FICHTNER

MWM 4

MERCIA WASTE
ENVIRECOVER FACILITY
PROOF OF EVIDENCE

Fichtner Consulting Engineers Limited
Kingsgate (Floor 3), Wellington Road North,
Stockport Cheshire SK4 1LW United Kingdom
t: +44(0) 161 476 0032 f: +44(0) 161 474 0618 www.fichtner.co.uk

PROOF OF EVIDENCE OF STEPHEN OTHEN

Public Inquiry Under Section 77 of the Town and County Planning Act 1990 (as amended)

Application by Mercia Waste Managemnt Ltd for the proposed development of an energy from waste facility on land at Hartlebury Trading Estate, Hartlebury, Worcestershire.

PINS reference: APP/E/1855/11/2153273

LPA reference: 10/000032/CM

DOC reference: MWM 4

Date: 14 October 2011

TABLE OF CONTENTS

1 Introduction

1.1 Background

1.1.1 I am the Technical Director of Fichtner Consulting Engineers Ltd. I hold a Master of Engineering degree in Chemical Engineering from the University of Cambridge and I am a Chartered Chemical Engineer and Member of the Institute of Chemical Engineers.

1.1.2 Fichtner Consulting Engineers Ltd is an engineering consultancy working mainly in the fields of waste management and renewable energy. We predominantly provide services to waste management operating and development companies and to banks and other financing bodies. In particular, we are currently managing the installation of four energy-from-waste plants, three on the UK mainland and one in Jersey, as well as a biomass-fired power station and developing specifications for a number of other plants.

1.1.3 I have worked at Fichtner Consulting Engineers Ltd since 1998 and I have worked for a variety of clients in a number of industries, but my main focus has been the waste industry. I have provided services for all of the major energy-from-waste plant operators and developers in the UK, including Veolia, SITA, Waste Recycling Group, Viridor and Covanta. These services have included reviews of operation and development of upgrade and improvement programmes. I have also been responsible for the preparation of permit applications under the Integrated Pollution Control, Integrated Pollution Prevention and Control and Environmental Permitting regimes for over twenty combustion plants processing municipal waste, refuse-derived fuel or biomass.

1.1.4 I and my colleagues have assessed a large number of alternative technologies for generating energy from waste.

1.1.5 I am a member of the Environmental Services Association Operators Working Group. In this role, I have been involved in discussions with the Environment Agency on the implementation of the R1 Recovery formula in the UK and the Environment Agency's intended regulatory role.

1.1.6 In the context of the Envirecover Facility specifically, I was responsible for the successful Environmental Permit application and for the air quality assessment which was submitted as part of the Environmental Statement.

1.2 Scope of Evidence

1.2.1 My evidence covers aspects of two matters raised by the Secretary of State.

a) (B) The extent to which the proposed development delivers the policies set out in PPS 10:Planning for Sustainable Waste Management.

b) (C) The extent to which the proposed development is consistent with advice in PPS1 Supplement.

1.2.2 If respect of both matters:

a) I have considered whether the Envirecover Facility would be defined as a Recovery Operation under the revised Waste Framework Directive'

b) I have presented the results of an updated options appraisal, carried out using the latest version of the Environment Agency's WRATE software;

c) I have considered whether the Envirecover Facility will lead to reduced emissions of gases which lead to climate change; and

d) I have provided an update on the potential for the Envirecover Facility to provide heat to nearby users.

1.2.3 The policy implications of my evidence are considered by Mr Roberts.

1.2.4 I have also addressed a number of points raised by WAIL in the Statement of Case. These are mainly addressed under the three headings above, but I have also addressed the following points:

a) That the facility would produce renewable energy;

b) The real and perceived impacts on health;

c) The physical size of the facility and the relationship between this and the required capacity.

1.2.5 Finally, I have included (in Appendix E) a response to the letter from Peter Luff MP.

2 Recovery Definition

2.1 Introduction

2.1.1 In this section of my evidence, I have explained why the Envirecover Facility will be a Recovery Operation under the Waste Framework Directive.

2.1.2 Under the 2006 Waste Framework Directive (2006/12/EC), which was a codified version of the original Directive on Waste (75/442/EEC) as amended:

a) "Disposal" was defined in Article 1(e) as "any of the operations provided for in Annex II A"

b) "Recovery" was defined in Article 1(f) as "any of the operations provided for in Annex II B".

c) Annex II A included Disposal Operation D10 – Incineration on Land; and

d) Annex II B included Recovery Operation R1 – Use principally as a fuel or other means to generate energy.

2.1.3 The interpretation of these definitions in various European Court rulings led to the position that the incineration of waste in an incineration plant was defined as "disposal", even if the energy was recovered very efficiently, whereas the combustion of waste in a cement kiln, for example, was defined as "recovery".

2.1.4 The revised Waste Framework Directive (2008/98/EC) (the rWFD, CD WSL1) includes definitions which clarify the position. It is clear from preamble (20) to the rWFD that this was the intention. Preamble (20) states "This Directive should also clarify when the incineration of municipal solid waste is energy-efficient and may be considered a recovery operation."

