Planung und Umweltrecht

Planung und Umweltrecht, Band 1
Herausgeber: Karl J. Thomé-Kozmiensky, Andrea Versteyl
Erscheinungsjahr: 2008
ISBN: 978-3-935317-33-7
Hardcover: 199 Seiten

Planung und Umweltrecht, Band 2
Herausgeber: Karl J. Thomé-Kozmiensky, Andrea Versteyl
Erscheinungsjahr: 2008
ISBN: 978-3-935317-35-1
Hardcover: 187 Seiten

Planung und Umweltrecht, Band 4
Herausgeber: Karl J. Thomé-Kozmiensky, Andrea Versteyl
Erscheinungsjahr: 2010
ISBN: 978-3-935317-47-4
Hardcover: 171 Seiten

Planung und Umweltrecht, Band 5
Herausgeber: Karl J. Thomé-Kozmiensky
Erscheinungsjahr: 2011
ISBN: 978-3-935317-62-7
Hardcover: 221 Seiten

Planung und Umweltrecht, Band 6
Herausgeber: Karl J. Thomé-Kozmiensky, Andrea Versteyl
Erscheinungsjahr: 2012
ISBN: 978-3-935317-79-5
Hardcover: 170 Seiten

Planung und Umweltrecht, Band 7
Herausgeber: Karl J. Thomé-Kozmiensky, Andrea Versteyl
Erscheinungsjahr: 2013
ISBN: 978-3-935317-93-1
Hardcover: 171 Seiten, mit farbigen Abbildungen

Planung und Umweltrecht, Band 8
Herausgeber: Karl J. Thomé-Kozmiensky
Erscheinungsjahr: 2014
ISBN: 978-3-944310-07-7
Hardcover: 270 Seiten, mit farbigen Abbildungen

Strategie Planung Umweltrecht

Strategie Planung Umweltrecht, Band 7
Herausgeber: Karl J. Thomé-Kozmiensky
Erscheinungsjahr: 2013
ISBN: 978-3-935317-93-1
Hardcover: 171 Seiten, mit farbigen Abbildungen

Strategie Planung Umweltrecht, Band 8
Herausgeber: Karl J. Thomé-Kozmiensky
Erscheinungsjahr: 2014
ISBN: 978-3-944310-07-7
Hardcover: 270 Seiten, mit farbigen Abbildungen

Paketpreis
Planung und Umweltrecht, Band 1 bis 6;
Strategie Planung Umweltrecht, Band 7-8
125,00 EUR statt 200,00 EUR

Einzelpreis: 25,00 EUR

Bestellungen unter www.vivis.de
oder

TK Verlag Karl Thomé-Kozmiensky
Dorfstraße 51
D-16816 Nietwerder-Neuruppin
Tel. +49.3391-45.45-0 • Fax +49.3391-45.45-10
E-Mail: tkverlag@vivis.de
Paradigm Shift in the British Waste Management Sector
– from Landfilling to Incineration –

Paul Carey

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Paradigm Shift: A fundamental change in approach or underlying assumptions

1. Situation twenty years ago

Twenty years ago, in 1994, the UK was still coming to terms with the advent of new legislation, principally the Environmental Protection Act 1990, under which many local government waste management operations were transferred to arm’s length companies, some of which were subsequently wholly or partly privatized. Other operations were the subject of public tenders in which the private sector to part. The author was involved in one of the first privately funded and operated energy from waste1 projects for Hampshire County Council, being a 400,000 tpa facility planned for Portsmouth.

1 The term energy from waste is used in preference to energy recovery since at this time the concept of recovery, as now defined, was not in use.
For a variety of reasons this project never saw the light of day, and eventually Veolia was awarded a contract for three smaller plants in different parts of Hampshire. Hampshire County Council was in many ways ahead of its time, being faced with a real shortage of landfill in their county, and was one of the few waste disposal authorities that foresaw the need to avoid landfill and use energy from waste.

Still, by 1995 only 2,610 tonnes, or nine percent of all of the UK’s waste was sent to a handful of energy from waste facilities, the prominent authorities, apart from Hampshire, being North London, Nottingham and Sheffield (Figure 1). 1999 saw the advent of the EU Landfill Directive which set targets for member states on the amount of biodegradable waste that could be sent to landfill and in turn the UK Government set national targets for recycling, composting and a reduction in biodegradable waste to landfill for relevant local authorities under the best value regime as described below.

