Friends of the Earth Cymru

Submission to the National Assembly for Wales Petitions Committee for Petition P-04-341 Waste and Incineration

1. What, in your view, is the best method of disposing of non-recyclable waste?

In years to come, and in line with Welsh Government policy, Wales will become a zero waste country. By its very nature then, „non-recyclable" or „residual" waste as a significant component of waste management is a transitory problem. We can track the reduction of residual waste through waste statistics[1]: In April to June 2007, the residual waste produced per person in Wales was 93kg. During the same period in 2011, that had reduced to 62kg – a reduction of precisely one third in just four years.

The challenge is how to manage this currently significant component of waste[2] so that we maximise the utility of that which can be recycled and minimise that which has no practicable fate other than final disposal in landfill.

There are a number of important principles at play that can help guide decisions the people of Wales might support:

- The proximity principle: that waste should be dealt with as close as possible to the site of its generation
- Maximum utility: waste should be dealt with in a way that increases its utility in a way commensurate with higher stages of the waste hierarchy
- Flexibility: in a field where the amount and composition of waste is changing so rapidly, flexible, modular waste management solutions are more able to adapt to changing circumstances than large-scale, high-capital infrastructure

Bearing in mind these principles, Friends of the Earth Cymru considers mechanical biological treatment (MBT) of residual waste to be the best currently available and proven technology for disposing of residual domestic waste.

The example of Bristol City Council's MBT plant (operated by New Earth Solutions) is instructive. This waste treatment plant takes in black bag waste and produces the outputs described in the Table[3]. For comparison, the outputs from an incinerator are also shown.

[1] Statistics for Wales, 27 September 2011, *Local authority municipal waste management, April-June 2011*
[2] 51% of waste is currently disposed of to landfill: Statistics for Wales, 3 November 2011, *Local authority municipal waste management report for Wales, 2010-11*
[3] LetsRecycle.com, 12 September 2011, *Olympian opens New Earth's Avonmouth MBT plant*

	Avonmouth MBT plant	Incinerator
Metals for recycling	3.5%	3.5%
Rigid plastics for recycling	5-8%	-
Biomass type refuse derived fuel	30%	-
Compost-like output	12-18%	-
Process losses	20-25%	-
Landfill	15-20%	-
Residue incinerated	10%	96.5%

Incinerators also leave residual bottom ash which equates to approximately 20% of the total mass of waste incinerated[4] and which, following further processing, may be used as an aggregate or otherwise disposed of to landfill (just over 2% of the total mass). About 7% of the total amount of waste incinerated is left as fly ash[5], which often contains toxic elements and is frequently disposed of in a hazardous waste facility.

Further information on Avonmouth MBT plant is available from:

- Gary Hopkins, Executive Member of Bristol City Council with responsibility for waste and recycling: "While with this contract, there is always the possibility of something going wrong, energy-from-waste was a certain loser. It would have needed far more waste than was available, would have been a contract for 25 years… and the New Earth contract [for 9 years] is very significantly cheaper".
  Email: _____
  Home phone number:

- New Earth Chief Executive Chris Cox: "We are fast becoming a national player and our aim is to achieve landfill diversion and second chance recycling… We have an emerging renewable energy business which will close the loop with our waste business. We are embracing new technology, developing our own technology next door which will be a combination of pyrolysis and gasification generating 7.5 MW"
  Email: _____
  Tel:

2. What are the advantages and disadvantages (in terms of the environment, health, local economy etc) of incineration?

Climate change

Incineration sends most of the carbon from waste into the air in the form of Carbon Dioxide (CO_2)[6]. A study by consultancy Eunomia shows that among waste processing options incineration ranks worst in climate change impacts[7]. Given the relatively high CO_2 emissions associated with incineration[8], it is clearly

[4] RenoSam and Rambøll, 2006, *Waste to energy in Denmark*
[5] ibid
[6] Friends of the Earth, May 2006, *Dirty truths: Incineration and climate change*
[7] Eunomia, January 2008, *Greenhouse gas balances of waste management scenarios*
[8] ibid

incompatible with the Wales and UK governments‟ commitments to steadily reducing the carbon emissions associated with electricity generation. With large incinerators this is compounded by the emissions from transporting the waste to the facility, which can mean hundreds of lorries a day on the road.

Toxic emissions and air pollution

Even modern incinerators emit toxic chemicals and produce toxic ash. There are large concentrations of dioxins in the residues that often emerge during start-up and shut-down periods. Of particular concern to health are the ultra-fine particles that can escape pollution control equipment and can be carried several kilometres by the wind. These can be inhaled by humans, causing chest complaints as well as eaten by grazing animals and passed through the food chain.

Toxic fly-ash from incinerator stacks would have to be transferred to a hazardous waste site, none of which exist in Wales, and tonnes of bottom ash would have to go into landfill.

Disincentive to recycling and waste reduction

The most energy efficient way of managing waste, as laid out in the waste hierarchy and European Waste Framework Directive, is “reduce, reuse, recycle”. The Welsh Waste Strategy „Towards Zero Waste‟ sets targets to reduce waste 65% by 2050 and recycle a minimum of 70% by 2025, the latter being a statutory requirement in the *Waste (Wales) Measure 2010*. The amount of waste we produce in Wales is already going down and local authorities are meeting targets in the Landfill Directive.

Major incinerators would act as a disincentive to any further improvement in waste reduction and recycling due to commitments to supply the incinerator with waste. The maximum 30% energy from waste limit in „Towards Zero Waste‟ is already being used to justify large facilities such as those proposed by Viridor at Cardiff. However, once these are built it would be extremely difficult to secure lower thresholds in future or meet the waste reduction and recycling targets beyond 2025 necessary for the One Planet Wales goal.

Inefficient energy production

Incinerators are described as „energy from waste‟ plants and even as producing „renewable‟ energy. But in practice they‟re only about 25% efficient if the heat isn‟t utilised. Incineration also uses 10 times more energy to destroy material than to recycle them. There are technologies such as Anaerobic Digestion which generate energy from waste much more efficiently.

As recycling rates increase, the composition of the waste available for incineration changes and the fraction of waste which is non-biogenic in origin is likely to rise, further undermining the claim of incineration as a source of renewable electricity[9].

Economics and inflexibility

[9] Friends of the Earth Cymru, July 2009, *Response to ‘Towards zero waste – One Wales: One planet’*

For large incinerators to pay their way long contracts are needed where local authorities and other bodies are tied in to provide them with waste to burn for 25-30 years. This goes against efforts to recycle and reduce waste and would lead to heavy financial penalties if contractors don't provide the incinerator enough waste to burn[10]. For example, Stoke-on-Trent City Council was sent a demand for £400,000 from Hanford Waste Services in respect of the city council failing to achieve minimum tonnage levels in 2009/10 for the Sideway incinerator[11].

Job creation and socio-economic effects

Research by Friends of the Earth shows that recycling creates 10 times more jobs than incineration, and can be a hub for other local green jobs[12]. Incineration, perceived as a „dirty industry" can be off-putting for job creation in green industries such as tourism and have a negative effect on the socio-economic health of an area.

3. Do you think it's a good idea for local authorities to collaborate on waste policy, which could lead to resource savings, or it more important for them to find the most appropriate solution for their locality? What are the reasons for your answer?

We have no predisposition one way or another to the scale of collaboration that waste management authorities should be permitted to enjoy. The real test to be met is: do waste management solutions fit with the principles described above, and do they contribute to Wales' continuous pursual of One Wales: One Planet? The scale of waste management solutions is then less important.

[10] Friends of the Earth, August 2009, *Long waste contracts*
[11] ThisIsStaffordshire.co.uk, 14 October 2010, *Council faces £400,000 claim over incinerated waste shortfall*
[12] Friends of the Earth, September 2010, *More jobs, less waste*

Avonmouth

Mechanical Biological Treatment (MBT) facility
with low-carbon and renewable energy generation

New Earth Solutions is a specialist business dedicated to delivering sound technical and environmental solutions to the UK's waste problems.

Driven by the outcomes of the Kyoto Protocol on Climate Change, New Earth Solutions has developed a wide range of technologies and processes designed to recover value from waste and to mitigate its impact on the environment.

The facility is New Earth's largest with a capacity of 200,000 tpa. It treats residual household waste streams for the West of England Partnership, which includes the four Councils of Bath and North East Somerset, Bristol, North Somerset and South Gloucestershire, well as capacity for other local authority and private sector customers.

The facility diverts waste away from landfill, helping local authorities to meet rising diversion targets and maximizing the recycling potential of the waste it treats by extracting valuable metals and plastics from the organic waste.

What is MBT?
The New Earth process at Canford utilises Mechanical Biological Treatment. In the mechanical stage, materials such as plastics and metals are recovered from the waste and sorted into the valuable recycling streams. Biodegradeable waste is also separated for further treatment.

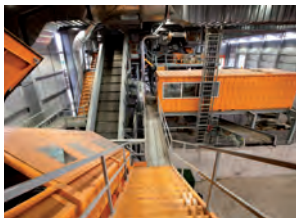
Avonmouth Facility

In the biological stage the biodegradable waste is composted in a fully-enclosed, controlled environment, to produce a useful land remediation compost. The MBT process can also produce a refuse-derived fuel suitable for use in low-carbon renewable energy generation in the planned energy facility.

Energy Generation
New Earth has been granted planning permission to build a low-carbon renewable energy facility on the site. The co-location with the MBT plant minimises the transportation requirements for the waste treatment by-products and diverts them away from landfill. This helps avoid rising landfill taxes as well as the added environmental advantages of renewable energy. The energy facility will generate up to 7.5MW of low-carbon renewable electricity.

New Earth MBT Process

Initial Preparation Upon delivery waste undergoes sorting to remove any oversized items that cannot be processed. The recovery of recyclable materials then begins with a “long-particle separation” process. The smaller biomass-rich particles known as ‘fines’, go to the bio-stabilisation halls for processing.



Sorting The remaining waste is sorted using various processes including magnets to extract ferrous metals, a windsifter to sort light waste from heavy, and optical sorting to identify and remove plastics by polymer type.

Bio-stabilisation Halls The fines and shredded waste is stored in long heaps, or ‘windrows’, in enclosed halls for a period of around 5 to 6 weeks. The composting process is self-heating, with the only manual intervention required being regular turning in order to maintain optimum conditions.

Environmental Controls Wireless probes inserted along the length of the windrows monitor the temperature and transmits data to the control system. Unique software translates this data into the optimum requirements for the waste to compost effectively, irrigating and oxygenating the windrows automatically.

Pasteurisation Bio-stabilised material is screened to remove contraries such as remaining plastics. The fine compostable output is then sanitised using pasteurisation vessels to ensure compliance with the Animal By Product Regulations.

The Product The resulting material can be used as a land remediation compound or soil conditioner for brownfield sites. Oversized screening residues can form part of a refuse-derived fuel for use in low-carbon renewable energy facilities, such as that planned for the Avonmouth facility.

Automated Control System The facility operates a continuous emissions monitoring system which enables control of the process environment as well as monitoring emissions to the atmosphere. This system ensures compliance with environmental monitoring standards and is assessed by the Environment Agency.

Emissions Control
Facilities are held under negative air pressure, helping to draw air inwards when doors are opened and minimise air escaping from the buildings. Avonmouth has a sophisticated emissions control system incorporating a chemical air ‘scrubber’ and a wood chip bio-filter before air

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Avonmouth

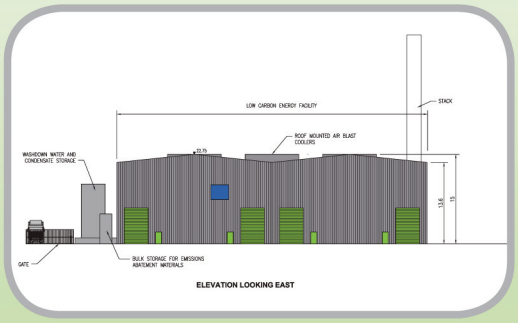
Renewable and low carbon energy facility

newEARTH ENERGY

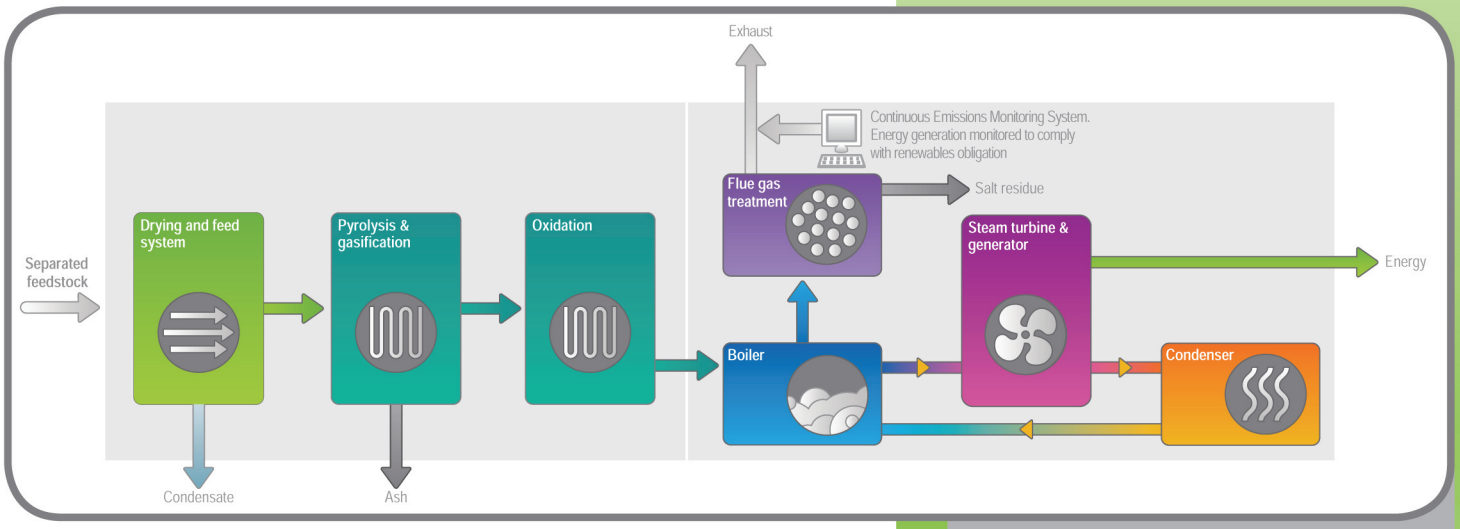
The Technology

The proposed facility would use Advanced Thermal Conversion (ATC) technology in the form of pyrolysis and gasification units, to generate up to 7MW of renewable and low carbon electricity.

Prepared feedstock would be fed to the ATC units mechanically. The pyrolysis stage involves heating the incoming feedstock in the absence of oxygen, converting it into a High Energy Fuel Gas (HEFG) and carbon rich char. The char will then be gasified using high-temperature steam with the controlled addition of oxygen. This converts the char into HEFG, with a remaining particulate ash to be safely disposed.



Proposed energy facility elevation looking east



The HEFG produced from both the pyrolysis and gasification processes would be combined and fed through a thermal oxidiser operating at around 1,200°C. The high temperature gas from the thermal oxidiser would be recycled and used as the heating medium for both the pyrolysis stage and a steam boiler. High temperature gas from the thermal oxidiser would power a conventional boiler unit, with high pressure steam from within the boiler driving a steam turbine set to generate up to 7MW of electricity.

The facility could also export heat, although the balance between electricity generation and heat supply would depend on the availability of suitable and viable consumers for this heat.

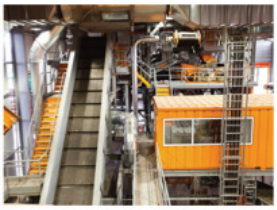
What is pyrolysis and gasification?
Pyrolysis and gasification are Advanced Thermal Conversion processes. These processes are fully contained and take place in zero or low oxygen environments, making them distinctly different from traditional incineration.

Air Quality

The Environmental Impact Assessment (EIA) and Environmental Permit (EP) applications will address potential effects on air quality associated with the construction and operation of the facility. The initial study submitted to Bristol City Council concluded that the potential effects of dust during construction are likely to be negligible.

The design of the facility incorporates a number of measures to ensure that there will be no impact on air quality from the operation of the plant. The Fuel Gas will be cleaned and exhaust gases from the thermal process will pass through an emissions abatement system, which will remove particles, nitrogen gases and other trace elements. The boiler exhaust will be at a suitable height to comply with the Environment Agency's requirement to ensure emissions are harmless to the local and wider environment. Existing air quality currently meets national objectives with the exception of certain busy roadside locations. The facility will be designed and operated to ensure that it would not affect the future achievement of these air quality objectives.

MBT process – material flows



Residual waste treatment - Indicative outputs

newEARTH SOLUTIONS

MBT only

100 tonnes of residual MSW

4 tonnes	Metals for recycling	4 tonnes
8 tonnes	Plastics for recycling	8 tonnes
21 tonnes	Remediation compost	10 tonnes
27 tonnes	Material loss in process	14 tonnes
20 tonnes	Energy recovery	46 tonnes
0 tonnes	Bio char	8 tonnes
20 tonnes	Residues to landfill	10 tonnes

MBT with ATG

100 tonnes of residual MSW

Planning Act 2008
Infrastructure Planning (Examination Procedure) Rules 2010

Energy from Waste Generating Facility at Brig Y Cwm, Near Merthyr Tydfil, Wales

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ON BEHALF OF
FRIENDS OF THE EARTH CYMRU
(FOEC)

IPC Reference Number: EN010004

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Introduction

1. This objection is submitted on behalf of Friends of the Earth Cymru and addresses the following concerns:

    1) The proposal is not sustainable and would undermine effective implementation of the National Waste Strategy for Wales. It would undermine recycling, increase waste transport and result in waste being treated lower in the waste hierarchy than would otherwise be the case. This is not consistent with the local, national and European policy objectives.
    2) The total environmental costs of the proposal outweigh the benefits of the scheme.
    3) The assessments of climate change impacts presented in support of the proposal are flawed and over-state benefits.
    4) The visual impacts of the proposal on this greenfield[1] site would be large and unacceptable.
    5) Lack of effective consultation and the failure of the process to facilitate meaningful public participation.
    6) The proposal is premature in relation to the emerging waste policy framework for commercial and industrial wastes in Wales.

[1] The site is not, in planning terms, previously developed land due to the restoration conditions on the current planning permission.

Ground 1 – Policy, Sustainability and Need

The proposal is not sustainable and would undermine effective implementation of the National Waste Strategy for Wales. It would undermine recycling, increase waste transport and result in waste being treated lower in the waste hierarchy than would otherwise be the case. This is not consistent with the local, national and European policy objectives.

The Waste Hierarchy, Need and Sustainability

2. The application acknowledges[2] that compliance with the National Waste Strategy for Wales means that "*there will be far less need for 'energy from waste' plants with the number and/or capacity required progressively reducing from 2025 to 2050*". In fact the Strategy envisages no requirement for Energy from Waste at the end of this period as this is the target date for "*One Planet Living*".
3. The implications of the proper implementation of the National Strategy are profound, in line with the urgent need to reduce the environmental and social impacts associated with over-consumption of resources and the related over-production of wastes. The applicant fails to grasp the significance of these changes and the proposal would dramatically undermine the effectiveness of the National Strategy. Whilst there is some room for discussion about the threats to recycling from incineration it is self evident that incineration, relying as it does on a continuous supply of relatively high calorific value feedstock, is incompatible with an ambitious programme of waste reduction as incorporated in the Welsh Strategy.
4. The application therefore fails to properly address the implications and obligations arising from policy for high recycling, waste reduction and the associated phase out of energy-from-waste.
5. The provision of a single, extremely large, incineration facility which inevitably lacks flexibility would be a retrograde step at a time when levels of waste in Wales are falling rapidly, Landfill Directive obligations are being comfortably met, the waste streams are changing rapidly and energy is being directed at achieving the highest possible levels of recycling consistent with an ambitious programme of waste reduction. In the event the application was approved then the inevitable consequence of reducing inputs from the proposed Welsh collection area would be the unsustainable longer distance haulage of waste from English Authorities to allow continued operation of the facility.

Waste Planning in Wales and 'Need':

'Our Vision of a Sustainable Wales is one where Wales: lives within its environmental limits, using only its fair share of the earth's resources so that our ecological footprint is reduced to the global average availability of resources, and we are resilient to the impacts of climate change' (Source: One Wales: One Planet (Welsh Assembly Government 2009)).

6. Planning Policy Wales says (Para 12.5.3):

[2] Engineering Design Statement para 4.1.4

Waste should be managed (or disposed of) as close to the point of its generation as possible, in line with the proximity principle. This is to ensure, as far as is practicable, that waste is not exported to other regions. It also recognises that transportation of wastes can have significant environmental impacts. The waste hierarchy, the proximity principle and regional self-sufficiency should all be taken into account during the determination of the BPEO for the network of waste management installations that provides the best solution to meet environmental, social and economic needs.