2.1.5 Hence, under the rWFD:

a) Article 3(15) defines "Recovery" as "any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy. Annex II sets out a non-exhaustive list of recovery operations";

b) Article 3(19) defines "Disposal" as "any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substances or energy. Annex I sets out a non-exhaustive list of disposal operations";

c) Annex I includes Disposal Operation D10 –Incineration on Land, which is identical to the definition in the 2006 Directive; and

d) Annex II includes Recovery Operation R1 - Use principally as a fuel or other means to generate energy, which is superficially identical to the definition in the 2006 Directive. However, the rWFD includes a footnote to R1, which states:

"This includes incineration facilities dedicated to the processing of municipal solid waste only where their energy efficiency is equal or above:
— 0,60 for installations in operation and permitted in accordance with applicable Community legislation before 1 January 2009,
— 0,65 for installations permitted after 31 December 2008,
using the following formula:
Energy efficiency = (Ep - (Ef + Ei))/(0,97 × (Ew + Ef))
in which:
Ep means annual energy produced as heat or electricity. It is calculated with energy in the form of electricity being multiplied by 2,6 and heat produced for commercial use multiplied by 1,1 (GJ/year)
Ef means annual energy input to the system from fuels contributing to the production of steam (GJ/year)
Ew means annual energy contained in the treated waste calculated using the net calorific value of the waste (GJ/year)
Ei means annual energy imported excluding Ew and Ef (GJ/year)

0,97 is a factor accounting for energy losses due to bottom ash and radiation.
This formula shall be applied in accordance with the reference document on Best Available Techniques for waste incineration."

2.1.6 The interpretation of this formula was not clear. Therefore, the European Commission has published "Guidelines on the Interpretation of the R1 Energy Efficiency Formula for Incineration Facilities Dedicated to the Processing of Municipal Solid Waste According to Annex II of Directive 2008/98/EC on Waste". (CD WSL6). I have considered this guidance below.

2.1.7 The Guidelines specifically state that *"The "R1-formula" is not strictly speaking an expression of efficiency in physics, but a performance indicator for the level of recovery of energy from waste in a plant dedicated to the incineration of municipal solid waste (MSWI)."* This point is worth emphasising, as the term "efficiency" has caused some confusion. The target is not that an energy from waste plant should have an efficiency of 65%, but that the result of the R1 Formula should be at least 0.65.

2.1.8 The Environment Agency will be the responsible authority for determining whether a plant meets the definition of R1 Recovery. The Environment Agency have published a briefing note (CD WSL8) on "Qualifying for R1 status using the R1 energy efficiency formula". I have quoted a number of points from the briefing note below:

a) *"There is no requirement for MWI to achieve R1 status or have their performance assessed against the R1 formula in the Environmental Permitting Regulations 2010 (EPR)"*. This confirms that R1 status is not obligatory.

b) *"The European Commission's guidelines provide detailed guidance on how to interpret and apply the R1 Energy Efficiency formula"*. This confirms that the Commission's Guidelines, discussed below, are the correct basis for interpreting the R1 Energy Efficiency Formula.

c) *"Those plants wishing to qualify as recovery operations by virtue of the R1 formula need to make an application to the Environment Agency."* The different times at which an application can be made are explained in Table 1 in the briefing note, which shows that the plant can apply for provisional R1 status prior to building the plant and on the basis of commissioning data, but that the plant will only receive final confirmation of R1 status after the plant has been operating for at least one year.

2.2 The Formula and EU Guidance

2.2.1 The footnote to the R1 definition states that the formula applies to "incineration facilities dedicated to the processing of municipal solid waste." Section 1.1 of the Commission Guidelines is concerned with the scope of the formula, and it states that

> *"Waste incinerators dedicated to the incineration of municipal waste are waste incinerators which have the permit and are technically designed in a way so that they are capable to incinerate mixed municipal solid waste. The R1 formula does not apply to co-incineration plants and facilities dedicated to the incineration of hazardous waste, hospital waste, sewage sludge or industrial waste."*

2.2.2 Later in this section, it is stated that

"In practice, the waste input into a MSWI is made of different mixed and heterogeneous fractions which are blended before feeding the hopper in order to optimize the combustion process. The calculation of the R1 formula shall be done on the waste composition which is actually incinerated in a facility, not only on the part of the waste which is classified as municipal waste or mixed municipal waste."

2.2.3 Hence, it can be see that the R1 Formula is applicable to the Envirecover Facility.

2.3 Recovery Efficiency Calculation

2.3.1 Applying the guidelines, the R1 Formula gives 0.693. The basis for this calculation can be found in Appendix A. It can be seen that the value is greater than 0.65 and so the plant can be defined as a Recovery Operation.

2.3.2 Appendix A also includes a calculation of the R1 Formula assuming that some heat is exported. This case is discussed in section 5 of my proof.

3 WRATE Report

3.1 Introduction

3.1.1 A technical options appraisal was carried out for the original planning application and included as an attachment to the Environmental Statement (Appendix 3.1 in CD PA1(d)). This options appraisal used version 1 of the Environment Agency's WRATE software.

3.1.2 Since the planning application was submitted, version 2 of the WRATE software has been released, which made a number of changes. Therefore, Fichtner have repeated the options appraisal using the new version, in order to confirm that the conclusions remain valid.

3.1.3 In addition, in the light of WAIL's comments on the use of Anaerobic Digestion, the updated options appraisal has considered the use of this technology for separately collected food waste.

