Pecyn dogfennau cyhoeddus

Y Pwyllgor Deisebau

Lleoliad:
Ystafell Bwyllgora 1 – y Senedd

Dyddiad:
Dydd Mawrth, 1 Mai 2012

Amser:
09:00

Cynulliad Cenedlaethol Cymru
National Assembly for Wales

I gael rhagor o wybodaeth, cysylltwch a:

Abigail Phillips
Clerc y Pwyllgor
029 2089 8421
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Agenda

1. Cyflwyniad, ymddiheuriadau a dirprwyon (09.00)

2. P-04-329 Rheoli sŵn o dyrbinau gwynt sy'n peri diflastod – trafod ymweliadau â safleoedd a thystiolaeth a ddaeth i law ar 28 Chwefror (09.00 – 09.10) (Tudalennau 1 – 25)

3. Deisebau newydd (09.10 – 09.20)

3.1 P-04-384 Cysylltiad â'r M48 o'r B4245 Cil-y-Coed/Rogiet (Tudalen 26)

3.2 P-04-385 Deiseb ar ryddhau balŵns a lanternau (Tudalennau 27 – 29)

3.3 P-04-387 Arwyddion a draeniad ar yr A467 (Tudalen 30)

3.4 P-04-388 Diogelu'r arfer o addoli ar y cyd fel gofyniad cyfreithiol (Tudalen 31)

4. Y wybodaeth ddiweddaraf am ddeisebau blaenorol (09.20 – 09.25)

4.1 P-04-365 Protect buildings of note on the Mid Wales Hospital site (Tudalennau 32 – 37)

4.2 P-04-369 Deiseb yn erbyn y Llwybr Arfordirol o Gaerdydd i Gasnewydd a thu hwnt (Tudalennau 38 – 46)

5. P-03-238 Llygredd ym Mornant Porth Tywyn – sesiwn dystiolaeth lafar (09.25 – 09.50) (Tudalennau 47 – 69)

Steve Brown, Asiantaeth yr Amgylchedd Cymru
Kathryn Monk, Asiantaeth yr Amgylchedd Cymru
Tony Harrington, Dŵr Cymru
Fergus O'Brien, Dŵr Cymru

6. P-04-341 Llosgi gwastraff – sesiwn dystiolaeth lafar (09.50 – 10.20) (Tudalennau 70 – 215)

Julian Kirby, Arbenigwr mewn Gwastraff, Cyfeillion y Ddaear
Haf Elgar, Ymgyrchydd, Cyfeillion y Ddaear

7. P-03-295 Kyle Beere – Gwasanaethau Niwroadsefydlu Paediatrig – Trafodaeth (10.20 – 11.00) (Tudalennau 216 – 236)

Katherine Simmons, Deisebydd (Kyle's Goal)
Frances Gibbon, Deisebydd (Kyle's Goal)
Julie Smith, Headway
Cerilan Rogers, Pwyllgor Gwasanaethau Iechyd Arbenigol Cymru
Daniel Phillips, Pwyllgor Gwasanaethau Iechyd Arbenigol Cymru
Dr Chris Jones, Cyfarwyddwr Meddygol GIG Cymru
Dr Heather Payne, Uwch Swyddog Meddygol, Iechyd Mamau a Phlant

8. Papurau i'w nodi (Tudalennau 237 – 260)

PET(4)-05-12 p4a

P-04-329 Control of noise nuisance from wind turbines

Petition wording

We call upon the National Assembly for Wales to urge the Welsh Government to pass a statute controlling the noise nuisance from wind turbines during anti-social hours. We ask for the implementation of respite periods during which time turbines would be switched off.

Noise respite periods are common in public health legislation. They are called for by the World Health Organisation in their Community Noise report; and are currently implemented in the U.K. on airport operations, construction sites and factories and other evening and overnight noise nuisance.

We ask that this applies to turbines above 1.3 MW, and that respite periods be between 18.00Hrs to 06.00Hrs for turbines within 1.5 Km of individual residences; and 22.00Hrs to 06.00 Hrs for turbines within 2Km of communities. Authorities within Wales determining applications under 50MW Plate Capacity, and the Infrastructure Planning Commission determining those over 50MW should make developers aware of this Public Health restriction which may affect individual turbines.

Petition raised by: James Shepherd Foster

Petition first considered by Committee: 27 September 2011

Number of signatures: 1074

Supporting information: In addition to human health, the measure would also protect nocturnal creatures, bats, owls, etc. Jonathan Edwards MP has called for a measure such as this. Rhodri Glyn Thomas AM has called for a measure similar to this. This would not affect, or be affected by TAN 8, because TAN 8 does not deal with health implications of turbines. Also it only requires turbine plate capacities as a value, and not the efficacy of the turbines themselves. Wales has a long history of neglect of Health and Safety issues, leading to large parts of the community having restricted lives. During development, the hearing of the young should not be left to chance, and until substantial and medically accepted research points to a relaxation of the times and distances set out in this petition, we should err on the side of caution.

Petitions Committee Visits to Alltwalis and Parc Cynog Windarms

27 February 2012

Background:
In September 2011, the Committee received a petition calling for the control of noise from wind turbines, which collected 1,074 signatures. The wording is as follows:

'We call upon the National Assembly for Wales to urge the Welsh Government to pass a statute controlling the noise nuisance from wind turbines during anti-social hours. We ask for the implementation of respite periods during which time turbines would be switched off.

Noise respite periods are common in public health legislation. They are called for by the World Health Organisation in their Community Noise report; and are currently implemented in the U.K. on airport operations, construction sites and factories and other evening and overnight noise nuisance.

We ask that this applies to turbines above 1.3 MW, and that respite periods be between 18.00Hrs to 06.00Hrs for turbines within 1.5 Km of individual residences; and 22.00Hrs to 06.00 Hrs for turbines within 2Km of communities. Authorities within Wales determining applications under 50MW Plate Capacity, and the Infrastructure Planning Commission determining those over 50MW should make developers aware of this Public Health restriction which may affect individual turbines.'

The Petitions Committee issued a general call for evidence on the subject of noise from wind turbines in September 2011. Responses on both sides of the argument were received, but a significant proportion of the responses in support of the petition came from the village of Gwyddgrug. These responses outlined problems experienced with noise emitted from Alltwalis windfarm.

The Committee therefore decided to visit Alltwalis windfarm to experience the noise for themselves. They also decided to visit Parc Cynog windfarm, which is 10 years older, in order to compare the two.

Alltwalis:

Present:
- William Powell AM, Chair
- Russell George AM
- Rhodri Glyn Thomas AM
- Joyce Watson AM
- Sergio Castedo, Statkraft
- Stuart Shaw, Statkraft

- Andrew Bullmore, Hoare Lea Acoustics
- Rob Fellows, Quatro Public Relations
- Abigail Phillips, Clerk to the Petitions Committee
- Sarita Marshall, Deputy Clerk to the Petitions Committee
- Helen Roberts, Committee Legal Adviser
- Rhodri Wyn Jones, Committee Support Officer

Statkraft told Members that noise complaints were received from nearby residences shortly after the windfarm was commissioned in October 2009. He told Members that it takes a certain amount of time to gather evidence of noise problems, owing to the fact that weather conditions have an impact on the sound emitted from wind turbines.

Statkraft stated that their first step was to try to establish whether the noise experienced exceeded the maximum levels set out in guidance or whether the noise was something other than the sound that might be expected to come from wind turbines.

Members were told that Statkraft acknowledged the strength of feeling in the community and therefore immediately began monitoring the noise and also implemented a helpline for local residents to contact to report noise.

Statkraft noted at the meeting that were examples of complaints being received when the turbines were not operational.

After three months of testing and monitoring, a problem with a turbine gearbox was identified, and there was a delay while a new part for the turbine was manufactured. Statkraft stated that once the problem was identified, the turbine was switched off at night. It was also found that wind speed and direction contributed to the problem.

The overall noise levels from the windfarm then fell within guidance limits but residents at a nearby farm continued to experience tonal noise. It was decided that the fix had not worked and Siemens therefore agreed to replace the whole gearbox.

The residents affected made a claim for financial compensation. Rhodri Glyn Thomas AM stated at the meeting that the level of compensation claimed was based on legal advice. Statkraft rejected the claim as they say they acted on complaints and the sound emitted overall fell within guidance limits. Statkraft responded by making their own offer of compensation, which included employing a member of the household to monitor the noise and free electricity, but have not received a response.

The residents have now withdrawn permission to allow Statkraft monitoring equipment to be installed at their residence, so Statkraft can no longer collect data, which is needed for the monitoring work.

Rhodri Glyn Thomas AM stated that the monitoring equipment was no longer allowed to be on that particular farm because permission had not been sought by Statkraft on several occasions before accessing the equipment.

In conclusion, Statkraft stated that they felt they had been transparent in their dealings and had investigated problems in order to attempt to resolve them. However, they can no longer monitor the problem area as they no longer have access to the land where they need to monitor the noise.

Parc Cynog:

Present:

- William Powell AM, Chair
- Russell George AM
- Rhodri Glyn Thomas AM
- Joyce Watson AM
- Ross Cant, Operations Manager, Vattenfall
- Martin Hooker, Planning Consultant working on behalf of Vattenfall
- Iori Evans, landowner
- Abigail Phillips, Clerk to the Petitions Committee
- Sarita Marshall, Deputy Clerk to the Petitions Committee
- Helen Roberts, Committee Legal Adviser
- Rhodri Wyn Jones, Committee Support Officer

Parc Cynog windfarm sits on a hill overlooking the sea, and the village of Llanmiloe is situated at the bottom of the hillside, next to the sea. Members were told that, apart from one residence, no complaints about noise from the windfarm have been received from the local community. The landowner also told Members that the turbines pose no threat to birds and that many birds use the birdfeeders on his land.

Roughly half of the turbines at the site were built in 2001, and the other half were built more recently.

The windfarm is managed by a community interest company, which makes about £30,000 profit a year for the local community.

Committee Service
March 2012

Statkraft

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Mr William Powell AM
Petitions Committee - Chairman
National Assembly for Wales
Cardiff Bay
Cardiff
CF99 1NA

7th March 2012

Dear Mr Powell,

I am writing to thank the Petitions Committee for their visit to the Alltwalis Wind Farm on the 27th February. Statkraft was pleased to host the visit and to have the opportunity to meet and answer questions directly from committee members, and to provide an accurate summary of the activities that have taken place since the first noise complaints were received in October 2009.

We understand that the public meeting held on the following day in Carmarthen included numerous comments about the Alltwalis Wind Farm and the way in which Statkraft has dealt with noise complaints.

We regret to hear that some committee members might have felt misled in regards our response to complaints, so we would like to place on record that all information provided to members and previously to Carmarthenshire County Council is wholly accurate, and we would be happy to provide detailed evidence to back up our response to dealing with noise complaints.

Statkraft has worked closely with many local residents, the local council and the wind turbine supplier to rectify the noise issues at the Alltwalis wind farm which culminated in a number of turbine retrofits, operation modifications on the wind farm and even a gearbox being changed on one of the turbines

It is unfortunate that since these retrofits were implemented and before the gearbox was changed, Statkraft has for the last year been repeatedly refused the request to access wind data from the monitoring equipment deployed at the end of 2009 at the home of the main complainants, despite receiving a significant financial claim from the owners of one of the properties. After numerous request to continue to monitor the noise from Alltwalis, Statkraft decided to retrieve all the equipment deployed having successfully shown to the Council and the Welsh Government that the Alltwalis Wind Farm is operating within full compliance of its conditioned noise limits, both in terms of the overall level of noise emissions at neighbouring residential properties and the absence of audible tonal elements within these noise emissions.