7. The requirements to demonstrate that a proposal represents the BPEO (Best Practicable Environmental Option) and that waste is disposed of in line with the proximity principle are not material considerations in waste planning in England. Crucially the BPEO assessment must deliver the dramatic reductions in waste arisings which are essential to assist the transformation to sustainability from the current deeply unsustainable society. The applicant does not appear to have fully appreciated these enormous differences from the English policy framework.

8. "Towards Zero Waste"(Welsh Assembly Government 2010), the "*overarching waste strategy document*" and the more detailed implementation in the sector plans, of which that for municipal waste has already been published (Welsh Government 2011), align with the Welsh Government's Sustainable Development Scheme "*One Wales: One Planet*"(Welsh Assembly Government 2009).

9. The key outcomes of the Strategy are:

    - A sustainable environment where the impact of waste in Wales is reduced to within our environmental limits (one planet levels of waste) by 2050.
    - A prosperous society, with a sustainable, resource efficient economy
    - A fair and just society, in which all citizens can achieve their full human potential and contribute to the wellbeing of Wales through actions on waste prevention, reuse and recycling.

10. They Strategy and plans have been prepared under section 79 of the Government of Wales Act 2006, which places on the Welsh Government a duty to promote sustainable development - the ultimate test of which is the to live within our environmental limits which demands the achievement of "One planet living".

11. The strategy sets a high standard for the protection of the environment in Wales and it is hoped that the IPC would aim for at least equivalent environmental standards.

12. 'Towards Zero Waste' therefore includes targets for levels of recycling which are significantly more ambitious than those in England. It is important to note, however, that they are the minimum levels the Welsh Government has recognised need to be achieved as part of the path to transfer from the deeply unsustainable way we live today towards the "one planet" goal.

13. The recycling targets for Wales are statutory targets set in the Waste (Wales) Measure 2010 supported by the Recycling, Preparation for Re-use and Composting Targets (Definitions) (Wales) Order 2011. As the minimum recycling targets are already achieved and even exceeded in parts of Europe it can be confidently predicted that significantly higher levels than the minimum targets can be achieved in practice if they are not undermined in practice by inappropriate policy decisions.

14. Crucially, and unlike in England, the recycling targets are integrated with ambitious, but necessary, targets for waste reduction.

One Planet Living

15. Achieving a "one planet goal" means reducing the ecological footprint of Wales to a 'fair earthshare' of c.1.88 global hectares/ capita from the 2003 level of 5.16 global hectares/ capita. This was the basis of the 2009 consultation "*Towards Zero Waste– One Wales: One Planet*" and the subsequent policy targets.
16. A reduction of nearly three-fold in our footprint requires major changes in the way we live, work and consume. Inevitably this will have profound impacts on the production of waste. The current targets in the Welsh Government strategy aim to achieve this by 2050.
17. The current Welsh Government targets, however, take no account of the fact that the per capita 'fair earthshare' reduces with increasing global population. Thus targets set for 2050 should be based on the projected population of the earth at that time rather than the population in 2003 from which the earthshare in the consultation and current targets was calculated.
18. The global population is anticipated to increase from the 2003 population of c. 6 billion to between 7.3 and c.10.7 billion in 2050 (Heinberg 2007):

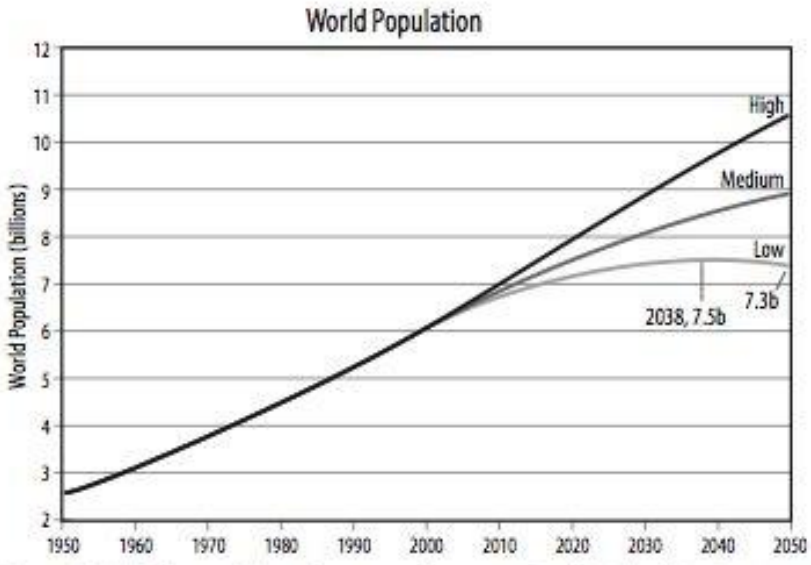


Figure 11. World population, history and forecast. Credit: United Nations Population Division, World Population Prospects

19. The consequence is that if the current targets, including those for reduction in total waste, are achieved and a footprint 1.8 gha/ capita is achieved by 2050 this will not be sufficient to achieve sustainability or "*one planet living*". The fair earth share in 2050 will be 1.03 to 1.48 gha/ capita and so Wales would still be consuming between 20% and 80% too many resources with a most likely scenario of c.50% overconsumption. Obviously this makes a significant difference to the levels of waste reduction required to achieve a 'fair earthshare' and the current targets for the reduction in waste certainly cannot be seen as conservative. Future reviews are likely to have to increase the current targets for waste reduction and thus waste management infrastructure must be flexible enough to cope with these changes.

Waste Reduction Targets and 'Need'

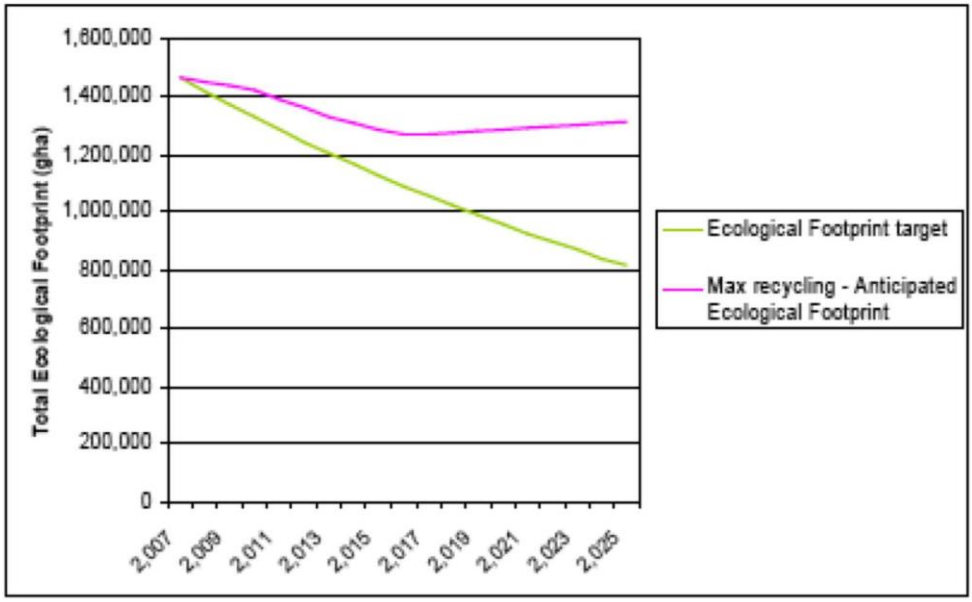
20. The report by consultants Arup assessing the ecological footprint associated with the Welsh waste strategy (Arup for Welsh Assembly Government 2009) emphasised that to significantly reduce the size of the ecological footprint:

    "*it is fundamental that recycling becomes an option for waste management only after reduction and reuse*" (*emphasis in the original*).

21. The Arup report shows that with recycling alone, even with the relatively high targets in Wales the total impact of waste arising will only be reduced by 10% for municipal waste, 6% for commercial and industrial waste and 14% for construction and demolition waste, based on a 2007 baseline.

22. This is best illustrated graphically and the figure below, taken from the Arup report, shows how even 70% recycling by 2025 fails to meet even the trajectory necessary to achieve the current 2050 ecological footprint target unless accompanied by very significant waste reduction:

Figure 22: Comparison of the reduction in EF that can be achieved through the targets in the proposed waste strategy versus that required to reduce the EF to sustainable levels



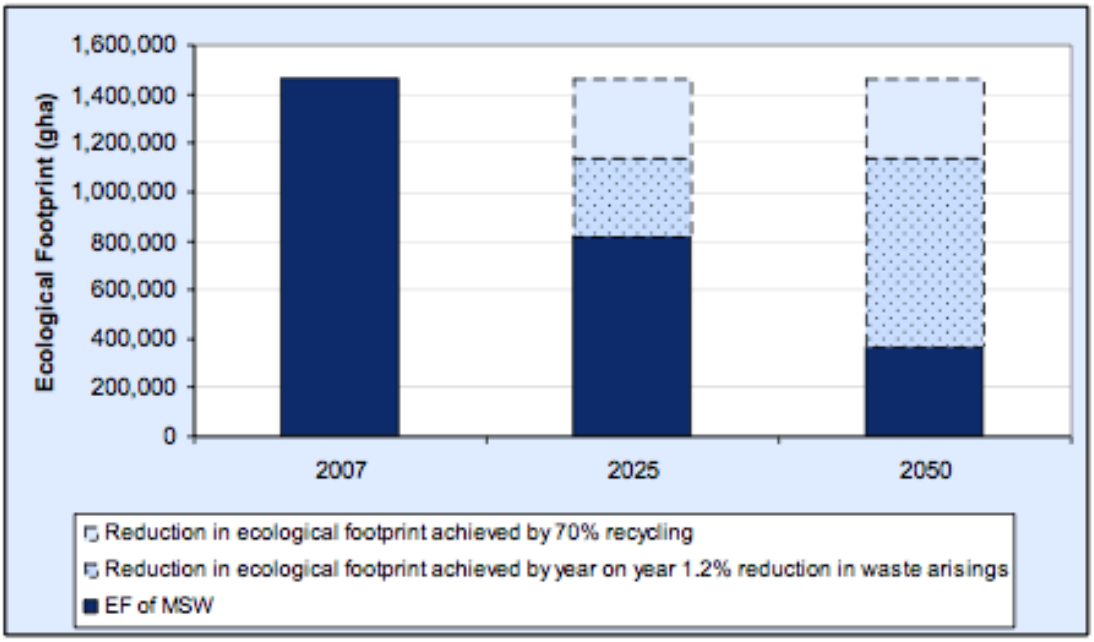
23. Furthermore this report confirms "*although the proposed recycling targets will help to reduce the EF* [Ecological Footprint] *of waste that can be recycled, research suggests that high statutory recycling targets can lead to local authorities focussing on recycling at the expense of waste prevention."*

24. Towards Zero Waste (page 4) attempts to address these concerns and says that by 2025, there will be "*a significant reduction in waste (of around 27% of 2007 levels)*" and (page 5) that by 2050 there will be a reduction of "*roughly 65% in waste compared to current levels*".

25. The key steps that will need to taken towards the 2025 milestone include the "*need to reduce our waste by around 1.5% (of the 2007 baseline) each year across all sectors"* in order to achieve the one planet goal for 2050.

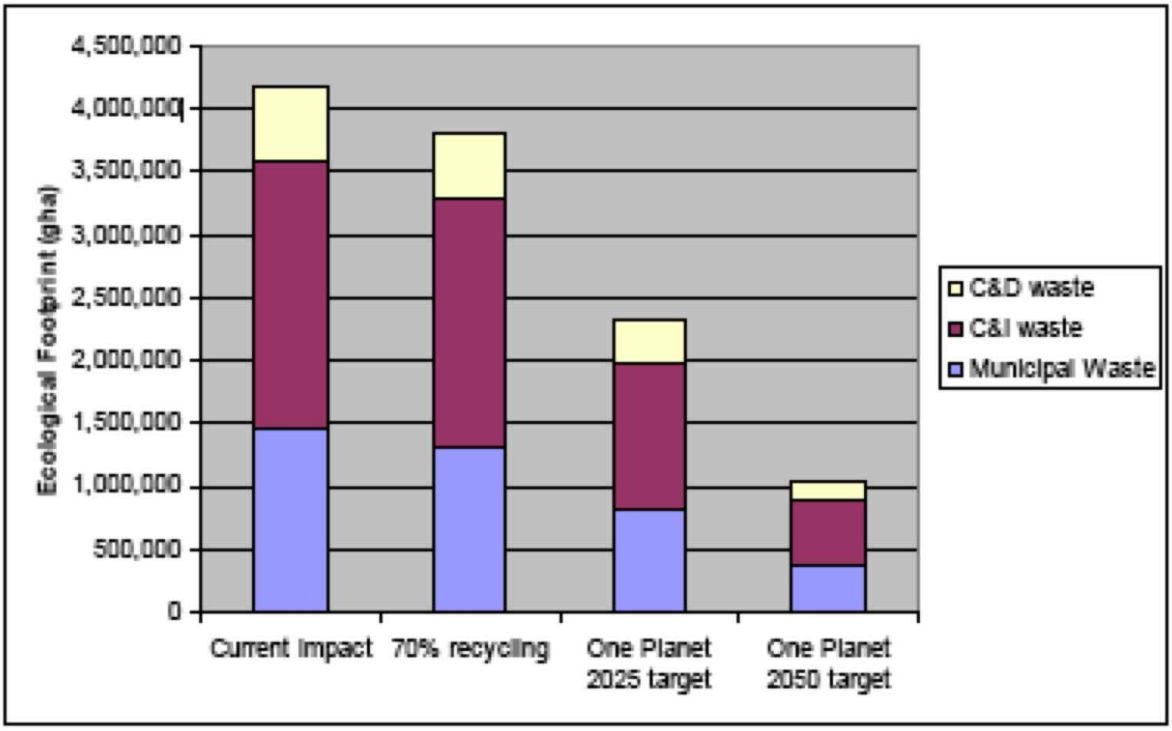
26. The targets are to be included in the sector plans and 'Towards Zero Waste' says "*we will consult on annual waste prevention targets of -1.2% for household waste, -1.2% for commercial waste, -1.4% for construction and demolition waste, and around -1.4% for industrial waste (in each case this will be a percentage of the 2007 baseline)*".

27. To date only the sector plan for municipal waste has been published. This includes a reduction target of 1.2% pa and the importance of the waste reduction contribution to the sustainability goals can be seen to be equivalent to the 70% recycling target up to 2025 and then very much greater in the period 2025 to 2050:



Ecological footprint (EF) of municipal solid waste (MSW) showing the impact of meeting the waste prevention and recycling targets (Welsh Government 2011)

28. A graph in the earlier Arup report (Arup for Welsh Assembly Government 2009) supporting the 2009 consultation more clearly shows the scale of mismatch between a 70% recycling target and the "One planet" goals without the recommended waste reduction targets:



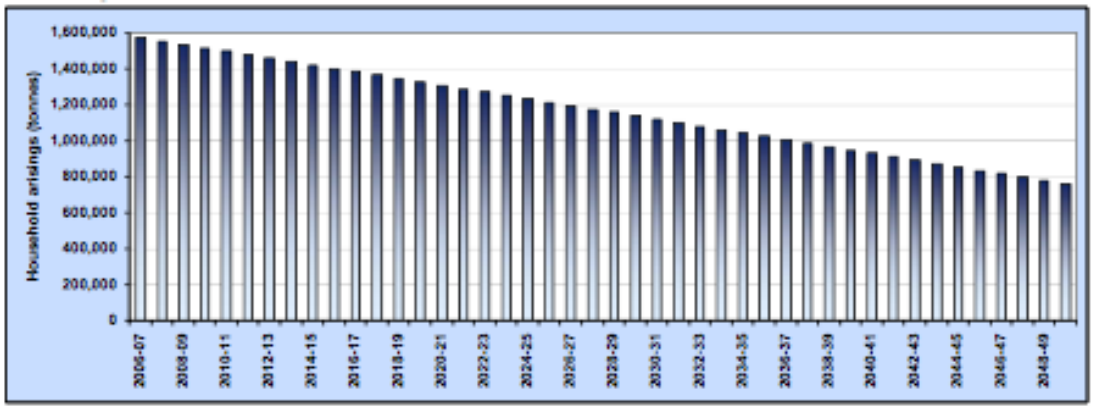
29. To reduce the Ecological Footprint to even 1.8 g/ ha capita at current population levels was assessed to require a further reduction in the footprint, on top of the 70% recycling targets, of:

    i Municipal waste - 34% by 2025 and 65% by 2050.
    ii Commercial and Industrial waste - 39% by 2025 and 69% by 2050

    iii Construction and Demolition waste - 28% by 2025 and 59% by 2050

30. These figures show that the final targets are pitched lower than is likely to be required to achieve the one planet goal.

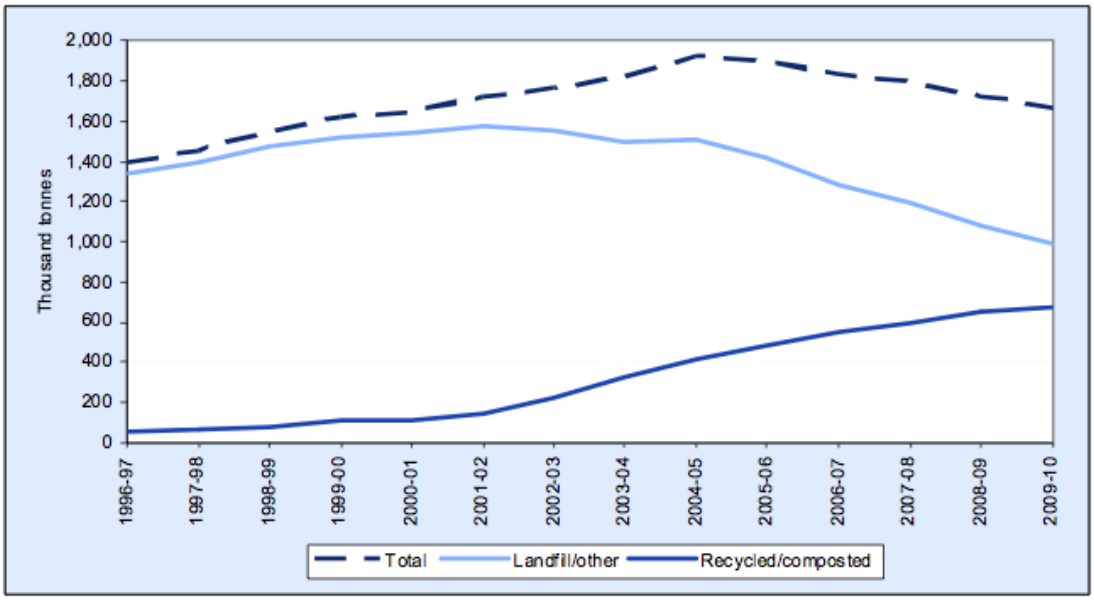
31. The effect of the adopted reduction target on household waste production over the period from 2007 to 2050 is illustrated graphically:



32. The applicant, by contrast, has largely relied on the excessive growth rates in the regional plans which pre-date the new national strategy and therefore have little relevance in relation to the long-term targets.

33. Current performance towards the recycling and reduction targets is promising and underlines how irrelevant the growth rates in the regional strategies have become.

34. The MSW Sector Plan confirms an average annual reduction in household waste of -1.7% that has already occurred between 2004-05 and 2009-10 – comfortably above the target reduction rate. MSW has fallen at a similar rate to household waste:



MSW waste arisings in Wales – source Wastedataflow and Municipal Waste Management Report for Wales, 2009-10 - November 2010 (Welsh Government 2011).

35. At the same time there has been an increase in the percentage of municipal waste recycled, reused and composted in Wales, from 37 per cent in January to March 2010 to 43 per cent in January to March 2011 and the provisional overall reuse/ recycling/ composting rate for 2010-11 was 44 per cent[3].

36. With a construction period of c.44 months (Supporting Statement Para 8.7) operation would be unlikely to start before 2016 and probably later by which time the total household arisings for Wales should be c. 1.4 million tonnes, less than twice the capacity of the incinerator. By 2025 with 70% recycling the residual household waste would be less than 360,000 tonnes and by 2040 residual household waste would be less than 270,000 tonnes.

37. In April 2011 the partnership of the five councils in north Wales named a reduced shortlist for its £800 million long-term residual waste treatment contract and did not include Covanta[4]. The contract will run for 25 years and includes approximately 150,000 tpa of waste – this already leaves a major shortfall in the Covanta need case which could only realistically be met by importing waste into Wales. The assessments and modelling in the application cannot therefore be relied upon as a robust assessment to support a BPEO case as the sourcing and transport of the additional waste to make up for the loss in north Wales could have a profound effect on the outcomes.

38. It can, in any case, be seen that at the outset the proposed incinerator would have the capacity to burn far more than the total residual household wastes for the whole of Wales, even if that was all available to the operators, which it is not, and if it was all suitable for incineration – which it wouldn't be.

39. Consequently increasingly large tonnages of C&I waste would be required but, as these wastes are far more price sensitive than MSW and tend to reduce quickly as prices rise, the collection areas would become much larger than just for Wales.