3.1.4 The full report can be found in Appendix B to my proof. I have summarised the results in this section.

3.2 Options Considered

3.2.1 In the options appraisal, we considered nine options for residual waste treatment in Herefordshire and Worcestershire. These are shown in the table below:

Option	Description
1	The Envirecover Facility exporting power only.
2	The Envirecover Facility exporting heat and power.
3	Out of county EfW, with landfill of waste up to the Authority's LATS allowance
4	An Autoclave facility at the Hartlebury site, with fibre recycled as fibreboard
5	An Autoclave facility at the Hartlebury site, with fibre landfilled
6	Two autoclave sites, at Hartlebury and Madley Airfield, with fibre recycled as fibreboard

Option	Description
7	Two MBT facilities, at Hartlebury and Madley Airfield, making a Refused Derived Fuel (RDF) to be burnt at an EfW Facility at Hartlebury
8	Two MBT facilities, at Hartlebury and Madley Airfield, making a Refused Derived Fuel (RDF) to be burnt at an EfW Facility out of county
9	Separate food waste collection feeding an Anaerobic Digestion plant, landfill of waste up to the Authority's LATS allowance and out of county EfW

3.2.2 Options 1 to 8 were covered in the original options appraisal. These were selected because they were included in the options appraisal carried out by the Council at an earlier stage. It should be noted that the Madley Airfield site, which is mentioned in options 6,7 and 8, was the planned site for a second autoclave when this was the intended approach to waste management and so it was appropriate to use this as the second site in the Options Appraisal.

3.2.3 Option 9 is the new option. This has been developed because WAIL have stated that they consider that a better alternative to the Envirecover Facility would be to extend the food waste collection, using Wychavon District Council as a model, and to use Anaerobic Digestion to process this food waste. We have developed this option based on waste flows in 2010/11, provided to use by Mercia Waste Management.

a) 1086 tonnes of food waste was collected in Wychavon and sent to composting facilities out of the county. As this only happens to food waste collected on alternative weeks, around 2,200 tonnes of food waste was collected in Wychavon over the whole year.

b) The total residual waste collected in Wychavon (including the food waste) was 22,900 tonnes over the year. Hence, collected food waste was 9.6% of residual waste.

c) Over the whole of Herefordshire and Worcestershire, 166,900 tonnes of residual waste was collected over the year. If 9.6% of this waste was collected as food waste, around 16,000 tonnes would be collected.

d) In order to be conservative, we have assumed that 20,000 tonnes could be collected. Hence, option 9 is based on 20,000 tonnes of food waste being sent to Anaerobic Digestion. As this would not have allowed the Authority to meet its LATS targets, we have used out of county EfW to achieve these targets.

3.2.4 Full details of all the options can be found in the report in Appendix B.

3.3 Results

3.3.1 Each of the nine options has been evaluated against fifteen criteria. These are se out below:

(1) Environmental criteria
  a) Abiotic resource depletion
  b) Global warming potential
  c) Human toxicity
  d) Freshwater aquatic ecotoxicity
  e) Acidification
  f) Eutrophication
(2) Financial criteria
  a) Capital cost
  b) Operating cost
(3) Risk criteria
  a) Reference facilities
  b) Planning risk
  c) BMW diversion from landfill
  d) Waste composition flexibility
  e) Waste tonnage flexibility
  f) End product liability
(4) Social criteria
  a) Transport

3.3.2 The Environmental Criteria have been evaluated using WRATE version 2, while the other criteria have been considered using a combination of quantitative and qualitative assessment. Each option then received a score between 0 and 10 for each criterion, where 10 is good and zero is bad. The scores for all criteria are weighted and combined to identify the preferred option. Full details can be found in Appendix B.

3.3.3 The highest scoring option is Option 2, the Mercia EnviRecover facility with CHP. This achieves the highest score, either alone or equal with another option, in nine of the fifteen assessment criteria. Option 1 (the Mercia EnviRecover facility) is second.

3.3.4 There is then a clear gap in scores to the third-placed Option 4(1 site autoclave with fibre to recycling). This however assumes that the fibre produced by the autoclave can be recycled into fibreboard. If instead the fibre is landfilled (Option 5) the overall score falls by 27 points, or about 10%. This reflects the more likely position, given the lack of a proven market for fibre.

3.3.5 The MBT based options come 6th and 7th with a significant difference to the scores obtained by the EfW with CHP. The out of county solution come came last; although the highest scoring in planning risk and capital cost, the high environmental impact, high transportation impact and high operating costs mean that the option does not score well.

3.3.6 The out of county option with an AD facility for source segregated food waste tied with the standard out of county option. While the operating costs and impacts of transport were improved with the inclusion of an in county AD facility, these were offset by reductions is score for planning risk, waste composition flexibility and abiotic resource depletion.

3.4 Conclusions

3.4.1 The use of WRATE version 2 did not change the rankings at all. This means that the conclusions of the original options appraisal are not changed by updating the WRATE assessment. However, there was a change in the relative scores. Previously, option 4 was only three points behind option 1 (287 compared to 290) and so both of these options could be considered virtually equivalent. Now, with the new version of WRATE, the gap is considerably bigger (313 to 287), meaning that the two Hartlebury EfW options are clearly preferred. This also means that, while recovering heat as well does lead to an improvement in the scores, the non-CHP option is still clearly preferred to all other options.

3.4.2 The solution proposed by WAIL scores relatively poorly. This is mainly due to a poor performance against most environmental criteria.