We are pleased to have formed a close working relationship with Carmarthenshire County Council whilst addressing the noise complaints and I am sure that they would be happy to provide further evidence in regards the steps that Statkraft has completed to address legitimate concerns.

Statkraft has shown itself to be a responsible developer and has, on numerous occasions, shut down one or more turbines in order to address noise complaints. We would be pleased to provide you with a copy of the resident noise log that will clearly and unequivocally demonstrate all noise complaints received and what action was taken.

The wind farm continues to legally operate within the conditions laid down by the local authority when planning consent was granted. Statkraft has shown with specific actions that it is willing to correct and operate Alltwalis Wind Farm within its conditioned noise limits.

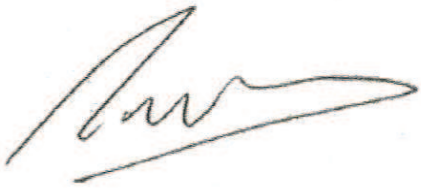
Whilst we provided you a summary of the noise report completed by our consultants, Hoare Lea Acoustics, we would also be pleased to provide the full report should you wish to receive additional analysis.

I would also like to reiterate the point that I made when we met that the wind farm is fully compliant and is operating within the conditioned limits established through the planning process. Statkraft is operating Alltwalis Wind Farm within its lawful rights. Please find enclosed a copy of the planning conditions that relate to noise.

Statkraft has conducted itself in an open and transparent manner. The information that was shared with the Petitions Committee when we provided a briefing and site visit is wholly accurate.

We would also be happy to answer any additional questions that you may have following the public meeting.

Yours sincerely



Sergio Castedo

Director

Statkraft Wind UK Ltd

cc Russell George AM

Bethan Jenkins AM

Rhodri Glyn Thomas AM

Joyce Watson AM

Sarita Marshall – Petitions Committee Clerk

CONSENTED NOISE LIMITS

2.1 The planning consent for the Wind Farm includes, as part of its associated conditions, limits for noise immission levels that are permitted at neighbouring residential properties as a consequence of the operation of the wind farm. The noise elements of the conditions state:

12 At the reasonable request of and following a complaint to the Council the operator of the development shall measure and assess at its expense the level of noise emissions from the wind turbine generators following the procedures described in Section 2.0, Pages 102 to 104 in the document "The Assessment and Rating of Noise from Wind Farms, ETSU-R-97" published by ETSU for the Department of Trade and Industry.

13 The level of noise emissions from the combined effects of the wind turbine generators when measured at Blaengwen Isaf, Rhoswen, Brynawelon, Gellifelen, Coedlannau Fawr, Lan Farm shall not exceed:

(i) During night-time the greater of 43dB(A) L90,10min or 5dB above the night-time LA90 background noise level at wind speeds not exceeding 12 metres per second.;

(a) and at all other times

(ii) The greater of 40dB(A) L90,10min or 5dB above the quiet day-time LA90 background noise level at wind speeds not exceeding 12 metres per second.

14 The level of noise emissions from the combined effects of the wind turbine generators when measured at Blaengwen Farm, Bedwhirion and Pen-llwydcoed shall not exceed:

(i) During night-time the greater of 45dB(A) L90,10min or 5dB above the night-time LA90 background noise level at wind speeds not exceeding 12 metres per second.;

(a) and at all other times

(ii) The greater of 45dB(A) L90,10min or 5dB above the quiet day-time LA90 background noise level at wind speeds not exceeding 12 metres per second.

15 Background noise levels referred to in this condition shall be those recorded by the regression lines in the Blaengwen Wind Farm Environmental Statement submitted with the application.

Night-time means 2300-0700 hours on all days. Quiet day-time means 1800-2300 hours on all days plus 0700-1800 hours on Sundays and 1300-1800 hours on Saturdays. Wind speeds shall be measured on site at a height of 10 metres above ground level.

16 At all other dwellings excepting those specified in Condition No. 15 the level of noise emissions from the combined effects to the wind turbine generators shall not exceed the levels specified in Condition No. 13.

17 The operator of the development shall produce wind speed and wind direction data to the Council at its reasonable request to enable compliance with and performance under Condition No.13 to be monitored. This wind data shall include the wind speed in metres per second (ms-1) and the wind direction in degrees from north for each 10 minute period. At the reasonable request of the Local Planning Authority the recorded data relating to 10m height above ground level shall be made available to them. Where wind speed is measured at a height other than 10m, the wind speed data shall be converted to 10m height, accounting for wind shear by a method whose details shall also be provided to the Local Planning Authority.

18 Details of the proposed turbines and their noise characteristics shall be submitted to the Local Planning Authority prior to their becoming operational.

21 Tonal noise shall be measured by the operator of the development at its expense for audibility at the reasonable request of and following a complaint to the Council in accordance with the document "The Assessment and Rating of Noise from Wind Farms, ETSU-R-97" published by ETSU for the Department of Trade and Industry.

If, at any property, the tonal noise from the combined effect of the wind turbines generators exceeds the threshold of audibility:-

(a) by more than 2.0dB but less than 6.5dB a penalty of ((5/6.5) x Audibility)dB shall be added to the noise level derived for that property measured in accordance with Condition 12.

(b) by more than 6.5dB a penalty of 5dB shall be added to the noise level derived for that property measured in accordance with Condition 12.

Extract from WIND TURBINE NOISE, SLEEP AND HEALTH, April 2010

Dr Christopher Hanning. BSc, MB, BS, MRCS, LRCP, FRCA, MD

Notes:
This paper is based on proofs of evidence produced for several UK Planning Inquiries. As such, it concentrates on the regulatory system in the UK. Other jurisdictions will have different systems.
The aim is to inform those seeking to regulate the siting of wind turbines close to human habitation.
It will be updated regularly as new information comes to hand.
Users are encouraged to check the Society for Wind Vigilance Website for the latest updates

Contents

Summary

Section 1 sets out the author's expertise in sleep medicine and physiology, the scope of the report and source material.

Section 2 reviews the basic physiology of sleep. Noise can disturb sleep by causing awakenings, which are remembered and arousals, which are not recalled but are more likely. Both disrupt sleep making it unrefreshing. Research on the effects of wind turbine noise has concentrated on remembered awakenings and has thus underestimated the effects.
Inadequate or poor quality sleep has many health consequences apart from daytime sleepiness and fatigue. These include obesity, poor memory, increased risk of diabetes, heart disease and high blood pressure. Vulnerable groups such as children and the elderly may be at greater risk.

Section 3 reviews research on wind turbine noise, sleep disturbance and health. These include the major contributions of van den Berg and Pedersen and the dose-response relationship derived from their data. Also considered are the Salford study and the Hayes McKenzie Partnership study commissioned by the DTI.
Recent major reports by WHO (the World Health Organisation) and RIVM (the National Institute for Public Health and the Environment in Holland) are reviewed, both of which mandate lower night time noise levels than are permitted by ETSU-R-97. Predicted external turbine noise should not exceed 35dB to avoid disturbance to sleep and 40dB to avoid risks to health. Experience of existing wind farms mandates a setback of at least 1.5km in order to avoid disturbance to sleep.
It is concluded that there is compelling evidence that wind turbine noise can and does disturb sleep and impair the health of those living too close and that current guidance is inadequate protection.

Section 4 examines the mitigation of wind turbine noise. It is concluded that the occupants of properties sited within 1.5km of turbines will suffer unacceptable levels of sleep disturbance and potential risk to their health.

Section 5 presents the conclusions of the report.

Section 6 lists the documents cited in support of this paper.

1. Introduction

1.1 The author

1.1.1. My name is Dr Christopher Hanning, Honorary Consultant in Sleep Disorders Medicine to the University Hospitals of Leicester NHS Trust, based at Leicester General Hospital, having retired in September 2007 as Consultant in Sleep Disorders Medicine. In 1969, I obtained a First class Honours BSc in Physiology and, in 1972, qualified in medicine, MB, BS, MRCS, LRCP from St Bartholomew's

Hospital Medical School. After initial training in anaesthesia, I became a Fellow of the Royal College of Anaesthetists by examination in 1976 and was awarded a doctorate from the University of Leicester in 1996. I was appointed Senior Lecturer in Anaesthesia and Honorary Consultant Anaesthetist to Leicester General Hospital in 1981. In 1996, I was appointed Consultant Anaesthetist with a special interest in Sleep Medicine to Leicester General Hospital and Honorary Senior Lecturer to the University of Leicester.

1.1.2. My interest in sleep and its disorders began nearly 30 years ago and has grown ever since. I founded and ran the Leicester Sleep Disorders Service, one of the longest standing and largest services in the country, until retirement. The University Hospitals of Leicester NHS Trust named the Sleep Laboratory after me as a mark of its esteem. I was a founder member and President of the British Sleep Society and its honorary secretary for four years and have written and lectured extensively on sleep and its disorders and continue to be involved in research. My expertise in this field has been accepted by the civil, criminal and family courts. I chair the Advisory panel of the SOMNIA study, a major project investigating sleep quality in the elderly, and sit on Advisory panels for several companies with interests in sleep medicine. I am an Associate Member of the General Medical Council, chairing Investigation Committee hearings and Registration Panels.

4.2. Mitigation of wind turbine noise

4.2.1. Bowdler (2008) has recently reviewed the causation of the swishing and thumping noises associated with wind turbines. He concludes that, while there are several theories, no definitive mechanism can be established. It follows that industry claims to mitigate turbine noise by changing blade shape, pitch and turbine spacing should be treated with scepticism until definitive evidence of their efficacy are presented.

4.2.2. It follows that attempts to reduce wind turbine noise immissions after a plant becomes operational are unlikely to be successful. Noise mitigation will reduce power output, which will be opposed by the operators. The importance of assuring residents that noise limits are capable of being met before construction was emphasised by Mr Lavender, Inspector at the Thackson's Well Inquiry (APP/E2530/A/08/2073384) who stated: *"securing compliance with noise limit controls at wind farms, in the event of a breach, is not as straightforward as with most other forms of noise generating development. This is because noise from turbines is affected primarily by external factors such as topography and wind strength, a characteristic that distinguishes them from many other sources of noise, such as internal combustion engines or amplified music, which can be more directly and immediately influenced by silencing equipment, insulation or operator control."* It follows that application of the precautionary principle is essential where there is any possibility of noise disturbance from wind turbines.

4.2.3. Thus, the **only** mitigation for wind turbine noise is to place a sufficient distance between the turbines and places of human habitation. PPS22 advises that ETSU-R-97 *should* (author's italics) be used to estimate noise levels around turbines which, taken with measurements of ambient noise, can, in theory, predict noise disturbance in adjacent properties. Many expert acousticians have severely criticised ETSU-R-97, not least Mr Dick Bowdler (2007), a former member of the Government's Noise Working Group considering ETSU-R-97. A number of Her Majesty's Inspectors have been equally critical, not least Mr Andrew Pykett (Appeal

ref:APP/Q1153/A/06/2017162) and Ms Elizabeth Ord (APP/W4705/A/09/2114165). As noted above, the recent recommendation by some members of the Noise Working Group to provide more allowance for wind shear in predicting turbine noise levels is a tacit admission of the unsuitability of ETSU-R-97 methodology for large turbines. In addition the suppressed recommendations by HMP, at least one of whose employees sat on the NWG, for a reduction in the ETSU-R-97 night time noise limits to 33-38dB(A) suggests very strongly that it is inappropriate to continue to rely on ETSU-R-97 as presently formulated.

4.2.4. Stigwood (2008) has shown that large turbines (hub heights 50-100m) are more likely than smaller turbines (hub height 30m) to cause excessive amplitude modulation, increased likelihood of low frequency noise and greater disturbance inside buildings. Internal noise can modulate over 15-20dB, changes which are easily perceived. This is probably due to different wind speeds and atmospheric conditions at these heights. He concludes that ETSU-R-97, which was developed for smaller turbines, is inappropriate for large turbines.

