UK Energy from Waste Statistics - 2014

Preliminary: December 2015

TOLVIK CONSULTING

Front Cover Image: Suez, Suffolk – Officially opened July 2015

CONTENTS

CONTEXT

This preliminary report looks to bring together data from a range of publicly available data sources into a single document for use by industry and others interested in the development of the UK Energy from Waste ("EfW") sector. It is hoped that the resulting analysis will, over time, become a consistent and reliable source of data on the sector.

This first report has been compiled from source data and whilst it has been compiled in good faith Tolvik cannot guarantee its accuracy. Where necessary gaps in data availability have been filled by Tolvik's analysis of other relevant information (e.g. by using prior year data).

It is hoped that, for the 2015 editions, which Tolvik expects to release in Summer 2016, EfW operators will be willing to work directly with Tolvik, where appropriate on a confidential basis, to provide more comprehensive data for aggregation into a more complete view of the sector.

Any comments/suggestions would be greatly appreciated to adrian@tolvik.com.

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. Further details can be found at www.tolvik.com.

1. OVERVIEW

1.1. Background

This report serves to highlight the extent to which the Energy from Waste ("EfW") market has developed in the UK over the last few years. As recently as 2008, less than 10% of Residual Waste arising in the UK was sent for combustion. In 2014 it is estimated that the equivalent figure (including exports of Refuse Derived Fuel ("RDF")) was 35%.

Figure 1: Facilities included in this Report (Lerwick Inset)

1.2. Scope

This Report covers 33 EfW facilities identified by the UK environment agencies as generating energy from the combustion of Residual Waste – i.e. "Municipal and/or Industrial & Commercial Waste" during 2014. The Report excludes facilities on Jersey and the Isle of Man.

The facilities included are shown in Figure 1 and listed in more detail in Appendix 1.

	# of Facilities	# of Lines	Capacity Mtpa
Fully Operational for 2014	26	51	6.77
In Commissioning during 2014	7	12	1.65
Total	**33**	**63**	**8.42**

Table 2: Facilities included in the Report

The facility on the Isles of Scilly shut at the end of 2014. Runcorn EfW has been considered in two phases with Phase 1 taking commissioning tonnage in 2014

The average age of all 33 facilities as at end of 2014 was 11.7 years.

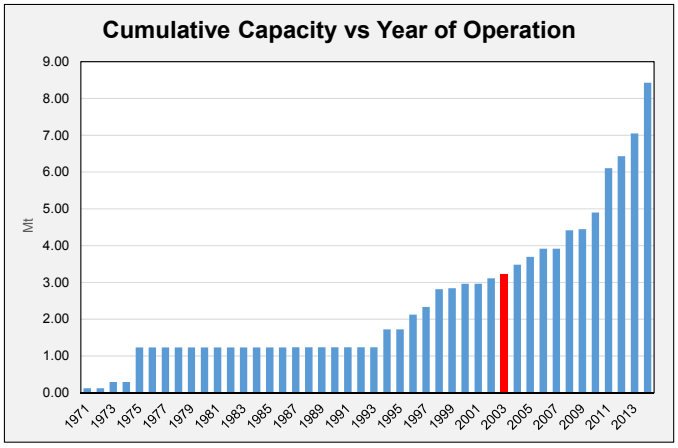


Figure 3: Cumulative Capacity vs Year of Operation

The capacity of an EfW used in this report is generally the capacity contained within an Environmental Permit save where an EfW Operator has reported an alternative capacity (which may be higher or lower).

It is hoped that the Report can be expanded in the future to cover Waste Incineration Directive compliant facilities combusting wastes including: biomass facilities for Recycled Wood; other biomass – both animal wastes and virgin wood; co-Incineration facilities – in particular cement kilns and hazardous waste Incinerators.

1.3. Data Sources

The principal data sources used to compile this Report were:

- EA: Waste Management Information 2014 – Published October 2015;
- SEPA: Waste Data 2013;
- Annual Reports from EfW Operators, accessed via third party Freedom of Information request;
- Wastedataflow for Calender year 2014.