4 Impact on Climate Change

4.1 Introduction

4.1.1 As discussed in the previous section, the WRATE appraisal demonstrates that the Envirecover Facility is beneficial to climate change compared to other options.

4.1.2 The Environmental Permit application included an alternative appraisal of climate change impacts. This is because the WRATE assessment did not consider the potential baseline, which is that all of the waste is sent to landfill, as this was not considered to be a valid option going forward. The current baseline is closer to option 3, with some out-of-county EfW, but clearly this cannot be depended upon, Therefore, I consider that it is valuable to compare the Envirecover Facility with the alternative of landfilling the waste. Therefore, I have explained the alternative calculation in this section.

4.1.3 WAIL made a number of statements on climate change impact in their statement of case. I have addressed these in this section.

4.2 Environmental Permit Calculation

4.2.1 The greenhouse gas assessment from the Environmental Permit application can be found in Appendix C. The approach taken was to compare two cases – 200,000 tonnes of waste processed at the Envirecover Facility and the same 200,000 tonnes of waste sent to landfill.

4.2.2 The Envirecover case takes account of:

a) The release of non-biogenic carbon dioxide from burning waste at the Facility;

b) The release of nitric oxide (N_2O) from the Facility;

c) The generation of electricity, displacing electricity generated by fossil-fuel power stations.

4.2.3 The landfill case takes account of:

a) The release of methane in landfill gas;

b) The capture of some landfill gas to generate electricity in gas engines, displacing electricity generated by fossil-fuel power stations.

4.2.4 There are two key assumptions made in the calculation which significantly affect the results. These are:

a) The capture rate of landfill gas; and

b) The source of power which is displaced by the electricity generated by the Facility or the landfill gas.

4.2.5 Therefore, we carried out a sensitivity assessment by varying these two assumptions. This showed that the Envirecover Facility would reduce overall emissions of greenhouse gases by between 14,900 and 182,100 tonnes of CO_2 equivalent per annum, depending on the assumptions.It can be seen that the calculation shows that the Facility would reduce carbon dioxide emissions even compared to a very efficient landfill site and when displacing gas-fired power stations.

4.3 Differences from WRATE Calculation

4.3.1 The WRATE assessment has been discussed in the previous section and the full report can be found in Appendix B. The WRATE assessment did not consider landfill as such, as simply landfilling all of the waste was not considered to be an acceptable option.

4.3.2 The WRATE assessment of the Envirecover Facility takes account of a number of different influences on greenhouse gas emissions, as follows:

a) Transportation of waste and residues, noting that this includes all waste transport within the Authority area;

b) Emissions from intermediate facilities, which are mainly transfer stations;

c) Benefits from recycling of ash and ferrous metals, allowing for the avoided emissions by reducing the use of virgin materials;

d) Emissions from the EfW plant itself, allowing for benefits by displacing power from other facilities and also including the impact of construction; and

e) Emissions from landfill of APC residues.

4.3.3 For option 1 in WRATE, the effect on greenhouse gas emissions of the facility is made up as follows, where a positive figure is a release of greenhouse gas emissions and a negative figure is a reduction in greenhouse gas emissions:

a)	Transportation	+2,325 tonnes CO_2-equiv
b)	Intermediate facilities	+395 tonnes CO_2-equiv
c)	Recycling	-14,146 tonnes CO_2-equiv
d)	EfW Facility	-6,862 tonnes CO_2-equiv
e)	Landfill	+21 tonnes CO_2-equiv

4.3.4 Hence, the total effect is -18,269 tonnes of CO_2-equivalent, which is a reduction in greenhouse gas emissions of over 18,000 tonnes of CO2-equivalent.

4.3.5 SOCG1 includes a statement that the original WRATE assessment shows a benefit of 7,361 tonnes of CO_2-equivalent. It can be seen that the use of version 2 of WRATE has increased the calculated benefit. This is primarily because WRATE version 2 gives more credit for recycling metals from the bottom ash.

4.3.6 It is possible to do a direct comparison with the Environmental Permit calculation in Appendix C. This considered the direct emissions associated with the Facility, which was quantified as an increase in emissions of 910 tonnes per annum. This is significantly different from the WRATE assessment, which is because WRATE also takes account of the other benefits associated with the Facility.

4.3.7 As noted, the WRATE assessment does not consider the benefit of diverting waste from landfill, which is quantified at over 35,000 tonnes of CO_2 equivalent per annum in the calculation in Appendix C, even for a landfill site with an efficient landfill gas collection system.

4.3.8 Hence, while the precise number depends on the assumptions made, I conclude that the Envirecover Facility will have a beneficial impact on climate change emissions compared to landfilling the waste. It is worth noting that this conclusion concurs with the Government's Waste Policy Review (CD WSL4), which states in paragraph 208 that *"The benefits of recovery include preventing some of the negative greenhouse gas impacts of waste in landfill. Preventing these emissions offers a considerable climate change benefit, with the energy generated from the biodegradable fraction of this waste also offsetting fossil fuel power generation, and contributing to our renewable energy targets."*

4.4 Response to WAIL

4.4.1 WAIL make a number of statements in their Statement of Case (CD PI4) on climate change. While I agree with a few of their numbers, I do not agree with their conclusions.