4.2.5. Despite, or because of, ETSU-R-97, complaints of noise disturbance from industrial wind turbines continue and it is clear that ETSU-R-97 can not be relied upon to prevent sleep disturbance in those living near wind turbines. To quote Mr Peter Hadden in evidence to the House of Lords Economic Affairs Committee, printed 12th November 2008 para 6: *"There is material evidence available to show that ETSU R 97 has failed to provide a reasonable level of protection to family homes from unbearable noise pollution where wind turbines are located too close to homes. Symptoms include sleep disturbances and deprivation, sometimes so severe that families are forced to evacuate their homes in order to stabilise well-being and to resume normal family life. This is a worldwide phenomenon where wind turbines are located too close to homes."*

4.2.6. It should be noted also that the application of ETSU-R-97 is advisory in PPS22, not mandatory (*should* not *must*). It is subordinate also to the precautionary principle set out in PPS 22. Rather than rely on a provably inadequate set of theoretical calculations to determine setback distance, it is logical to look at the real world and the relationship between setback and noise complaints from existing sites. Human senses and opinion are used to judge visual impact. It is therefore consistent and logical to rely on human senses and opinion in respect of noise impact. Many of these sites causing problems have been in place for several years. Current applications are for large 2.0-3.0MW turbines and thus allowance must be made for their additional noise in determining setback.

4.2.7. While it may be possible to produce a reasonable acoustically based theoretical approach to calculating set-back distances (Kamperman and James 2008b), it makes more sense to rely on recommendations from observations of the effects on real people at established wind farms and the dose-response relationship described by Pedersen (2009a&b) is relevant.

4.2.8. New Zealand Standard 6808, cited in draft form above, has been published recently (March 2010). It permits a turbine noise level of 40dB $L_{A90(10min)}$ or 5dB above background, whichever is the greater. In areas where a higher degree of acoustic protection is warranted, the evening and night-time level may be set at 35dB $L_{A90(10min)}$ or 5dB above background, whichever is the greater. Wind speeds are referenced to hub height.

4.3. Conclusions

4.3.1. There are two possible approaches to judging an appropriate setback distance. The first is to determine a dose-response relationship between turbine noise and a health concern, for example, sleep disturbance. The next step is to determine an acceptable level of sleep disturbance. For example, should it be 0%, 1% or 5% of the population for 1 night per year, per month or per week? Consideration should be given to whether the measured concern, in this case reported sleep disturbance, is sufficiently sensitive. I have shown that reported sleep disturbance is the tip of an iceberg and that arousals with sleep fragmentation are likely to be more common and insidious with consequences including fatigue and elevated blood pressure In this situation, it would be appropriate to invoke the precautionary principle and select a conservative dose level (turbine noise) that minimises the measured response (sleep disturbance). Examination of data from the Swedish and Dutch studies suggests that an external predicted noise level of no more than 35dB(A) would be appropriate. This view is supported by a presentation by members of RIVM, the widely respected Dutch National Institute for Public Health and Environment, (Jabben et al 2009) which recommends an outdoor L_{den} limit of 40dB(A) which corresponds to an external noise level of about 35dB(A). The data is now available as a RIVM report (Verheijen et al. 2009) which recommends that wind turbine parks be designed so as to stay below L_{den} 40 dB at nearby dwellings which is regarded as the “no effect” level. L_{den} 45 dB(A) is recommended as a maximum allowable limit which should avoid severe effects and minimise health effects. Hayes (2007) notes that “the intent of New Zealand Standard 6808 is not inaudibility but the prevention of severe annoyance”. The relevant section of that Standard states: “***4.4.2 Acceptable limit:*** *As a guide to the limits of acceptability, the sound level from the WTG (or windfarm) should not exceed, at any residential site, and at any of the nominated wind speeds, the background sound level (L_{95}) by more than 5dB(A), or a level of 40 dB(A) L_{95}, whichever is the greater.*

Hayes therefore concedes that the noise level above which severe annoyance occurs is 40dB(A). Thorne (2010), from an analysis of noise complaints concludes that unreasonable noise occurs at noise levels above 30dB(A)$_{LA90}$ in the presence of excess amplitude modulation. Together with van den Berg he states: “*We believe annoyance and loss of amenity will be protected when the wind turbine noise limit would be 30 dBA L_{95} in conditions of low wind speed at the dwellings and modulation restricted to 3dB”*.

Overall, it is apparent that the present ETSU-R-97 noise limits are too high to protect receptors from severe annoyance and sleep disturbance and that a level of 35dB(A) is appropriate, in the absence of excessive modulation.

4.3.2. The second approach is to correlate reports from those living in proximity to wind turbines to their distance to the turbines, the approach taken by, amongst others, WindVOiCe (Wind Vigilance for Ontario Communities). This has the disadvantage that symptoms are generally self-reported and subjective. Nevertheless, it can be argued that it is logical to rely on the actual reports of human receptors in the same way that human opinions are used to judge visual amenity. It has the advantage also that it may better detect those subjects that are most sensitive to turbine noise than surveys. It has the merit also of simplicity. The New South Wales Legislative Council General Purpose Standing Committee No 5, under the Chairmanship of Mr Ian Cohen, a member of the Green Party, has recently published the report of an inquiry into rural wind farms (NSW 2009).

Recommendation 7 to the NSW Planning Minister is for a minimum setback of 2 km. In the UK, Mr Peter Luff, MP for Mid-Worcestershire, introduced a Bill to Parliament to establish a legal minimum setback distance.

4.3.3. **Table II** (see end of text) shows recommendations for setback distance by a number of authorities. References can be found in the Bibliography. In general, noise engineers recommend lesser setback distances than physicians. The former rely more on measured and/or calculated sound pressures and the latter on clinical reports. It is logical to prefer the actual reports of the humans subjected to the noise rather than abstract calculations, even if the latter accurately measure ambient noise and allow for the low frequency components of wind turbine noise. Calculations can not measure annoyance and sleep disturbance, only humans can do so. **In my opinion, based on the reports cited in the table and the data from the WindVOiCe survey, a minimum setback of 1.5km is appropriate.**

4.35. **Turbines which result in external noise levels greater than 35dB(A) or are sited closer than 1.5km from housing therefore present an unacceptable risk of causing sleep disturbance and high levels of annoyance to those residents and, to a smaller number, a risk to health.**

5. Planning considerations

5.1 ETSU-R-97

5.1.1. UKGovernment policy is that ETSU-R-97 should be used for the assessment of the likely impact of wind turbine noise and this was restated in a 2007 policy statement. Developers will often assert that, as it is government policy, ETSU-R-97 may not be questioned. However, as Mr Justice Mitting stated in a judicial review brought by the Renewable Energy Foundation: “It will always be open to any objector to an application for permission to develop a site as a windfarm, to contend that the Statement is technically inadequate or erroneous.” David Forsdick, of Landmark Chambers, a leading barrister with particular expertise in planning matters, stated, at a seminar on renewable energy on the 1st October 2008 (Forsdick 2008): *“...., general policy and guidance cannot prevent consideration of: a. the specific facts of an individual case; b. scientific information which suggests that the general methodology may need to be adjusted on the facts of an individual case; or c. actual experience elsewhere on the ground which shows that the government approved methodology does not always accurately predict the impacts.*
Thus, whilst it is undoubtedly true that it is not for parties to an inquiry to question the merits of government policy, their evidence on the matters in the previous paragraph is plainly capable of constituting “other material considerations” which the decision maker has to take into account and, in an appropriate case, reach a conclusion on.

5.1.2 It would seem logical that the specific facts of an individual case would include the presence of particularly sensitive or vulnerable receptors, such as the elderly and children, and the likelihood of excessive wind shear or amplitude modulation.

5.1.3. There is now a large body of scientific information showing that the ETSU-R-97 methodology is in need of adjustment for wind shear and excess amplitude modulation.

5.1.4. There is a large body of evidence also showing that ETSU-R-97 noise levels are too high for human health and well being. These include the 2009 WHO Night Noise Guidelines and the 2006 draft reports by HMP to DTI.

5.1.5. It follows that it is appropriate and reasonable for planners and decision makers not to rely exclusively on ETSU-R-97 methodology and to take account of the other material considerations set out in this paper.

6. Overall Conclusions

6.1. The appropriate mitigation of sleep disturbance and annoyance from industrial wind turbine noise is a maximum external turbine noise level of 35dB(A) or a setback of at least 1.5km.

CD Hanning

8th April 2010

NOISE RADIATION FROM WIND TURBINES INSTALLED NEAR HOMES: EFFECTS ON HEALTH

By Barbara J Frey, BA, MA (University of Minnesota) and Peter J Hadden, BSc (Est Man), FRICS.

The report was published in January 2012 and is specific to wind turbine noise guidelines in the UK.

Conclusions

The experience of families internationally show conclusively that when wind turbines are built in proximity to houses, the environmental noise pollution adversely impacts on people's health.

Wind turbines emit noise with many characteristics – pulsating noise, intermittency, tonal qualities, amplitude modulation and low frequency noise – which singly or in combination merit special attention and limits because of observed, unwanted impacts on health, according to the World Health Organizations' guidelines.

These findings are reflected also in the pilot studies conducted during the past few years by physicians in the UK, the USA, an in Australia, where results indicated that families are suffering from various degrees of negative health and sleep issues because of environment noise from wind turbines.

Despite evidence-based research studies that demonstrate a relationship between the adverse impacts of environmental noise on health, some governments – including that of the UK – have instead opted to follow the advice of acoustic engineers from the wind energy industry. This approach favours industrial development, constructing wind turbines in proximity to homes and other sensitive facilities, to the detriment of public health.

Although acoustic engineers and engineers involved with wind turbine design acknowledge that predicting acoustic radiation from wind turbines is imprecise, with variable and often doubtful results, the UK Government continues to foster self-regulation by the wind energy industry. This has led to the current situation, with inadequate standards of protection from environmental noise pollution for neighbouring families.

As governments encouraged more wind turbine installations, and with more constructed near homes and communities because of inadequate guidance, complaints about noise increased. Several governments have responded and recently imposed stricter regulation on the wind energy industry after assessing community and family complaints and health issues, as well as by assessing current evidence-based research and reports on environmental noise and its injuries to health: Denmark lowered allowable wind turbine noise emissions, including stricter regulation on low frequency noise, both outside and inside homes and other facilities and areas; the State Government of Victoria, Australia, increased set-back distances to a minimum of 2km between a wind turbine and a residence; and Japan has initiated an epidemiological study of the impacts of wind turbine noise on people.

Moreover, the WHO reports – Guidelines for Community Noise, Night Noise Guidelines for Europe, and the Burden of Disease from Environmental Noise, along with evidence-based research findings, indicate that the inaudible effects of noise (e.g. low frequency noise), as well as the audible, may have significant impacts on people. Current UK guidance is not only out-dated, it does not include these recent guidelines from the World Health Organization. Indeed, UK guidance does not incorporate methods that reflect how humans perceive and react to sounds and noise, especially dose-exposure-response relationships. These have a relationship to how noise affects health and sleep and a sense of well-being.

Furthermore, because the UK Government, through its agencies, ministers and civil servants, is aware of issues with wind turbine noise guidance, there are potential human rights violations, because those with health complaints apparently related to wind turbines constructed in proximity to their homes have been ignored in their efforts to seek changes, controls, or redress. Furthermore, recent UK Planning Legislation closed a route that had been available to ordinary families seeking recourse in order to protect themselves from environmental pollution. Noise conditions are unwieldy, and difficult and expensive to enforce; thus, people are exposed to unremitting environmental noise, with the consequent injuries to health and loss of amenity, through no faults of their own.