2. Situation ten years ago

In 2004 the situation in the UK was much the same as in 1994. Indeed, there had been a decline in the amount of waste sent to energy from waste facilities in the late 1990s as some older incineration only plant that failed to comply with the requirement of the UK’s new Environmental Protection Act 1990 and the new EU Directive 2000/76/EC on the incineration of waste – commonly known as WID, later consolidated into the Industrial Emissions Directive 2010 – (Figure 1 and 2). Whilst the impact of the Landfill Directive in the UK was still in its infancy, in continental Europe between forty and sixty percent of waste was treated by energy from waste – although some national statistics at that time were considered unreliable – whereas in the UK the percentage remained well below ten percent.

![Figure 1: MSW treatment in United Kingdom](source: Eurostat 2014)
3. Government strategy

The UK Government has always been an active follower of EU legislation and routinely puts directives into UK law promptly, and sometimes more stringently, than its EU counterparts. This was certainly the case for waste and environmental legislation. However, it would be true to say that little of the UK Government's strategy for dealing with waste has been generated by internal pressure, with more or less everything being driven by Europe. The two key Directives, in addition to WID, were the Landfill Directive 1999 and the Waste Framework Directive 2008. The Landfill Directive 1999/31/EC was – partly – put into effect in the UK by the Waste and Emissions Trading Act 2003. This imposed targets on the UK to reduce the amount of biodegradable municipal waste sent to landfill:

- By 2010 to 75 percent of that produced in 1995
- By 2013 to 50 percent of that produced in 1995
- By 2020 to 35 percent of that produced in 1995.

The Waste Framework Directive 2008 had the underlying policy objective of making the EU a recycling society that sought to prevent waste and, where waste cannot be prevented, to use it as a resource. It imposed the waste hierarchy for how waste should be managed, of:

- Prevention
- Re-use
- Recycling
- Other recovery (for example, energy from waste)
- Disposal (landfill and incineration without energy recovery – as a last resort)
4. Increases in recycling
The UK’s achievements in recycling have lagged far behind the leading EU 27 countries of Germany, Denmark etc, but in recent times, recycling rates have increased to a point where they can be considered respectable. There has been a belated effort over the last ten years to put pressure on consumers and retailers especially to recycle more. The drivers have been various, but mostly the increases have been achieved through effective communication by local government, playing on the conscience of the population. In 2012 the average UK recycling rate had risen to 28 percent (1995: 7 percent).

5. Emphasis on reduce and reuse
Most recently the emphasis has been on waste minimisation and reuse and the mantra of reduce, reuse, recycle, recover – derived from the waste hierarchy – has become more commonly known across most, but not all, of the UK’s population. All of this has led to a more general better understanding of some of the waste management issues facing the UK, and, coupled with a greater general awareness of the need to reduce greenhouse gases, has led to increased rates of recycling. However, it would be true to say that in general the majority of the population pay no heed to what happens to their waste after it leaves their house or apartment; that is until a planning application for a waste management facility is promoted near them.

6. Regional differences
As noted above, certain waste authorities such as Hampshire County Council were faster to implement energy from waste schemes than others. Until the advent of the PFI programme (see below) there was little effort – or incentive – to divert residual waste – i.e. that left over after reduce, reuse and recycle – away from landfill due to its low costs and high availability. The structure of local government with often fragmented responsibilities for collection, treatment and disposal of waste in certain areas (e.g. county areas) led to a range of patterns for collection of recyclables and disposal of residual waste. Pressure on local authority capital programmes and revenue budgets also inhibited the scale of investment that was required to deliver large scale, high cost processes as alternatives to traditional methods.