4.4.2 WAIL state that the Facility will release 575 g of CO_2 per kWh of power exported. I nearly agree with this figure – the calculations in Appendix C give 302 kg of CO_2 released per tonne of waste to generate 532 kWh per tonne of waste, leading to a figure of 568 g of CO_2 per kWh.

4.4.3 WAIL state that average grid emissions are 500g of CO2 per kWh. I have considered a range from 373 g to 835 g CO2 per kWh.

4.4.4 WAIL do not acknowledge the other benefits of the Envirecover Facility, particularly the displacement of landfill emissions. These are, however, very important and, indeed, are emphasised in paragraph 208 of the waste policy review, which I quoted above.

4.4.5 WAIL claim that the Government Target for renewable energy is a carbon intensity of 50 g CO_2 per kWh. I would note that in December 2010, the Government published their "Response to the Statutory Consultation on Renewables Obligation Order 2011"[1]. In Chapter 2 of this document, the Government states that *"Solid biomass and biogas electricity will need to have a carbon intensity of 285.12 kgCO2/MWh or lower to be eligible for ROCs from April 2013"* The Government also state that *"Waste, biomass wholly derived from waste, landfill gas or sewage gas will not need to meet the sustainability criteria and will not need to report on sustainability."*

4.4.6 It is clear that Government policy does not support WAIL's position here.

4.4.7 WAIL also state, in paragraph 2.6.1 of their Statement of Case, that *"WAIL contends that the proposals do not produce sustainable renewable energy."* This statement is not in accordance with National and European Policy over the last decade or so.

[1] http://www.decc.gov.uk/assets/decc/Consultations/Renewables%20Obligation/1059-gov-response-ro-order-2011-cons.pdf. See Appendix F for relevant extracts.

4.4.8 When the Renewables Obligation was first being considered, the Government produced a Preliminary Consultation[2]. Section 2.4 of this document made it clear that energy-from-waste was considered a renewable source of energy:

> *"All sources of renewable energy are at different stages of development in Great Britain. Large scale hydro, (i.e. exceeding 10MW installed capacity) and energy from waste (energy recovery from municipal solid waste [MSW] and from mixed streams of industrial and commercial waste [ICW]) are already commercially viable,well established in the market, and can compete with electricity from fossil fuels. For this reason, the Government considers that these two renewable energy sources, large scale hydro and energy from waste, should be excluded from the Obligation. This will allow resources to be targeted more effectively on those renewables needing continued support."*

4.4.9 This position has been maintained since 2000. It was reinforced by the 2009 Renewable Energy Directive[3], which defines "energy from renewable sources" as including "biomass" where the definition of "biomass" includes "the biodegradable fraction of industrial and municipal waste".

[2] New and Renewable Energy. Prospects for the 21st Century. DTI 2000. See Appendix G for relevant extracts.

[3] EU Directive 2009/28/EC. See Appendix H for relevant extracts.

4.4.10 More recently, National Policy Statement (NPS) EN-3 (CD NNP15), which specifically covers Renewable Energy Infrastructure, states in paragraph 2.5.2 that

> *"The recovery of energy from the combustion of waste, where in accordance with the waste hierarchy, will play an increasingly important role in meeting the UK's energy needs. Where the waste burned is deemed renewable, this can also contribute to meeting the UK's renewable energy targets. Further, the recovery of energy from the combustion of waste forms an important element of waste management strategies in both England and Wales."*

4.4.11 In the context of this quote, the waste to be processed at the facility is expected to contain 55% to 65% biodegradable material, as stated in paragraph 5.4.1 of the Environmental Statement, and so this portion of the energy is deemed renewable.

4.4.12 In the Waste Policy Review 2011 (CD WSL4), paragraph 212 states that one of the overarching goals is to ensure that *"recovery of energy from waste makes an important contribution to the UK's renewable energy targets, minimising waste to landfll and helping to meet UK carbon budgets."* Paragraph 215 includes projections for "waste derived thermal combustion in England" and predicts an increase from the current 1.2 TWh to 3.1 to 3.6 TWh by 2020, further confirming the government's support for energy-from-waste.

4.4.13 This is further supported by the Renewables Roadmap (CD ESL5). Box 7 on page 68 of the Roadmap states *"Biomass electricity has the advantage that it is both predictable and controllable and so can be used for baseload or peaklod generation. Energy from waste has the added advantages that it extracts value from biomass at the end of its useful life and reduces the amount of waste otherwise sent to landfill and thus reduces methane emissions."*

4.4.14 Finally, the Climate Change Supplement to PPS1, which WAIL refer to, defines "renewable and low carbon energy" as including "energy-from-waste". This inclusion was supported by the Inspector at the Inquiry into the proposed Severnside Energy Recovery Centre, as in his conclusions in paragraph 224 of his report (CD ID5) he states *"Furthermore, renewable energy would be derived from the biodegradable fraction of waste delivered to this EfW plant*".

4.5 Conclusion

4.5.1 From the calculations presented in this section, I conclude that the Envirecover Facility will reduce emissions of greenhouse gases compared to landfilling waste. I also conclude that national and European policy clearly defines the energy from the biodegradable fraction of waste as renewable.