40. It is obvious that flexibility of future waste management options is the key if there is to be any prospect of achieving the necessary policy goals. The currently proposed incinerator represents an excessively large plant that would provide a substantial impediment to delivering even the higher recycling levels – and is completely incompatible with the levels of waste reduction that are necessary to achieve the Welsh Government targets.

Displacing Landfilled Waste?

41. It is claimed that the proposed facility "*would only target residual waste generated within Wales which would otherwise be disposed of to landfill*". This provides another way to assess the waste available for the facility by examining the trends in landfilled waste in Wales.

42. The latest Environment Agency data shows that landfilled waste in Wales is falling much faster than the reductions in MSW waste arising. This is probably largely due to the effectiveness of the landfill tax driver and is

[3] http:/ / wales.gov.uk/ topics/ statistics/ headlines/ environment2011/ 110628/ ?lang=en

[4] http:/ / www.letsrecycle.com/ news/ latest-news/ councils/ three-left-in-running-for-major-welsh-waste-contract

reducing due to commercial and industrial wastes being reduced, reprocessed or recycled. The consequence is that the total level of non-hazardous household, industrial and commercial waste landfilled in Wales has fallen from 2,370,000 tonnes in 2000/ 1 to 1,274,000 in 2010[5].

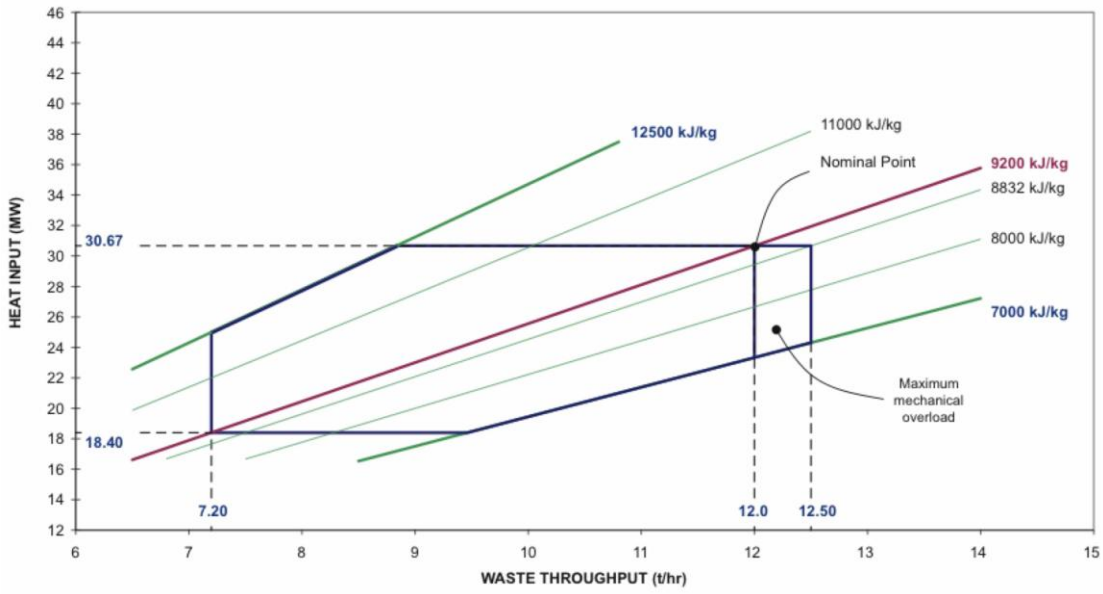
43. This landfill stream fell by 11% just between 2009 and 2010.

44. Further falls are inevitable as a result of the continuing escalation of landfill tax – furthermore a significant part of this waste is likely to be unsuitable for incineration in any case because it doesn't burn.

45. Taking these two factors together and plotting current trends indicates that by 2015/ 16 there would be less than 750,000 tpa of incinerable waste landfilled in Wales.

46. It is clear, therefore, that proper interpretation of policy shows that the waste arising projected to be available for the facility from Wales are seriously over estimated.

47. If the incinerator was built it would need 'feeding' as the operating range of modern incinerators is rather narrow as shown by an indicative Stoker diagram from the IPPC application for another recent application (at Rufford, refused on appeal):



48. The waste throughput would be larger on the Covanta plant but the principle is the same and shows that the proposed incinerator can only operate if it is fed waste with a combination of calorific value and quantity which lies within the blue area of the Stoker Capacity Diagram.

49. It is important to be confident, therefore, that the quantities and calorific value of the waste would fall within the operating parameters of the stoker diagram, and ideally be close to the 'nominal point' over the next twenty five or more years. The consequence of failing to do so is that waste which should be reduced or recycled would have to be fed to the incinerator to keep it operating.

Use of Commercial and Industrial Waste

50. Covanta claim that any shortfall in MSW can be made up by using

[5] Excluding, for simplicity, closed gate landfill sites – wastes disposed at these sites are very unlikely to be available for incineration in any case.

commercial or industrial wastes. This argument cannot be valid when, as shown above, the total levels of household, commercial and industrial wastes suitable for incineration and landfilled in Wales will be smaller than the plant capacity by the time it was constructed.

51. Furthermore experiences of Veolia in Sheffield provides a warning about how failure to address the waste stream properly at the application stage can prejudice local management of waste in the future and increase transport distances.

52. In 2001 Veolia had claimed in response to objections that their new incinerator was too big that any shortfall could be met by the use of commercial and industrial wastes, as with Covanta. In 2008, however, Veolia made an application to vary a condition attached to the planning permission for their Sheffield Incinerator[6] to allow municipal waste to be collected from Barnsley, Doncaster and Chesterfield and to increase the waste collected outside Sheffield to 75,000 tonnes because the commercial and industrial waste was unsuitable for combustion in the plant due to the higher calorific value than municipal waste and so was unsuitable for the plant.

53. In a letter from the Technical Director of RPS (Covanta's consultants), Jonathan Standen, dated 13th May 2008, Veolia provides responses to questions posed by Sheffield City Council's Planning Department, as follows[7]:

> ***The submission should review the original incinerator capacity assumptions and clearly explain the reasons why the actual throughput as turned out to be different. Is this all down to the growth in recycling?***
>
> *With planning permission granted in 2002 for the now operational Sheffield Energy Recovery Facility, it is evident that waste arisings have not grown as quickly as was assumed at the time the planning application for that development was made. Recycling rates have exceeded projections and will continue to do so particularly with Sheffield City council's desire to increase recycling well beyond 25%.*
>
> ***I am not clear as to why the burning of higher calorific value trade waste is a problem for the district heating system. I understand it produces the same amount of heat but with less waste. Is the concern that the lower waste throughput means lower gate fees for Veolia? When the original application was considered the incinerator capacity was tested against higher recycling rates, up to 45%. It was argued that if this were to occur...the capacity gap could be filled with up to 80,000 tonnes of commercial waste. It is now being arguing that this level of commercial waste is a problem.***

[6] Application to vary Condition 3 attached to permission 01/ 10135/ FUL (Bernard Road Energy Recovery Plant) 01/ 10135/ FUL (Bernard Road Energy Recovery Plant)

http:/ / planning.sheffield.gov.uk/ publicaccess/ tdc/ DcApplication/ application_detailview.aspx?keyval=K1L2Z7NY09T00

[7] http:/ / planningdocs.sheffield.gov.uk/ WAM/ doc/ Application%20(Other)-290491.pdf;jsessionid=6C9528E686E34AB4F12A35A0EA16A7F0?extension=.pdf&wmTransparency=0&id=290491&wmLocation=0&location=Volume3&contentType=application%2Fpdf&wmName=&pageCount=3

Essentially the classification of wastes as set out within the Waste Framework Directive determines how wastes are defined. The composition commercial wastes today do not reflect the circumstances which prevailed in 2001.

54. Given the differences in composition and calorific value between municipal and commercial/ industrial waste then it is not a straight forward matter to change them over to fill any shortfall that faces Covanta.

55. It is also notable that Covanta's consultants, RPS, say that in just seven years the composition of commercial waste has changed to the extent that it is no longer possible to incinerate waste assessed to be suitable for incineration in 2001 then it is practically inevitable that the changes over the life of this proposed facility will have even more serious implications.

56. This experience demonstrates that reliance on commercial and industrial wastes to replace future reductions in municipal waste arisings is not a robust approach. A more likely outcome is that Covanta would attempt to fill the shortfall in Wales by importing MSW from England with unsustainable long distance haulage contrary to the proximity principle.

Recycling levels and targets:

57. Another consideration which may further reduce the quantity of waste available to Covanta is that the current recycling targets in Wales may be increased further – as has happened so many times since the "*aspirational*" 25% targets set in the 1990s.

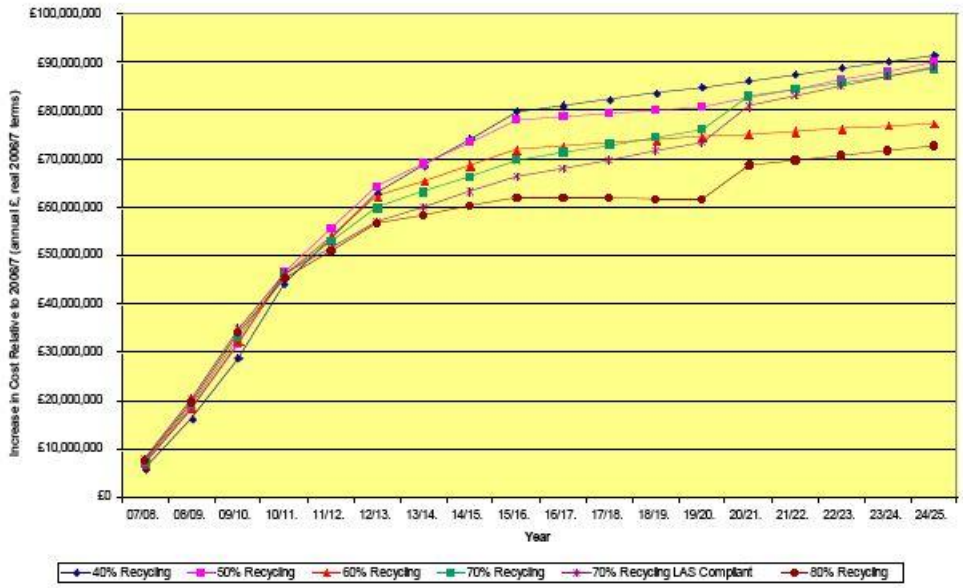
58. The current recycling targets are set as minimum targets in any case and the BPEO is likely to have higher levels of recycling than are current targeted. WRAP reports (WRAP 2010) A recent report by Environment Agency in Wales for the Welsh Assembly Government identified that up to 90% of MSW in Wales could potentially be recycled. They say:

    The 90% figure includes more paper, plastic film, disposable nappies, other glass, other organics and fines. Some of the other organics (such as wood based cat litter) and fines could be placed into an organics collection, but further developments in recycling technology, together with additional recycling infrastructure (particularly for disposable nappies) would be required in order for up to 90% of MSW to be classified as being potentially recyclable or compostable.

59. It is clear that recycling has not been maximised with the statutory targets for Wales. Whilst collection at that level currently presents difficulties the increasing pressures on fuel and resources over the coming decades will inevitably mean that more materials will be designed for easy recyclability. The changes in product design have already started to take effect but increasing cost, consumer and regulatory pressures will inevitably accelerate the process. The need for infrastructure to support the BPEO is therefore in appropriate recycling capacity and not for incineration.

60. This is reinforced by the fact that the original 2009 Welsh policy consultation reports (Welsh Assembly Government 2009) showed that the most cost effective recycling level over the period to 2024/ 25 would be 80% of the waste:

Figure 3: Evolution in Annual Increases in Cost Relative to 2006/7 (annual increase in real £ 2006/7)

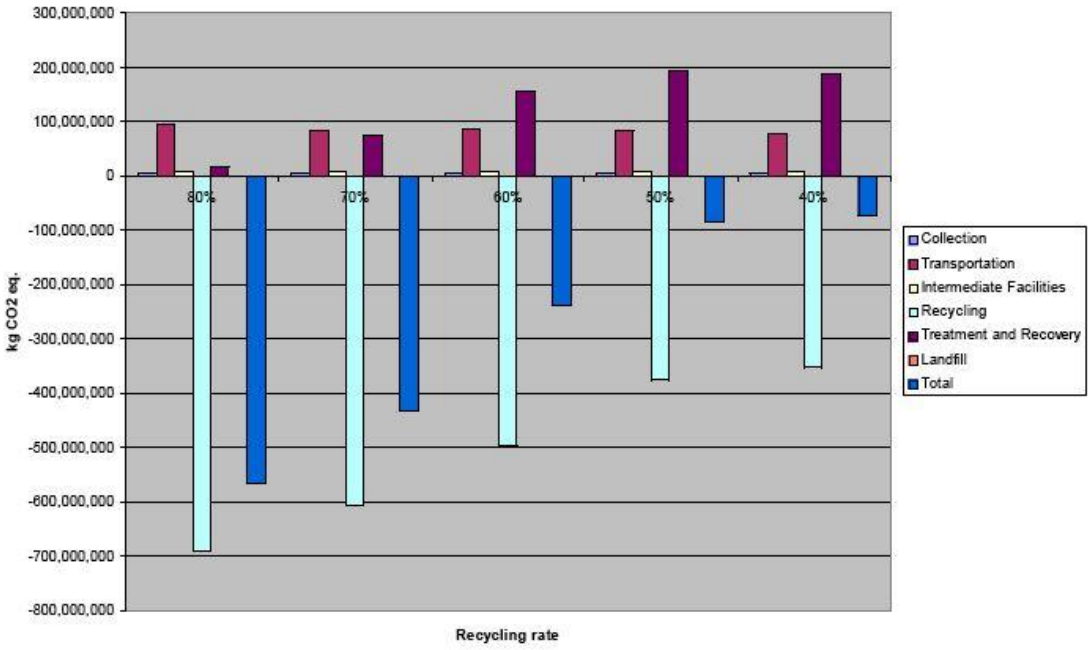


61. Again the changes in product design are likely to increase the cost effectiveness of recycling at the highest levels.

62. In addition to the cost savings there are also major environmental advantages in achieving these levels of recycling compared with the minimum levels of recycling required by current policy and legislation.

63. The projected greenhouse gas savings in Wales are shown to more than double (from a net c.250,000 tonne saving to a net 550,000 tonne saving) when recycling levels increase from 60% to 80%:

Figure 1 – Global warming potential for each recycling target option for 2024/25 (a negative figure means greenhouse gas emissions are displaced).



64. This modelling was carried out by the Environment Agency using the

WRATE model and this is based on the indicated recycling targets with incineration of the residual wastes. It can be seen that whilst recycling has a strong carbon dioxide benefit the emissions from incineration with CHP are assessed as being a net carbon dioxide producer.

65. Properly assessed, with appropriate assumptions about, for example, the displaced electricity generation, the proposed incinerator would similarly be a net producer of carbon dioxide (especially as at the proposed site there is little realistic prospect of CHP ever being applied to the plant).

Incineration vs Recycling

66. The question of whether incineration undermines recycling is clearly an important one. Firstly there is little doubt that in the majority of circumstances recycling is environmentally beneficial.

67. In their evidence to the Environmental Audit Committee for their report into Climate change and local, regional and devolved Government (House of Commons Environmental Audit Committee 2008), WRAP drew attention to their specialist review of international studies "*Environmental Benefits of Recycling*" (WRAP 2006) which shows how increased recycling is helping to tackle climate change and emphasises the importance of recycling over incineration and landfill as the appropriate way forward. The evidence from WRAP said:

    i *In the vast majority of cases, the recycling of materials has greater environmental benefits than incineration or landfill.*

    ii *The UK's current recycling of these materials saves 18 million tonnes of CO_2 equivalent greenhouse gases per year, compared to applying the current mix of landfill and incineration with energy recovery to the same materials.*

    iii *This is equivalent to about 14% of the annual CO_2 emissions from the transport sector and equates to taking 5 million cars off UK roads.*

68. WRAP concluded:

    14. The message of this 2006 study is unequivocal. Recycling is good for the environment, saves energy, reduces raw material extraction and combats climate change. It has a vital role to play as waste and resource strategies are reviewed to meet the challenges posed by European Directives, as well as in moving the UK towards more sustainable patterns of consumption and production, and in combating climate change by reducing greenhouse gas emissions.

69. WRAP tabulated the results of their review showing the numbers of studies in each category:

Table ES 4: Overall environmental preference of waste management options across all reviewed scenarios

	Recycling v Incineration			Recycling v Landfill		
Material	Recycling	Incineration	No preference	Recycling	Landfill	No preference
Paper	22	6	9	12	0	1
Glass	8	0	1	14	2	0
Plastics	32	8	2	15	0	0
Aluminium	10	1	0	7	0	0
Steel	8	1	0	11	0	0
Wood						
Aggregates				6	0	0
Totals	80	16	12	65	2	1

	Incineration v Landfill			Recycling v Mixed			Grand Total
Material	Incineration	Landfill	No preference	Recycling	Mixed	No preference	
Paper	1	0	0	12	0	0	63
Glass							25
Plastics	2	0	1				60
Aluminium	2	0	0				20
Steel							
Wood	7	0	0				7
Aggregates							6
Totals	12	0	1	12	0	0	201

70. It is clear that for all material streams recycling was assessed as being preferable to incineration. This is remarkable considering that several of the original papers were supported by the waste disposal industry in an attempt to justify less recycling and more disposal. For paper just six out of 37 papers reviewed by WRAP supported incineration over recycling. When the original papers are examined it is clear that these tended to make assumptions that are known to favour incineration such as the displacement of high carbon electricity generation - as in the WAG/ Environment Agency WRATE assessment. When future projected carbon intensities of displaced generation are substituted then few if any of the papers maintain the support for incineration over recycling.

71. In 2010 WRAP updated this 2006 review of waste management options (Michaud, Farrant et al. 2010). They assessed 55 'state of the art' LCAs on paper and cardboard, glass, plastics, aluminium, steel, wood and aggregates.

72. The conclusion, they said again "*was clear – most studies show that recycling offers more environmental benefits and lower environmental impacts than the other waste management options*". It is particularly relevant that recycling has been re-confirmed by as being the best option for the plastics upon which Covanta would be increasingly reliant given the reductions in paper and bio-waste:

    - The results confirm that mechanical recycling is the best waste management option in respect of the change potential, depletion of natural resources and energy demand impacts. The analysis highlights again that these benefits of recycling are mainly achieved by avoiding production of virgin plastics.
    - The environmental benefits are maximised by collection of good quality material (to limit the rejected fraction) *and by replacement of virgin plastics on a high ratio (1 to 1).*

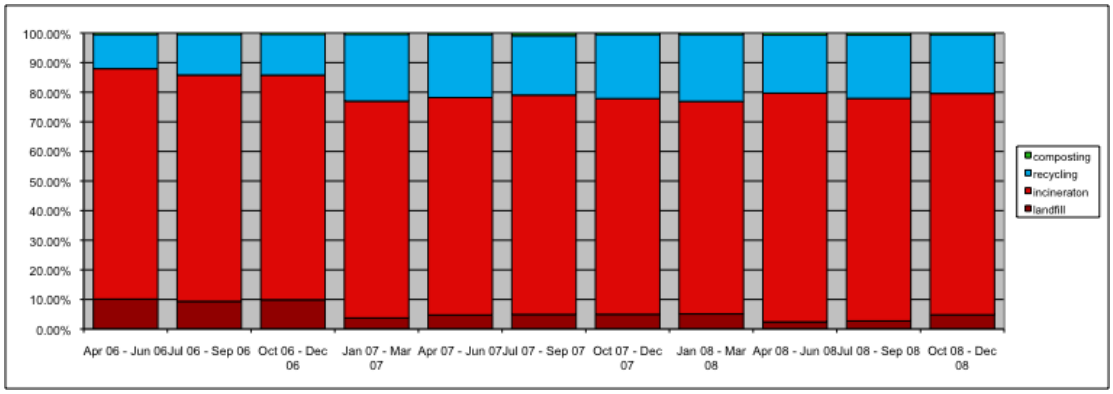
- *Incineration with energy recovery performs poorly with respect to climate change impact*, but pyrolysis appears to be an emerging option regarding all indicators assessed, though this was only analysed in two LCA studies.
- Landfill is confirmed as having the worst environmental impacts in the majority of cases.
- As the UK moves to a lower carbon energy mix, recycling will become increasingly favoured.