2. WASTE PROCESSING

2.1. Total Volumes

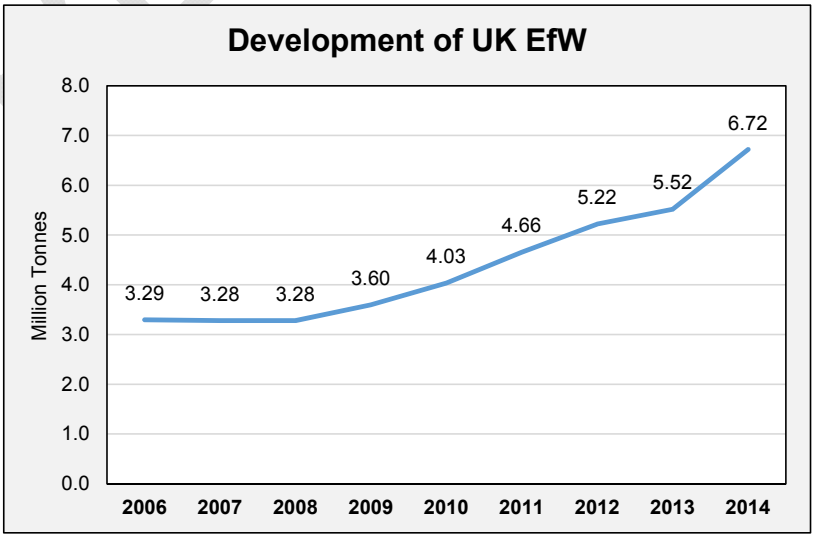
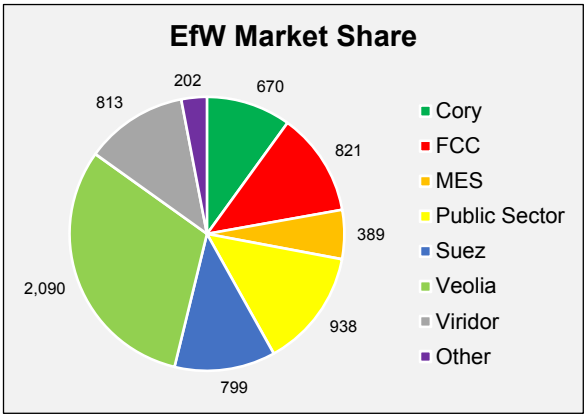


Figure 3: Total Tonnage processed in 2014 Source: EA, Tolvik Analysis

In 2014 total of **6.72Mt** of Residual Waste and RDF was processed at UK EfWs, up 21% on the equivalent 2013 figure – in large part due to a number of EfW facilities moving into the commissioning phase. In the context of the UK Residual Waste market this figure represents 24.5% of the estimated 27.4Mt market.

2.2. Market Share – 2014 Tonnes



Operator	# of EfW	Tonnes (kpa)	Share
Veolia	8	2,090	31.1%
Public Sector	5	938	14.0%
FCC	3	821	12.2%
Viridor	6	813	12.1%
Suez	3	799	11.9%
Cory	1	670	10.0%
MES	3	389	5.8%
Other	4	202	3.0%

Figure 4: Market Share – 2014 (includes JV projects) Source: Tolvik Analysis

Figure 4 shows that in 2014 Veolia had the greatest share of operational EfW capacity. With a number of EfWs at the end of 2014 in commissioning/early stages of operation, these market shares are expected to change rapidly in the next couple of years.

2.3. Facility Availability

The average availability on the basis of reported hours across operational EfWs in 2014 was **89.0%.** This represents a significant improvement on the 2010 Tolvik estimate of 83%, in part due to the reducing age of the EfW fleet in the UK.