5 Heat Users

5.1 Introduction

5.1.1 The Options Appraisal has confirmed that there is a benefit to recovering heat as well as electricity from waste. This is supported by the Waste Policy Review. For example, paragraph 216 states *"The potential for deploying more efficient electricity generation could further enhance the renewable energy derived from this waste. Better use of heat, both directly and through continued growth in the market for refuse derived fuels going to industrial Combined Heat and Power users will also play an important part in ensuring that we extract the maximum value from residual waste. The introduction of the Renewable Heat Incentive (RHI) is expected to bring forward an increase in the combined and dedicated generation of renewable heat from waste as well as production of biogas for heat production and the injection of biomethane into the gas grid."*

5.1.2 However, the Waste Policy Review also acknowledges the challenges of developing heat users in parallel with energy from waste plants. Paragraph 237 states: *"Experience to date with CHP infrastructure has highlighted a potential difficulty in securing long term customers for heat ahead of construction of the plant."*

5.1.3 The Applicant recognises the benefits of heat use and has been investigating this for some time. In paragraph 5.4.7 of the Environmental Statement, it is explained that the Hartlebury Trading Estate has the potential to take heat, as it comprises around 160,000 m^3 of industrial units and office space. In this section of my proof, I have reported on the work done by the Applicant and commented on the progress made in securing heat users for the plant in advance of construction.

5.2 Heat Studies

5.2.1 The Applicant has commissioned a number of studies to identify and quantity heat users. Two of these are described in the Environmental Statement and two further studies have been completed since the Environmental Statement was published.

5.2.2 Firstly, as explained in paragraph 5.4.8 of the ES, the Applicant commissioned Parsons Brinkerhoff in November 2009 to undertake a desktop study to establish potential levels of demand and to model a potential heat distribution network in the estate. This study identified around 8,300 MWh of potential heat use per annum and concluded that, at this level of demand, a district heating system would be of marginal viability.

5.2.3 The first study did not identify any significant process users of heat, but focussed on space heating users. Therefore, in February 2010, the Applicant commissioned Parsons Brinkerhoff to carry out a second, more detailed, study as explained in paragraph 5.4.9 of the ES. For this study, Parsons Brinkerhoff contacted the various tenant companies on the estate and other local companies to identify actual and potential heat demands. As explained in paragraph 5.4.11 of the ES, three possible process heat users were identified:

a) Preheating combustion air for the Waresley brickworks, operated by Weinerberger;

b) Preheating combustion air for the Hartlebury brickworks, also operated by Weinerberger; and

c) Providing heat to a food manufacturer.

5.2.4 The study also identified that heat could be supplied to a small district heating scheme for the Waresley Park housing development.

5.2.5 In September 2011, the Applicant commissioned a study by SLR Consulting on heat users in the local area and on the potential for other industries, which could relocate to the estate, to use heat. This is consistent with the point made 5.4.16 of the ES that there is a relatively high turnover of building occupiers in the estate.

5.2.6 Finally, the Applicant has been working with Wienerberger to develop the supply of heat to the Waresley brickworks. A Regulation 19 submission has been made on the potential route for heat supply and a letter of support for this scheme has been supplied by Wienerberger (see Appendix NR5 to Mr Roberts' proof). The Applicant commissioned Fichtner to carry out a technical assessment of the scheme and this assessment is attached as Appendix E.

5.2.7 To summarise the scheme:

a) Wienerberger has a demand for steam to preheat combustion air for the brick kilns. The air would be heated from 95°C to 200°C using steam extracted from the turbine at about 22 bar(a).

b) The maximum heat demand would be 1.39 MW, which is equivalent to 10,135 MWh per annum.

c) Supplying this steam would reduce the power exported by the plant by 0.39 MWe.

5.2.8 The report confirms that the scheme is technically viable. It is also commercially viable, providing that the Renewable Heat Incentive is implemented.

5.3 Conclusion

5.3.1 The Applicant will not be a position to make contractual commitments to supply heat for a Facility which has not yet obtained planning permission. However, it is clear that the Applicant has spent some time investigating potential heat users near to the Envirecover Facility. This has included a detailed investigation of the most significant process user.

5.3.2 I conclude that there is potential for heat users on the Estate and that there is a good possibility that this can be developed.