Meanwhile, the World Health Organization reports and medical evidence offer methods and guidance that deal effectively with industrial environmental noise and offer a degree of protection to the public's health, if Government would choose to respond to the science of the matter, rather than to political and economic expediency.

Recommendations

Although the underlying mechanisms are not yet fully understood, when wind turbines are built near homes, it is undeniable that their noise causes a constellation of unwelcome effects, with varying degrees, on health, sleep, and health quality of life.

Further study may reveal the cause/effect, dose/exposure relationships, but as these are undetermined, the precautionary principle should apply in order to protect the public health. Preventive proactive policy functions to preserve the public's health, whereas reactive palliative responses are often inadequate, not to mention, too late.

Although government agencies and the wind energy industry and their consultants contend that the adverse health effects are conjecture or negligible or 'mere' annoyance, one may also argue that their calculations are based on models that make unproven assumptions about what sounds are or are not annoying to people. Wind turbine noise calculations were not tested on subjects in field study scenarios. Furthermore, leading acousticians disagree on the methodologies to measure, analyse, predict, and prevent wind turbine noise. Current guidelines rely on calculations that are based on variables that result in imprecise and inaccurate predictions of actual wind turbine noise and how people living nearby perceive the noise.

Therefore, wind turbines should not be sited near homes, communities, or other sensitive facilities, e.g. schools, and residential homes for special populations, such as the chronically ill or aged. The precautionary principle should apply.

The guidance for and the methodology to measure wind turbine noise should be straightforward and easily applied by local planning authorities and environmental health officers and – importantly – enforceable by them without delays. Denmark has introduced guidelines for wind turbine noise that reduces previous allowable levels; noise must now remain below limits both indoors and outdoors, and the guidance includes audible noise as well as inaudible noise, such as low frequency noise. Denmark's guidance also acknowledges that background noise does not mask wind turbine noise. Therefore, background noise is not a basis for setting audible noise levels. These standards comply with the WHO reports and their findings; the UK should do no less.

The dBA measure noise from the wind turbine(s) should not exceed levels in the bedroom at night with the window partly open, of not more than 30 dBA LAmax, nor within amenity areas around the home where the limit will be L night, outside, 30dBA, or as prescribed by the World Health Organization's research updates on environmental noise.

Regarding amplitude modulation (AM), the guidance must not exceed the parameters set in Planning Appeal Decision APP/Q1153/A/06/2017163,S.20: "20.a. A change in the measured LAeq, 125 milliseconds turbine noise level of more than 3dB (represented as a rise and fall in sound energy levels each of more than 3dB) occurring within a 2 second period.

20.b. The change identified in (a) above shall not occur less than 5 times in any one minute period provided the LAeq, 1 minute turbine sound energy level for that minute is not below 28dB.

20.c. The changes identified in (a) and (b) above shall not occur for fewer than 6 minutes in any hour."

[See Hulme, APP/Q1153/A/06/201163]

Public health policy for the environmental noise of wind turbines should link directly to the EC Environmental Noise Directive, and the WHO Guidelines for Community Noise, Night Noise Guidelines for Europe, and the Burden of Disease from Environmental Noise. These are reports by independent, international, multidisciplinary panels with expertise in their fields. As guidance is updated, national guidance should change to reflect current knowledge and practice.

To evaluate these guidelines and their implementation for national application, the UK Government should empanel an independent committee, based on the WHO model, i.e. comprised of medical experts independent of the wind industry, in sleep medicine, physiology, psychoacoustics, and epidemiology, and to consult with acousticians as deemed necessary. Although acousticians or medical experts working within or as consultants to the wind energy industry would be welcome to submit comments, they would have to recuse themselves from participation in devising guidance and methods. The panel should be led by the Public Health department of State, not by an agency such as DECC, whose objectives differ from those departments whose primary objectives are health protection and disease prevention.

Because prediction of wind turbine noise is an uncertain process, the principles with Lord Reay's bill, "Wind Turbine Minimum Distance from Residential Premises", presented to the House of Lords, should be adopted as a matter of urgency, but with these reduced set-backs, which accommodate more recent research and guidance, e.g. the Danish EPA guidance 2011, the State of Victoria, Australia guidance, the WHO Burden of Disease from Environmental Noise 2011.

Wind turbine heights (to blade tip)

Setback between nearest residence to the wind turbine height; up to 25m - 1km; 25m-35m - 1.5km;

35m-100m - 2km; Greater than 100m - 3km

[Lord Reay. Wind Turbines (Minimum Distances from Residential Premises) Bill [HL] 2010-11 http://services.parliament.uk/bills/2010-11/windturbinesminimumdistancesfromresidentialpremiseshl.html]

These should be considered minimum set-back distances depending upon, e.g., local terrain, the size of the array, terrain, blade flicker, and agricultural and community needs. As part of the application process, noise background levels should also be measured indoors, in rooms used by families or other sensitive facilities, e.g. the sitting/living room, other communal rooms, the study, as well as bedrooms, with the window of that room open.

Compliance testing and enforcement of conditions are essential; it is common practice in industrial situations. This is vital because noise prediction may need recalculation. The hours of operation may require limits or possibly shutdown during the night or in certain meteorological conditions.

Ongoing compliance with guidance and conditions is the responsibility of the wind turbine owners. A warranty should be provided to the local authority that certifies that the wind turbines will not exceed the prescribed noise emission levels. If the noise exceeds the allowable limit, then the wind energy company must close down the site until the Environmental Health Officer approves a plan for amelioration that will most likely meet the original conditions. Alternatively, the developer may arrange to purchase all neighbouring properties exposed to the environmental noise pollution, at their fair market value prior to the wind turbine scheme, plus compensation for moving home.

The local authority must also accept responsibility to investigate noise complaints.

To reiterate, the precautionary principle should prevail. Either locate wind turbines further away from homes and communities, or invoke a moratorium, in order to protect the public's health. The policy and the practice should be proactive, not reactive.

E-mail from Grwp Blaengwen Chair

We've attached a brief from a Britsh Medical Journal paper[i] which came out shortly after the Commitee's meeting in Carmarthen. We believe it fully endorses the committee's decision to refer the matter to the Assembly Health department. We would like to see a Welsh research project on the matter. We have also attached a copy of the World Health Organisation Guidelines[ii] for Europe, which we would be grateful for you to forward to the Minister and Committee Members, Both expose the shortcomings of the ETSU methodology in protecting health.

We have written in our responses to two current wind turbine applications that local people in Gwyddgrug and those who know what happens here have no reasom to have confidence in planning conditions based on ETSU -R-97. There's plenty more to be said about that but two points are, that the World Health Organisation's guidelines are quite clear that the ETSU limits are too high. And Mr Griffriths must agree that people should be able to have confidence in planning conditions... that they will be protected, and that local authorities have the resources they need, legal, human and financial, to fulfil their duties of care.

The fact remains that the previous Minister Jane Davidson wrote at the end of 2009 to Rhodri Glyn Thomas AM saying that there would be a review of TAN 8, and that his constiiuents would have opporetunties to comment, according to Assembly policy and practice. A copy of that letter was given to two members of the Environment Committee - William Powell and Russel George.

I'd be grateful if this information is placed before the committee

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[i] The British Medical Journal paper is included in the public papers pack

[ii] The World Health Organization guidelines can be found here:
http://www.euro.who.int/__data/assets/pdf_file/0017/43316/E92845.pdf

BMJ

BMJ 2012;344:e1527 doi: 10.1136/bmj.e1527 (Published 8 March 2012)

EDITORIALS

Wind turbine noise

Seems to affect health adversely and an independent review of evidence is needed

Christopher D Hanning *honorary consultant in sleep medicine*[1], Alun Evans *professor emeritus*[2]

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The evidence for adequate sleep as a prerequisite for human health, particularly child health, is overwhelming. Governments have recently paid much attention to the effects of environmental noise on sleep duration and quality, and to how to reduce such noise.[1] However, governments have also imposed noise from industrial wind turbines on large swathes of peaceful countryside.

The impact of road, rail, and aircraft noise on sleep and daytime functioning (sleepiness and cognitive function) is well established.[1] Shortly after wind turbines began to be erected close to housing, complaints emerged of adverse effects on health. Sleep disturbance was the main complaint.[2] Such reports have been dismissed as being subjective and anecdotal, but experts contend that the quantity, consistency, and ubiquity of the complaints constitute epidemiological evidence of a strong link between wind turbine noise, ill health, and disruption of sleep.[3]

The noise emitted by a typical onshore 2.5 MW wind turbine has two main components. A dynamo mounted on an 80 m tower is driven through a gear train by blades as long as 45 m, and this generates both gear train noise and aerodynamic noise as the blades pass through the air, causing vortices to be shed from the edges. Wind constantly changes its velocity and direction, which means that the inflowing airstream is rarely stable. In addition, wind velocity increases with height (wind shear), especially at night, and there may be inflow turbulence from nearby structures—in particular, other turbines. This results in an impulsive noise, which is variously described as "swishing" and "thumping," and which is much more annoying than other sources of environmental noise and is poorly masked by ambient noise.[4 5]

Permitted external noise levels and setback distances vary between countries. UK guidance, ETSU-R-97, published in 1997 and not reviewed since, permits a night time noise level of 42 dBA, or 5 dBA above ambient noise level, whichever is the greater. This means that turbines must be set back by a minimum distance of 350-500 m, depending on the terrain and the turbines, from human habitation.

The aerodynamic noise generated by wind turbines has a large low frequency and infrasound component that is attenuated less with distance than higher frequency noise. Current noise measurement techniques and metrics tend to obscure the contribution of impulsive low frequency noise and infrasound.[6] A laboratory study has shown that low frequency noise is considerably more annoying than higher frequency noise and is harmful to health—it can cause nausea, headaches, disturbed sleep, and cognitive and psychological impairment.[7] A cochlear mechanism has been proposed that outlines how infrasound, previously disregarded because it is below the auditory threshold, could affect humans and contribute to adverse effects.[8]

Sixteen per cent of surveyed respondents who lived where calculated outdoor turbine noise exposures exceeded 35 dB LAeq (LAeq, the constant sound level that, in a given time period, would convey the same sound energy as the actual time varying sound level, weighted to approximate the response of the human ear) reported disturbed sleep.[4] A questionnaire survey concluded that turbine noise was more annoying at night, and that interrupted sleep and difficulty in returning to sleep increased with calculated noise level.[9] Even at the lowest noise levels, 20% of respondents reported disturbed sleep at least one night a month. In a meta-analysis of three European datasets (n=1764),[10] sleep disturbance clearly increased with higher calculated noise levels in two of the three studies.

In a survey of people residing in the vicinity of two US wind farms, those living within 375-1400 m reported worse sleep and more daytime sleepiness, in addition to having lower summary scores on the mental component of the short form 36 health survey than those who lived 3-6.6 km from a turbine. Modelled dose-response curves of both sleep and health scores against distance from nearest turbine were significantly related after controlling for sex, age, and household clustering, with a sharp increase in effects between 1 km and 2 km.[11] A New Zealand survey showed lower health related quality of life, especially sleep disturbance, in people who lived less than 2 km from turbines.[12]

A large body of evidence now exists to suggest that wind turbines disturb sleep and impair health at distances and external noise levels that are permitted in most jurisdictions, including

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the United Kingdom. Sleep disturbance may be a particular problem in children,[1] and it may have important implications for public health. When seeking to generate renewable energy through wind, governments must ensure that the public will not suffer harm from additional ambient noise. Robust independent research into the health effects of existing wind farms is long overdue, as is an independent review of existing evidence and guidance on acceptable noise levels.