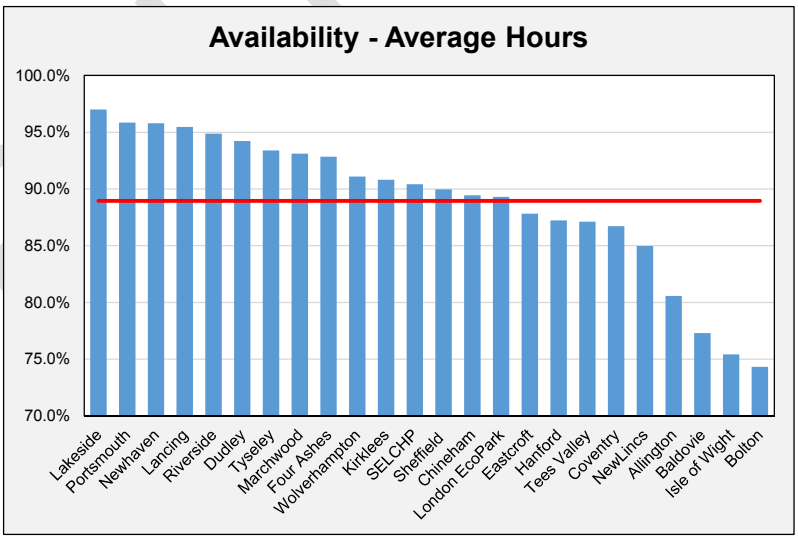


Figure 5: Availability (Hrs) in 2014 Source: Annual Returns, Tolvik Analysis

The equivalent figure based on tonnages processed compared with nominal plant capacity produces an average "availability" per facility of **88.2%.**

2.4. Waste Inputs – Waste Sources

Reliable data with respect to the sources of waste inputs, and in particular the mix between Local Authority Collected Waste ("LACW") vs Commercial and Industrial ("C&I") Waste were not available for 2014. The data on Wastedataflow was did not sufficiently identify tonnages of Residual Waste sent to EfWs, to co-incineration (e.g. in cement kilns) or exported as RDF.

This is an area identified as requiring development in subsequent years.

3. ENERGY GENERATION

3.1. Total Power Production

In 2014, total gross power production from UK EfWs, using the average parasitic load in Section 3.5, is estimated to have been 3.94TWh with a net figure of 3.37 TWh.

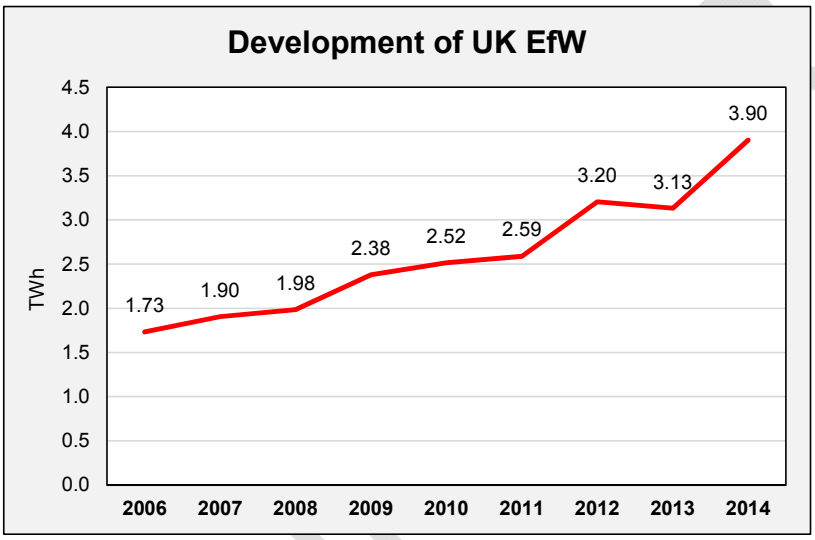


Figure 6: Total Power Production in 2014 Source: DUKES

This compares closely with 3.90TWh estimated by DECC in Digest of UK Energy Statistics ("DUKES"). In 2014, according to DUKES, the UK EfW sector contributed **1.1% to the overall UK energy supply.** This is in line with the current EU average.

3.2. Total Heat Offtake

In 2014 only 5 EfWs in the UK reported beneficial use of heat alongside power, with Eastcroft and Sheffield contributing the majority of heat.