6 Size of Plant

6.1 Introduction

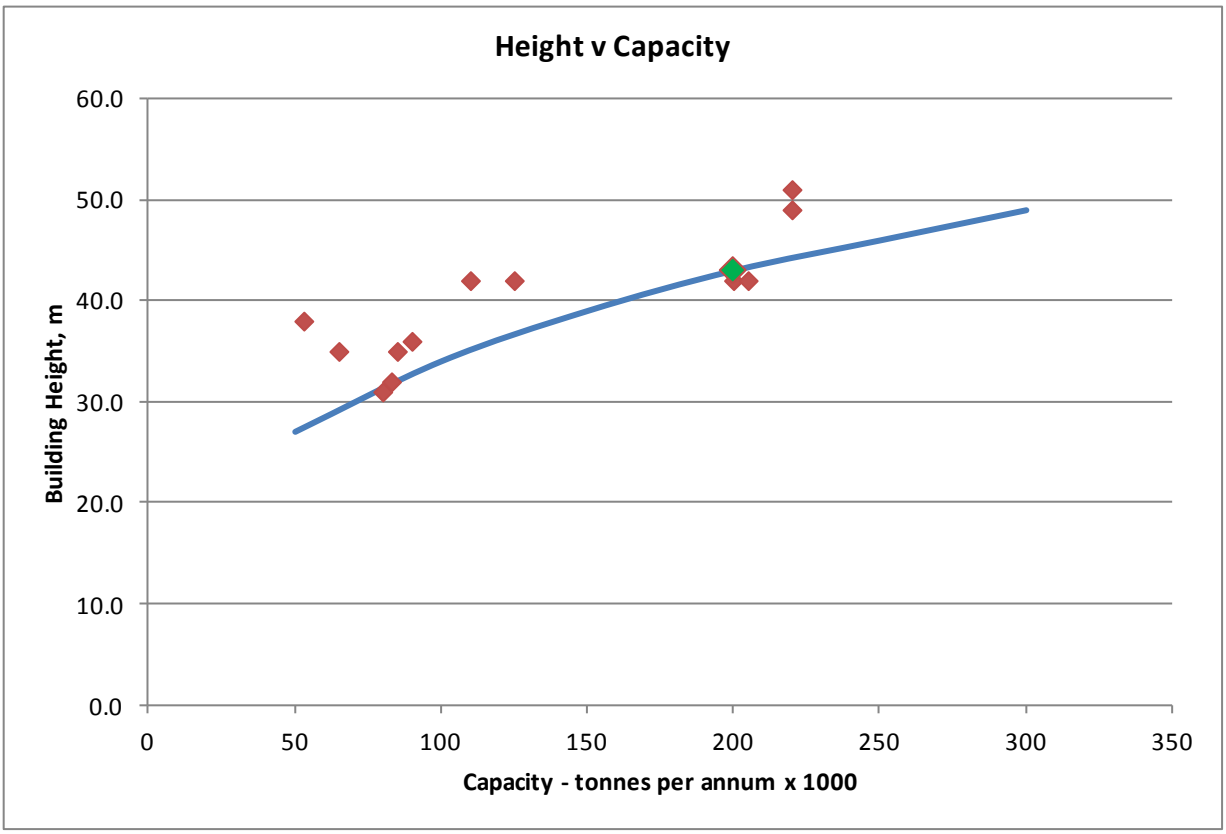
6.1.1 It is clear that one of WAIL's main reasons for objecting to the Facility is the visual impact of the Facility. In this section of my evidence, I have considered the main influences on building height and explained why there is not a linear relationship between plant capacity and building height. I have also considered whether recovering food waste before incineration would have a significant impact on the size of the plant.

6.2 Discussion

6.2.1 The main driver for building height is the size of the main combustion chamber and boiler. In order to comply with the Waste Incineration Directive, the combustion gases must be maintained at a temperature of 850°C or more for at least two seconds. The volume required for this dictates the volume of the combustion chamber. Since the two seconds remains constant regardless of capacity, the volume of the chamber is directly proportional to the waste throughput of the boiler. Assuming the geometry of the secondary combustion chamber remains approximately the same, the capacity of the facility is therefore directly proportional to the cube of the height of the secondary combustion chamber.

6.2.2 It is a reasonable approximation to say that the height of the boiler is therefore directly proportional to the cube root of the capacity. This is illustrated in the graph below in which roof height is plotted against stream capacity. In interpreting this diagram, it is important to recall that the Envirecover Facility would be partially buried. Therefore, for the purposes of this comparison, the height of the boiler house has been taken as the full building height of 43 metres.

Figure 1 – Relationship between building height and capacity



6.2.3 It is clear that the height of the boiler is not increasing in proportion to the processing capacity of the boiler and that even a small plant has quite a significant building height.

6.2.4 The diagram also shows the actual building height for a number of different Energy-From-Waste plants across the UK, with the Appeal Scheme shown as a green point. It can be seen that there is not a consistent pattern, which is because different boiler suppliers apply different configurations to their boilers, and because the use of architectural treatment, particularly curved roofs, tends to increase the height of the building.

6.2.5 The data used in the diagram is shown in the table below. The table also shows the height of each plant if it were adjusted to the Envirecover capacity using the cube rule. This illustrates that the Envirecover building is at the low end of the building height range, even without allowing for the reduction in apparent building height by sinking the base of the plant by 8 metres.

Table 1 – Plant Capacity and Building Height

EfW Plant	Capacity (1000tpa)	No. of Streams	Capacity per Stream (1000tpa)	Height (metres)	Height if Adjusted to Envirecover Capacity
Jersey	105	2	53	38	59
Isle of Man	65	1	65	35	51
Portsmouth	165	2	83	32	43
Coventry & Solihull	250	3	85	35	47
Marchwood	180	2	90	36	47
London Waste	550	5	110	42	51
Cleveland	250	2	125	42	49
Envirecover	**200**	**1**	**200**	**43**	**43**
Tyseley	400	2	200	42	42
Lakeside	410	2	205	42	42
Sheffield	220	1	220	49	47
Riverside	660	3	220	51	49

6.2.6 If additional food waste were to be recovered and treated elsewhere, as suggested by WAIL, the tonnes of waste to be processed by the Envirecover Facility would reduce. However, since food waste has a low calorific value, the energy in the remaining waste would not reduce as much. The size of the plant depends primarily on the thermal capacity and so the removal of food waste would have less impact that might otherwise be expected. For example, the removal of 20,000 tonnes of food waste from the residual waste stream, as considered in the Options Appraisal, would reduce the weight of waste by around 10% but would only reduce the thermal capacity by around 5%.