73. WRAP concludes that:

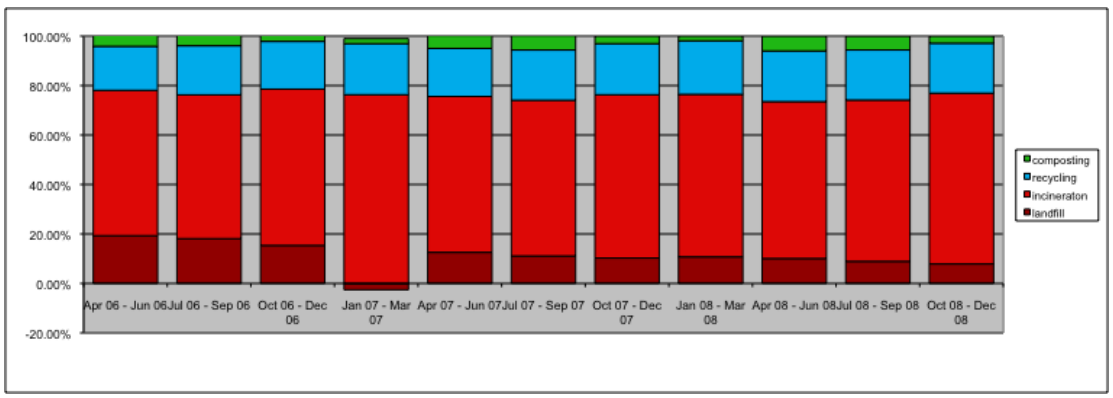
> *"Looking to the future, as the UK moves to a lower carbon energy mix, collection quality improves and recycling technology develops, then recycling will become increasingly favoured over energy recovery for all impact categories".*

74. The specific benefits of recycling in relation to climate change are addressed below. The results show that with the possible exception of waste wood incineration is not the preferred option for any element of the waste stream and that recycling should be maximised.

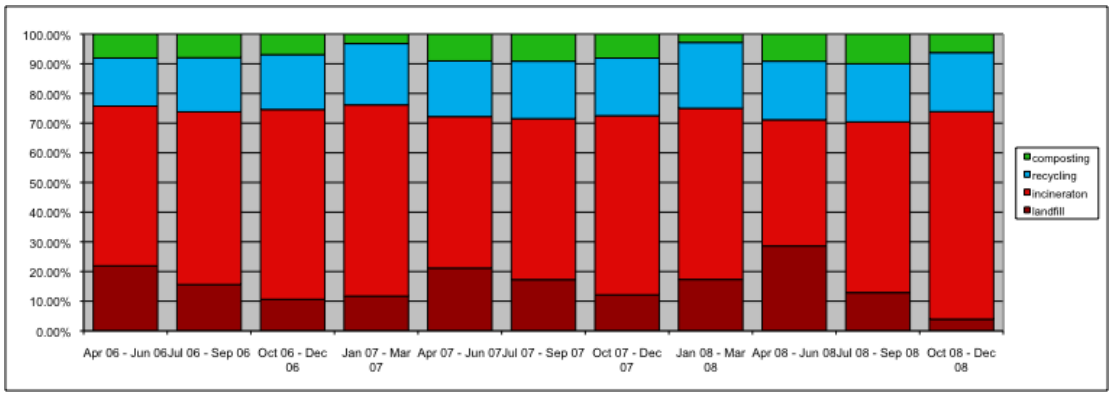
75. There is increasing evidence that higher levels of incineration undermine recycling. This is not surprising as incinerators rely particularly on paper and plastic waste to provide the homogenous waste stream with a stable calorific value that is necessary to achieve stable combustion. There is little doubt that this can, and does, happen. In Lewisham, for example, Veolia's (inaccurately named) SELCHP plant and the contract with the local authority has resulted in very low local recycling levels:



76. A similar situation with poor recycling rates arises in Portsmouth where Veolia has another incinerator:



77. Even Sheffield, one of the original "*recycling cities*" of the early 1990's has ground to a halt and needs to dramatically reduce the proportion of waste incinerated if even modest recycling targets are to be achieved:



It can be seen from the above tables that incineration causes significant local depression in recycling rates. In each case the future growth of recycling is severely constrained and incineration capacity will need to reduced - this is likely to involve contractual penalties and to increase the collection area from which the incinerator must source waste in order to continue operations.

Other examples of conflicts of Incineration and Recycling:

78. It is often claimed that there is no evidence that incineration competes with recycling for waste. In reality, there is of course a link – there is only so much waste available, so the amount processed through all treatment techniques must add up to 100% of the waste. Regional data for household waste from Denmark, often claimed to be an exemplar for incineration, in 2005 clearly shows that regions with high incineration have lower recycling and vice versa:

Region	*Recycling*	*Incineration*	*Landfill*
Hovedstaden	21%	77%	2%
Nordjyllnad	29%	63%	8%
Sjælland	31%	59%	10%
Midtjylland	40%	53%	7%
Syddanmark	41%	52%	6%

79. A study by the Zero Waste New Zealand Trust[8] reported that thermal conversion technologies need a constant supply of materials, often with a high fuel value (like paper and plastics), which can shift the focus away from recycling programs. The study stated that developing thermal conversion technologies can "*result in the creation of long-term contractual agreements with local authorities guaranteeing a certain tonnage of waste per year. This situation effectively destroys incentives for local decision-makers to minimize waste or lead resource recovery programs.*"

[8] Zero Waste New Zealand Trust, *Wasted Opportunities – A Closer Look at Landfilling & Incineration*,
http:/ / www.zerowaste.co.nz/ default,33.sm

80. The Guardian reported that East Sussex County Council is "*so worried it may not be able to fulfil its contract that it has now capped Lewes and Wealden's recycling levels - effectively penalising them if they recycle more than about 30% of their waste*" (Vidal 2006). The incinerator would be operated under a contract with Veolia. Local MP Norman Baker raised the issue in Parliament[9] saying:

    Norman Baker (Lewes) (LD): The Government rightly promote recycling, but is the Minister aware that Lewes district council's recycling levels have effectively been capped at 27 per cent by East Sussex county council, which will not provide further recycling credits because it wants a waste stream to feed its incinerator? Is it not about time that East Sussex county council was pulled out of the stone age and that councils that want to recycle more, such as Lewes council, which believes it can increase recycling by 50 per cent., were allowed to get on with it?

81. In 1995 Cleveland County Council signed a contract to supply waste for incineration. A 12,000 tonnes 'shortfall' in the first year led to penalties of £147,000 (ENDS 1996). The Associate Director of Environmental Services at Stockton Borough Council said "*essentially we are into waste maximisation… constrained from doing even a modest amount of recycling*".

82. Environmental Data Services (ENDS 2002) reported that an application to expand the Edmonton incinerator was rejected by Energy Minister Brian Wilson "*on the grounds that it might squeeze out recycling*". A larger incinerator, the Minister said, would give the local authority "*little incentive to do more recycling over and above the statutory minimum; and meeting or bettering recycling targets would lead to a shortfall…[resulting in] waste being imported from other areas, in contradiction of the proximity principle*". ENDS said "*Mr Wilson spelled out that it is the Government's policy that "waste should be minimised and recycling and composting undertaken before energy from waste is considered*."

83. The Inspector's report from the Ridham Dock Incinerator inquiry[10] concluded that if permission were granted the "*provision of greater incineration capacity than necessary would tend to undermine efforts to increase waste recycling and recovery locally, and encourage the transportation of waste from a more widespread catchment area*".

[9] Hansard 2 July 2009 : Column 477

[10] Ridham Dock, Kent, 17 Oct 02: APP/ W2275/ A/ 01/ 1061392

Ash Generation and Disposal

84. The proposed incinerator would both produce 'bottom ash' and 'air pollution control residues'('APC') (including both boiler ash and bag filter dust).

85. The application proposes that the bottom ash from the facility, which constitutes c.25% of the original waste by mass or c. 187,500 tpa, would be carried by rail to an ash recycling facility located at Newport, Gwent.

86. It appears that this proposal is speculative and that no site has actually been identified. The WRATE report (Doc 8.5) says:

    "Covanta intends to use a rail- linked ash recycling facility (ARF) in south Wales; we have assumed this site to be adjacent to the Newport WTS to enable the WRATE assessment to be undertaken realistically as this is currently an option under consideration".

87. The actual distance moved, and even whether by road or rail, could therefore change significantly and given the large tonnage of waste involved this can have significant effects on the modelling results and the overall environmental impacts of the scheme.

88. The application also indicates that it would be expected to export fly ash equivalent to approximately 4% of the incoming waste mass i.e. 15,000 tpa.

89. The intention with the APC residues is to transport them by rail to a Newport transfer station for onwards bulk transport by road for disposal at Wingmoor Farm Landfill, Bishops Cleeve, Gloucestershire. There is no doubt that the 'fly ash' is hazardous waste and there is no facility in Wales able to deal with these wastes.

90. The ES is silent on both the environmental impacts of the bottom ash treatment and on the health and environmental impacts of fly ash disposal.

91. The treatment of bottom ash is clearly either a direct or indirect impact of the application and schedule 4 of the Environmental Assessment Regulations[11] require that all 'direct and indirect' impacts of an application should be assessed. As this has not been done it is not possible to 'second guess' the significance of the omission.

92. Similarly the long-term impacts of the disposal of APC residues, which represent a large increase in the production of hazardous wastes from Wales, should have been considered as part of the environmental statement.

93. The omission of such consideration is potentially serious in the light of recent research relating to emissions from the proposed Bishop's Cleeve landfill site (Macleod, Duarte-Davidson et al. 2006; Macleod, Duarte-Davidson et al. 2007).

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[11] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 SI 1999 No. 293 Sched 4 Para 4. Requires:
A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development, resulting from:
(a) the existence of the development;
(b) the use of natural resources;
(c) the emission of pollutants, the creation of nuisances and the elimination of waste,
and the description by the applicant of the forecasting methods used to assess the effects on the environment.

94. Whilst it is described in the application as being 'inert' this is incorrect – bottom ash is never classed as 'inert'. The bottom ash is currently taxed as "inactive" waste for landfill tax purposes although this may be about to change as the default position in the recent Customs and Excise consultation is that the bottom ash should be taxed at the standard rate of landfill tax.

95. In practice the designation of bottom ash is either as non-hazardous or hazardous waste. At the end of 2006 the Environment Agency indicated that they had tested some bottom ash samples and:

"Levels of lead and zinc in a number of isolated compliance monitoring samples have exceeded the hazardous waste threshold for H14."

96. H14 is the hazardous waste criteria for ecotoxicity. Veolia has indicated (Veolia Environmental Services 2007) that when they had tested for metals and then used the Environment Agency WM2.2 assessment methodology to determine the whether the wastes were hazardous wastes about 40% of the samples from UK incinerators were found to be hazardous waste under the H14 criteria.

97. This follows increasing concern about the environmental impact of combustion residues in disposal and utilisation, especially for the release of toxic substances such as heavy metals (such as arsenic, cadmium, chromium, copper, mercury, molybdenum, nickel and, particularly in relation to ecotoxicity, lead and zinc) together with soluble salts from the residues (Stegemann, Schneider et al. 1995; Hartenstein and Horvay 1996; Hunsicker, Crockett et al. 1996; Abbas, Moghaddam et al. 2003).

98. The content of toxic metals present in the bottom ash from municipal waste incinerators is usually 10-100 times larger than in natural soils (Theis and Gardner 1990).

99. As a result of the toxicity associated with the heavy metals and other contaminants several researchers have concluded that bottom ash should be classified as a hazardous waste because of the ecotoxic properties it exhibits.

100. Ferrari et al (Ferrari, Radetski et al. 1999) subjected municipal waste incineration bottom ash to a range of ecotoxicity tests in both the leachate and solid phase.

101. Their results clearly demonstrated "*a significant increase in all antioxidant stress enzyme activity levels across all plant tests even at the lowest test concentrations (solid phase and leachate)*". This was demonstrated to be a good indicator of solid or leachate phase toxicity.

102. As with many other test regimes it is clear from this work that the bottom ash may not prove hazardous in all tests. This indicates that care must be taken with the test regimes and that selective testing could deliver apparently reassuring, and hence misleading, results. For ash to be demonstrated to be hazardous, however, a single failure of an appropriate test is sufficient.

103. Ibáñez et al. (Ibáñez, Andrés et al. 2000) found that all four samples of MSW bottom ash from two incinerators (one in an industrial and the other in a rural area) contained chemicals at or above the hazardous waste range. It should be noted that this study was published even before zinc oxide and chloride had to be considered when assessing the hazardous classification of ash.

104. More recently the work by Lapa et al (Lapa, Barbosa et al. 2002) on the

EC Valomat project concluded:

"all bottom ashes [including sample B1] should be classified as ecotoxic materials."

105. Radetski et al (Radetski, Ferrari et al. 2004) then investigated the genotoxic, mutagenic and oxidant stress potentials of municipal solid waste incinerator bottom ash leachates and reported:

"The MSWIBA leachates were found to be genotoxic with the Vicia root tip micronucleus assay.

106. These findings were confirmed by Feng et al. (Feng, Wang et al. 2007):

In this study, our results clearly demonstrated that MSWIBA leachates had genotoxicity on Vicia faba root cells as other researches did (Radetski, Ferrari et al. 2004). Bekaert et al. (199912) demonstrated that the aqueous leachates from a landfill of MSWI ash had a significant genotoxicity on the amphibian erythrocytes.

107. UNEP (UNEP and Calrecovery Inc 2005) warned in 2005 that whilst ash from incinerators has been reused in civil engineering works:

"in industrialised countries, the most prevalent method of management is disposal of the ash in lined landfills to control the risk of underground pollution by soluble toxic chemicals leached out of the ash.

108. UNEP continued:

"Both fly ash and bottom ash contain chemical constituents that pose potential serious risks to operating personnel and the public. The chemical constituents of concern include heavy metals, dioxins, and furans".

109. Feng expressed surprise about countries that do not include bottom ash on their hazardous waste lists:

However, in many countries and territories (such as USA, some OECD countries, China), Bottom ash is not included in the List of Hazardous Wastes, being dumped into landfills directly or after maturation (Gau and Jeng, 1998; (Ibáñez, Andrés et al. 2000);(Lapa, Barbosa et al. 2002)). Therefore, we suggested that the comprehensive evaluation of the environmental impacts of BA is necessary before decisions can be made on the utilization, treatment or disposal of bottom ash.

110. Ore et al (Ore, Todorovic et al. 2007) examined the leachate from bottom ash that had been stored outside for six months and then used for road construction.

111. They carried out several ecotoxicity tests and found a high initial release of salts and Cu in line with relatively high concentrations in laboratory generated MSWI bottom ash leachates presented in the literature (Meima and Comans 1999; Lapa, Barbosa et al. 2002)

112. A mung bean assay using *Phaseolus aureus* revealed the toxicity of bottom ash leachate - which continued to the final tests three years later, albeit due to different compounds leaching.

113. Leachates with significantly higher concentrations of Al, Cl, Cr, Cu, K, Na, NO_2–N, NH_4–N, total N, TOC and SO_4 were generated in the road-section built on bottom ash when compared to the road-section built with conventional gravel. Compared to the leachate from gravel, the concentrations of Cl, Cu and NH_4–N were three orders of magnitude higher, while those of K, Na and TOC were one order of magnitude

[12] Bekaert, C., Rast, C., Ferrier, V., et al., 1999. Use of in vitro (Ames and Mutatox tests)and in vivo (Amphibian Micronucleus test) assay to assess the genotoxicity of leachates from a contaminated soil. Org. Geochem. 30, 953–962.

higher. After 3 years of observations, while the concentrations of most components had decreased to the level in gravel leachate, the concentrations of Al, Cr and NO_2–N in bottom ash leachates were still two orders of magnitude higher.

114. The authors concluded that high concentrations of chloride emitted from the road can lead to increased toxicity to the recipient, e.g. for plants, and the bottom ash reused in a road construction could thus have a toxicological impact on the surroundings.

115. If the ash had not been weathered (and carbonated) for six months before use then the leaching would have been significantly more damaging.

116. A series of ring tests for ecotoxicity methods have been carried out in Europe (Becker, Donnevert et al. 2007; Moser 2008). These included sampling and testing of incinerator bottom ash from a Dutch incinerator (Cu 6,800 mg/ kg; Zn 2,639 mg/ kg; Pb 1,623 mg/ kg) a high pH (about 10.5). The bottom ash was found to be ecotoxic in these tests even after it had been aged for several months (Römbke, Moser et al.).

117. The Environment Agency has admitted it does not "*have 100% confidence*" in its classification of incinerator bottom ash (IBA) as non-hazardous waste (ENDS 2009).

118. It cannot therefore be assumed that the bottom ash would be suitable for re-use as proposed. Furthermore if there are even slight concerns about the quality of bottom ash then following the regulatory fiasco at Byker where the Environment Agency allowed heavily contaminated bottom ash and fly to be spread on allotments, it is likely that customers will be reluctant to take incinerator ash. There are other alternatives for more homogenous ash locally – at Aberthaw, for example, there is at least 500,000 tpa of power station ash available for recycling.

119. Any recycling of incinerator ash is therefore likely to displace the recycling of this power station ash and this would have no environmental benefit as incinerator bottom ash from mass burn facilities like this proposal contains a wider range and higher concentration of heavy metals whilst being less homogenous than power station ash even if it was not hazardous waste.

120. The WRATE assessment indicates:

> *RPS developed an amended process to ensure a fair representation of anticipated metals recovery. This is particularly important as WRATE results are sensitive to assumptions relating to recovery of non-ferrous metals.*

121. In practice post incineration recovery of non-ferrous material is difficult and unsatisfactory due to heavy alloying of the various metals and the difficulty of subsequent recovery. Even ferrous metals recovered post incineration are badly contaminated and have low scrap value. These practical problems are not reflected in the WRATE assessment and thus the model gives a distorted perspective of the real, low, values of any recovered metals. It is notable, in any case that the application does not secure any recovery of the metals as this is left entirely to others. In practice recovery is likely to be low with high levels of residual landfill for the reasons detailed below.

122. Even when incinerator bottom ash is 'recycled' only part of the ash can be used. In Hampshire, for example, where particular efforts have been made to increase the acceptability of incineration only about 33% of the

ash seems to be utilised according to Project Integra reports[13]. This contrasts sharply with the impression given in the application and in the WRATE modelling assumptions are unclear[14] but appears to assume that 100% recycling would be delivered. In Hampshire, however, only approximately 33% of the ash is recycled:

Currently Portsmouth produces 12,000 tonnes of IBA, which is currently landfilled. Under the new recycling scheme, 12% will be process losses (water etc), 8% will be oversize and landfilled, there will be 8% residue from the process, which will also be landfilled. This will give a remaining 72% for recycling, of this material the contractor predicts that 50% will be sold, with the remainder being used in landfill engineering projects. This means that there will be a diversion of approximately 4,000 tonnes of IBA from landfill to a recycling route.

123. Furthermore I note that the Covanta's consultants, RPS, commented in March 2007 on another proposal in Exeter that:

"*In practice….markets for such material [combustion residues] are difficult to secure and are piecemeal.*"

124. For that application it was assumed that:

"*all residues will be transported and disposed of at the landfill site.*"

125. This would be the appropriate approach to take in this application also. Given the likelihood that at least a significant proportion of the ash would ultimately have to be regulated as hazardous waste for which no site is available in Wales this would be an enormous increase in exports to England – contrary to the policy goals of Planning Policy Wales.

126. **On the basis of the evidence available it is reasonable to conclude that much of the bottom ash should be treated as hazardous waste and would have to be landfilled in England.**

POPs Regulations and 'priority consideration' of alternatives

127. Technical Appendix 7.1 of the application on air quality refers to the European Regulation (No 850/ 2004 on persistent organic pollutants and amending Directive 79/ 117/ EEC as amended) (European Commission 2004).

128. This regulation implements the obligations arising from the Stockholm Convention and the 1979 Convention on Long-Range Transboundary Air Pollution (United Nations Economic Commission for Europe (UNECE) 1979) together with the associated UNECE protocols on Persistent Organic Pollutants (UNECE 1998).

129. The Regulation is "*binding in its entirety and directly applicable in all Member States*".

130. Article 6(3) of the Regulation requires that:

131. *3. Member States shall, when considering proposals to construct new facilities*

[13] Project Integra Sub Strategy (Partner Implementation Plan) – 2006/ 7 to 2012 Portsmouth City Council November 2006 http:/ / www.portsmouth.gov.uk/ media/ et20061219r7app.pdf

[14] Contrary to the Environmental Assessment Regulations which require that the data used to support the application should be provided in order that it may be checked by others. This is particularly important when using 'black box' models such as WRATE with user specified variables. Essentially a consultant can reverse engineer any output they desire by careful selection of a few key variables making it essential that a proper audit trail should be available to the IPC and objectors.

*or significantly to modify existing facilities using processes that release chemicals listed in Annex III, without prejudice to Council Directive 1996/61/EC (1), give priority consideration to alternative processes, techniques or practices that have similar usefulness but which avoid the formation and release of substances listed in Annex III. (*my emphasis)

132. The substances listed in Annex III are:

Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/ PCDF)

Hexachlorobenzene (HCB) (CAS No: 118-74-1)

Polychlorinated biphenyls (PCB)

Polycyclic aromatic hydrocarbons (PAHs)

133. Incineration of waste, as proposed, clearly results in releases of all these substances - especially in residues but also in emissions to atmosphere (European Commission 2006).

134. Section 4(b) of the Persistent Organic Pollutants Regulations 2007 (HMSO 2007) requires the Environment Agency to comply with Article 6(3) of Council Regulation (EC) 850/ 2004 (as amended) (European Commission 2004) 'the EC POPs Regs'), If it is considering an application for an environmental permit.