Facility	Export (MWh)	Commentary
Eastcroft	110,385	
Sheffield	88,560	
Coventry	12,911	
Newlincs	TBA	Details not available
Gremista	TBA	Details not available
SELCHP		Connected to heat demand; no offtake reported in 2014
Runcorn		Connected to heat demand; no offtake reported in 2014
Total	**211,856**	

Figure 7: Total Heat Offtake in 2014 Source: Annual Reports

3.3. Renewable Content

DUKES reports that for EfW facilities in 2014 *"the biodegradable content is now considered to be about 50 per cent which has been used for this years' survey but will continue to be reviewed periodically."*

A detailed review by Tolvik of Ofgem derived information across operational EfWs suggests that for those EfWs for which reasonably reliable data is available the average is **51.8%** with a range of 47-61%.

3.4. Generation per Tonne of Input

Figure 8 provides the net power export of electricity per tonne of waste input during 2014. This is a helpful but not wholly accurate method of measuring the efficiency of an EfW and is dependent, inter alia, on the wastes processed at each EfW. There is, for example, currently limited data with regards to the calorific value of waste accepted at each facility.

The average for 2014 was **495KWh** of power exported per tonne processed; Figure 8 shows the figures for the individual EfWs with those also exporting heat in 2014 shown in red.

Further analysis will be required in subsequent reports to understand the sources of the differences – but undertaking Chi squared tests for (a) EfW age (b) EfW capacity (on the basis that an older, smaller plant is likely to be less efficient) did not yield any statistically significant correlation.

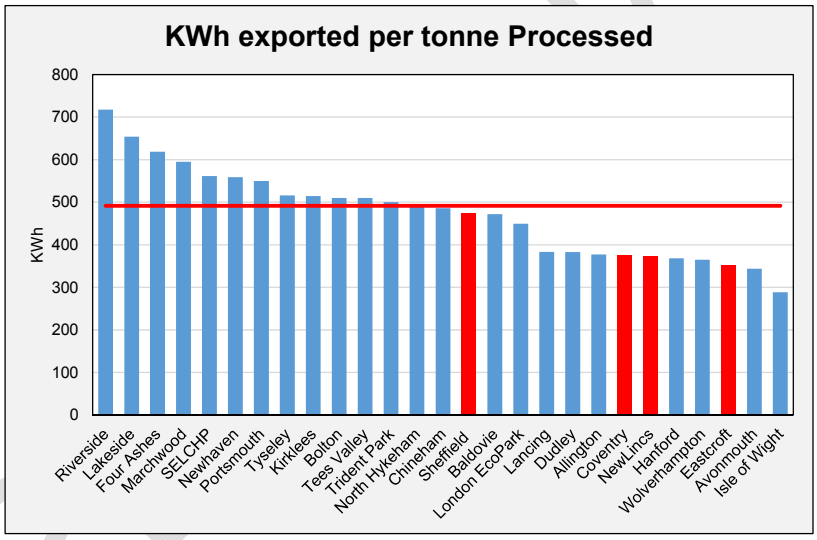


Figure 8: KWh/tonne waste processed Source: Annual Reports

3.5. Parasitic Load

The average parasitic power load across the 12 operational EfWs which reported their data was **14.4%** with a range of 10.1% - 19.9%. There is a reasonable statistical correlation between facility capacity and parasitic load. Further research on this is required.

3.6. Efficiency and R1

As at the end of 2014 the EA advised that of the operational EfWs only Riverside, Newhaven, Tees Valley were R1 compliant – i.e. regarded as recovery (rather than disposal) facilities under the Waste Framework Directive.

By the end of 2015 this figure had increased to 14.

2014	2015
Riverside	Ardley
Newhaven	Kirklees
Tees Valley	Four Ashes
	South Devon
	Suffolk
	Sheffield
	Tyseley
	Ferrybridge
	SELCHP
	Portsmouth
	Southampton

Table 9: Operational R1 accredited EfWs Source: EA

4. OPERATIONAL DATA

4.1. Ash Outputs

Operator	Tonnes Recorded (ktpa)	Average % for Reported EfWs
Incinerator Bottom Ash ("IBA")	1,320	20.6%
Air Pollution Control Resides ("APCr")	234	3.6%
Metals Recovery	108	1.7%

Table 10: 2014 Outputs (Sample: 27 EfWs)

4.1.1. Incinerator Bottom Ash ("IBA")

In 2014 IBA accounted on average for 20.6% of all waste inputs. As shown in Figure 11 IBA outputs expressed as a percentage of waste inputs generally within a close range – with the reported exceptions being Riverside, Allington and Lancing (which is largely recycled wood fired but accepts some RDF).

