate fee including transport costs of £50/t[6]
Basic Dirty MRF with output exported	Basic recycling facility maximising recyclables and minimising landfill inputs and exporting low grade RDF to Netherlands

Table 4: Assumptions supporting Figure 5

Figure 5 assumes a spot EfW gate fee in northern Europe for mixed Residual Waste of €30-€50/t, and an exchange rate of €1.15=£1.

It has been reported to Tolvik (but not validated) that some operators are suggesting total 'door to door' transport costs of £20/t; more widely €30-€35/t (used in Figure 5) is regarded as a reasonable estimate for the Netherlands; costs to Sweden and Germany are likely to be higher.

Descriptions of the various options in Figure 5 are set out in Table 4. The Green band represents the potential range of gate fees for RDF export via Dirty MRF.

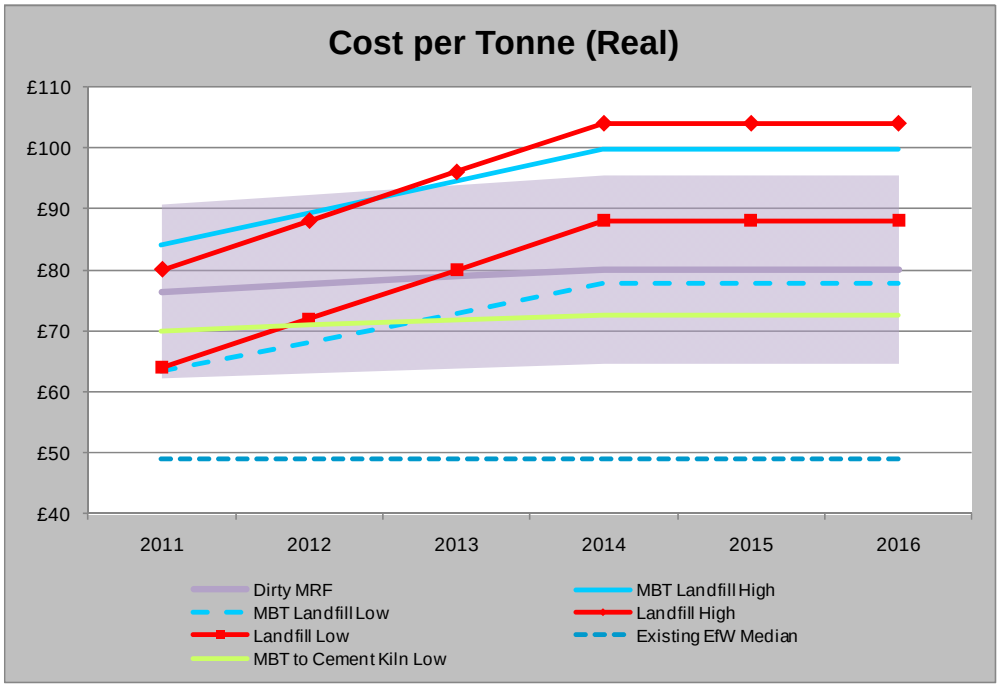
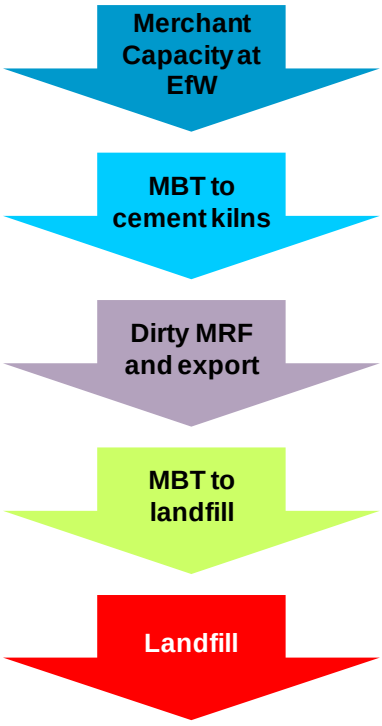


Figure 5: Cost per tonne for various waste treatment options

Assuming market conditions in the UK and northern Europe remain broadly as at present, Figure 5 highlights an emerging economic hierarchy for waste treatment.



As evidenced in Europe, spare capacity at **existing EfWs** can, **if necessary**, be marketed on a marginal cost basis and so become the least cost option in the short term. There is limited UK capacity.

The second option is that of **MBT facilities able to produce a high specification SRF** which is acceptable to cement kilns or other facilities for co-incineration; as with EfW this is constrained by the available market capacity in the UK and the price it is willing to pay – unless export markets deeply discount for quality SRF as a feedstock

The short term competitiveness of the **Dirty MRF** solution (median shown as solid green line) against landfill is clear but it is very sensitive to market conditions – both the transport and gate fee cost in Europe as well as recyclate values.