135. The Environment Agency cannot, as part of the environmental permitting process, give effect to the requirement to "*give priority consideration to alternative processes, techniques or practices that have similar usefulness*" but which avoid the formation and release of PCDD/ PCDF, HCB, PCB and PAHs. This must inevitably be a planning function and this has been confirmed by the Environment Agency in legal correspondence to the Hull-based anti-incineration campaign group 'HOTI'. The Agency said (2nd December 2009):

"The encouragement of recycling and promotion of alternative waste management solutions within a particular area are matters for local waste planning authorities and the Secretary of State, not for the Agency"

136. This has been acknowledged in a recent public inquiry Decision letter (Grantham 2011) saying:

"IR1239. Uncontested evidence suggests that the proposed ERF would be a net producer of persistent organic pollutants (POPs) and that it is therefore necessary, under European law, to give priority consideration to alternative processes that would not generate and release these substances. This would appear to a matter for the planning regime, rather than the pollution control authority. [1035-1036]

IR1240. The implications of the law are not for me to decide. Nevertheless, this argument lends weight to the suggestion that the application should be refused so that more waste, which would otherwise be incinerated, could be recycled, composted or fed to an anaerobic digester. [1046]"

137. The Applicant suggests that because high temperature incineration can be used to destroy POPs the regulation does not apply to incineration. This is a weak argument which is not consistent with the approach of the Inspector above nor of the Environment Agency. This is not, in any case, a hazardous waste incinerator but a proposal for a municipal waste incinerator which will generate relatively high levels of dioxins and other POPs in the air pollution control residues but for which alternatives which produce no, or lower emissions of POPs, are available.

138. "*Priority consideration*" should therefore be given to alternative technologies such as anaerobic digestion and MBT processes.

Ground 2 – High Environmental Costs

The total environmental costs of the proposal outweigh the benefits of the scheme.

External Costs of Emissions:

139. The assessment in the application and environmental statement only consider the air pollution and health impacts in the immediate vicinity of the proposed incinerator.

140. It is much too simplistic to assume that as long as the air quality standards are achieved at the point of maximum ground level concentrations then emissions from the incinerators would be acceptable and would have no adverse impact on health or the environment, The high level of air pollution related deaths acknowledged by COMEAP and the Government demonstrates this.

141. The inadequacy of the applicants approach particularly in relation to pollutants which have no threshold such as particulates is clear. By 2001 Staessen (Staessen, Nawrot et al. 2001) concluded that "*current environmental standards are insufficient to avoid measurable biological effects*". More recently Kraft et al (Kraft, Eikmann et al. 2005) found that no safe level could be established for oxides of nitrogen and concluded that "*on basis of epidemiological long-term studies a threshold below which no effect on human health is expected could not be specified*". Thus the NOx emissions should be considered in a similar way to other no-threshold emissions such as particulates. It is self-evidently wrong to ignore the impacts from such emissions because the majority of the effects are not in the very tightly defined immediate vicinity of the incinerator.

142. Furthermore the failure to consider the secondary impacts described by above represents a major flaw in the application and is inconsistent with the obligations from the Environmental Assessment Regulations.

143. The statutory requirements for the contents of an environmental statement includes:

'the likely significant effects (including direct, indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative) of the proposed development on the environment resulting from:

"The existence of the proposed development

The use of natural resources

The emission of pollutants, the creation of nuisances and the elimination of waste" and a description is required of the forecasting methods used to assess the effects on the environment.' (my emphasis)

144. The EU definition of 'Indirect Impacts' is:

Indirect Impacts: Impacts on the environment, which are not a direct result of the project, often produced away from or as a result of a complex pathway (sometimes referred to as second or third level impacts or secondary impacts).

145. The release of emissions which form secondary particulates have not been addressed at all in this application.

146. The EU "*Clean Air For Europe*" ('CAFE') programme has assessed the secondary impacts of pollutants in detail for each country in the EU25 together with assessments for emissions on the four major seas around

Europe. The overview of the methodology (AEA Technology plc 2005) says, in relation to the assessment of the impacts of air pollution on human health:

The pollutants of most concern here are fine particles and ground level ozone both of which occur naturally in the atmosphere. Fine particle concentration is increased close to ground level by emissions from human activity. This may be through direct emissions of so-called 'primary' particles, or indirectly through the release of gaseous pollutants (especially SO_2, NO_x and NH_3) that react in the atmosphere to form so-called 'secondary' particles. Ozone concentrations close to ground level are increased by anthropogenic emissions, particularly of VOCs and NO_x. (my emphasis)

147. Ozone is clearly a secondary impact associated with the release of VOCs (volatile organic compounds) and NOx, both of which are significant emissions from the facility as demonstrated below. As with the effects of secondary particulates, however, the impacts of secondary ozone appear to have been completely omitted from consideration in the environmental statement.

148. These are serious omissions from any assessment of a major combustion facility.

149. In an effort to establish whether the emissions that have been omitted from consideration in the application have any 'significant' impacts I have applied the UK specific CAFE external costs to the projected emissions from the incinerators.

150. Oxides of nitrogen are responsible for the generation of secondary particulates which are the primary contributors to the health impacts (Howard 2009).

151. No bag filter system can be effective at reducing those particulate levels because they are formed after the filters. The appropriate approach would be to use primary NOx reduction techniques such as selective catalytic reduction (SCR) which is in increasingly common use on incinerators around the world but is not proposed for this incineration plant.

152. The emissions data in the application shows that the incinerator would produce about 825 [15] tonnes per year of oxides of nitrogen if operated at the Waste Incineration Directive Standards:

Emissions	*Average Daily Emission Conc. mg/m3*	*Annual Emissions tonnes*
Total Dust	10	41.25[16]
Volatile organic compounds	10	41.25

[15] Emission rates do not appear to be included in the application therefore it has been assumed that the incinerator produces c.5,500 m3/ tonne of flue gas

[16] Corrected to 24.75 in the calculations to allow for $PM_{2.5}$

(VOCs)		
Sulphur Dioxide (SO_2)	50	206
Nitrogen Oxides (as NO_2)	200	825
Ammonia	10	41.25

153. The CAFE Programme assessment of the impacts and associated external costs is detailed extensively (AEA Technology plc 2005; AEA Technology plc 2005; AEA Technology plc 2005) and has been subject to a publically available peer review (Krupnick, Ostro et al. 2005). The CAFE process recommended tighter standards on human health grounds.

154. COMEAP has recently accepted (COMEAP 2008) EU work showing children are more sensitive to air pollutants and can suffer a wide range of ill-health and developmental harm; this is not included in the CAFE estimates.

155. The costs associated with PM are considered by the US reviewers to be higher than used for CAFE; the health coefficient is to be taken to range from 6%-17% per 10ug/ m^3 $PM_{2.5}$, instead of the previous 6%. The more recent COMEAP report on the effect on mortality of long term exposure to air pollution (COMEAP 2009) accepts, in response to the US peer reviewer's critique, that 6% is out-of-date.

156. To calculate the external environmental costs associated with this proposal I have used the (conservative) CAFE costs without updating them for the increased harmfulness now acknowledged.

157. I have applied those costs to the total emission levels derived from the application, as above, and the maximum and minimum country specific external costs. I have then multiplied these costs over a nominal 25 year operating period.

158. Using this approach the minimum external costs associated with emissions of particulates, VOCs, SOx, NOx and ammonia alone is in the range €156 million to €427 million.

159. I have assessed the sensitivity of these externalities to the claimed operating regime where the actual emissions are likely to be lower than the permitted emission levels (though if lower levels are to be relied upon then Covanta offer to guarantee those lower emission levels by incorporating them into their environmental permit).

160. To do this I have taken emission levels of PM, VOCs, SOx as 40% of the WID standards. For NOx, which is a more demanding target for an incinerator with only SNCR I have taken average emissions at 90% and for ammonia slip, largely linked to the achievement of NOx levels, I have taken 80% of the application emissions levels.

161. The outcome is that the total external costs range from € 103 million to € 274 million. These are, in any terms, enormous external costs to satisfy the requirements of the EIA Directive and the implementing Regulations they should be included in the Environmental Statement.

162. The applicant has also clearly failed to properly assess the health and environmental impacts of the emissions from their proposal. The consequence of ignoring these secondary and far field impacts of the emissions means that the public, by accepting damage to their health, would be subsidising the applicant by approximately €8.3 - €22.7 per tonne of waste burned.

163. I note that these external damage costs are very similar to those calculated for direct non-greenhouse gas related emissions by Eunomia (Eunomia Research & Consulting and TOBIN Consulting Engineers 2008) and others:

Table E - 1: Externalities from Landfill, Incineration and MBT

	Landfill	Incineration	MBT
Direct emissions non-GHG related	€ 2.64	€ 23.51	€ 0.49
Direct emissions GHG related	€ 59.13	€ 28.71	€ 15.62
Total Direct Emissions	**€ 61.78**	**€ 52.22**	**€ 16.11**
Offsets GHG related	-€ 1.60	-€ 6.79	-€ 4.72
Offsets non-GHG	-€ 2.95	-€ 9.61	-€ 6.18
Total Offsets	**-€ 4.55**	**-€ 16.40**	**-€ 10.90**
Net Environmental damages	**€ 57.23**	**€ 35.82**	**€ 5.22**
Disamenity	€ 4.25	€ 14.30	€ 9.28[a]
Total External Costs	**€ 61.48**	**€ 50.12**	**€ 14.49**

a) This is an average of the two figures for landfill and incineration (see discussion in main text below).

Note: GHG = greenhouse gases

The Total Costs of Incineration:

164. The capital cost of an EfW plant is very much greater than that of a conventional electricity generating station of the same capacity (AEA for DTI 2005) and this is due to two main factors:

i) the low energy density of MSW compared with other renewable fuels (and even more so compared with conventional fossil hydrocarbon fuels) necessitating physically much larger plant,

ii) the need for advanced pollution control equipment fitted to the plant and the costs of safe disposal of ash and other residues.

165. The European Commission's thematic strategy on waste prevention and recycling notes that "*at low energy efficiencies incineration might not be more favourable than landfill*" (ENDS 2007).

166. This conclusion is supported by a large body of literature showing that the external costs of thermal treatment are actually very similar to those for landfill. Studies finding similar results include, but are not limited to:

Rabl, A., J. V. Spadaro, et al. (2008). "Environmental Impacts and Costs of Solid Waste: A Comparison of Landfill and Incineration." Waste Management & Research **26**(2): 147-162. (Rabl, Spadaro et al. 2008).
Holmgren, K. and S. Amiri (2007). "Internalising external costs of electricity and heat production in a municipal energy system." Energy Policy **35**(10): 5242-5253. (Holmgren and Amiri 2007)
Eshet, T., O. Ayalon, et al. (2006). "Valuation of externalities of selected waste management alternatives: A comparative review and analysis." Resources, Conservation and Recycling **46**(4): 335-364. (Eshet, Ayalon et al. 2006)
HM Customs & Excise (2004). "Combining the Government's Two Health and Environment Studies to Calculate Estimates for the External Costs of Landfill and Incineration, December 2004." (HM Customs & Excise 2004)

Eunomia (2006) A Changing Climate for Energy from Waste? Final report for Friends of the Earth. (Hogg and Eunomia Research & Consulting Ltd 2006)

Eunomia Research & Consulting and TOBIN Consulting Engineers (2008). Meeting Ireland's Waste Targets - the Role of MBT Final report for Greenstar (Eunomia Research & Consulting and TOBIN Consulting Engineers 2008)

Turner, G., (Enviros Consulting), D. Handley, (Enviros Consulting), et al. (2004). Valuation of the external costs and benefits to health and environment of waste management options Final report for DEFRA by Enviros Consulting Limited in association with EFTEC, DEFRA. (Turner, Handley et al. 2004)

167. An independent study by Dijkgraaf (Dijkgraaf and Vollebergh 2004) concluded:

> *"The net private cost of WTE (waste-to-energy) plants is so much higher than for landfilling that it is hard to understand the rational behind the current hierarchical approach towards final waste disposal methods in the EU (European Union). Landfilling with energy recovery is much cheaper, even though its energy efficiency is considerable lower than that of a WTE plant."*

168. This conclusion is similar to that reached by the OECD (Organisation for Economic Co-operation and Development (OECD) 2007) this year following their review of waste Management in the UK and the Netherlands:

> *"In both countries, there is currently a strong preference given to incineration compared to landfilling of waste – as reflected e.g. in the landfill taxes they apply. A similar preference underlies the Landfill Directive of the European Union, which fixes upper limits for the amounts of biodegradable waste member states are allowed to landfill.*
>
> *However, estimates in both countries indicate that the environmental harm caused by a modern landfill and a modern incineration plant are of a similar magnitude, while the costs of building and operating an incinerator are much higher than the similar costs for a landfill. Hence, the total costs to society as a whole of a modern incinerator seem significantly higher than for landfilling - which indicates that some reconsideration of the current preference being given to incineration could be useful."*

169. And:

> *"Analyses of the negative environmental impacts of landfilling and incineration in both countries suggest, however, that the foundation for the present preference for incineration is questionable from the point of view of total social costs".*

170. It should be noted that the "*social costs"* of waste management include the respective *private costs i.e.* the costs to society of building and operating the various management options together with the external environmental costs.

171. **It is concluded that there would be serious health impacts associated with secondary pollutant generation from the proposed incinerator which have not been assessed in the application, contrary to the requirements of the Environmental Assessment Regulations and that the total environmental costs of the proposal outweigh the benefits.**

External Costs Calculations:

Emissions	Average Daily Emission Conc. mg/m3	Annual Emissions tonnes	External Costs Min €	Max €	Annual Costs Min	Annual Costs Max	25 year Costs Min	25 year Costs Max
Total Dust[17]	10	24.8	37,000	110,000	€ 915,750	€ 2,722,500	€ 22,893,750	€ 68,062,500
Volatile organic compounds (VOCs)	10	41.3	1,100	3,200	€ 45,375	€ 132,000	€ 1,134,375	€ 3,300,000
Sulphur Dioxide (SO_2)	50	206.0	6,600	19,000	€ 1,359,600	€ 3,914,000	€ 33,990,000	€ 97,850,000
Nitrogen Oxides (as NO_2)	200	825.0	3,900	10,000	€ 3,217,500	€ 8,250,000	€ 80,437,500	€ 206,250,000
Ammonia	10	41.3	17,000	50,000	€ 701,250	€ 2,062,500	€ 17,531,250	€ 51,562,500
					€ 6,239,475	**€ 17,081,000**	**€ 155,986,875**	**€ 427,025,000**

Emissions	Annual Average Daily Emission Concentration mg/m3	Sensitivity - average emissions as % of WID	25 year Costs at < WID emissions Min	25 year Costs at < WID emissions Max
Total Dust	10	40%	€ 9,157,500.00	€ 27,225,000.00
Volatile organic compounds (VOCs)	10	40%	€ 453,750.00	€ 1,320,000.00
Sulphur Dioxide (SO_2)	50	40%	€ 13,596,000.00	€ 39,140,000.00
Nitrogen Oxides (as NO_2)	200	90%	€ 72,393,750.00	€ 185,625,000.00
Ammonia	10	80%	€ 7,012,500.00	€ 20,625,000.00
			€ 102,613,500	**€ 273,935,000**

[17] Corrected to $PM_{2.5}$

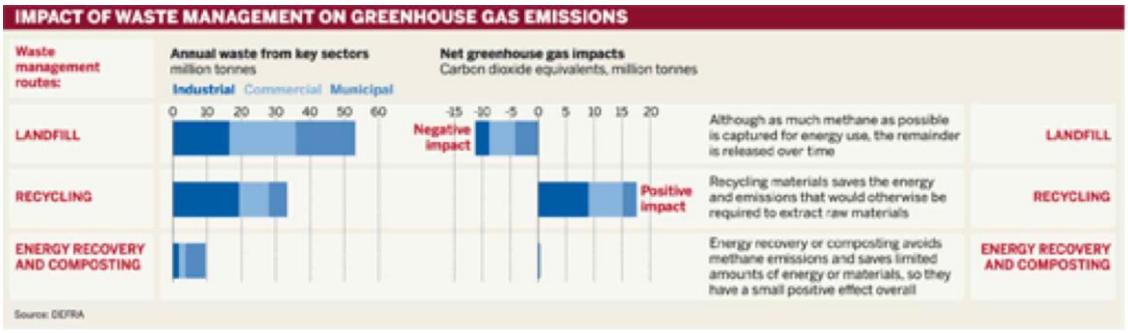
Ground 3 - Carbon Emissions and Climate Change:

The assessments of climate change impacts presented in support of the proposal are flawed and over-state benefits.

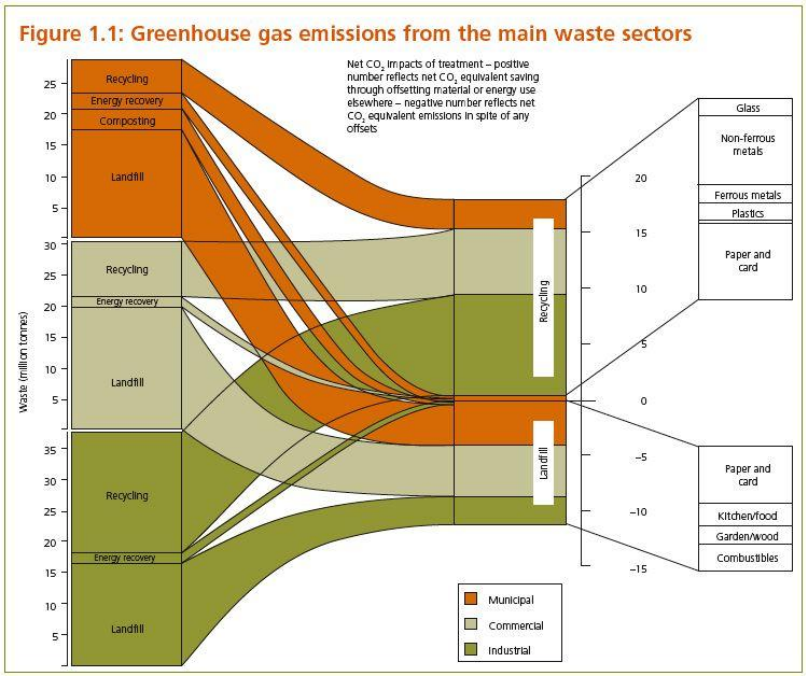
Climate Change Issues

172. Climate change remains the world's greatest environmental challenge. For the past 100 years or so, greenhouse gases have been accumulating in the atmosphere, primarily as a result of burning fossil fuels and changes in land use. Over the same period, global average temperatures have increased by around 0.8°C. The first decade of the twenty-first century was the warmest since instrumental records began. The world is committed to further climate change. Emissions of carbon dioxide from energy use have increased by 30% in the past ten years. Even if emissions peak within the next decade and then reduce year-on-year at 3-4% for the rest of the century, global temperatures still have around a 50:50 chance of rising above 2°C by 2100.

173. Tables in the previous English waste strategy "Waste Strategy 2007" (Department for Environment Food and Rural Affairs 2007) showed that whilst recycling makes a strong positive contribution to reducing climate change impacts, energy from waste is, at best, very slightly positive (ENDS 2007):



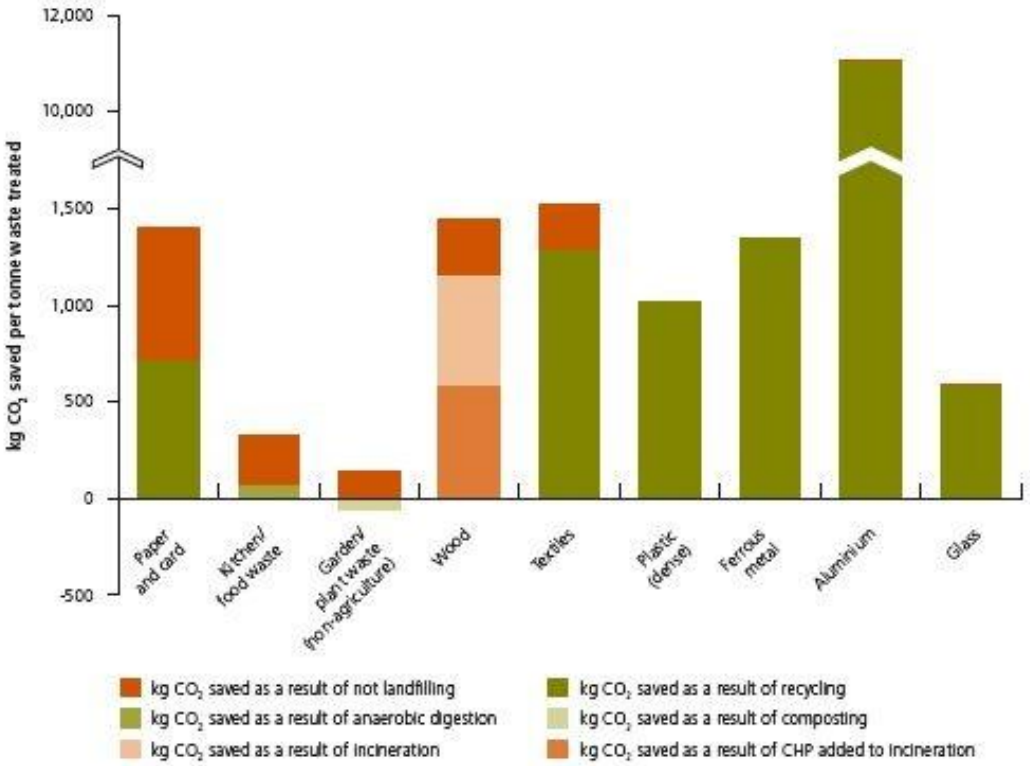
174. This can also be seen in figure 1.1 from WS 2007:



175. It can be seen that recycling gives positive benefits in terms of greenhouse gases in every case whilst incineration is effectively considered carbon neutral. Clearly the 'opportunity cost' of incineration in circumstances where recyclable material is burned would include the lost benefits associated with recycling.