6.2.7 Therefore, I conclude that the building height is reasonable for the capacity of the plant and that the visual impact is further reduced by lowering the boiler house into an 8 metre hole. In addition, if the capacity were to be reduced by recovering food waste, the building height would not be reduced significantly.

7 Perception of Health Effects

7.1 Introduction

7.1.1 I note that WAIL mention, in paragraph 3.10 of their Statement of Case, that they consider *"there is genuine and significant public concern about the perceived health effects of emissions from the proposed development in this location"*.

7.1.2 Mr Roberts will present evidence on the significance which should be accorded to perception of health risks. Since I was responsible for the air quality and health chapters in the Environmental Statement, I wish to draw attention to the methodology and conclusions on this matter.

7.2 Air Quality Assessment

7.2.1 The impacts of the Envirecover Facility on local air quality were assessed as part of the Environmental Impact Assessment. Full details can be found in Appendix 13.1 to the Environmental Statement (within CD PA1(d)).

7.2.2 I and my team used atmospheric dispersion modelling software, ADMS4.1, to model the dispersion of emissions from the Envirecover chimney. The model takes account of the impact of buildings and local terrain on air flows across the land and the dispersion of the plume from the Facility. We used five years of weather data, supplied by the Meteorological Office from the closest available site, to ensure that variability in weather conditions would be fully taken into account.

7.2.3 In order to ensure that our results would be conservative, we assumed that the Facility would operate for the entire year at the maximum levels permitted by the Waste Incineration Directive. In reality, the Facility would be offline for at least 10% of the year for maintenance and it, like all other similar plants in the UK, would operate well below the emission limits for most of the time.

7.2.4 The results of the modelling demonstrated that the impact of emissions on local air quality would be negligible. This was true at all local houses and at all protected habitats within 10 km of the site. I consider that this should provide significant reassurance to local people.

7.3 Human Health Risk Assessment

7.3.1 I acknowledge that much of the local concern about health effects relates to emissions of persistent pollutants. Heavy metals and dioxins and furans will remain in the environment and have the potential to accumulate in the soil, unlike, for example, nitrogen oxides which do not accumulate but convert to nitrogen in the soil.

7.3.2 Once in the soil these substances can be taken into plants through the roots, and then work their way into the food chain through animals and into humans. Humans received virtually all of their exposure to dioxins through food, as an example. Therefore, we carried out a human health risk assessment, using a methodology developed by the US Environmental Protection Agency. This models all potential exposure routes for dioxins and metals, so that the level of exposure to these substances can be estimated.

7.3.3 The results of this modelling, described in section 8 of Appendix 13.1 to the Environmental Statement, showed that the emissions from the facility were highly unlikely to have an adverse impact on human health.

7.3.4 This conclusion concurs with the view of the Health Protection Agency. In their September 2009 statement on "The Impact on Health of Emissions to Air from Municipal Waste Incinerators" (CD OD2), they state:

> *"The Health Protection Agency has reviewed research undertaken to examine the suggested links between emissions from municipal waste incinerators and effects on health. While it is not possible to rule out adverse health effects from modern, well regulated municipal waste incinerators with complete certainty, any potential damage to the health of those living close-by is likely to be very small, if detectable. This view is based on detailed assessments of the effects of air pollutants on health and on the fact that modern and well managed municipal waste incinerators make only a very small contribution to local concentrations of air pollutants. The Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment has reviewed recent data and has concluded that there is no need to change its previous advice, namely that any potential risk of cancer due to residency near to municipal waste incinerators is exceedingly low and probably not measurable by the most modern techniques. Since any possible health effects are likely to be very small, if detectable, studies of public health around modern, well managed municipal waste incinerators are not recommended."*

7.4 Conclusion

7.4.1 The work carried out in the Environmental Statement demonstrated that the concerns expressed by local people are misplaced and illogical. The impact of the facility on human health and local air quality will be negligible.

8 Conclusions

8.1.1 In my evidence, I have demonstrated that the Envirecover Facility has a number of significant benefits in terms of sustainability.

a) I have demonstrated that the Envirecover Facility would be defined as a Recovery Operation under the revised Waste Framework Directive, because the R1 Formula gives a result of 0.693, which is greater than the threshold of 0.65.

b) I have shown that national and European policy states clearly that generating energy from the biodegradable fraction of municipal waste is renewable energy.

c) I have demonstrated that the operation of the Envirecover Facility would reduce global emissions of carbon dioxide, due to the avoidance of landfill and the displacement of power generated from fossil fuels.

8.1.2 I have presented the results of an updated options appraisal, which considered nine different options for managing residual waste within Herefordshire and Worcestershire. This has confirmed that the Envirecover Facility is the preferred option, with or without a heat offtake.

8.1.3 In that context, I have confirmed that there is the potential for heat to be used on the industrial estate and provided an update on progress in developing heat users.

8.1.4 I have responded to two further points raised by WAIL in their statement of case:

a) I have demonstrated that the Envirecover Facility is appropriately sized given the capacity of the plant.

b) I have explained the assessment which I and my team carried out on air quality and health effects and confirmed that adverse impacts are highly unlikely.

FICHTNER

Fichtner Consulting Engineers Limited
Kingsgate (Floor 3), Wellington Road North, Stockport Cheshire SK4 1LW United Kingdom
t: +44(0) 161 476 0032 f: +44(0) 161 474 0618 www.fichtner.co.uk