As landfill tax rises so any technical solution which reduces volume, such as **MBT** becomes relatively more attractive when compared to landfill – and this is shown clearly in Figure 5 where it starts broadly equivalent to landfill and then becomes cheaper with time.

At the bottom of the hierarchy, in all senses, sits **landfill**.

This suggests that given that there is limited merchant capacity at UK EfWs and cement kilns etc, **export of RDF is an increasingly attractive economic option**.

It must be stressed, however, that this **hierarchy only applies to waste on short term contracts**.

Gate fees for long term access to facilities such as those built in response to LACW procurements may be different – as evidenced by the WRAP Gate Fee report which highlights very clearly, for example, that for new EfWs these are estimated to range between £85/t and £120/t. This suggests that for **waste on long term contracts** the export of RDF **may be even more economically attractive** – although this does not necessarily reflect the commercial risk given that export approval process needs to be repeated annually.

4. CURRENT AND POTENTIAL EXPORT ACTIVITY

4.1. Historic Export Activity

In 2009 total notifiable exports from the UK totalled 243ktpa, none of which was RDF.

In June 2010 it was reported[7] that Shanks had secured the first approval for the export of 40ktpa of RDF over the following 12 month period.

Unaudited 2010 data released by the EA to Tolvik under a Freedom Of Information (FOI) Act request shows a significant increase in overall exports to 506ktpa, and for the first time **38ktpa** of wastes were identified by the EA as RDF for export to Poland, Netherlands and Estonia.

4.2. Current Export Activity

In the last 6-9 months there has been a further acceleration in the level of notifications received by the EA for export of RDF and by December 2010 it was reported[8] that 178ktpa of RDF exports had been approved.

As at 13 March 2011 this had increased to **238ktpa** of waste for export to R1 facilities under European Waste Catalogue 19 12 10 *(combustible waste – refuse derived fuel)* from 12 individual notifications.

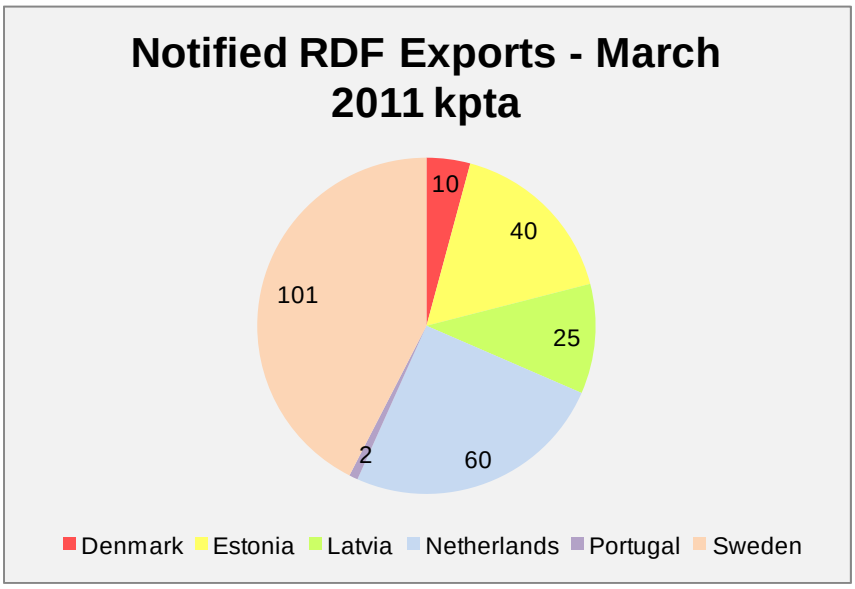


Figure 6: Notified Exports at March 2011 Source: EA

However, there is a strong probability that this will continue to increase significantly during 2011. For example, according to information provided in the Netherlands[9], applications to the Dutch authorities for imports by the end of April 2011 totalled more than 220ktpa (significantly higher than the 60ktpa in Figure 6) and significant further applications have been made in the last couple of months.

Of course not all the notified RDF will necessarily be exported but based on the information above it is not unreasonable to assume that the export of over **500ktpa** of RDF could be approved over the course of 2010/11.

4.3. Potential UK RDF Production

The current level of RDF production is difficult to assess given that if the output from a treatment facility is sent for thermal treatment then arguably it can be described as RDF; if it is landfilled it is simply a reject from the process.

However, it is possible to estimate the potential capacity for RDF production assuming limited investment at existing waste management facilities. These facilities have been split into three categories – transfer stations/physical treatment, MBT/autoclave and 'clean MRF'.