176. Waste Strategy 2007 also included a helpful comparison of the carbon benefits of diverting wastes from landfill. The assumptions made by DEFRA are: paper and card, textiles, plastics, metals and glass are recycled; food waste is anaerobically digested, and garden/ plant waste is composted. Only wood is incinerated with energy recovery – even this assumption is questionable as discussed below.

Chart 4.1: Estimated carbon benefits of diverting different waste materials from landfill

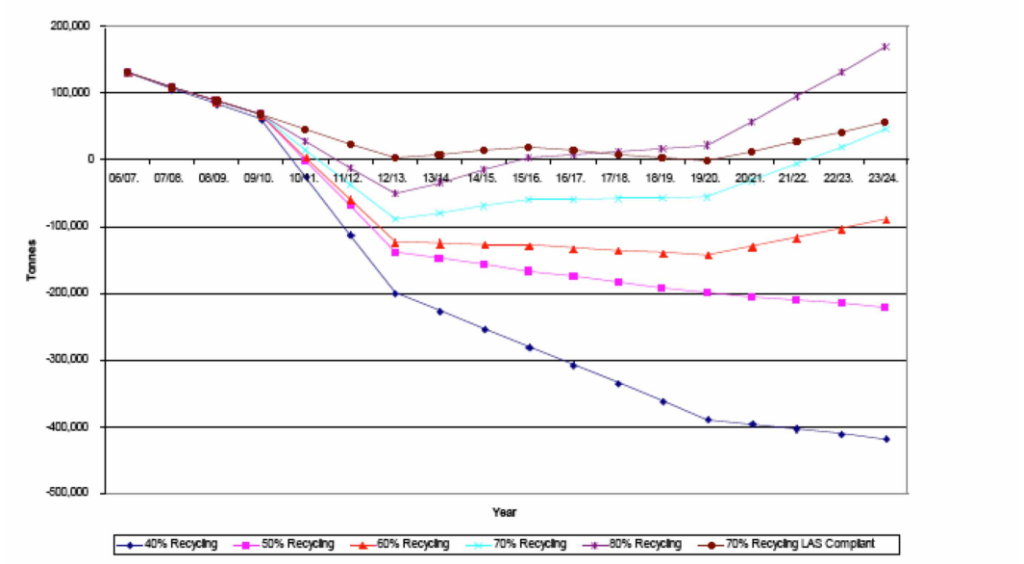


177. Similarly modelling for the Committee on Climate change report 'Building a low-carbon economy – the UK's contribution to tackling climate change' (Committee on Climate Change 2008) indicated that by far the most effective treatment strategy to reduce greenhouse gas emissions from waste was to increase recycling.

178. It is clear from the work that has been carried out and published on the National Waste Strategy (Welsh Assembly Government 2007) that the Landfill Directive targets for diversion of biodegradable municipal waste can be met without incineration.

179. To do so requires a 70% recycling target with 52% recycling/ composting in 2012/ 13, which the consultants say will be cost effective because recycling will be cheaper than the costs of treating the residual wastes in the longer term.

Figure 2: Balance of Landfill Allowances, All Recycling Scenarios (positive means targets exceeded, negative means a shortfall with targets not being met)



Renewable Energy?

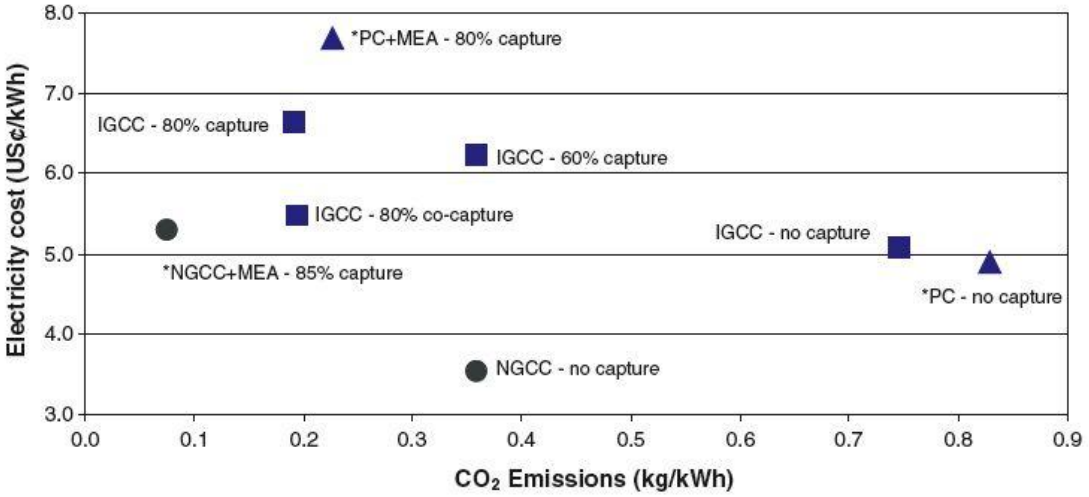
180. It would be self-defeating and inconsistent with the Welsh Government's approach to renewable energy to include options which produce more carbon than conventional fossil fuel power stations as a climate change abatement strategy.

181. Yet incineration, according to a recent parliamentary answer (HC Deb, 17 January 2011, c480W) by the minister from DECC, produces 540 gCO_2/ kWhr, without even taking account of biogenic carbon, whilst the UK 'Average Mix' electricity generation in 2007/ 8 produced 480 gCO_2/ kWhr. The assessments of climate change impacts are therefore flawed and over-state benefits.

Electricity Generator	**DECC**	**BIS Data**	**FoE Data**
Coal fired power stations		910	835
Combined Cycle Gas Turbines (CCGT)		360	382
UK 'Average Mix' electricity generation in 2007/ 8		480	
Waste fired power station (incinerator)	540		1645 total 510 non-biogenic
Renewables		0	

182. The data in the final column is derived from a report by Eunomia for Friends of the Earth (Hogg and Eunomia Research & Consulting Ltd 2006).

183. Whilst Government data shows that incineration already produces significantly higher climate changing emissions than the UK average mix and far higher than combined cycle gas turbines the difference will become substantially greater in the near future as gas fired pant become more efficient and coal fired plant are fitted with carbon capture with lower carbon intensities than incineration (Ordorica-Garcia, Douglas et al. 2006):



CO2 mitigation cost comparison chart (*from Riemer P. The capture of carbon dioxide from fossil fuel fired power stations. IEA Green House Gas Research. Report IEAGHG/ SR2, London, UK, 1993.)

184. These data are consistent with those reported by Huang (Huang, Rezvani et al. 2008) who calculates 725-804 g CO_2/ kWh for IGCC which reduces to 86-97g CO_2/ kWh with carbon capture.

185. The consequence is that incineration produces more fossil based carbon dioxide (and far more total carbon dioxide) than the current average mix of electricity supply, much more fossil carbon dioxide than combined cycle gas turbine (CCGT) power stations and more than future coal fired plant fitted with carbon capture.

186. It is irrational to class such a high carbon emitter as a "*low carbon*" supply of electricity or to pretend that it has a role in climate protection – particularly when considering future emission scenarios.

Would the proposal generate "Renewable Energy"?

187. Only the non-fossil element of waste is renewable energy and this follows the definition of biomass in Article 2 (e) of Directive 2009/ 28/ EC on the promotion of the use of energy from renewable sources (amending and subsequently repealing Directives 2001/ 77/ EC and 2003/ 30/ EC). The definition of biomass in the Directive is consistent with that from the earlier Directives:

> (e) 'biomass' means the biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste; (my emphasis)

188. The then Minister, Malcolm Wicks (Wickes 2008) confirmed that in the UK "*only the biogenic carbon content can be counted as renewable*".

What is the Biogenic Carbon Content of Waste?

189. The balance of the fossil and biogenic carbon in waste is therefore central to the assessment of the carbon dioxide emissions from incineration and any claimed renewable energy generation is dependent on this balance.

190. The Supporting Statement claims (Para 34):

The Brig y Cwm Facility would generate up to 67MW of electricity (with no CHP) to export to the grid of which just over 50% would be classified as renewable energy, contributing to UK and Wales targets.

191. Thus implying that more than 50% of the waste that would be burned would be biogenic. I note that significantly higher assumptions have been made in the WRATE assessment and thus this over-estimates the renewable energy element (and because the carbon emissions from the biogenic element are ignored, it understates the true carbon emissions from the proposal).

192. Even the supporting statement claim for the proportion of renewable energy overestimates the biogenic carbon content of the waste which would be incinerated however.

193. This can be seen from the 2007 DTI consultation (Department of Trade and Industry 2007) on the review of the Renewables obligation.

194. The UK Government response to the submissions to the consultation was published in January 2008 (BERR 2008) and said :

Deeming the biomass fraction of waste: *we will proceed with the introduction of deeming, but will begin with a lower deemed level of 50% fossil fuel energy content that will increase over time to 65% following a trajectory in line with the Government's waste policy*[18].

195. And warns:

5.9 Ofgem will be given powers to withhold ROCs for mixed waste streams where there is reasonable doubt that the biomass energy content reaches the deemed level. This is consistent with the approach currently used under the scheme for issuing Climate Change Levy Exemption Certificates. It should be noted that lowering the deemed level of fossil-fuel energy from 65% to 50% is likely to increase the risk for some stations that a test of reasonable doubt will be met.

196. This consultation and response considers the carbon levels in the waste that would be burned after the removal of the recyclables that the Government clearly considers should be taken out. Thus at present only about 40% of the output from an incinerator would be biogenic carbon and this would be expected to fall to 35% by 2018 as more recycling is undertaken.

[18] The Government propose setting the deemed levels of fossil energy content at: 50% from 2009 to 2013; 60% from 2013 to 2018; 65% from 2018. There is the possibility of producing evidence of different waste analysis but this must be well founded and evidence based: *We will allow operators the opportunity to present Ofgem with evidence that the fossil fuel content is lower than the deemed level and look to make the fuel measurement system more flexible.*

Annex E: Analysis on Biomass Fraction of Waste for Use in Deeming the Fossil Fuel Fraction of Waste

			Unsorted waste			Scenario A[32]			Scenario B[33]		
	Biomass %	GCV (MJ/kg)	% waste	Total GCV	Biomass GCV	% waste	Total GCV	Biomass GCV	% waste	Total GCV	Biomass GCV
Paper and card	100	12.6	18.0	2268.0	2268.0	2.7	340.2	340.2	9.0	1134.0	1134.0
Plastic film	0	23.6	2.7	637.2	0.0	9.5	2249.3	0.0	8.6	2039.0	0.0
Dense plastic	0	26.7	3.5	934.5	0.0	1.4	373.8	0.0	2.1	560.7	0.0
Textiles	50	15.9	2.4	381.6	190.8	1.2	190.8	95.4	1.4	229.0	114.5
Absorbent hygiene products	50	8.0	2.2	176.0	88.0	7.8	621.3	310.6	7.0	563.2	281.6
Wood	100	18.3	3.2	585.6	585.6	1.6	292.8	292.8	2.4	439.2	439.2
Other combustibles	50	15.6	1.5	234.0	117.0	5.3	826.0	413.0	4.8	748.8	374.4
Non-combustibles	0	2.8	12.3	344.4	0.0	43.4	1215.7	0.0	39.4	1102.1	0.0
Glass	0	1.5	6.6	99.0	0.0	3.3	49.5	0.0	3.3	49.5	0.0
Ferrous metal	0	0.0	1.6	0.0	0.0	0.8	0.0	0.0	0.8	0.0	0.0
Non-ferrous metal	0	0.0	0.4	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.0
Kitchen waste	100	5.3	17.2	911.6	911.6	4.3	227.9	227.9	4.3	227.9	227.9
Green waste	100	6.5	19.2	1248.0	1248.0	1.9	124.8	124.8	1.9	124.8	124.8
Fines	50	4.8	4.0	192.0	96.0	14.1	677.8	338.9	12.8	614.4	307.2
WEEE	0	7.6	4.5	342.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hazardous household waste	0	0.0	0.6	0.0	0.0	2.1	0.0	0.0	1.9	0.0	0.0
TOTAL			**99.9**	**8353.9**	**5505.0**	**99.7**	**7189.9**	**2143.6**	**100.0**	**7832.6**	**3003.6**
Biomass GCV					**66%**			**30%**			**38%**

Base data from:
Carbon Balances and Energy Impacts of the Management of UK Wastes: Table 3.2 (GCV); Table 1.24 (municipal waste composition England), Table B1.2 (recycling and recovery upper limits – for Scenario A), Impact of EfW and recycling policy on UK GHG emissions: Table 3.1 (% biodegradability)

32 Scenario A: Removed 85% paper/card, 75% food, 90% green, 50% wood, textiles, glass & metals, 60% dense plastic, WEEE
33 Scenario B: Removed 50% paper/card, 75% food, 90% green, 25% wood, 40% textiles & dense plastic, 50% glass & metals, WEEE

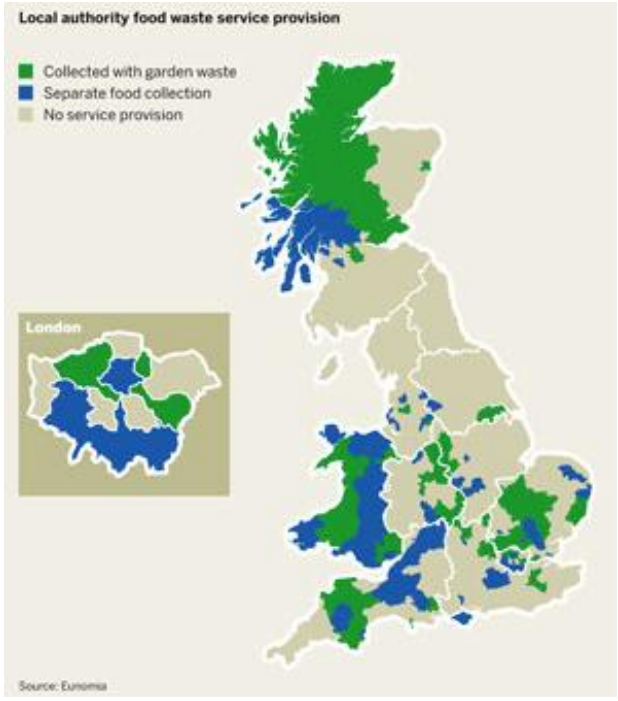
197. The approach taken by RPS in the WRATE modelling in support of the application is misleading because it takes an average of the biogenic/ biodegradable content of the MSW (and C&I) waste streams and makes no allowance for the changes in residual waste composition as recycling increases. The easiest target materials for recycling and paper and card for both MSW and in C&I wastes and these will inevitably be significantly reduced in residual wastes.

198. The levels of food waste collection in Wales are also high with all 22 authorities now operating separate collections. Some authorities such as Cardiff and Conwy, are only just rolling out their schemes and so their collection levels are likely to increase in the next year. Most collect food waste separately from garden waste, but the majority still goes to composting schemes (ENDS 2011).

FOOD WASTE RECYCLING BY COUNCIL IN THE UK

Area	No of boroughs	None	Food recyclers	Pilots
England (except London)	308	200	97	11
London	33	14	18	1
Scotland	32	19	18	1
Wales	22	–	20	2
Northern Ireland	26	12	13	1
UK total	**421**	**245**	**154**	**22**

199. Currently 82% of Welsh households have access to food waste collection and the Welsh government wants this to hit 90% by 2012 (ENDS 2011).



200. As the food waste collection levels in Wales are much higher than in England it is not sensible to use data for the biogenic carbon in the waste based on English levels as RPS does. Furthermore as the collection levels increase due to the continuing expansion of food waste collections the levels of biogenic carbon in residual waste will fall further.

201. This is not reflected in the application modelling data – indeed the WRATE report (Doc 8.5) claims that the biogenic to fossil ratios in the waste which would be incinerated are very high:

2.10 The biogenic to fossil carbon content ratio of the applied MSW composition is 63:37, representing relatively low fossil carbon content as the composition is dominated by paper and card and organics. This ratio is important for GWP results as only fossil carbon emissions contribute to GWP. The GWP performance of thermal treatment options may be limited by the combustion of plastics, as this releases fossil carbon as CO_2.

202. And:

2.12 The biogenic to fossil carbon ratio of the applied C&I waste composition is 66:33. Consistent with the MSW composition C&I waste is relatively low in fossil carbon, the composition being dominated by paper and card and organics with significant further contributions of biogenic carbon from wood and combustibles.

203. The levels claimed for biogenic carbon in the waste by RPS/ Covanta can be seen to be seriously overstated when compared with the likely current levels of c.40% (and would, in any case, assume that the incinerator is planning to burn mainly recyclable paper and digestible food waste!). The overestimation of the renewable output is at least 50% and, as can be seen below, the carbon dioxide emissions are similarly underestimated because RPS has ignored the biogenic emissions.

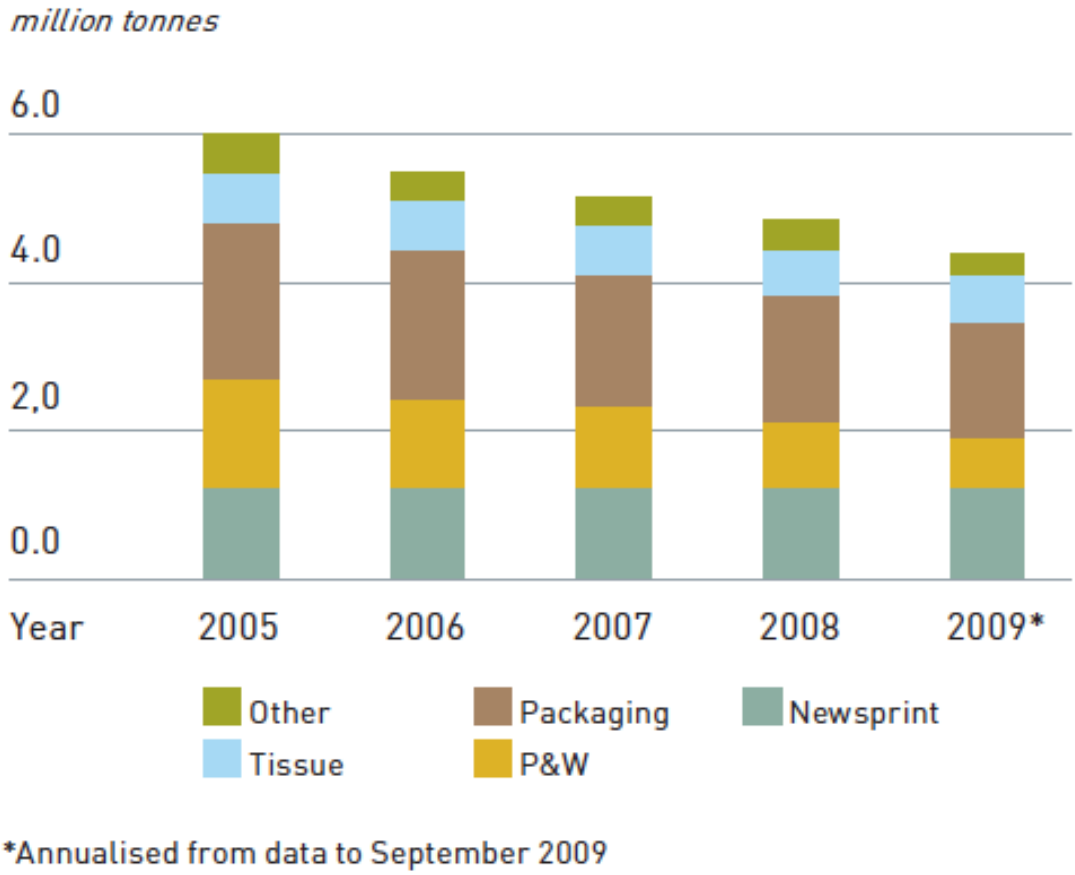
204. Little weight can therefore be placed on the claimed carbon savings attributed to the WRATE modelling.