7. EU Directives
Whilst some have been referred to above, for completeness the following EU directives were instrumental in changing the UK’s stance on waste management:

- Waste Framework Directive 2008 – this is the key Directive that has driven the UK’s waste policy in recent years. It is enacted into English law by the Waste (England and Wales) Regulations 2011
- Landfill Directive 1999 – as mentioned above, this was the initial driver for the UK’s waste policy, to reduce the amount of waste sent to landfill
8. Government responses

As already noted the UK Government readily implements EU directives, and legislation was enacted to do so over the last ten years to encourage greater use of energy from waste, although this was not a specific policy, it being left to individual authorities to make such decisions in their capacity as both as waste disposal authorities as well as local planning authorities. The legislation was both of the carrot and stick type. The Waste Resources Action Programme (WRAP) was an effective carrot. Taxation measures such as the Landfill Tax was an effective stick. The Landfill Allowances Trading Scheme proved in ineffective and underused system which was subsequently stopped.

There was also the binding obligations that the UK imposed on itself under the Climate Change Act 2008 to reduce the UK’s greenhouse gas emissions by eighty percent of 1990 levels by 2050. In 2007, direct greenhouse gas emissions from waste amounted to nearly 23 million tonnes of carbon dioxide equivalent, or around four percent of total UK emissions - around ninety percent of these emissions were from landfill. In carbon terms, it is now widely accepted that energy from waste is generally better than landfill for residual waste, as it produces less methane – a much more powerful greenhouse gas than carbon dioxide – than landfill, and also produces energy which can be offset against the carbon emissions produced by a traditional fossil fuel powered generating station.

The Renewable Obligation, under which renewable power of different types is given variable additional price support through a complicated market mechanism, also acted to encourage energy from waste using either combined heat and power (EfW CHP) or Advanced Conversion Technologies (ACT) such as gasification and pyrolysis. The latter scheme has resulted in many schemes using gasification to be promoted, and often favoured by waste disposal and planning authorities, but due to the smaller scale of such schemes, their inability to attract traditional lender finance due to their relative novelty, and the resulting high gate fees, very few have been built and put into effective operation.

Of all of the measures implemented, the Landfill Tax has proven to be energy from waste's best friend. This tax, applied per tonne of waste sent to landfill, has risen sharply in real terms to a current level of 80 GBP per tonne, and can be truly claimed to be the most effective promoter of energy from waste in the UK. The same scheme has seen many waste authorities look for Mechanical and Biological treatment (MBT) schemes instead, but many of these rely on energy from waste facilities – often in

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2 Anaerobic Digestion (AD) is also a technology that delivers energy from food waste and other biodegradable fuels through production of combustible biogas, generating electricity or heat or injecting gas into the grid – the latter benefitting from significant incentives under the Renewable Heat Incentive.
another authority’s area – to dispose of the biodegraded output euphemistically called Refuse Derived Fuel (RDF). The impact of drivers such as the Landfill Tax and the PFI programme for local authorities (see below) has led to spare capacity in the new fleet of energy from waste plants; exacerbated in some degree by the economic downturn which has led to an overall reduction in waste arisings.

9. PFI Programme

Although initially introduced into the public sector by the Conservatives as early as 1992, under the socialist Labour Government after 1997 there was a greater emphasis on private sector delivery of public services projects. This included roads, hospitals, schools and waste facilities. The need to divert waste from landfill with large investments was achieved by a series of public tenders under the Waste Infrastructure development Programme (WIDP); set up to deliver landfill diversion targets for 2020 through supporting development of residual waste infrastructure. PFI projects were subsidised by Government in the form of PFI Credits; being payments to the successful local authorities which offset some of the higher costs of embarking on this investment route. Accordingly, local authorities were promised a series of subsidy payments over a defined term in order to defray the increased waste disposal costs coming from capital investment in treatment facilities that were consistent with national policy objectives including MBT or energy from waste facilities. In the early years counties such as Nottinghamshire and Norfolk were already, in 2005, in the advanced stages of setting their strategy and implementing PFI procurement schemes. Similar PPP projects were also developed, being similar to PFI projects but without the government subsidy. At this time there was a dearth of potential bidding candidates due to a combination of factors including the complexity and cost of the PFI process as well as the relatively closed nature of the UK waste disposal market.

By mid-2008, when MVV Umwelt decided to enter the UK market, the number of waste PFI tenders was considerable, resulting in a number of other new entrants. These included companies from Europe and North America, sometimes backed by investors from even further away.