Transfer stations/physical treatment - On the basis that a throughput of at least 50ktpa will be required to justify the investment needed to produce RDF, Tolvik has undertaken a desktop review of all permitted waste transfer stations and physical treatment facilities in England and Wales handling more than 50ktpa of Household, Industrial and Commercial (HIC) waste in 2009 (i.e. with the potential to become a 'Dirty MRF'). Facilities used solely in the transfer of LACW and other specialist waste streams were excluded.

Figure 7: Dirty MRF in Action Source: Powerday

With a total throughput at such facilities of 13.4Mt in England and Wales, it is estimated that such facilities could potentially produce between 1.3 and 3.1Mt of RDF. Similarly figures were estimated for Scotland and Northern Ireland.

MBT/Autoclave – A detailed analysis was undertaken of each of the facilities making up the current 1.9Mt of existing MBT/autoclave capacity to assess their potential to produce RDF.

Clean MRFs - it is estimated that total inputs to clean MRFs in 2009 was 4.9Mt and assuming an average of 10% rejects[10] from these facilities, 2.5-5% has been estimated to be suitable for the production of RDF.

Sources	Inputs Mt	RDF – High Estimate	RDF – Low Estimate
C&D Recycling	5.3	0.1	-
HIC Transfer stations	4.3	1.1	0.4
Dirty MRFs etc	3.8	1.9	0.9
Total – England and Wales	**13.4**	**3.1**	**1.3**
Scotland/NI	1.4	0.3	0.1
Total	14.8	3.4	1.4
MBT/Autoclave	1.9	1.1	0.7
Clean MRFs	4.9	0.2	0.1
Other	-	0.1	0.1
Total	**21.6**	**4.8**	**2.3**

Table 8: Potential RDF Production from Existing Facilities Source: Tolvik Analysis

Overall therefore Tolvik estimates that, based on 2009 capacities and throughputs, there is the potential with limited investment for the UK to generate between **2.3Mt** and **4.8Mt** of RDF.

To put this into context, the potential level of 2011 RDF exports of 500tkpa in Section 4.2 represents 10-20% of this total availability.

4.4. UK RDF Treatment Capacity

As RDF is a waste it needs to be treated in a Waste Incineration Directive (WID) compliant facility. In the UK there are three potential facility types – existing EfWs, co-incineration in cement kilns and other specialist WID-compliant facilities.

EfWs - historically only limited quantities of RDF have been sent to existing EfW facilities as the focus has been upon treating mixed Residual Waste which, because of its lower calorific value, permits a greater tonnage of waste to be processed than RDF. However, Tolvik is aware of a number of operators that in 2010 started to accept limited quantities of RDF in order to optimise overall plant performance. It is unlikely that overall capacity for RDF will be more than 5% of total capacity – i.e. circa **0.2Mt**.

Cement Kilns - The main market for RDF to date has been the UK cement industry but it has a need for a high quality SRF rather than RDF. The UK cement industry has suffered significantly from the effects of the recession, with cement production dropping 24% between 2008 and 2009 from 10.1Mt to 7.6Mt[11]. This led to the closure/mothballing of several plants – including Barrington in Cambridgeshire and Westbury in Wiltshire. This in turn has had a corresponding effect on fuel demand – although this has been mitigated to some extent by operators' desire to maximise the use of waste fuels as an additional source of revenue and for improving their environmental performance. According to the EA for England and Wales, in 2009 total waste inputs were down by 11.5% from 0.50Mt in 2008 to 0.45Mt in 2009 – a figure which includes hazardous wastes, tyres, and solvent derived fuels. Overall the current market for mixed waste derived RDF is estimated to be no more than circa **0.2-0.3Mt.**

Specialist WID Compliant Facilities - Whilst there are a number of WID compliant facilities in the UK, it is understood that only Slough Heat and Power (SHP) regularly accepts significant quantities of RDF-like fuels – the rest currently focus on specific biomass sources – waste wood, animal wastes etc. In 2009 SHP accepted just under **0.2Mt**.

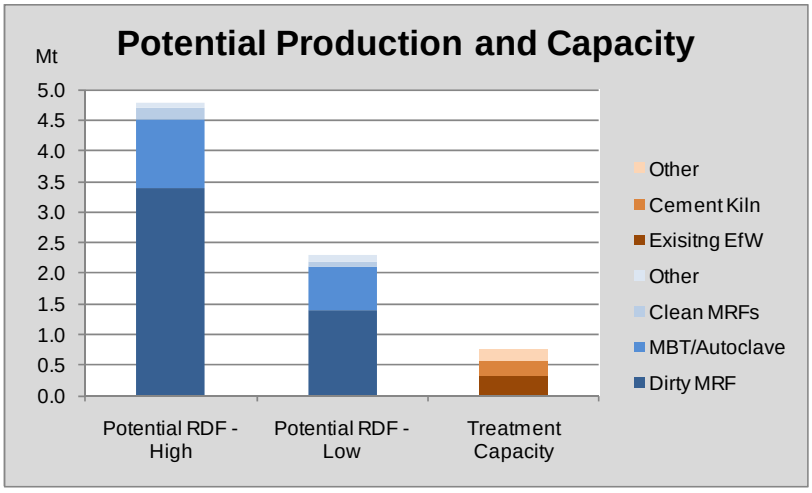


Figure 9: RDF Treatment Capacity vs Potential RDF Production Source: Tolvik Analysis