205. I conclude that it is incorrect to define mass burn incineration/ energy from waste as renewable energy for planning purposes without first assessing whether the waste can be reduced, re-used, recycled (and in the case of food waste treated by the Government's preferred method of anaerobic digestion) and secondly determining the residual unrecyclable

biomass fraction of that waste.

Future Changes in Biogenic Elements of Waste

206. A report published in February 2010 on UK paper production by WRAP (WRAP, 2010) shows that around 5 million tonnes of paper and board was manufactured in the UK in 2008, 3% less than in 2007 and that this continues the steady decline seen over recent years:



*Annualised from data to September 2009

207. The pace of decline increased in late 2008 and 2009 as a number of mills closed. Data for the first nine months of 2009 suggested that paper production will be about 15% lower in 2009 than in 2008. A consequence of the fall in demand has been the recent closure of the Bridgewater Paper Company (ENDS, 2010).

208. Furthermore this reduction in domestic production, which precedes any economic downturn, is not being replaced by imported paper and board. Indeed imports are falling as well:

Table 1: UK consumption of paper and board

million tonnes

Paper grade	2007	2008	2009[1]
Newsprint	2.5	2.4	2.1
Printings & writings	4.5	4.2	3.7
Tissue	1.1	1.1	1.1
Packaging	3.4	3.2	3.0
Other paper and board	0.6	0.6	0.5
Apparent consumption of unconverted paper and board[2]	**12.1**	**11.5**	**10.4**
Net imports of converted products[3]	0.8	0.6	..
Net imports of packaging around other goods (estimated)	1.2	1.1	..
Estimated total consumption	**14.1**	**13.2**	**..**

[1] Annualised from data to September 2009.
[2] UK home sales plus imports of unconverted paper and board.
[3] For example, boxes, cartons, books, brochures, catalogues and nappies.

Sources: CPI, HM Revenue and Customs and WRAP estimates

209. About 24 and 33% of the household waste stream is paper and card (Burnley, 2007). As this has been consistently falling nationally over at least the past five years it is not surprising that that household waste arisings are also consistently falling. This fall will also certainly be influenced by the major campaign being run by WRAP "*Love food- Hate waste*"[19] which targets the major component of household waste.

210. WRAP concluded that "*there is likely to be some rebound in paper consumption as the UK emerges from recession, but the long-term trend in consumption is likely to be downward*." (my emphasis)

211. For some paper sectors – such as newsprint – declining consumption and increased production will mean that the UK will be more self-sufficient, meaning that there will be domestic end markets for more of the paper recovered from the UK waste stream.

212. Recent research by Moberg et al. (Moberg, 2010) comparing newsprint with the increasing use of tablet e-papers, for example, shows that printed newspaper in general had a higher energy use, higher emissions of gases contributing to climate change and several other impact categories than the electronic readers. It was concluded that tablet e-paper has the potential to decrease the environmental impact of newspaper consumption. The recent introduction by Apple of the iPad[20] is likely to accelerate the move away from paper. The waste electronics generated instead of paper are quite unsuitable for incineration – not least because they contain high value resources which are increasingly targeted for recovery from the design stage (Kuo, 2010).

213. Increased incineration capacity represents a further threat to the future of remaining UK paper recycling capacity, an issue of particular concern in Wales given the importance of Shotton to the economy, as it is

[19] http:/ / www.lovefoodhatewaste.com/

[20] http:/ / www.apple.com/ uk/ ipad/

inevitable that incinerators and paper recyclers will increasingly compete for the diminishing tonnage of recyclable paper.

Accounting for Biogenic Carbon

214. The WRATE report (Doc 8.5) confirms, however that the biogenic emissions of carbon have been ignored in the assessment:

In line with "Guidelines for National Greenhouse Gas Inventories Volume 5 Waste" published by the Intergovernmental Panel on Climate Change (IPCC) in 2006, biogenic CO_2 emissions are excluded from WRATE GWP calculations. The carbon in MSW is of both biogenic (short-cycle) and non-biogenic (fossil) origin. IPCC guidance states that CO_2 emissions from combustion of biomass materials (e.g. paper, food and wood) contained in the waste are biogenic emissions and should not be accounted for in emissions estimates.

215. In fact IPCC (IPCC 2006) says:

if incineration of waste is used for energy purposes, both fossil and biogenic CO_2 emissions should be estimated. Only fossil CO_2 should be included in national emissions under Energy Sector while biogenic CO_2 should be reported as an information item also in the Energy Sector.

216. The need for estimates to be provided is acknowledged by RPS at Para 1.33, although they fail to do so as part of the application but IPPC continue:

Moreover, if combustion, or any other factor, is causing long term decline in the total carbon embodied in living biomass (e.g., forests), this net release of carbon should be evident in the calculation of CO_2 emissions described in the Agriculture, Forestry and Other Land Use (AFOLU) Volume of the 2006 Guidelines.

217. No consideration appears to have been given to this by RPS. In this case the useful biogenic carbon is mainly assumed to come from paper (carbon in food contributes practically no energy as almost all the heat is used to boil the water in the food waste).

218. Hogg reports "*Brief discussions with IPCC suggest that they believe that the issue of biogenic carbon is effectively dealt with through the reporting under the Land Use, Land-Use Change and Forestry (LULUCF) sector*"(Hogg and Eunomia Research & Consulting Ltd 2006). He comments "*The approach used here is to use stock changes to estimate emissions. In theory, IPCC has suggested (in a private communication) that this is meant to include not just uptake of CO_2 by crops and forests etc but also, the release of CO_2 after use as food, fuel or from waste disposal. Perhaps unsurprisingly – neither incinerators nor landfills obviously look like something which registers under 'Land-use Change and Forestry' – these do not seem to be reported. We believe this is a potentially significant omission*".

219. It appears, therefore, that the claim made by the applicants in relation to the need to report is incorrect but because of the confusing approach adopted by IPCC under-reporting is widespread.

220. Whether actually accounted by IPCC or not the biogenic carbon should be reported and not ignored as in this application.

221. That this is the appropriate approach has recently been confirmed in a strongly worded editorial by Ari Rabl in the International Journal of Life Cycle Assessment (Rabl, Benoist et al. 2007):

In a part of the LCA community, a special convention has been established according to which CO_2 emissions need not be counted if emitted by biomass. For example, many studies on waste incineration do not take into account CO_2 from

biomass within the incinerated waste, arguing that the creation of biomass has removed as much CO_2 as is emitted during its combustion.

222. Rabl continues:

"*The logic of such a practice would imply absurd conclusions, e.g. that the CO_2 emitted by burning a tropical forest, if not counted, would equalize the climate impact of burning a forest and preserving it, which is obviously wrong. Likewise, the benefit of adding carbon capture and sequestration (CCS) to a biomass fuelled power plant would not be evaluated because that CO_2 is totally omitted from the analysis.*

223. Amongst the advantages of including biogenic carbon emissions, Rabl says, are those:

By explicitly counting CO_2 at each stage, the analysis is consistent with the 'polluter pays' principle and the Kyoto rules which imply that each greenhouse gas contribution (positive or negative) should be allocated to the causing agent.

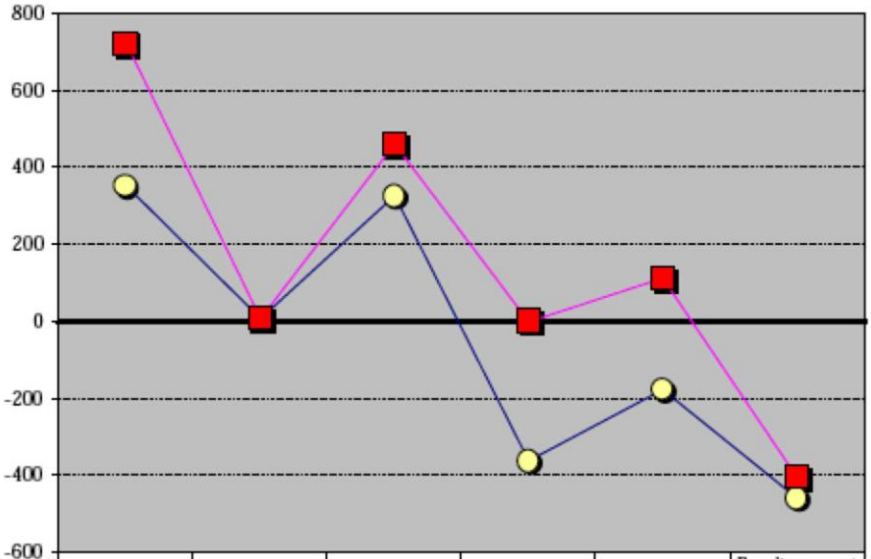
224. The total annual emissions of carbon dioxide from the proposed incinerator would be approximately 188,000 tonnes of carbon[21] (as per figure 2.3 in the WRATE assessment) but RPS has ignored c.121,700 tonnes per annum because they are claimed to be biogenic. Properly corrected for the levels of recycling, as above, the total fossil based carbon dioxide emissions would be at least 113,000 tonnes (compared with the claimed 66,000 tonnes). This represents very large error in the application and the total carbon emissions converted to carbon dioxide from the facility, at close to 700,000 tonnes are enormous so the scope for errors in the claims relating to the biogenic content can be large.

225. The high levels of carbon emissions from incineration, when properly assessed are not surprising and are consistent with the published literature. Lifecycle calculations for real efficiencies of biostabilisation and following the IPCC prescription are included in the Eunomia ATROPOS model, which found (Eunomia Research & Consulting and EnviroCentre 2008) that "*scenarios using incineration were amongst the poorest performing*"[22] while those using MBT were much better. A detailed review by AEAT for the European Commission (AEA Technology, Smith et al. 2001) similarly finds that MBT when sequestration is taken into account performs much better than energy from waste. The graph when the displaced fuel is assumed to be low carbon, as will be increasing the case over the next 40 years and is true when there is competition on price or for subsidy with renewables, as in the UK, shows:

[21] Note that the figures are for carbon rather than carbon dioxide (for which it is necessary to multiply them by 44/ 12)

[22] This report was peer reviewed by EMRC Consulting, who concluded that the report is free from major flaws in terms of the methods and data used. The findings and recommendations of the peer review were incorporated into the final report.

Figure 21: Overall net greenhouse gas fluxes from waste management options – EU-average landfill gas collection and wind electricity replaced kg CO2 eq/tonne MSW.



	Landfill raw waste	Mass burn	RDF-FBC	MBT landfill	MBT incin	Recycling, compost & AD
Net flux	350	8	324	-363	-178	-458
Net flux excluding sequestration	720	8	458	1	111	-403

226. Mass burn, uniquely amongst the scenarios, is unaffected by considerations of sequestration because the carbon is nearly all released immediately. It is therefore favoured by models which do not take any account of sequestration. WRATE[23] is one such model and I comment further on this below.

227. Unlike with waste recycling, which can be implemented rapidly given the political will (and the rapid intensification of recycling in WWII was one example) reductions in carbon intensity targets for electricity generation are more likely to be relatively slow and difficult to achieve. This underlines the importance of ensuring that all new facilities are compatible with and make the maximum possible contribution to the necessary c. 75% reduction in carbon intensity (from greater than 300 to c.80 g CO_2/ kWh) which is necessary between 2020 and 2030.

228. The Environment Agency biomass policy (Environment Agency 2009; Georges and Huyton 2009) says that by 2030, "*biomass electricity will need to be produced using good practice to avoid emitting more GHG emissions per unit than the average for the electricity grid indicated to be necessary by the Committee on Climate Change*".

229. This would require that any incinerator should produce electricity with a carbon intensity of 80 gCO_2/ kWh.

[23] WRATE is Waste and Resources Assessment Tool for the Environment

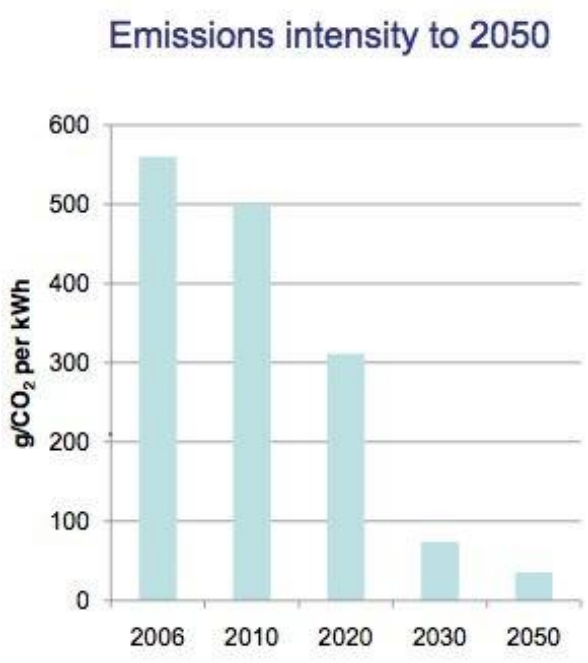
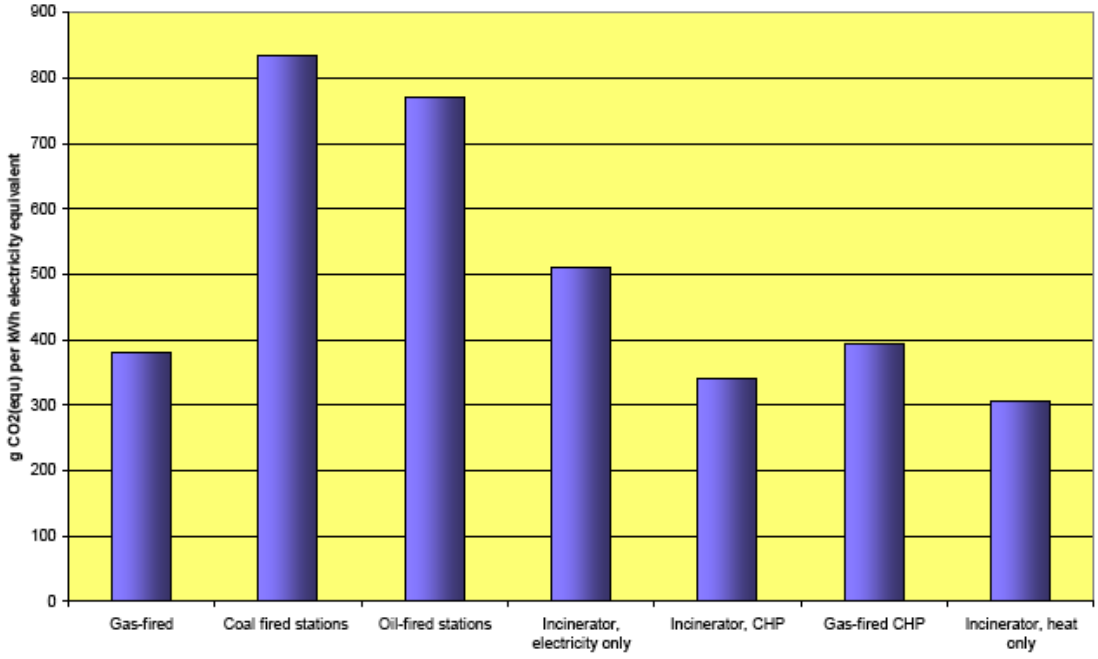


Figure: CO2 intensity per kWh of electricity generated, 2006-2050 (Committee on Climate Change 2008)

230. However the carbon intensity of incineration, even if biogenic carbon is ignored - as shown in the figure below (Hogg and Eunomia Research & Consulting Ltd 2006), is more than 500 g/ kWh. This is clearly inconsistent with the climate change objectives and viewed this way incineration is unarguably, in the words of the Environment Agency (Environment Agency 2009) a "*carbon sinner*" rather than a "*carbon sink*".

Figure 1: Excludes CO_2 from Biogenic Carbon, Heat=0.4 x Electricity

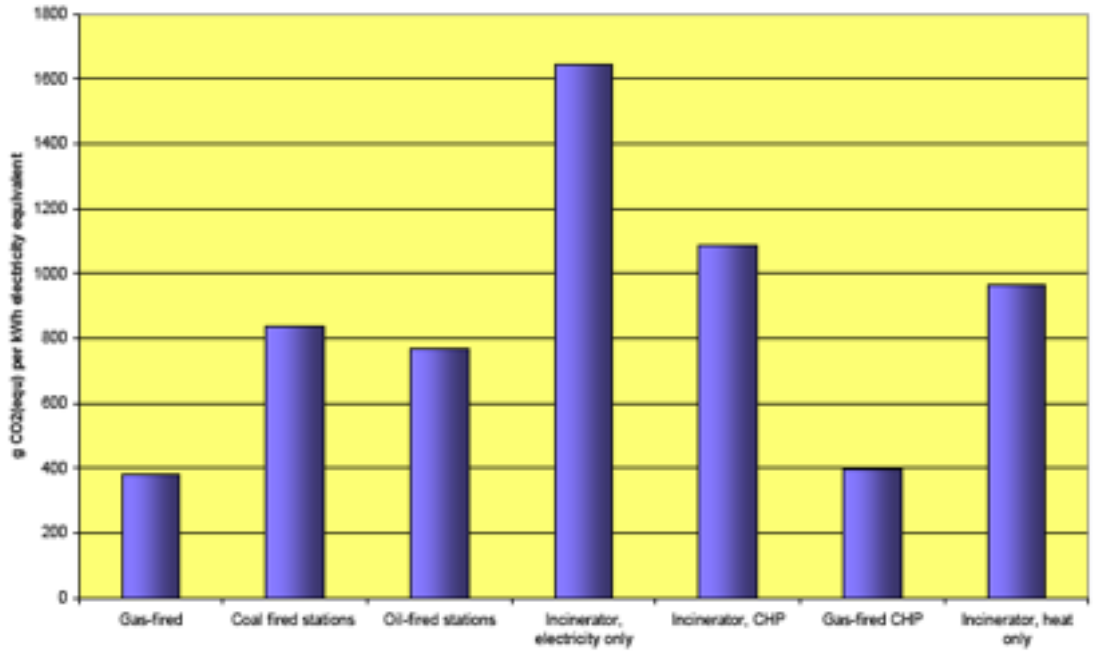


231. With higher levels of recycling the fossil fuel derived impacts are even worse. Data from the DTI (Department of Trade and Industry 2007; BERR 2008), discussed above, showed that the biogenic proportion of residual waste reduces with increased recycling. Whilst unsorted waste was calculated to derive 66% of the calorific value from biomass this falls to 38% when recycling c 45% and then to just 30% biomass when recycling c

60%. This is because the wastes that tend to be pulled out for recycling/ composting are those like paper and kitchen waste with high biogenic proportions. This concentrates the plastics and composite materials in the residual.

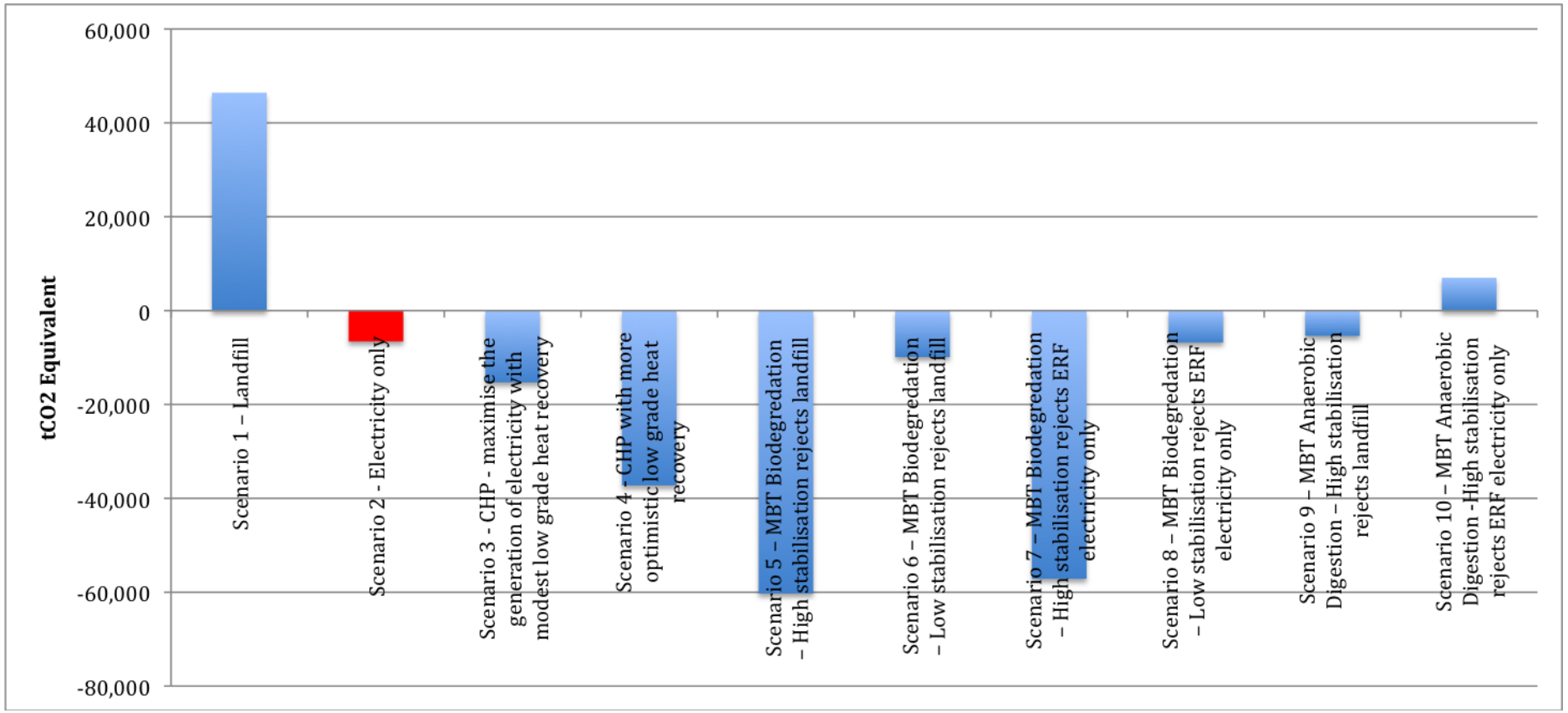
232. If biogenic carbon is included, as shown in the figure below (Hogg and Eunomia Research & Consulting Ltd 2006), then electricity only incinerators are likely to have approximately **20 times** the carbon intensity of the fuel mix required in 2030.