10. Industry responses

For a time there was very much a feeding bonanza for waste companies of differing sizes and backgrounds to tender waste PFI projects. The timescale for each tender was long and bidding costs were high, and by a process of elimination at each stage a final shortlist of two bidders were selected for a final tender. This involved negotiating a contract and specification to suit the technical solution proposed. Technical solutions were rarely prescribed by the waste authority but it was often understood between the lines if energy from waste would be acceptable. Even if it was, the winner of the bidding competition would have to still obtain the necessary consents. Under UK law this is applied for to a separate planning authority, although in many cases this authority would sit in the same council as the waste authority, but with impartial and different
objectives, officers and politicians. With the final decision being made by politicians, a successful application was, and remains, a substantial risk for any large energy from waste project developer. As if to make things fairer, the same planning risk applied to developers of MBT plants whose RDF output was scheduled to go to either cement kilns, or to merchant energy from waste plants, often in another authorities’ area.

There are a number of examples of bidders being successful in the contract tender process and being subsequently unable to obtain planning permission, with background political pressure being applied to either refuse or frustrate the planning application, without which the project cannot go ahead even if it is has been demonstrated by the authority’s own criteria to be the best waste management solution for that area.

11. Current situation

As of mid-2012 the amount of MSW sent to energy from waste capacity in the UK has almost doubled to 5,000 tonnes per annum (Annexe 1), and accounted for 17 percent of MSW treatment. This was still low compared to many EU 27 countries (Figure 3).

![Figure 3: Comparison of EU 27 countries](image)

Source: CEWEP/Eurostat 2014

The total energy from waste capacity in the UK as of mid-2015 is projected to be over 8.5 million tonnes per annum, with a further one million still under construction³.

³ MVV internal data
Each of the new PFI schemes will have the benefit of a long term residual waste supply contract and have spare capacity to deal with private sector commercial and industrial waste as well as any top up waste form other waste disposal authorities who do not have sufficient treatment capacity. Most achieve R1 status, and some, such as MVV’s CHP facility in Plymouth, exceed that requirement by a significant margin. All will be operated by a cluster of large companies, such as MVV, Veolia, Viridor and SITA. Many were controversial projects at the time of development, but with the passage of time will probably become an almost accepted part of the local infrastructure, providing a valuable contribution to the avoidance of landfill and the reduction of greenhouse gases. Almost all of them offer additional capacity for commercial and industrial waste, although some of this waste category is baled and exported to continental Europe for use in cement kilns.

In parallel with the PFI backed developments a number of waste wood biomass energy from waste plants have been developed and successfully built. These are not reliant on waste authority contracts and may have been built on a merchant basis, including MVV’s facility at Ridham Dock, in Kent. They do benefit from the ROC regime to a significant extent, and depending on their location will still receive a gate fee for wood, although many are having to pay for the fuel in competition with each other and exports to Europe. Statistics on the total capacity of these facilities is not necessarily collected by a single source but the estimated capacity as of end 2014 is based on at least eleven WID compliant facilities and approximately 4.25 million tonnes per annum, including Ridham Dock which starts taking in wood then.

### 12. Future prospects

The surge of PFI projects is now substantially over. Just a few remain in the bidding phase and several have been cancelled when the allocated PFI funding was withdrawn, either for simple government cost saving reasons, or more recently because the UK Government had decided that its commitments under the landfill directive would be met without them. By mid-2015 several more new facilities will be in operation, or close to that point. As noted above, MVV’s own data suggests the total UK MSW energy from waste capacity could be 9.5 million tonnes per annum. The total UK fleet of energy from waste plants, including the new PFI schemes, will by mid-2015 number over thirty facilities (see the following list). DEFRA’s own data for the PFI scheme is included in Figure 4 to 6.

**List of UK energy from waste plants expected to be in operation as of Mid-2015**

- Stallingborough, North Lincolnshire
- Marsh Barton, Exeter
- Crymlyn Burrows, Neath Port Talbot
- Forth Drove, Peterborough
- Dudley, West Midlands
- Chineham, Hampshire
- Wolverhampton, West Midlands
- Bolton, Greater Manchester
- Huddersfield, Yorkshire
- North Hykeham, Lincolnshire
Paradigm Shift in the British Waste Management Sector