Figure 9 demonstrates that the potential RDF production capacity far exceeds treatment capacity – which helps to explain why only limited RDF has been produced in the UK to date.

5. EUROPEAN MARKET OVERVIEW AND UK EXPORT PLANS

This section provides a brief, high level snapshot of each of the key potential European markets.

5.1. Belgium

Belgium has historically been a relatively self-contained waste market with limited imports and exports of waste and limited movement of waste between the different regions of Flanders, Brussels and Wallonia. In 2009 it was reported that Belgian incinerators operated at circa 97% capacity with 2.48Mt processed at facilities with a total capacity of 2.55Mt[12].

In 2010 there was an additional 0.5-1.0Mt of capacity[13] planned/under construction which, if all were constructed, would move Belgium as a whole into a position of significant over-capacity. However, it is understood that several planned extensions/new plants have been cancelled in the face of competition for waste and a desire not to stimulate imports, and provided that domestically produced waste remains within Belgium, it would be reasonable to assume that no material over-capacity should result.

This said, with gate fees historically at or a little above the €100/t level with and additional €3-€7/t incineration tax, Belgian operators are being aggressively targeted by competition from the Netherlands. In response, a new trade body has been set up seeking clarification of the R1 status and a questioning of whether the pre-treatment requirements under WSR are being met.

Summary: At present Belgium has limited scope to accept UK produced RDF but may have interest in SRF for cement kilns.

5.2. Netherlands

Over the last few years, the Dutch waste incineration market has been moving towards over-capacity which has been accelerated by the effects of the recession which, it is understood, reduced volumes of waste from SMEs by 30%.

According to information from NL Agency[14], total capacity at EfW facilities at the end of 2009 was 7.2Mt with a further 0.6Mt under construction. 0.4Mt has since been decommissioned (AVR Rotterdam). With only 6.3Mt of waste incinerated and negligible volumes of combustible waste to landfill, this was the equivalent to an over-capacity of 15%.

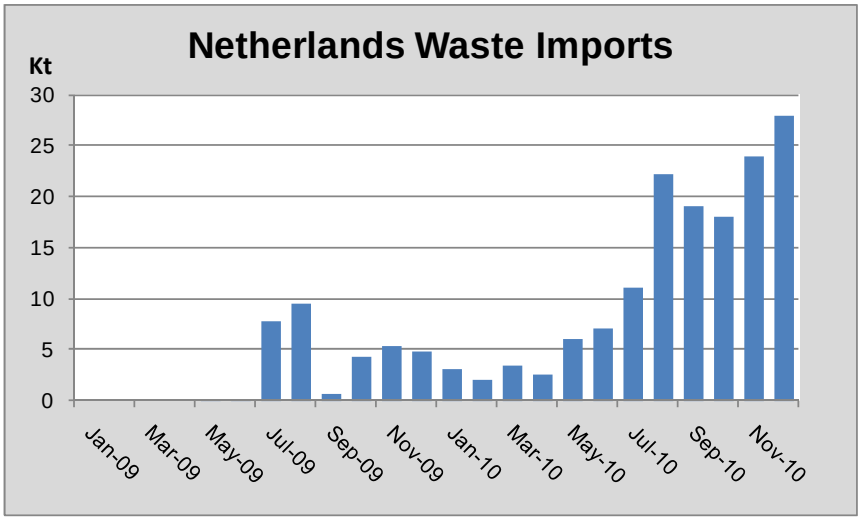


Figure 10: Monthly Imports of Waste into Netherlands Source: NL Agency[15]

As Figure 10 shows, the Dutch market has responded through significant increases in imports – in 2010 144ktpa was imported but it is estimated that this will as much as 400ktpa in 2011.

Historically whilst gate fees in the Netherlands have been towards the €100/t mark (there are no incineration taxes in the Netherlands), they have fallen rapidly over the last few years. For example in order to re-secure a medium term contract with a municipality in 2010 one operator was required to drop their gate fee from €100/t to €42/t. In March 2011 it was reported that gate fees at a recently expanded facility were being offered to municipalities at **€30/t.**

Summary: The level of over-capacity and the proximity of the Netherlands make it a particularly attractive export market for UK produced RDF.