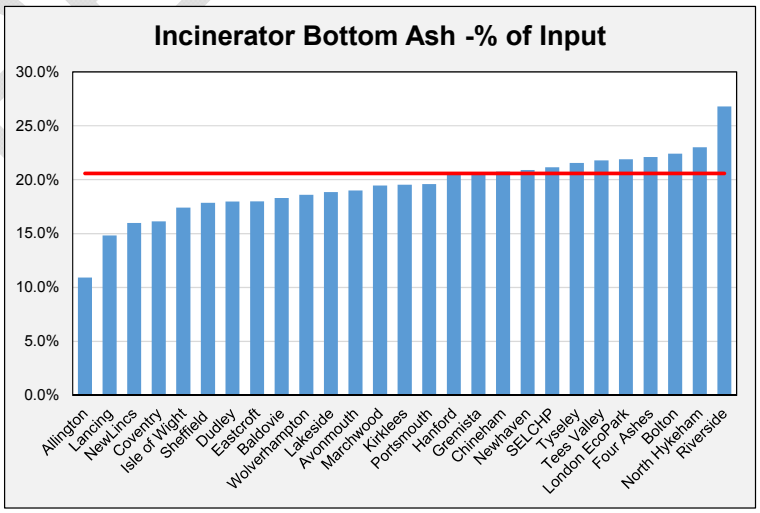


Figure 11: IBA as a % of input tonnages

A number of EfW operators recycle their IBA or have plans to do so. Other than in Wales this does not currently "count" towards recycling targets.

However, if it is conservatively assumed that in 2014 that 75% of all EfW inputs in the UK were of Household Waste and that 90% of IBA can be recycled, there is the potential for the UK to recycle 6.72Mt x 75% x 20.6% x 90% = 934kt of IBA, the equivalent of **3.3%** of all Household Waste.

4.1.2. Air Pollution Control Resides ("APCr")

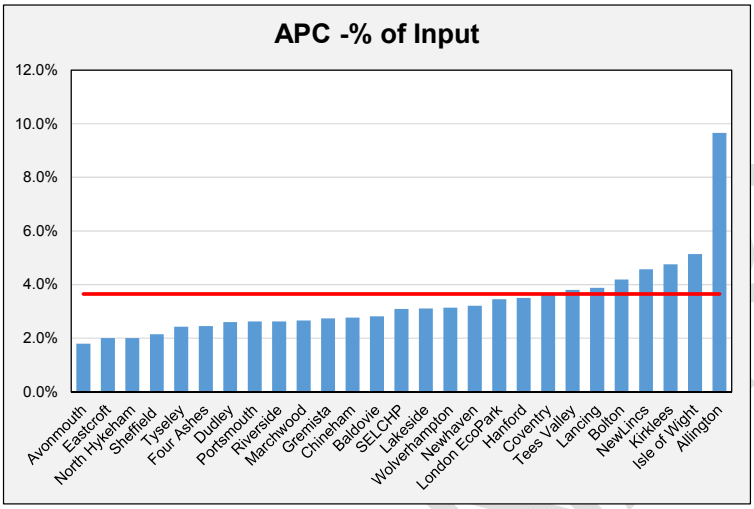


Figure 12: APCr as a % of input tonnages

APCr tonnages generally lie below 4% of all inputs, save for Allington which has a fluidised bed technology.

4.1.3. Metals

The December 2015 EC proposals for a Circular Economy confirmed that metals extracted from EfW would regarded as eligible and "count" towards recycling.

Again assuming 75% of inputs to UK EfWs in 2014 were of Household Waste and with the average 1.7% recovery rate, this represents a very modest 0.3% contribution towards House Recycling rates.