- Eastcroft, Nottingham
- Marchwood, Hampshire
- Portsmouth, Hampshire
- Hanford, Stoke-upon-Trent
- Solihull, West Midlands
- Bernard Road, Sheffield
- Newhaven, East Sussex
- Devonport, Plymouth
- Billingham Plant #1, Teesside
- Billingham Plant #2, Teesside
- Great Blakenham, Suffolk
- Ardley, Oxfordshire
- Four Ashes, Staffordshire
- Air Products, Teesside
- Tyseley, Birmingham
- Trident Park, Cardiff
- Runcorn Phase 1, Cheshire
- Runcorn Phase 2, Cheshire
- Lakeside, Slough
- SELCHP, London Borough of Lewisham
- Allington, Maidstone
- Edmonton, London Borough of Enfield
- Belvedere, London Borough of Bexley

*was shut down in 2012

Source: MVV

Figure 4: WIDP projects and contractors

Source: DEFRA PFI/PPP Data

There remains a *bank* of sites across the country which have consent of some kind for an energy from waste facility. Often these are smaller plants based on ACT, and, to be honest, probably have little chance of being built due to a lack of funding or secured, longer term waste streams. One example in Scotland was recently shut down after problems with emissions and an eventual fire. Another, the New Earth facility in Avonmouth, is operational using RDF although its exact status remains unclear.
Figure 5: PFI projects (residual waste facilities)

Figure 6: PPP projects (facilities)

Source: DERA
The future for significant capacity additions, by way of large energy from waste plants, is uncertain. There is the potential for a few merchant plants designed to take the higher calorific value waste coming out of the MBT plants that still have to find an outlet for the majority of their products, or to cater for commercial and industrial waste. A current application for a 200,000 tonnes per annum facility, in West Sussex, is a good example although as of June 2014 this had not been approved. One of the few sites to have consent for a large conventional combustion energy from waste plant in the midlands could be used for commercial and industrial waste if the owners have the courage to fund it on a merchant basis. In contrast, a large 700,000 tonnes per annum plasma-gasification plant is being built at Teesside by Air Products; the source of waste for this is unclear but is likely to be commercial and industrial waste.

DEFRA have recently updated their document, Energy from Waste: a guide to the debate https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/284612/pb14130-energy-waste-201402.pdf to add a final chapter setting out future policy direction. It sees a long term role for energy from waste both as a waste management tool and as a source of energy. Energy from waste is in a unique position to fulfil a range of objectives across a number of Government departments. For DEFRA it helps divert waste out of landfill, for DECC it is a potential source of low carbon energy, for DCLG it can be a contributor to waste planning objectives and for DfT it is a potential source for a variety of transport fuels. It can also contribute to growth in the waste and energy sectors as well as the construction sector through infrastructure development. Now that the Government is on track to meet its 2020 landfill diversion targets, which have driven its waste management policy for the last ten years, it is looking towards the wider societal and environmental benefits.

There are four key principles that underpin current thinking on energy from waste and which are expected to remain critical to the development of a sustainable policy into the future:

- Energy from waste must support the management of waste in line with the waste hierarchy
- Energy from waste should seek to reduce or mitigate the environmental impacts of waste management and then seek to maximise the benefits of energy generation
- Government support for energy from waste should provide value for money and make a cost effective contribution to UK environmental objectives in the context of overall waste management and energy goals
- Government will remain technology neutral except where there is a clear market failure preventing a technology competing on a level footing.

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4 The main UK Government departments are: Department for Environment, Food and Rural Affairs (DEFRA), Department for Energy and Climate Change (DECC), Department for Community and Local Government (DCLG) and Department for Transport (DfT)
Government wants to encourage developers to consider these principles as a key part of the decision making process around future development of new projects and operation of existing plant. This means that infrastructure proposals, technologies and services that are aligned with these principles should be on a much firmer footing and more robust to future policy than those which are not.

Planning remains the largest barrier; until it is taken out of the hands of local politicians it will remain a significant risk for developers who will be forced to spend significant funds obtaining planning consent, or fighting the almost inevitable legal challenges that follow successful application. After that, the market will determine what projects will succeed in the light of regularly changing government carrots and sticks.

Acknowledgement

The assistance of the following people in reviewing this paper is gratefully acknowledged:

David Kilduff, Walker Morris LLP
Niranjan Patel, DEFRA
Dr Hansjörg Roll, MVV Umwelt GmbH.