5.3. Germany

The German waste market is the largest market in north Europe, and the German thermal treatment market segments into three elements with total capacity estimated to be 26.3Mt:

Treatment Facilities Mt	Capacity
EfW	19.3
RDF – Power Plants	5.0
RDF – Co Incineration	2.0
Total Capacity	26.3

Table 11: German Thermal Treatment Capacity – 2010 Source: Prognos

Latest data suggests that as at the end of 2010 the total feedstock supply for EfW and RDF Power Plants was 20.2Mt – suggesting a current **over-capacity** of 17**%** with some further (albeit limited) capacity still to be built.

This over-capacity has had significant impact on a market in which gate fees recently were over €150/t. Spot gate fees for C&I Waste in 2010 dropped, according to EUWID, to an average of €70/t. Within this average there are significant regional variations with prices reported as low as €40/t and as high as €110/t. Imported RDF would compete in these markets.

The structural dynamics of the German incineration market are significant to understanding the potential for RDF imports. Gate fees at incinerators for municipally collected waste are significantly higher on average than for C&I Waste, with a high proportion of municipally collected waste processed in public sector owned EfWs and gate fees set by way of a 'cost plus' mechanism charged to local residents.

For more information about Prognos and its work on the German and European waste markets, please see www.prognos.de or contact Bärbel Birnstengel (phone: + 49 30 52 00 59-215, email: Baerbel.Birnstengel@prognos.com)

The challenge for German facilities, particularly those which are some distance from the coast, will be to be able to develop a suitably attractive logistics solution.

For RDF Power Plants where the over-supply is greatest, average spot gate fees have fallen to €40/t and below and for high CV SRF to a specification, it is understood that payments are now being made to attract the necessary feedstock. The market dynamics are very different to incineration and are driven by more by energy considerations rather than simply gate fee economics.

In particular, whilst demand for non-nuclear energy in Germany will rise, RDF Power Plants will be subject to EU emissions legislation which will reduce their price competitiveness when compared to incinerators (which will not be subject to such constraints).

Summary: A potentially significant market for RDF exports from the UK but one which may struggle to compete with Netherlands (benefits of proximity) and Sweden (benefits of marginal cost economics).

5.4. Denmark

In Denmark it is estimated that there is 3.5Mt of constructed EfW capacity but that suitable combustible waste is circa 3Mt – suggesting a potential **over-capacity of up to 20%.** As a result two wholly merchant EfWs were shut in Summer 2010 as the shortage of waste at economic gate fees made them commercially unviable.

However, the age profile of Danish incinerators is amongst the oldest in Europe and there have been a number of recent applications to the Danish EPA for new facilities (as well as some expansion of capacity), but in the light of market trends 8 such applications were recently refused.

At circa €50/t Denmark has the highest incineration tax of the countries covered in this Briefing Report and its ongoing retention currently under review. Not only does it restrict Denmark's ability to address the over-capacity through waste importation (particularly given that the underlying gate fees for commercial waste offered by some municipal incinerators is low – below €30/t) but puts Denmark market under real competitive threat from other European markets.

Summary: Denmark is unlikely to be an attractive market for UK RDF exports until such time as the incineration tax is removed.

5.5. Sweden

Sweden has long had an extensive network of highly efficient incineration facilities, with the focus on heat production for district heating rather than electricity production. Total processing capacity has recently exceeded domestic waste production and with further capacity under construction, analysis by Profu[16] suggests that the over-capacity in the incineration market in Sweden, which is currently estimated to be circa 600ktpa, (about 12%) could increase over the next few years to up to 2.0Mt.

Recently much of this excess capacity has been met through imports from Norway, where use of Swedish EfWs helped Norway meet its landfill bans. However the market has now reached the stage that Norwegian imports are insufficient to meet the shortfall and Swedish operators are looking elsewhere to source feedstock, including the UK.

A more detailed analysis of the Swedish incinerator market is available in English for purchase from Profu by contacting Mattias Bisaillon (phone: +46 70 364 93 50, e-mail: mattias.bisaillon@profu.se). For more information about Profu, see www.profu.se

The competitiveness of the Swedish EfW market has been assisted by the removal of incineration tax in October 2010 and spot gate fees in 2010 were variously reported to be as low as €10-30/t. Tolvik's analysis of the Sweden market in partnership with Profu shows that the heavy reliance on CHP (and the revenue from the sale of heat), means that Swedish incinerators may be able to offer spot prices lower than elsewhere in Europe.

Summary: Sweden is potentially one of the most attractive European markets for the export of UK produced RDF although it does not benefit from the same transport economics as the Netherlands

5.6. Norway

Norway has traditionally had a short-fall in thermal treatment capacity (resulting in exports to Sweden) but there has been a recent increase in capacity from 1.1Mt to a projected 1.8Mt by the end of 2011.