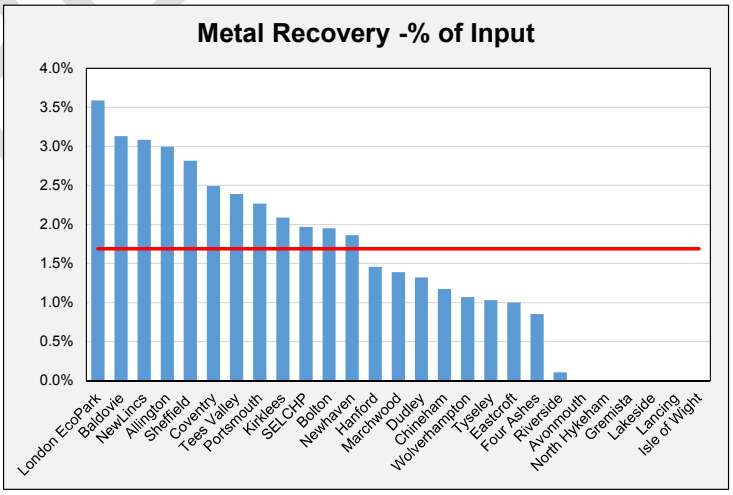


Figure 13: Metal Recovery as a % of input tonnages

4.2. Consumable Use

This is often recorded on EfW Operators' annual returns and an analysis of consumable use will be included in subsequent reports.

4.3. OPRA Scores

All permitted facilities have an Operational Risk Assessment ("OPRA") score provided by the appropriate regulatory authority. Of the 33 identified facilities operational in 2014, OPRA scores were identified for 26 English EfWs. As expected, most EfW facilities had a score of A or B but two had scores of D or E.

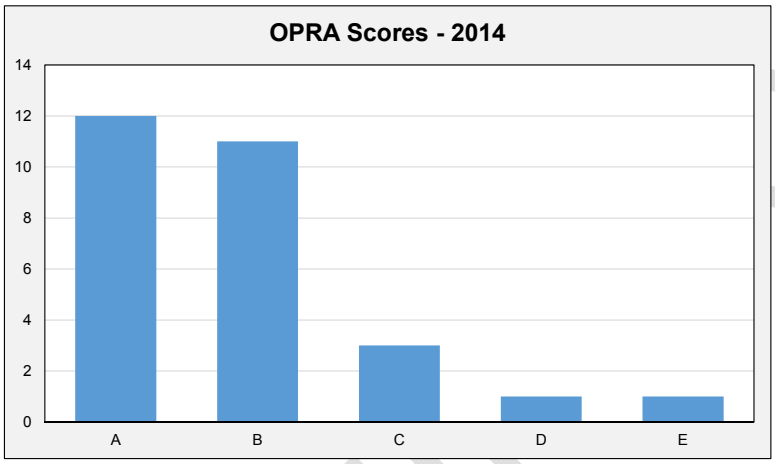


Figure 14: 2014 OPRA Scores Source: EA

Future reports may also assess the environmental compliance of operational EfWs.

5. COMMERCIAL

5.1. Revenue

Currently apart from very limited data which is available in the annual accounts for various EfWs, the only data on gate fees available in the public domain is that which is contained in the "*WRAP Gate Fee Reports*" which relate to Local Authority Collected Waste. However the WRAP data for 2014 and 2015 have such different sample sizes that it would be inappropriate to draw any conclusions from comparing the two.

Type of Facility	Sample Size	Gate Fee (£/ per tonne)	
		Median	Range
All facilities	31	£67	£35 to £112
Pre - 2000	22	£59	£35 to £100
Post - 2000	9	£94	£62 to £112

Table 15: Local Authority EfW Gate Fees Source: WRAP Gate Fees Report 2014

Type of Facility	Sample Size	Gate Fee (£/ per tonne)	
		Median	Range
All facilities	52	£86	£36 to £132
Pre - 2000	27	£73	£36 to £110
Post - 2000	25	£99	£65 to £132

Table 16: Local Authority EfW Gate Fees Source: WRAP Gate Fees Report 2015

Tolvik is keen to explore with EfW operators how gate fee data may be gathered confidentially and aggregated into an overview of the market. This is something which, for example, is done by Profu, Tolvik's partners in Sweden on an annual basis and is regarded as valuable information.