Figure 3: Includes CO_2 from Biogenic Carbon, Heat=0.4 x Electricity



233. Modelling by RPS for another incinerator application, since refused by the Secretary of State, at Rufford in Nottinghamshire, shows very clearly that electricity only incineration is one of the worst options in terms of climate change impacts. This can be seen most clearly when the results are plotted graphically as below. RPS's model also shows that even with the most optimistic scenarios for CHP use, which are very unlikely to be delivered on this site, MBT with high stabilisation and landfill still performs better than incineration:

Climate Change impacts of the Scenarios modelled by RPS – the 'low' scenarios have been plotted :



The proposed option, electricity only incineration, is highlighted in red

234. Incineration is actually one of the worst options in climate change terms and only really does well when compared with poor quality landfill of mixed wastes – an option that must be phased out to meet the requirements of the Landfill Directive in any case[24].

235. The MBT option with high stabilisation and residues to landfill performs more than nine times better in climate change terms than the incinerator. Furthermore if biogenic carbon emissions were counted the electricity only incineration option would be a large net producer of greenhouse gases whilst the better MBT option would be largely unchanged.

236. I should note that the WRATE software used in this application differs from the RPS model used in Nottinghamshire because it does not properly account for the reduction in respirability of treated residues. Almost uniquely amongst modern LCA models WRATE therefore penalises MBT and compost-based options by largely ignoring the biological changes undertaken in the processes and attributing them with high methane emissions – and thus climate change impacts. The consequence is that when the RPS results presented above were compared to those from the Environment Agency using WRATE then the options which included a residual landfill or MBT/ compost element will appeared to perform worse than a mix including higher levels of incineration. The Environment Agency did, however, acknowledge that the RPS model used in that case was more sophisticated in it's capabilities than WRATE. It is unfortunate, therefore, that RPS has reverted to WRATE for the current assessment.

237. In doing so they appear to have used inappropriate displaced electricity mixes for modelling of incineration in the future. Policy requires a progressive and increasingly rapid reduction in the carbon intensity of the future fuel mix. This reduces the benefits associated with incineration – because the displaced electricity is generated with lower carbon emissions.

238. RPS say:

For Project Year 2020 the Wales marginal fuel mix is represented by 100% fossil fuel sources (33.8% coal; 4.2% gas; 62% combined cycle gas turbine CCGT). This fuel mix has a significant GHG burden, so offsetting its use by recovering energy from waste (i.e. a fuel comprising <100% fossil carbon) can lead to significant emissions savings.

239. No details have been given for other project years (but even the 2020 data does not appear to be based on the reductions in carbon intensity required by policy as detailed in the *UK Low Carbon Transition Plan (Department for Energy and Climate Change (DECC) 2009)*. If the actual carbon intensity in the transition plan was used, including an increased contribution from low carbon renewables, then incineration would fare much worse as the benefits from displaced electricity would be very much lower than assessed.

240. I conclude that little weight can be placed on the results from the WRATE modelling.

[24] the MBT/ AD options also perform fairly badly which was anomalous when compared with other similar assessments – that was why PAIN was so keen to obtain the input data but the refusal of RPS to provide it means that I cannot assess what assumptions have been used in those cases.

Displaced Electricity Assumptions

241. The assumptions made about the electricity supply displaced by an incinerator are one of the most critical aspects of modelling (Wallis and Watson 1994; AEA Technology, Smith et al. 2001; Turner, Handley et al. 2004; Hogg and Eunomia Research & Consulting Ltd 2006) – the more 'dirty' in climate change or emission terms the displaced electricity the better the incinerator looks in the comparison.

242. The Government's advice (Department for Environment Food and Rural Affairs 2006) on the displaced electricity to use is that it is appropriate to assume that new build CCGT is displaced.

243. This has been confirmed in a recent parliamentary answer (Hansard 2008):

"For long-term electricity savings the Government assume that new-build combined-cycle gas turbine (CCGT) generation is displaced. It is currently estimated that new-build CCGT plant emits 0.43 kg carbon dioxide per kWh delivered to the point of consumption. This emissions factor includes distribution losses."

244. The assumptions made by RPS is that the displaced electricity is equivalent to the emissions from the marginal mix which includes emission intensive "*peak lopping*". This is entirely inappropriate for a facility which will be operating in base load configuration. A more appropriate comparator is with the alternative low carbon base load generation that would be displaced by the incinerator in the transition to a low carbon grid over the period to 2030. Using a high carbon generator as a base load plant represents a large opportunity cost and makes decarbonisation targets much more difficult to achieve.

Future Carbon Emissions

245. The Climate Change Act 2008 requires that greenhouse gas emission reductions through action in the UK and abroad of at least 80% by 2050, and reductions in CO_2 emissions of at least 26% by 2020, against a 1990 baseline (ENDS 2008). The 2020 target will now be reviewed to reflect the move to all greenhouse gases and the increase in the 2050 target to 80%. A carbon budgeting system which caps emissions over five year periods, with three budgets set at a time, will set out the trajectory to 2050. The first three carbon budgets will run from 2008-12, 2013-17 and 2018-22, and must be set by 1 June 2009. The Government must report to Parliament its policies and proposals to meet the budgets as soon as practical after that (DEFRA 2008).

246. Implementation of the Act will mean that energy and particularly electricity generation needs to be very significantly 'decarbonised' over the coming decades. As this happens the benefit from energy generation from waste, in climate change terms, even if biogenic carbon is ignored will rapidly turn negative. In the meantime, the marginal new sources will have to have a carbon intensity which, on the average, declines rapidly over time. Therefore practically the worst thing that could be done with waste – looking to 2050 and the Government's targets – is to burn waste containing plastics, or any other fossil carbon, at the low efficiencies of the proposed incinerator. Whilst the current climate performance of energy from waste is poor the technology will become an increasing liability over the coming years.

Combined Heat and Power

247. Incinerators are particularly inefficient generators of electricity. This can be improved by operation as combined heat and power ("CHP") plants but, if this is to be meaningful and effective, this requires a large heat load. Only in those circumstances, as can be seen below, is incineration likely to be notably better than landfill.

248. In a 2005 report for DEFRA on extending the Renewable Obligation to include energy from waste with CHP ILEX consulting wrote:

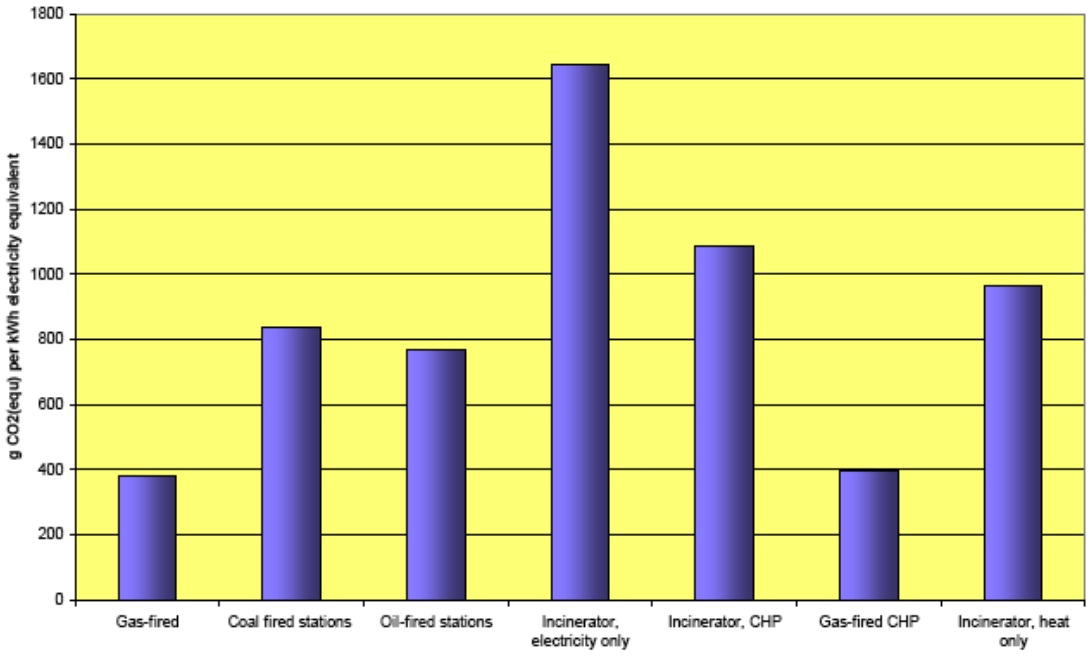
> *We estimate that EfW with CHP will produce a net environmental gain, producing additional carbon savings beyond that from electricity-only EfW plant – of between 120 kgCO_2 and 380kgCO_2 for each MWh$_{th}$ of heat produced.*

249. They thus estimated that:

> *" a 400kt/yr EfW with CHP facility would create additional carbon savings of between 0.7 and 1.0 million tonnes[25] of carbon dioxide (CO2) in total over a 20-year lifetime, over and above those achieved by a conventional EfW facility without CHP."*

250. The graph below, from research by Eunomia (Hogg and Eunomia Research & Consulting Ltd 2006) for Friends of the Earth shows how electricity only incinerators produce about twice as much carbon dioxide per kWh as coal fired power stations.

Figure 3: Includes CO_2 from Biogenic Carbon, Heat=0.4 x Electricity



251. For completeness it should be noted that this graph includes biogenic carbon. This is the appropriate approach to adopt when accounting for incinerator emissions. The applicants have ignored this element of the emissions claiming that it is 'climate neutral' but that would only be valid in an incineration life cycle assessment if the climate change impacts of a

[25] Additional net carbon savings assumed for the upper bound a plant operating at 20 MWth capacity producing 125 GWhth per annum, at a net saving of 380kgCO_2/ MWhth. For the lower bound ILEX assumed a plant operating at 45MWth capacity producing 280 GWhth per annum at a net carbon saving of 120 kgCO_2/ MWhth.

biogenic carbon dioxide molecule was different from any other carbon dioxide molecule.

252. The Waste Incineration Directive (European Commission 2000) says:

Article 4 (2)(b):

(b) the heat generated during the incineration and co-incineration process is recovered as far as practicable e.g. through combined heat and power, the generating of process steam or district heating;

Article 6 (6):

6. Any heat generated by the incineration or the co-incineration process shall be recovered as far as practicable.

253. Whilst the Environment Agency is the body normally responsible for implementing the "*Waste Incineration (England and Wales) Regulations 2002*" (HMSO 2002) the locational requirements for CHP can only be secured at the planning stage and should be addressed as part of this application.

254. The Environment Agency has confirmed this in their submission:

"Location is a matter for the DCO and not something that can be reviewed during the determination of the Environmental Permit. In light of the above and the importance given to CHP within the draft National Policy Statement (NPS) on Energy, we highlight the effect of location on the potential for CHP as an important issue.
We note that the draft Energy NPS states that if the operator is not proposing CHP they should "explain why CHP is not economically or practically feasible". We suggest in light of this that their proposal to link CHP with future developments in the area should be fully investigated to ensure adequacy at the planning stage. Based on our understanding of Department of Energy and Climate Change heat maps, we would suggest that the options for developing heat user capability could be limited at this time. There is always potential for future development which could utilise the heat, but the likelihood of their availability in the foreseeable future should be assessed fully as part of the application. Should these developments not proceed it would appear unlikely, based on our experiences on similar sites in the UK, that CHP would actually be developed. We are therefore, based on the information seen thus far, unlikely to be able to require anything more than CHP readiness in the Environmental Permit.".

The concerns about the deliverability of CHP in this location are well made. The proposals for CHP are vague and are extremely unlikely to deliver a year round heat load of the scale which would be required to significantly increase the efficiency of the facility. Operators invariably promise future potential CHP loads as part of their applications but there are no large scale examples of this being delivered after construction. The mis-named SELCHP (South East London Combined Heat and Power Plant) remains CHP less after nearly two decades of efforts to find heat loads in an mixed urban area. The prospects for a facility of the size of this proposal finding a large CHP load when sited in the middle of open moorland are much less attractive.

Ground 4 – Visually Intrusive Development on a Greenfield Site

The visual impacts of the proposal on this greenfield[26] site would be large and unacceptable.

A Greenfield Site

255. The Planning Statement supporting the application says at Para 5.21 that the proposed development:

> *"Would be on previously developed land (pdl) even though it forms part of a site for which there is an approved restoration strategy. Whilst it would not strictly meet the definition of 'pdl' in Planning Policy Wales (Edition 3), therefore, it is plain that the site cannot reasonably be described as a 'greenfield' site".*

256. This is a surprising interpretation by Consultants who had just fought, and lost, another incinerator public inquiry at Rufford in Nottinghamshire on grounds including their mistaken identification of a Greenfield site as brownfield/ Previously developed land[27].

257. Planning Policy Wales defines 'Previously developed land' in Figure 4.1 on Page 56 as land:

> *"which is or was occupied by a permanent structure (excluding agricultural or forestry buildings) and associated fixed surface infrastructure... and land used for mineral extraction and waste disposal ... where provision for restoration has not been made through development control procedures" (our emphasis)*

258. In this case provision has been made for restoration through the development control procedure as part of the current permission and thus the land is NOT defined as previously developed for planning purposes and it is wrong for the applicant to say that the development "*would be on previously developed land"* in a planning context, as here.

259. The situation is very clear - a site can be either Greenfield or Brownfield depending on its specific characteristics. It cannot be both. In this case the proposal is on Greenfield land but the consultant has made considerable efforts to avoid the implications of this conclusion and has apparently invented a new category which has been accorded a lower status than a greenfield site.

260. The applicant accepts that "*There is a strong preference for the re-use of land in PPW with paragraph 4.8.1 confirming that previously developed land should, wherever possible, be used in preference to greenfield sites*".

261. Thus this erroneous approach brings into question the selection of this

[26] The site is not, in planning terms, previously developed land due to the restoration conditions on the current planning permission.

[27] In that case the Inspector Mr Rupert Grantham wrote Grantham, R. (2011). Planning Inspectors's Report to the Secretaru of State for Communities and Local Government re Application by Veolia ES Nottinghamshire Limited Land at former Rufford Colliery, Rainworth, Nottinghamshire NG21 OET. Application Ref: 3/ 07/ 01793/ CMW SOS Ref: APP/ L3055/ V/ 09/ 2102006 Dated 17th March 2011, Planning Inspectorate.: -IR1232: "...the site selection process failed to prioritise previously developed land, over the Rufford site. Furthermore, it has not been demonstrated that the sustainability credentials of developing brownfield sites, which were identified in the process, are worse than those of developing Rufford"

site as the most suitable location for the facility or whether it represents the BPEO – not least because there are scores of brownfield sites in Wales. There is no need to use a Greenfield site for a waste development like this one and if this Greenfield site was to be favoured above an alternative brownfield location then there is an opportunity cost in terms of the lost potential for remediation and the returning the rejected brownfield sites to beneficial use.

262. For completeness I note that the approach suggested above in relation to this site being greenfield is consistent with the decision of the Secretary of State in relation to an appeal relating to the Sandyforth opencast coal site (Secretary of State for Communities and Local Government 2006).

263. In that case the SoS said:

The definition of previously developed land in Annex C to PPG 3 Housing states: "The definition includes defence buildings and land used for mineral extraction and waste disposal where provision for restoration has not been made through development control procedures."

264. And concluded:

*Inquiry Document 52 (Report to Planning and Development Committee of 30 April 1996) includes a list of recommended conditions, including those to cover the restoration of the site. As such, the Secretary of State concludes that the appeal site does not constitute previously developed land, and should be considered a greenfield site, in line with the extracts from PPG3 above. (*my emphasis*)*

265. Similarly the successful Judicial Review by Capel Parish Council and the decision of Collins J in *Capel Parish Council v Surrey County Council* [2009] EWHC 350 (Admin) (5th March 2009) (England and Wales High Court (Administrative Court) 2009) has highlighted the importance of the correct designation of sites – particularly in relation to the comparisons with alternatives (see, for example (ENDS 2009)).

266. The Court considered the question of the greenfield nature of the Capel site and the judgement says (Para 30)…"*That permission had, as I have indicated, expired in December 2004 and there was a condition of restoration of the land. Thus it has properly to be regarded as a greenfield site*".

267. The judge commented (Para 32) that "*An error in identifying the nature of a site, in particular whether it was greenfield or previously developed, is of considerable importance*".

268. That case related to a development plan but the same principle can be applied in relation to the inappropriate weighting in the site selection process by RPS as the Judge continued "*SCC's errors could have undermined the whole process of identification of suitable sites and certainly it was necessary in my view for the inspectors to look at the whole process afresh*".

269. The alternative sites should therefore be revisited in the light of the weighting given by RPS following their comment "*it is plain that the site cannot reasonably be described as a 'greenfield' site"* there should be "*a rigorous examination*" of the site selection procedure and the merits of "*any …… alternative sites*" compared with the Brig y Cwm site.

Visual Impact

270. Whilst the applicant attempts to hide the major visual impacts of the scheme by reference to and comparison with the Ffos-y-fran Opencast Scheme the proposal is undoubtedly a massive development in an exposed area of open countryside with major, and damaging, visual

impacts both during the day and at night from nearly all perspectives.

271. The full impacts of the scheme have not been properly assessed, including, for example, the extent of the visibility of the plume from the 115m high stack.

272. The site lies within the Merthyr Tydfil Landscape of Outstanding Historic Interest and the restoration of the land at Ffos-y-fran aims to re-establish a natural landform and features which would contribute to the open character of the area.

273. The harm associated with the visual impact of the proposal will therefore gradually increase and even the applicant admits that the impact from near to the site will have long term adverse effects from Major/ Moderate in the day, which are significant in terms of the EIA Regulations. These impacts cannot be effectively mitigated by the design solution due to the open character of the landscape and it is difficult to understand how the applicant can claim that this does not conflict with policy in terms of the visual impacts.

Ground 5 – Public Participation

The failure of the process to facilitate meaningful public participation.

274. The application and accompanying environmental statement are voluminous documents and accessibility is vital to enable effective public scrutiny and participation in the decision making process. Whilst copies are available in local venues including libraries the amount of paperwork involved means that in practical terms personal copies of the reports are needed to allow careful review. It is disappointing, therefore, to find that the cost of the documents is at least £400 –a price beyond the means even of national NGOs and certainly not affordable for local residents. It is not substitute to say that documents are available on the web – some of the figures are only available as files larger than 460MB and are not practical downloads except on the highest speed connections.

275. Participation has been further hindered by the proposed changes to the application which generated another mountain of documents to review and the reliance on 'black box' models for much of the justification without providing full details of the input parameters and assumptions. These models often cost thousands of pounds and it is not possible for local residents and the wider public to access them to test the results upon which the application is founded.

Ground 6 - Prematurity

The proposal is premature in relation to the emerging waste policy framework for commercial and industrial wastes in Wales.

276. The Welsh Government is currently developing[28] a number of sectoral waste plans for consultation in 2011 including:

- Construction and demolition;
- Food Manufacture and Retail Sector Plan;
- Collection, Infrastructure and markets;
- Remaining Industrial and Commercial waste; and
- Public Sector.

277. The Covanta application is for an extremely large facility which over the potential operating lifetime would require more residual waste than each of these sectors produced. To consent such a large operation at this time would have significant impacts in relation to Strategy and make future policy development largely academic. This would not be an acceptable outcome at a time of such rapid change in waste streams and associated policy development.

278. The pending sectoral plan on Industrial and Commercial waste is particularly important given the lack of good recent data on this waste stream and the reliance of the facility on this waste as the MSW waste reduces.

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28 http:/ / wales.gov.uk/ topics/ environmentcountryside/ epq/ waste_recycling/ bysector/ ?lang =en

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