Competing interests: Both authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; CDH has given expert evidence on the effects of wind turbine noise on sleep and health at wind farm planning inquiries in the UK and Canada but has derived no personal benefit; he is a member of the board of the Society for Wind Vigilance; AE has written letters of objection on health grounds to wind farm planning applications in Ireland.

Provenance and peer review: Not commissioned; externally peer reviewed.

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Cite this as: *BMJ* 2012;344:e1527

For Attention of the Petitions Committee
Petition
Meeting 13th. March 2012

I have been asked by members of Galar, and the Blaengwen Group to offer further clarification to the letter I have sent to Mr. William Powell , because they feel it disadvantages their case if the committee are not fully aware of the implications of their visit to both Pendine and Alltwalis on the 27th and 28th. February.

The research on this petition was done entirely by myself from a design engineering background with a working knowledge of Health and Safety legislation regarding acoustics in the manufacturing sector. Knowledge on the wind turbine sector is through research, visiting conferences, visiting turbine sites and gathering information from engineers involved in the installation and operation of existing turbine sites over several years. The research for the petition was carried out by myself and though I discussed the reasoning with others, I didn't fully inform everybody on the technical detail and where the research took place.

I have visited Pendine, and because it has several attributes that would make it acceptable as a community, rather than commercial development; I used the information I got from that visit, in the research for the petition. Prime reasons I considered it more a community wind farm are: Turbines feed into local grid, (no transmission lines and pylons); blade tip height to land mass for shore sites, local involvement and landowner supports jobs with income, biodiversity projects etc. This specification was longer than the petition itself, so using Pendine as a model of turbines which would be acceptable the limit of 1.3MW (see petition para. three), as the community level turbine.

I would stress this does not mean that turbines of 1.3MW and below are noise free, but as most wind farm distress noise is caused by factors which are related to larger blade spans, or swept areas. 1.3MW was chosen as being the maximum size community projects would require, and turbines around that size tend to attract less noise complaints. I also believed that noise problems arising, in these circumstances, could be dealt with at a community level. It should be noted the Blaengwen turbines are 2.3MW installed ((or plate) capacity, 1MW greater than the 1.3MW we suggest as a community development. (43% larger).

What the petition set out to do, was point out a serious health problem, and at the same time offer what was considered a solution. Using a combination of existing legislation which was cost neutral to the developer, and yet relieved the County Councils of operating monitoring systems; which are laborious, expensive, confrontational and contentious. The system would also be cost neutral to the electrical consumer.

It was felt, when drafting the petition the Pendine type community project may be disadvantaged by being included alongside much bigger projects, so we included the 1.3MW break point. There is cross party political agreement in Wales on community energy projects, a view accepted by the majority in our group, and we do not want to obstruct developments which are locally approved and meet ecological and biodiversity parameters.

I apologise for the misunderstanding, and hope this explanation makes our intentions is clear.

James Shepherd Foster

John Griffiths AC /AM
Gweinidog yr Amgylchedd a Datblygu Cynaliadwy
Minister for Environment and Sustainable Development

Llywodraeth Cymru
Welsh Government

Eich cyf/Your ref P-04-329
Ein cyf/Our ref JG/05714/12

William Powell AM

Chair Petition's committee

committeebusiness@Wales.gsi.gov.uk

18 April 2012

Dear William,

Petition: P-04-329 control of noise from wind turbines

I am writing in response to your letter of 19 March, following the meeting of the Petitions Committee on 28 February.

All wind turbine developments proposed for Wales need to comply with the Planning system. Proposals under 50MW are considered by the Local Planning Authority and those above by the Infrastructure Planning Commission or the Department of Energy and Climate Change. The consenting authority is expected to give due consideration to the guidance contained within TAN 8 which endorses the ETSU-R-97 guidelines.

Following concerns raised about the consistency of approaches taken to the practical application of ETSU-R-97, the UK Government commissioned consultants Hayes Mckenzie to carry out a research project to analyse matters arising in the consideration of noise impacts when determining wind farm planning applications. The review highlighted the potential problems faced by local planning authorities dealing with noise assessments for wind farm sites, both in terms of the way the documents are structured, and in the variations in the way some factors are taken into account in the assessments. This suggested best practice guidance is required to confirm and, where necessary, clarify and add to the way ETSU-R-97 should be implemented in practice.

Variation in approach in a number of different areas was found including:

- Background noise measurements, and interpretation of data
- Prediction methodology used
- The way 'wind shear' is taken into account

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In addition, it is considered that guidance could usefully be provided on:

- Setting the day-time hours noise limit within the range specified by ETSU-R-97
- Dealing with the issue of modulation in the noise
- What constitutes a 'financially involved property'

Consideration could be given to:

- A simplified assessment procedure of limiting turbine noise to a fixed level
- The structure of planning conditions especially where cumulative impact of more than one site occurs.

Following the review, the Institute of Acoustics is leading a working group on establishing best practice guidance. Welsh Government Officials are part of this group. It is anticipated that a final version of guidance will be published in September.

With regard to the point you have raised on reviewing TAN8, in June 2010 Jane Davidson issued a Cabinet Statement which indicated how the previous government would meet its One Wales commitment to reviewing TAN 8. The approach adopted revised the over-arching chapter 12 of Planning Policy Wales (PPW) as well as an appropriate factual update of TAN 8 in a letter which was published alongside the revised policy. PPW was revised in February 2011 following a public consultation and TAN 8 was factually updated.

Best wishes,

John

John Griffiths AC / AM
Gweinidog yr Amgylchedd a Datblygu Cynaliadwy
Minister for Environment and Sustainable Development

P-04-384 Linc i'r M48 o B4245 Cadico/Rogiet

Geiriad y ddeiseb:

Mae'r ddeiseb yn gofyn i Lywodraeth Cymru adolygu'r penderfyniad diweddaraf i eithrio ffordd gyswllt M48/B4245 o Raglen Mesurau Gwella Coridor yr M4. Byddai ffordd gyswllt yr M48/B4245 i'r dwyrain o Wndy a Magwyr yn lleihau'r tagfeydd ym mhentrefi Rogiet, Gwndy a Magwyr. Byddai'r ffordd gyswllt yn gwella'r system drafnidiaeth integredig ac yn cyfrannu at les cymdeithasol y trigolion a'r economi leol.

Bydd methu â darparu seilwaith allweddol yn gwrthdaro â'r Cynllun Datblygu Lleol ar gyfer Cynllun Gofodol Cymru Sir Fynwy.

Cyflwynwyd y ddeiseb gan: Cllr James Harris

Ysytyriwyd am y tro cyntaf gan y Pwyllgor: 1 Mai 2012

Nifer y llofnodion: 275

P-04-385 Deiseb ynghylch rhyddhau balwnau a llusernau

Geiriad ddeiseb:

Rydym yn galw ar Gynulliad Cenedlaethol Cymru i annog Llywodraeth Cymru i ddeddfu yn erbyn rhyddhau balwnau a llusernau Tsieineaidd (neu lusernau awyr) i'r awyr yn fwriadol.

Cyflwynwyd y ddeiseb gan: Bryony Bromley

Ysytyriwyd am y tro cyntaf gan y Pwyllgor: 1 Mai 2012

Nifer y llofnodion: 564

Gwybodaeth ategol: Derbyniodd Eco-bwyllgor Rhanbarthol Caerdydd (sy'n cynnwys cynrychiolwyr o eco-ysgolion baner werdd Caerdydd) gynnig yn ddiweddar i weithio tuag at gael deddfwriaeth i atal rhyddhau nifer fawr o falwnau a llusernau Tsieineaidd/llusernau awyr yn fwriadol ar yr un pryd gan eu bod yn cael effaith niweidiol ar fywyd gwyllt, ar y tir ac yn y môr.

Rhyddhau balwnau

Cafwyd sawl achos o anifeiliaid gwyllt yn cael eu darganfod gyda balwnau latecs yn eu stumogau, a oedd yn rhwystro eu llwybr treuliad. Gall rhywogaethau morol, yn enwedig crwbanod morol a rhai adar môr, feddwl mai sglefren fôr, sy'n ysglyfaeth iddynt, yw'r balwnau ar wyneb y dŵr a'u llyncu neu efallai y byddant yn mynd yn sownd ac yn boddi. Unwaith y bydd balŵn wedi'i lyncu, gall rwystro'r llwybr treulio a gallai hynny arwain at farwolaeth drwy lwgu. Mae'r Gymdeithas Cadwraeth Forol wedi cynnal awtopsïau ar nifer sylweddol o anifeiliaid gwyllt yn y môr sydd wedi cael eu canfod wedi'u golchi ar draethau, gan gadarnhau effaith balwnau ar y llwybr treulio.

Mae Undeb Cenedlaethol yr Amaethwyr wedi hysbysebu'r risg y gall anifeiliaid sy'n pori dagu ar falwnau ac y gall falwnau halogi gwair, sydd eto'n peri risg o dagu (http://www.telegraph.co.uk/earth/agriculture/farming/8494881/Farmer-wins-compensation-after-Red-Nose-Day-balloon-kills-cow.html)

Mae ymgyrchoedd marchnata diweddar wedi awgrymu ei bod yn bosibl rhyddhau balwnau 'ecogyfeillgar' gan ddefnyddio balwnau bioddiraddadwy sy'n gallu pydru ar yr un raddfa â deilen Dderw.

- Mae lefel uchel o daninau mewn dail Derw a gall gymryd dwy flynedd iddynt bydru'n llwyr os na chânt lefelau uchel o olau haul neu ddŵr.

Yn dilyn gwaith ymchwil a wnaed yn 2008, mae Cadw Cymru'n Daclus wedi datgan y dylid ystyried bod rhyddhau balwnau'n fwriadol yn fath o daflu sbwriel. Ers iddo ddechrau cofnodi sbwriel ar ffurf balwnau fel rhan o'i arolwg LEAMS (System Archwilio a Rheoli Amgylcheddol Lleol) yn 2008-09, mae Cadw Cymru'n Daclus wedi gweld sbwriel ar ffurf balwnau ym mhob un o 22 o awdurdodau lleol Cymru. Yn un sir, gwelwyd sbwriel ar ffurf balwnau ar 17% o'r strydoedd.

Mae'r Gymdeithas Cadwraeth Forol wedi cynnal ymgyrchoedd i atal rhyddhau balwnau ers 1996, ac mae o leiaf 23 o awdurdodau yn y DU ar hyn o bryd yn gweithredu gwaharddiad ar ryddhau nifer fawr o falwnau ar yr un pryd. Mae'r data'n dangos bod cyfanswm y sbwriel ar ffurf balwnau a geir ar draethau Cymru wedi treblu dros y 15 mlynedd nesaf yn anffodus, wrth i'r arfer ddod yn fwy poblogaidd.

Mae tua 10% o'r balwnau a gaiff eu rhyddhau i'r awyr yn disgyn i'r ddaear mewn un darn. Mae'r ffigur hwn yn uwch pan fydd rhubanau a thagiau plastig wedi'u clymu wrthynt.

http://www.mcsuk.org/downloads/pollution/dont%20let%20go.pdf

Llusernau Tsieineaidd / Llusernau Awyr

Mae Asiantaeth y Môr a Gwylwyr y Glannau wedi cyhoeddi rhybudd ynghylch peryglon llusernau Tsieineaidd, ar sail y ffaith eu bod yn cael eu camgymryd am ffaglau a ddefnyddir os bydd pobl mewn perygl.

Mae'r RSPCA wedi rhybuddio y gallai'r weiren sy'n llunio strwythur y llusernau achosi "anesmwythder anhygoel" i wartheg os caiff ei llyncu.