Future reports will also consider revenue from power and heat sales – ideally by reference to the annual average gross values.

5.2. Costs

Tolvik is interested in exploring how EfW data with regards to key operating costs could be best benchmarked to produce meaningful data.

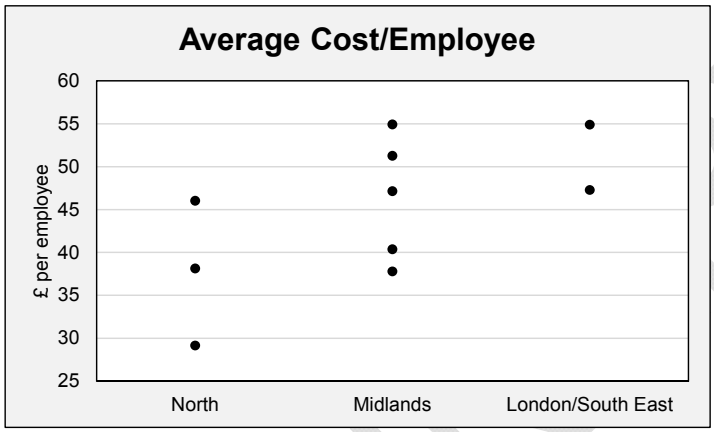


Figure 17: Average personnel costs VOA, Tolvik analysis

For example, for a number of UK EfW facilities, details with respect to **personnel costs** can be found in operating company accounts. In others the figures are 'polluted' by other operational activities – eg transport and so a comparison is meaningless and has been excluded from this Report. Whilst there will be a number of facility specific factors which influence average personnel costs, the range of average personnel costs (with one exception) is **£38k - £55k.** The exception (with a low average of £29k) is for an EfW where it is believed that certain senior positions have been subcontracted to a third party – so pulling down the average.

Another example is business rates. In the UK these are based on rateable values with the standard rate payable in England in 2014 of £0.482 per £ of rateable value. For EfW facilities the average rateable value in 2014 was £6.75 per tonne of capacity (i.e. business rates cost of £3.25/t of capacity) but the range for rateable values was from £2.66/t to £10.73/t of capacity. That there is some variation is not surprising – not least because many EfWs have other facilities on the same site – but the extent of this range is greater than might have been expected.