This increase in capacity is expected to be sufficient to result in a modest over-capacity[17] so much so it was reported that in response to this over-capacity a Norwegian waste operators have been seeking to source imports from as far afield as Italy.

Norway removed its incineration tax in October 2010 at the same time as Sweden; however a number of systemic challenges in the Norwegian market[18] mean that Norway continues to be at a competitive disadvantage to Sweden.

Summary: Whilst there is a potential relatively small scale market for the acceptance of UK produced RDF, it is likely to be less competitive than other markets.

5.7. Estonia

Estonia represents a very small market on an international scale with two incinerators planned (one currently under construction) with total capacity of 0.3Mt. These facilities are projected to see gate fees of €30-40/t[19] and are designed to meet local landfill diversion requirements.

In addition Kunda Nordic Cement Plant has an RDF demand (with feeding MBT capacity planned) but in the short term it is meeting much of its RDF requirements through imports.

Summary: It is unlikely to that there will be any short term opportunities for the additional export of UK produced RDF.

5.8. Company Export Plans

As reported in December 2010, export activity is being led by several major UK waste companies:

SITA

SITA views the export of RDF as an interim measure before its own thermal treatment facilities are developed in UK and the development of the export market has been undertaken in conjunction with the wider SITA Suez group. Recent reported RDF export projects are understood to include:

- Mitcham Eco-Park – outputs from the onsite MRF and other activities;
- Byker/Ellington – export of 41ktpa of RDF as part of a long term agreement with Newcastle City Council;
- Connon Bridge, Cornwall – export of circa 20ktpa of RDF from a 34ktpa temporary facility pending construction of Cornwall EfW;

Shanks

The focus of Shanks' current export activity is from its two ELWA MBT facilities where SRF outputs have historically been delivered to cement kilns in the UK.

However, Shanks are reported to now be exporting SRF from these MBT facilities to Netherlands (where they have existing operations) and Estonia. SRF from its Dumfries MBT operation is understood to be thermally treated locally.

Biffa

Approval has been granted for the export of RDF from Biffa's Leicester MBT operation and it is understood that they are exploring other export opportunities.

Other Operators

From data provided by the relevant authorities outside the UK, a number of other operators are in the process of arranging for RDF exports.

With the supply chain rapidly maturing to address the logistical challenges associated with transfrontier shipments of waste, and with several organisations looking to broker waste exports, it is likely to become increasingly easier for smaller operators to consider accessing these export markets.

However, the challenge for such operators will be to arrange for sufficient security both to satisfy the relevant authorities and to demonstrate to offtakers the ability to maintain feedstock supply.

6. OPPORTUNITY OR THREAT?

The earlier sections of this Briefing Report have identified that the export of RDF from the UK is currently a commercially attractive and achievable management option.

How likely is it that this situation will continue and if so, what will be the effect on the development of the UK waste treatment market?

In Tolvik's opinion there are two key factors which will influence this – future trends in northern Europe and if and how, with time, the EA's Position Statement with respect to RDF exports is amended.

6.1. The North European Market

Table 12 sets out the drivers which are most likely to impact on the future feedstock supply/treatment capacity balance in the north European incineration market. Whilst there will, of course, be variations from country to country, it is not unreasonable to assume that the increasingly integrated nature of the market will ameliorate the effects of these country specific influences on the overall market.

Feedstock Supply	
↑	There is a general view that the **recession** adversely impacted on C&I Waste tonnages and, to a lesser extent, on household waste – particularly bulky waste. A **recovery** should bring some degree of improvement and with generally higher baseline recycling rates than the UK, it could reasonably be argued that the risk of further recycling fully eroding the benefits any recovery in waste arisings is less in northern Europe than might be expected in the UK
↓	Further EU **legislative pressures** for increased recycling will impact on the tonnages of mixed waste across Europe – eg Germany which is seeking targets beyond those set out in the revised Waste Framework Directive
↑	It is possible to argue that sustained low gate fees have the potential to impact on the **economics of recycling** to such an extent that lower value recyclables are withdrawn from the recycling market and directed to the thermal treatment market
↓	For some facilities, particularly those with operational obligations – particularly heat supply, it may be preferable to source **alternative suitable feedstocks** rather than rely on volatile waste markets for fuel
↑	Northern Europe is successful in **attracting RDF from the UK** on a sustained basis to meet shortfall in feedstock
↑	Lower gate fees impact on overall economics such that northern Europe is successful in **attracting suitable wastes from those countries in southern and eastern Europe** which are not seeking self sufficiency and which do not plan to introduce landfill tax
Treatment Capacity	
↓	There are relatively modest plans for small further **increases in treatment capacity** through **projects already under construction;** whilst in the main to date market economics have served to limit operators' further expansion plans there is ongoing pressure in Scandinavia, for example, to move away from fossil fuels and in Germany to find replacements for the nuclear capacity (to be decommissioned by 2022). These trends may accelerate the movement by incineration market from waste treatment to energy production