Mae Undeb Cenedlaethol yr Amaethwyr wedi galw am wahardd llusernau Tsieineaidd, oherwydd y perygl y gallent ei beri i anifeiliaid sy'n pori.

http://www.bbc.co.uk/news/magazine-11265560

Oherwydd y perygl o dân, rhybuddiodd Cymdeithas y Prif Swyddogion Tân bobl i beidio â rhyddhau llusernau, gan ddweud, er eu bod yn edrych yn wych, ni ellir eu rheoli unwaith y maent yn yr awyr.

http://www.bbc.co.uk/news/uk-england-13934378

Mae Cymdeithas Hedfan Iwerddon wedi amlygu'r risg y mae llusernau'n ei beri i awyrennau ac y mae'n mynnu yn awr y dylid gofyn am ei chaniatâd cyn i lusernau gael eu rhyddhau yng Ngweriniaeth Iwerddon. Mae hefyd yn

mynnu y dylid hysbysu'r Uned Rheoli Traffig Awyr agosaf, Gwylwyr y Glannau Iwerddon a'r Orsaf Garda leol.

(Cyhoeddiad gan Gymdeithas Hedfan Iwerddon 'Sky Lanterns and the risk to Aviation'.)

P-04-387 Arwyddion a System Ddraenio ar yr A467

Geiriad y ddeiseb:

Ddydd Sadwrn, 18 Chwefror 2012, collodd gŵr a thad cariadus ei fywyd ar yr A467 mewn damwain car angheuol – damwain a allai fod wedi'i hosgoi, yn ein barn ni, petai gan y ffordd system ddraenio ddigonol. Byddai system o'r fath wedi sicrhau na fyddai modd i'r holl ddŵr wyneb gasglu ar y ffordd ac achosi i'r cerbyd sglefrio ar y dŵr. Nid oes arwyddion parhaol ar y ffordd ar hyn o bryd sy'n rhybuddio bod perygl o lifogydd arni.

Mae hon yn ffordd ddeuol brysur yng Nghymru a dylid bod ganddi system ddraenio briodol i ymdopi â'r amodau tywydd hyn er mwyn sicrhau diogelwch ar gyfer yr holl fodurwyr sy'n teithio arni.

Rydym yn deisebu i alw am newid y system ddraenio ar hyd y rhan hon o'r ffordd er mwyn sicrhau nad yw hyn yn digwydd eto ac nad oes yn rhaid i deulu arall ddioddef yn yr un modd. Mae angen codi arwyddion gwell er mwyn rhybuddio modurwyr o'r peryglon. Erfyniwn arnoch i wneud yr ymdrech i lofnodi'r ddeiseb hon – mae pob llofnod wir yn cyfri.

Cyflwynwyd y ddeiseb gan: Stacey Gallagher

Ysytyriwyd am y tro cyntaf gan y Pwyllgor: 1 Mai 2012

Nifer y llofnodion: 362

P-04-388 Diogelu'r arfer o addoli ar y cyd fel gofyniad cyfreithiol

Geiriad y ddeiseb:

Rydym ni, y rhai sydd wedi llofnodi isod, yn galw ar Gynulliad Cenedlaethol Cymru i annog Llywodraeth Cymru i ddiogelu'r arfer o addoli ar y cyd fel gofyniad cyfreithiol ar gyfer ysgolion yng Nghymru.

Mae addoli ar y cyd yn ofynnol yn ôl y gyfraith ym mhob ysgol yng Nghymru ar hyn o bryd, ac; mae'n rhoi cyfleoedd i blant a phobl ifanc ymchwilio i ysbrydolrwydd ac i ystyried materion bywyd; mae'n hyrwyddo lles corfforaethol ysgolion ac yn annog unigolion i lwyddo a, phan fydd siaradwyr allanol o'r gymuned leol yn cymryd rhan, mae'n hyrwyddo cydlyniant cymdeithasol; mae'n atgyfnerthu agweddau cadarnhaol; mae'n rhoi ymwybyddiaeth o farn drwy'r byd yn ehangach a dealltwriaeth o'r farn honno i blant a phobl ifanc; mae'n gwella llythrennedd crefyddol

Cyflwynwyd y ddeiseb gan: Jim Steward

Ysytyriwyd am y tro cyntaf gan y Pwyllgor: 1 Mai 2012

Nifer y llofnodion: 3,915 (llofnodion electronig ac ar bapur)

P-04-365 Protect buildings of note on the Mid Wales Hospital site

Petition wording:
We call upon the National Assembly for Wales to urge the Welsh Government to list or otherwise protect buildings of note on the former Mid Wales Hospital site. Unlisted but in the Conservation Area they are an invaluable part of the architectural and social heritage of Talgarth.

Petition raised by: John Tushingham

Date petition first considered by Committee: 28 February 2012

Number of signatures: 206

Supporting information: The Brecon and Radnor County Asylum had a Grand Opening in 1903. The souvenir booklet describes how thousands of people were present and every nook and corner of the huge building was inspected. Altogether the establishment was a wonder of its time. It is now in an appalling state of decay but this important example of an early Edwardian asylum of the compact arrow echelon style, designed by Giles, Gough and Trollope, noted by Pevsner and on SAVE Britain's' Heritage, Buildings at Risk register, is thoroughly worthy of conservation. Situated approximately half a mile from Talgarth in outstandingly beautiful countryside within the Brecon Beacons National Park, and Talgarth Conservation Area, it has a special relationship with Talgarth. Loss of any of the original/notable buildings would be an unacceptable loss of Talgarth's heritage assets.

SAVE
BRITAIN'S HERITAGE
70 Cowcross Street, London EC1M 6EJ

Petitions Committee of the Welsh Assembly
Cardiff Bay
Cardiff
Wales
CF99 1NA

Abigail.Phillips@Wales.gov.uk

21 February 2012

Dear Ms Phillips,

Talgarth Hospital, Powys

We write to give our strong support to efforts to save the former mental asylum at Talgarth. SAVE has been closely involved in finding solutions for a large number of mental hospitals being made redundant since we published the first comprehensive survey of the architecture of mental hospitals, *Mind Over Matter* in 1995. In our experience these large Victorian and Edwardian hospitals are eminently suitable for reuse. Almost all of them are built on fine south-facing sites to ensure there was constant fresh air and sun in the wards.

They are often laid out on impressive formal geometric plans. The hospital at Talgarth is on an arrow- shaped or echelon plan which gives all the wards good views out over the beautiful surrounding countryside. In addition, the small courtyards behind provide shelter from wind and intimacy of a small village.

We wish to point to three very successful examples of reuse of hospitals built on similar plans.

The first is the former Exe Vale Hospital outside Exeter. This is built on a radial plan and fell into a very serious state of decay considerably worse than Talgarth. It was nonetheless successfully rescued and converted as a mixture of flats and houses by the development company, Devington Homes. The hospital now makes extremely attractive homes for families and retired people and every unit has been sold. The following link - http://www.devingtonhomes.co.uk/devington-park.php illustrates how handsome the buildings now look, how attractive the homes are within and also shows the very well managed landscape around the hospital.

The second example is the former hospital at Moorhaven which is on the edge of Dartmoor National Park and is therefore very comparable to Talgarth. This has been successfully converted to a village community with houses and cottages in the former ward buildings and communal facilities in the hall, chapel etc.

The third is the former Warley Hospital outside Brentwood, Essex. This is laid out on an intricate plan of three-sided courtyards comparable to the layout at Talgarth. The courtyards have not been used for parking but have been planted as gardens providing an extremely attractive approach and outlook for the houses. A similar plan could be adopted at Talgarth.

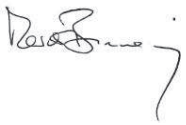
The Talgarth Hospital buildings are situated in a conservation area and there should be a strong presumption in favour of retention. We urge your authority to resist any application for demolition of the original stone-built hospital buildings. Completed in 1903 these are well and substantially built and all of a piece built to a carefully considered plan by the architects, Giles, Gough and Trollope.

The situation of the hospital outside Talgarth in the National Park means that a substantial residential development can be created without the need for new buildings that might be out of character in the park. There is also potential for a number of holiday lets which would encourage tourism to the area. Self-catering accommodation is becoming increasingly popular in all holiday destinations notably in Wales.

A number of the Talgarth buildings would adapt extremely well to this use.

A scheme along the lines we propose would leave the hospital surrounded by lawns and its attractive landscape setting would remain as it was when it was first designed. This is an exceptional opportunity to preserve a substantial complex of historic buildings in their original setting.

Yours sincerely,



Marcus Binney
President, SAVE Britain's Heritage

Cc: Abigail Phillips, Petitions Committee Clerk, National Assembly for Wales~
Petitions, National Assembly for Wales
John Tushingham, MWHAANG Secretary
Virginia Brown, MWHAANG

Powys

County Hall
Spa Road
Llandrindod Wells
Powys
LD1 5LG

William Powell AM
Chair – Petitions Committee
Welsh Assembly Government
Cardiff Bay
Cardiff
CF99 1NA

28 March 2012

Dear Mr Powell

Petition: Protect Buildings of Note on the Mid Wales Hospital Site

Thank you for your letter dated 7 March 2012 addressed to Mr J Patterson, the Chief Executive of Powys County Council. The letter has been forwarded to me for reply.

I note the intent of the petition is to urge Welsh Government to list or otherwise protect buildings of note on the former Mid Wales Hospital site. In responding to this petition on behalf of Powys County Council, the only view or opinion that I am able to offer is that the advice of Cadw should be sought on whether the buildings are of sufficient special architectural and or historic interest to merit listed building status.

Yours sincerely

County Councillor Wynne Jones
Cabinet Member
Regeneration & Culture

BRECON BEACONS NATIONAL PARK

Lle i enaid gael llonydd
One of Britain's breathing spaces

Mr W Powell AM	**Date 30th March 2012**
Chair Petitions Committee	**Officer: Rosie Burton**
National Assembly for Wales	**Title: Building Conservation Officer**
Cardiff Bay	**Tel: 01874 620433**
Cardiff, CF99 1FA	**Email:** rosie.burton@breconbeacons.org
	Our Ref Talgarth Conarea/RCB
	Your Ref

Dear Mr Powell AM

Petition: Protect Buildings of Note former 'Mid Wales Hospital' site

Thank you for notifying the National Park Authority (NPA) regarding the above petition. The following represents officer's views.

The NPA reviewed and consulted upon the extent of the Talgarth Conservation area in June and July 2011. The former Mid Wales Hospital site has been included within the confirmed extended Conservation Area. The NPA considered that the area had historical and architectural character it was desirable to enhance or protect.

Conservation areas are areas of historic and architectural character which the local planning authority consider are desirable to enhance and protect. The designation affords protection from the total demolition of building in that any proposal for redevelopment has to be approved by the local planning authority first via Conservation Area Consent. (Outside Conservation Areas planning permission is not required for demolition unless a building is listed.) Conservation Area Consent is unlikely to be approved without a full planning application for the redevelopment of the site being submitted concurrently. Consent is likely to only be granted if the existing buildings were shown to be beyond repair and the redevelopment was a significant enhancement to the Conservation Area.

From the perspective of retaining individual buildings Cadw approached the NPA on 1st March 2012 regarding the potential for listing any of the buildings. The NPA's response was to explain that at present the Authority was considering the approval process of a 'Local List of Historic Assets' criteria and if approved it was proposed to place some of the buildings at the Former Mid Wales Hospital on such a list. While this status would not afford statutory protection for the buildings, the local list is a material consideration in the determination of planning applications.

Awdurdod Parc Cenedlaethol Bannau Brycheiniog
Plas y Ffynnon, Ffordd Cambrian, Aberhonddu, Powys, LD3 7HP
Ffôn: (01874) 624437 Ffacs: (01874) 622574
E-bost: ymholiadau@bannaubrycheiniog.org
Safle ar y we: www.bannaubrycheiniog.org

Brecon Beacons National Park Authority
Plas y Ffynnon, Cambrian Way, Brecon, Powys, LD3 7HP
Telephone: (01874) 624437 Fax: (01874) 622574
E-mail: enquiries@breconbeacons.org
Website: www.breconbeacons.org

You will be aware that many of the buildings are in a very poor state of repair but three ones that may be in a reasonable condition are the main hall, the central office building and the chapel.