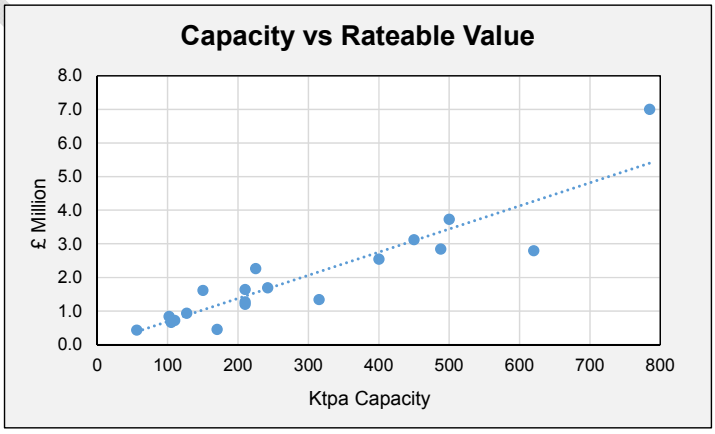


Figure 18: Rateable Value vs EfW Capacity Source: VOA, Tolvik analysis

APPENDIX 1 – EfWS OPERATIONAL IN 2014

Name	Location	Region	Postcode	Operator Group	Operational Date	Lines	Capacity ktpa	2014 tonnes
Riverside	Belvedere	London	DA17 6JY	Cory	2011	3	785,000	669,861
Tyseley	Birmingham	W Midlands	B11 2BA	Veolia	1996	2	400,000	374,237
Coventry	Coventry	W Midlands	CV3 4AN	Public Sector	1975	3	315,000	264,830
Dudley	Dudley	W Midlands	DY2 8JT	MES	1998	2	105,000	93,961
Newhaven	Newhaven	S East	BN9 0AB	Veolia	2011	2	242,000	239,348
Bolton	Bolton	North West	BL3 2NP	Viridor	1971	1	127,000	73,773
Chineham	Basingstoke	S East	RG24 8LL	Veolia	2003	1	102,000	100,173
Isles of Scilly	Porthmellon	S West	TR21 0JY	Public Sector	1987	1	3,500	1,600
Allington	Allington	S East	ME16 0LE	FCC	2008	3	500,000	507,224
Kirklees	Huddersfield	Yorkshire/Humber	HD1 6NT	Suez	2002	1	150,000	131,433
SELCHP	Lewisham	London	SE14 5RS	Veolia	1994	2	488,000	438,578
NewLincs	Stallingborough	Yorkshire/Humber	DN41 8BZ	Groupe Tiru	2004	1	56,000	52,391
London EcoPark	Edmonton	London	N18 3AG	Public Sector	1975	5	620,000	558,205
Eastcroft	Eastcroft	E Midlands	NG2 3JH	FCC	1973	2	170,000	170,396
Portsmouth	Portsmouth	S East	PO3 5QH	Veolia	2005	2	210,000	202,090
Sheffield	Sheffield	Yorkshire/Humber	S4 7YX	Veolia	2006	1	225,000	215,531
Gremista	Shetlands	Scotland	ZE1 0TA	Public Sector	1999	1	26,000	24,000
Baldovie	Dundee	Scotland	DD4 0NS	Public Sector	2000	1	120,000	92,760
Lakeside	Colnbrook, Slough	S East	SL3 0FE	Viridor	2010	2	450,000	453,552
Marchwood	Southampton	S East	SO40 4BD	Veolia	2004	2	210,000	205,829
Hanford	Stoke	W Midlands	ST4 4DX	MES	1997	2	210,000	184,861
Tees Valley	Haverton Hill	North East	TS23 1PY	Suez	1998/2012/2014	5	756,000	644,099
Lancing	Lancing	S East	BN15 8TU	Enviropower Ltd	2011	1	20,000	57,276
Wolverhampton	Wolverhampton	W Midlands	WV1 1QB	MES	1998	2	110,000	110,132
Isle of Wight	Isle of Wight	S East	PO30 5YX	Ameycespa	2009	1	30,000	19,097
Avonmouth	Avonmouth	S West	BS11 8AZ	New Earth	2013	2	120,000	73,376
Marsh Barton	Exeter	S West	EX2 8QA	Viridor	2014	1	60,000	37,726
Runcorn	Runcorn	North West	WA7 4JE	Viridor	2014	2	400,000	156,369
North Hykeham	North Hykeham	E Midlands	LN6 3QZ	FCC	2013	1	154,000	143,444
Four Ashes	Cannock	W Midlands	WV10 7DG	Veolia	2013	2	340,000	314,576
Trident Park	Cardiff	Wales	CF24 5EN	Viridor	2014	2	350,000	30,000
Ardley	Ardley	S East	OX27 7PH	Viridor	2014	2	300,000	61,263
Suffolk	Great Blakenham	Eastern	IP6 OJE	Suez	2014	2	269,000	23,111

APPENDIX 2 – GLOSSARY

APCr	Air Pollution Control residues
C&I Waste	Commercial and Industrial Waste
DUKES	Digest of UK Energy Statistics
EA	Environment Agency
EfW	Energy from Waste
IBA	Incinerator Bottom Ash
LACW	Local Authority Collected Waste
RDF	Refuse Derived Fuel
Residual Waste	Solid, non hazardous, combustible waste which remains after recycling either treated (in the form of an RDF or SRF) or untreated (as “black bag” waste).
Recycled Wood	Processed waste wood of Grades A-C as defined by the Wood Recyclers Association
SRF	Solid Recovered Fuel