↑	Changing conditions make continental MBT facilities unviable and so **MBT capacity is decommissioned** from the market
↑	**Economic obsolescence** – lower gate fees put pressure on older, less efficient facilities which are squeezed through a combination of higher maintenance costs, lower gate fees and lower energy sales. In Germany, for example, 36% of facilities are over 20 years old. It would be reasonable to assume that low gate fees could speed up the **decommissioning** of such facilities or indeed make operators consider **mothballing** some more modern facilities
?	**Technical obsolescence –** it is not clear the potential for technical obsolence may impact on future capacity - either directly (eg any further emissions requirements over and above those required to comply with WID) or indirectly – where a failure to meet the R1 criteria is politically unacceptable

Table 12: Factors influencing the North European Market

6.2. The EA Position Statement

The EA's Position Statement with respect to RDF export makes it clear that is driven by the limited UK waste infrastructure capacity. Given this reference, it is likely that, in time the EA will review the statement.

However, the outcome of such a review is unclear. Whilst it is possible that the RDF definition will, as part of such a review, be conformed to the European standard (i.e. that mixed municipal waste must be '**substantially altered'**), it is less clear whether such a change would raise the required level of pre-treatment and if it did whether the new requirement would be such that that the EA would object to the export of RDF from some Dirty MRFs which has been the result of only limited processing. It is also not clear whether in doing so the EA would be interpreting rWFD in a different way to the other relevant authorities in Europe and so stand accused of 'gold plating' European legislation.

How soon such a review might be is difficult to predict and, in the absence of UK landfill diversion alternatives, it may be in policy makers' interests to maintain the status quo for as long as possible. This would be consistent with the light regulatory touch across much of (English) waste policy. On the other hand were an example of 'inappropriate' export to reach the national press, policy makers' hands could be forced.

6.3. Impact on the Development of UK Infrastructure

Significant new EfW capacity is planned in the UK – based on Tolvik's own databases, over 15Mt is either consented or proposed.

There is a **clear risk that sustained high levels of RDF exports could undermine investor confidence** in these facilities – particularly those with a large merchant waste element. This is likely to be both through putting a limit on the expected level of gate fees (below the expected landfill + landfill tax metric) as well as reducing the willingness of feedstock suppliers to enter into long term waste supply obligations.

For developers of 'conventional' merchant EfWs, unless the EA Position Statement is changed, the economics are clear – gate fees will need to compete with RDF production, transport and export. In addition, as operators seek export markets in the short term an unexpected technical challenge may present itself – namely of a market in which high CV RDF is as prevalent as mixed waste – with the consequential impact on plant design and capacity.

For developers of specialist RDF thermal treatment facilities, the short term development of the export market provides a potentially mixed message; on the one hand there can be greater certainty with respect to the availability of high CV fuels, but on the other hand gate fee expectations may be lower than required to achieve satisfactory returns if there is an ongoing need to compete with marginal capacity at European facilities.

As a consequence of these threats it is possible that developers would look to put pressure on the EA to make early changes to the Position Statement so as to constrain exports. Whether any such change would provide sufficient certainty to debt and equity funders for them to be willing to invest (in particular to merchant facilities) is, however, open to question.

6.4. Waste Producers and Sustainability

From a corporate social responsibility and economic perspective the RDF export market is potentially attractive to waste producers – both local authorities and commercial concerns - keen to both reduce costs, carbon footprint and reduce tonnages sent to landfill.

However export of waste for thermal treatment has the potential to attract adverse publicity both in the UK and in the importing member state. In the short term it is likely that a robust argument can be developed which is consistent with the EA's Position Statement - i.e. that it is an interim measure as the UK develops its own capacity.

A longer term export strategy may prove to be more challenging to justify, but Tolvik is aware of European studies which have assessed **the net environmental impacts of waste import**. Given the high efficiency of north European incinerators (particularly those with significant heat offtake), it is quite possible that that the carbon impacts associated shipping the RDF could be more than offset by the relative efficiency of European incinerators when compared with electricity only UK EfWs.

Were such a conclusion reached, it could act as a counter-argument to any pressure from developers that export should be subject to greater controls.