Cadw have a remit to make recommendations to the Minister regarding buildings that fulfil the criteria for Listing. I understand that Cadw have made a number of visits in the past to the site and concluded that there were no buildings worthy of listing. Our last correspondence with Cadw relating to this matter was at the beginning of March this year. We have not to date received any further correspondence from them.

If you require any further information please contact me or the Senior Heritage Officer Rosie Burton

Yours sincerely

Tracy Nettelton
Head of Strategy, Policy and Heritage

Awdurdod Parc Cenedlaethol Bannau Brycheiniog
Plas y Ffynnon, Ffordd Cambrian, Aberhonddu, Powys, LD3 7HP
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E-mail: enquiries@breconbeacons.org
Website: www.breconbeacons.org

Mae'r Awdurdod yn croesawu gohebiaeth yn y Gymraeg neu'r Saesneg

The Authority welcomes correspondence in Welsh or English

P-04-369 Deiseb yn erbyn y Llwybr Arfordirol o Gaerdydd i Gasnewydd a thu hwnt.

Geiriad y ddeiseb:
Rydym yn galw ar Gynulliad Cenedlaethol Cymru i annog Llywodraeth Cymru a Chyngor Cefn Gwlad Cymru, i derfynu'r Llwybr Arfordirol arfaethedig o gwmpas Cymru, yng Nghaerdydd.

Prif ddeisebydd: Roger Price

Ystyriwyd gan y Pwyllgor am y tro cyntaf: 28 Chwefror 2012

Nifer y deisebwyr: 14

Gwybodaeth ategol: Credwn y byddai gosod y llwybr rhwng Caerdydd a Chasnewydd a thu hwnt yn achosi aflonyddu gormodol a dinistriol ar y miloedd o adar gwyllt ar yr arfordir, sy'n hedfan i ffwrdd ar ddim (goddefgarwch o bobl, y Gylfinir: tua 400 llath, Pibydd y Mawn a'r Pibydd Coesgoch: tua 200 i 300 llath yn unig). Mae'r adar hyn yn dibynnu ar y llain tir cul a'r morfa heli hwn ger eu parth bwydo, i orffwys ac fel noddfa ddiogel.

Dynodwyd y lle fel Safle o Ddiddordeb Gwyddonol Arbennig at ddibenion cadwraeth, ac mae'n rhan o Gynllun Rhyngwladol Pwysig i Adar, Aber Afon Hafren. Bu'r safle hwn yn lloches am filoedd o flynyddoedd yn sicr, a chaiff ei fygwth yn aml.

Er bod nifer o ddewisiadau eraill ar gael i gerdded, nid oes dewis arall ar gael I'r cynefin arfordirol hwn.

John Griffiths AC /AM
Gweinidog yr Amgylchedd a Datblygu Cynaliadwy
Minister for Environment and Sustainable Development

Llywodraeth Cymru
Welsh Government

Eich cyf/Your ref P-04-369
Ein cyf/Our ref JG/05547/12

William Powell AM
Chair Petition's committee

committeebusiness@Wales.gsi.gov.uk

15 March 2012

Dear William,

Petition P-04-369 : Against the Proposed Cardiff to Newport Coastal Path

Thank you for you letter of 27 February regarding the above petition.

Important nature conservation designations exist along the Severn Estuary between Cardiff and Newport, including Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar designations. Careful consideration has therefore been given to the route of the Wales Coast Path in that area.

A thorough assessment has been carried out to evaluate the potential impact of the Path on local wildlife. The required Appropriate Assessment was completed by Cardiff, Newport City and Monmouthshire County Councils under the lead of the Countryside Council for Wales (CCW) in summer 2011. It concluded that the Path would not have an adverse effect on the integrity of the designated sites provided that mitigating measures were taken to ensure that at-risk species were well protected. These include improved screening, severe winter weather restrictions, and appropriate and effective signage. All required mitigation will be implemented.

The local authorities involved have undertaken with CCW to regularly monitor and review the arrangements, and we do not support the view held by the Petitioners.

Best wishes

John

John Griffiths AC / AM
Gweinidog yr Amgylchedd a Datblygu Cynaliadwy
Minister for Environment and Sustainable Development

Bae Caerdydd • Cardiff Bay
Caerdydd • Cardiff
CF99 1NA

English Enquiry Line 0845 010 3300
Llinell Ymholiadau Cymraeg 0845 010 4400
Correspondence.John.Griffiths@wales.gsi.gov.uk

To: Welsh Assembly Petitions committee.
From: Roger Price
Ref: P- 04 -369 Against the Proposed Cardiff to Newport Coastal Path and beyond.
Date: 22.04.2012

Thank you for your email of the 5th and attached letter ref JG/05547/12. Since originally sending information to the Petitons committee, I have written to eight Cardiff and Newport Assembly Members and also Newport Council. I also sent them two pages of 'The Severn Estuary Regulation 33' by Natural England and the CCW, in particular, item 5.7.2.3 on the subject of Vulnerability, which I enclose for your information and which accords with our viewpoint. I would like to repeat that our concerns are based on many years of experience of the response of the shorebird populations to human presence, and that is why we do not agree with the optimistic conclusions of the assessment previously made or that mitigation measures will be effective. We sympathise with the Minister because he is reliant on the information passed to him.

With regard to the suggestion that screening will be provided, that seems to me to be fraught with practical difficulties. Would it make sense for walkers to walk between Cardiff and Newport behind a screen? We consider some 5.5 of the 8.5 mile stretch Cardiff to Newport to be vulnerable to disturbance. Also there is a 2 mile stretch of saltmarsh at Collister Pill on the way to Chepstow to consider.

I enclose an explanatory sketch showing a cross section of some of the foreshore and the adjacent sea bank. Where the bank is separated from the immediate sea, it is an earthen structure typically approx. 8ft high or more. This is a very exposed area and has much stronger winds than the streets of Cardiff for example. It`s difficult to conceive of a strong appropriate form of screening, even made of galvanised steel, and the costs would be considerable and the appearance awful. I imagine the Minister`s letter relates to some very restricted screening and therefore ineffective.

The photo I enclose shows Peterstone saltmarsh looking towards Newport (Img 2076), with the seabank on the left, on top of which it is proposed to construct the Coastal Path. Photo Img 2506 shows Shelduck gathering on the grassy area close to this seabank at high tide. Rumney Great Wharf is used in the same way. Img 1773 shows a flock of Knot alighting behind Curlew at high tide in the same area. These photographs were only possible because the photographer was concealed from the birds, which were not far from the seabank. Img 1634 is of Dunlin and Knot alighting at Peterstone Gout Pill. Img 1639 is of a flock of about a 1000 Knot. We do get flocks of up to 5000 Dunlin, but I don`t have a photograph of this to show.

As you may know, the maps showing the route of the proposed coastal path are accessible on the CCW website www.ccgc.gov.uk. I have followed the path from the River Dee to Chepstow on the website and it must be remarked, that the path deviates from the coast on many occasions across fields and countryside and roads and into built up areas.

I have noted, starting in North and West Wales, as a minimum: 7 miles deviation from the coast at Penrhyndeudraeth. Fairbourne to Twyne 8 miles. Aberdovey to Borth 14 miles. Many miles around military firing ranges, nature reserves. Margam steelworks (6miles) and other industrial sites and docks. At Cardiff, having crossed the Barrage,the path is a street walk into Cardiff, up around the dock area and Atlantic Wharf and then back to Cardiff foreshore.

If terminating the Path at Cardiff is not acceptable, then I would argue that the only acceptable outcome from a responsible wildlife/birdlife conservation committed Government, would be to route the coastal path between Cardiff and Newport away from the coast and the B4239 (which has access points to the seawall and should therefore be avoided). In support of this I enclose a suggested route running across country just north of the Cardiff to Newport railwayline using existing tracks and roads but requiring some new tracks, total length 8 miles. This would be in line with what has been done elsewhere.

North East of Newport on the coast, we would suggest that the Collister Pill saltmarsh which has similarities with Peterstone, should be bypassed from Magor to Caldicot Moor and join the coast bypass which is already shown for the military firing range. I enclose a suggested route for this. In addition, an odd short deviation of the path from the road down to Goldcliffe Pill and back to the road, should be deleted in our view. These Pills or creeks are formed where the reens drain into the sea through sluices.

Their sheltered thick muddy habitat is particularly attractive to certain wading birds like Shanks, Sandpipers , Herons, Egret and also duck. So the less disturbance the better for these often scarce species.

If these new inland Coastal Path routes bypassing sensitive areas important to birds were adopted, our most important concerns would be addressed. In addition there would be much less of a requirement for effective regular Local Authority monitoring etc. with the associated costs, and the paths themselves, protected from the harsher environment close to the shore, should require much less maintenance.

Yours Sincerely

Roger Price - writing on behalf of those supporting the Petition.

Enclosures :
Severn Estuary Regulation 33 front page.
Reg.33 Item 5.7.2.3—Vulnerability.
Cross sectional sketch of the zones close to the seabank.
Photo jpeg image 2076 Peterstone Saltmarsh and seabank.
Img 2506 Shelduck social gathering at high tide.
Img 1773 flock of Knot alighting behind group of Curlew at high tide .
(Knot migrate from Arctic Canada and Greenland to the UK for the winter).
Img 1634 Dunlin and Knot alighting on the mudflat at Peterstone Gout Pill.
Img 1639 a flock of the same Knot about 1000 in number.

Severn Estuary Regulation 33 Front Page

The Severn Estuary / Môr Hafren European Marine Site

comprising :

The Severn Estuary / Môr Hafren Special Area of Conservation (SAC)

The Severn Estuary Special Protection Area (SPA)

The Severn Estuary / Môr Hafren Ramsar Site

Natural England & the Countryside Council for Wales' advice given under Regulation 33(2)(a) of the Conservation (Natural Habitats, &c.) Regulations 1994, as amended.

June 2009

NATURAL ENGLAND

Cyngor Cefn Gwlad Cymru
Countryside Council for Wales

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

A Welsh version of all or part of this document can be made available on request from the Countryside Council for Wales

Reg.33 Item 5.7.2.3 – Vulnerability

affect the suitability saltmarsh areas as resting and roosting sites for birds where open terrain with low vegetation is an important factor.

viii. Noise or visual disturbance

Overwintering birds are disturbed by sudden movements and sudden noises. This can have the effect of displacing the birds from their feeding grounds. Disturbance can prevent the birds from feeding and in response they either a) decrease their energy intake at their present (disturbed) feeding site through displacement activity, or b) move to an alternative less favoured feeding site. Such a response affects energy budgets and thus survival. There is intermittent disturbance to the internationally important migratory species and the waterfowl assemblage from both the landward and seaward side of the site which has increased in recent years, due to the estuary becoming more populated and the development of all weather recreational pursuits. All supporting habitats are currently **highly vulnerable** to noise and visual disturbance.

ix. Toxic contamination through the introduction of synthetic and/or non-synthetic compounds

Waterfowl are subject to the accumulation of toxins through the food chain or through direct contact with toxic substances when roosting or feeding. Their ability to feed can also be affected by the abundance or change in palatability of their prey caused by toxic contamination. At the moment there is no evidence to show that this is the case on the Severn Estuary, but the estuary is vulnerable to oil spills and there is a continuous discharge of toxins into the estuary, some of which bind to the sediments. This is an area that requires further assessment. The intertidal mudflats and sandflats and the saltmarsh are currently **highly vulnerable** to the introduction of synthetic and non-synthetic compounds.

x. Changes in nutrient loading

Changes in organic or nutrient loading can change the species composition of the plants on the saltmarsh and thus the structure of the sward. Increases in nutrients can cause excessive algal growth on the mudflats, denying the birds access to their invertebrate prey and changing the invertebrate species composition in the sediment. However, high nutrient loads can also be beneficial to some species of birds by increasing the density and size of prey items. Though the water quality has been improved in recent years there are still local areas of concern. On balance, any increase in nutrient loading should be avoided. At present the intertidal mudflats and sandflats are **moderately vulnerable** to this category of operation.

xi. Changes in thermal regime

It is thought unlikely that changes in the thermal regime within the Estuary will affect the designated bird species of the assemblage directly but such changes may have marked effects on the community composition of supporting habitats on which these species are dependant for feeding. The intertidal mudflats and sandflats of the estuary are considered to have **moderate sensitivity** and **moderate exposure** and therefore **moderate vulnerability** to changes in thermal regime. Impacts on these habitats may affect the long term survival of individuals (in terms of energy and competition) or alter behavior and patterns of use or distribution.