6.5. Potential Scenarios

In response to these various influences, Tolvik has identified four potential future scenarios:

- "**Market Recovery**" - North European market over-capacity disappears within 5 years, continental gate fees rise and lower export volumes reflect the changed economics. The ***development of UK waste infrastructure is then likely to be delayed***.
- **"Export Solution"** - North European market over-capacity remains at least at current levels with further downward pressure on spot gate fees and with the potential in some markets to fall further to €0/t. Any changes to the EA Position Statement do not materially influence export activity and ***waste infrastructure development in the UK*** (particularly for merchant tonnages) ***is lower*** than needed for 'self sufficiency'.
- **"Interventionist"** – Whilst the market over-capacity in northern Europe at least remains at current levels, the EA Position Statement undergoes early revision and with tightening of the EA's position which effectively reduces exports to high quality RDF/SRF. The export market therefore has a ***little long term impact on the development of UK waste infrastructure***.
- **"Controlled"** - As UK treatment capacity comes on stream, the EA Position Statement is amended such that the onus on potential RDF exporters is to provide the EA with justification that insufficient UK treatment capacity is available to meet RDF production (which is a mirror to the EA's current position on RDF imports). This creates some initial

investor uncertainty but ***only limited delays in the development of UK waste infrastructure***.

The outcomes of these scenarios on the development of UK waste infrastructure are significantly different and it is clear that whilst the **recent over-capacity in northern Europe has been the result of a number of market factors** (municipalities developing their own capacity, operators seeking to secure market share; improvements in recycling, effects of the recession etc), the potential **medium to long term consequences on the UK market** are likely to be **a function both of market factors** and **policy development**.

To date there has been little discussion of the issues raised in this Briefing Report and, in Tolvik's opinion, now is the time, as exports start to rise, for waste export policy be debated more fully in the UK by the various stakeholders – including policy makers, developers, investors, waste producers and waste operators with the aim to provide a clearer long term UK waste export strategy.

Appendix 1 – Definitions & Glossary

BMW	Biodegradable Municipal Waste
CEWEP	Confederation of European Waste to Energy Plants
C&I Waste	Commercial & Industrial Waste
CV	Calorific Value
Dirty MRF	Basic recycling facility processing mixed Residual Waste into recyclables and a low grade RDF
EA	Environment Agency
EfW	Energy from Waste
FOI	Freedom of Information
LACW	Local Authority Collected Waste
MBT	Mechanical Biological Treatment
MRF	Materials Recycling Facility
MSW	Municipal Solid Waste
Mt	Millions of Tonnes
ONS	Office for National Statistics
pa	per annum
PPP/PFI	Public Private Partnership/Private Finance Initiative
RDF	Refuse Derived Fuel
Residual	Residual Waste Non hazardous, active, municipal and commercial and industrial waste tonnages that remain after recycling & composting activities have taken place
Residual Waste Treatment	any form of residual waste treatment and/or disposal that uses a specific technology ie MBT, EfW, Gasification to treat and or dispose of residual waste. This definition excludes recycling & composting and landfill.
ROCs	Renewable Obligation Certificates
RWTF	Residual Waste Treatment Facility
SRF	Solid Recovered Fuel
WID	Waste Incineration Directive

Appendix 2 – Key References and Data Sources

1 Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste, Article 2(b)

2 http://www.environment-agency.gov.uk/research/library/position/41215.aspx accessed on 6 May 2011

3 Environment Agency Guidance on Low Risk Waste Activities April 2011 Version 50

4 WRAP Gate Fees Report 2010

5 WRAP Gate Fees Report 2010

6 MRW - 26 May 2011

7 Letsrecycle.com - 02 June 2010

8 Letsrecycle.com - 17 December 2010

9 http://www.senternovem.nl/uitvoeringafvalbeheer/Afval_over_de_grens/Beschikkingen_on-line/beschikkingen_nuttige_toepassing.asp

10 WYG – Review of Kerbside Recycling Collection Schemes – May 2010, WRAP MRF Quality Assessment Study - 2009

11 MPA Monthly Cement Clinker Production http://cement.mineralproducts.org/downloads/industry_statistics.php

12 Belgian Waste to Energy website - www.bw2e.be

13 Country Reports 2010 - CEWEP – accessed from CEWEP Website www.cewep.eu

14 Afvalverwerking in Nederland, Gegevens 2009 - NL Agency – August 2010

15 Ontwikkelingen in het afvalbeheer - Herman Huisman - Kurhaus Scheveningen - 17 februari 2011

16 Profu Mottagningsavgifter för avfallsförbränning 2010

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18 Avfallnorge: Rammebetingelser for energiutnyttelse fra avfall Hvordan kan lønnsomheten i norske anlegg forbedres? Arbeidsgruppe for energiutnyttelse Rapport nr 3/2011

19 First Waste-to-Energy plant in Estonia and Baltics Urmo Heinam Eesti Energia AS 14th April 2011