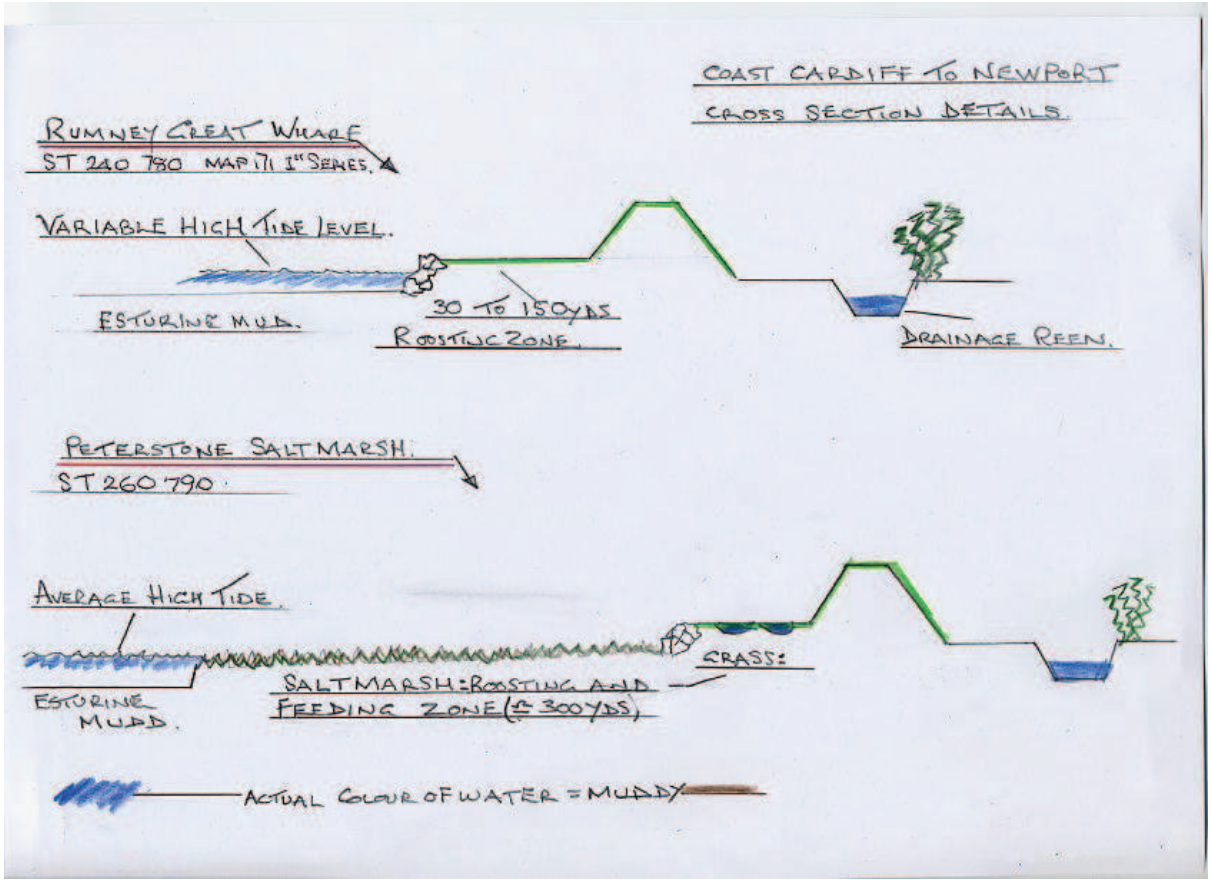
xii. Changes in salinity

It is thought unlikely that changes in salinity within the Estuary will affect the waterfowl assemblage feature directly but such changes may have marked effects on the supporting habitats on which these species are dependant for feeding. The saltmarshes, intertidal mudfalts and sand flats and hard substrate habitats (rocky shores) of the estuary are considered to have **low to moderate sensitivity** and **high exposure** and therefore **moderate to high vulnerability** to changes in salinity. Impacts on these habitats may affect the long term survival of individuals (in terms of energy and competition) or alter behavior and patterns of use or distribution.

xiii. Changes in oxygenation

It is thought unlikely that changes in oxygenation within the Estuary will affect the waterfowl assemblage feature directly but such changes may have marked effects on the community composition of supporting habitats on which these species are dependant for feeding. The saltmarshes, intertidal mudfalts and sand flats and hard substrate habitats (rocky shores) of the estuary are considered to have **low sensitivity** and **high exposure** and therefore **moderate vulnerability** to changes in oxygenation. Impacts on these habitats may affect the long term survival of individuals (in terms of energy and competition) or alter behavior and patterns of use or distribution.

Cross sectional sketch of the zones close to the seabank



Peterstone Saltmarsh and seabank

Shelduck social gathering at high tide

Flock of Knot alighting behind group of Curlew at high tide

Dunlin and Knot alighting on the mudflat at Peterstone Gout Pill

Flock of Knot about 1000 in number

P-03-238 Llygredd ym Mornant Porth Tywyn

Geiriad y ddeiseb

Deiseb gan drigolion Sir Gaerfyrddin yn gofyn am ymchwiliad cyhoeddus gan Lywodraeth Cynulliad Cymru i'r llygredd carthffosiaeth ym Mornant Porth Tywyn a Bae Caerfyrddin.

Cyflwynwyd y ddeiseb gan: Rhys Williams

Nifer llofnodion: 2240

Ystyriwyd gyntaf gan y Pwyllgor: Medi 2009

Petitions Committee Site Visit to Burry Port

27 February 2012

The Committee received a petition calling for 'a public inquiry by the Welsh Assembly Government into the sewage pollution of the Burry Inlet and Carmarthen Bay' in 2009. The petition, which was submitted by Rhys Williams and collected 2,240 signatures, resulted from concerns that pollution from combined sewage overflows (CSOs) in Burry Inlet was adversely affecting the cockle population and may be the cause of the premature cockle mortalities there. On 27 February, the Committee visited Burry Port to hear from local people about the problems.

Cllr Bill Thomas addressed the Members, giving detailed information about the problems of pollution and premature cockle mortalities. Among the points made by Cllr Thomas were that:

- Cockle gatherers do not believe pollution to be solely responsible for cockle deaths, but do believe it to be a contributory factor;
- Since 2005, the mortalities have begun every May;
- The cockles now spawn at eight months rather than two years;
- The testing done in the area, which has concluded that sewage is not responsible for the cockle mortalities, is unreliable as it was done at high tide and at one site only;
- The high incidence of overspills is not effectively recorded by the relevant agencies;
- Significant investment has been made in UV treatment, but it has been suggested that this treatment is not appropriate for the water at Burry Port;
- The pollution will worsen when 16,000 new homes are built under the LDP;
- The export industry and local economy has been hit severely by the cockle mortalities but campaigners are also concerned about the impact of the pollution on the environment;
- An effluent plan for the area is urgently needed

The Chair of the Cockle Association told Members how the problem has affected cockle pickers' livelihoods, meaning that they now survive on roughly 12 weeks' work a year.

Members stated that the following actions are available to them:

- Individual Members are able to raise the issue during Plenary business
- As Members of the Environment and Sustainability Committee, William Powell and Russell George could request that that Committee give the matter urgent consideration
- The Petitions Committee can request oral and/or written evidence from relevant bodies and can produce a report on the issue, which would include recommendations to the Welsh Government.

Committee Service
March 2012

Environment Agency Wales update to the Welsh Assembly Petitions Committee on the outcome of the Burry Inlet Cockle Mortality Investigation Report 2009-20011, dated 17January 2012

Following the recent completion of the investigations into the mass mortalities of cockles in the Burry Inlet, we are now able to provide the following summary of the report's main findings, conclusions and recommendations. We have also outlined how the information will be used to improve the management of the fishery to better serve the needs of the community and the environment on which it depends.

Project Background and History

The Burry Inlet is a large estuarine complex located in South Wales between the north coast of the Gower Peninsula and the south-east coast of Carmarthenshire. Chronic mass mortalities of cockles (*Cerastoderma edule*) in the Burry Inlet have been observed annually since 2002. In 2008, the Welsh Government asked Environment Agency Wales to co-ordinate and facilitate an investigation into the cockle mortalities. This was developed , in collaboration with Hull, Bangor and Swansea Universities, Centre for Environment, Fisheries & Aquaculture Science (CRFAS) and the Countryside Council for Wales.

The original two-year programme was extended by one year to undertake more integrated data analyses. The study aimed to understand the causes and consequences of cockle mortalities in relation to their fisheries and to inform future management of the cockle beds. It also addressed the socio-economic and environmental sustainability of the cockle fishery. The study reviewed existing literature and undertook a detailed field sampling and laboratory programme during March to July 2009 at two sites in the Burry Inlet and a comparison site in the Dee Estuary. The study was comprehensive, including the health of the cockles and the other estuarine fauna, the nature of their populations, the types and quality of the sediments and the water quality.

Although the study focused on the Burry Inlet, its fishery and cockle population, the methods used and findings will be very relevant to other similar areas, species and fisheries that may be experiencing similar problems. The overall study provides an understanding of the populations in relation to both the functioning ecology and human activities in the area.

The technical report is divided into four main sections, in addition to references and appendices:

1. Scientific Reviews (Water Quality, Physical Characteristics of the estuaries and the cockle beds, Ecology and Dynamics of cockles, other bivalves and the other sand flat fauna, Cockle Individuals and Health);

2. Scientific Investigation undertaken in 2009 (Water Quality, Ecology and Dynamics, Cockle Individuals and Health, Combined Data Analysis);

3. Fisheries Management;

4. Conclusions and Recommendations.

The project began by bringing together the local community, policy makers and scientists to systematically map out all possible causes of cockle mortalities in a typical estuarine area such as the Burry Inlet. This produced a set of questions which could be tested through scientific investigation to confirm or eliminate possible causes of cockle deaths. Hence the research objectively tested:

- Whether the mortalities were as evident as the anecdotal evidence suggested and, if so, whether similar patterns of mortality could be seen in other species in the estuary. Were they related to water or sediment characteristics and thus related to 'external' factors such as pollution:

- Were they caused by 'internal' cockle factors such as abnormal growth, early spawning or pressures from overcrowding, or:

- Were they caused by, or reflected in, the physiological health of the organisms and their parasite levels.

We know that typically first-year cockles always suffer much higher mortality rates than older cockles, and most populations experience occasional mass mortalities. There is little analytical work on these mass mortalities and hence the research aimed to determine if possible whether the observed patterns were normal or abnormal for cockle populations.

Summary of Main Findings

The report is clear that there is no evidence that pollution in the water or sediment is related to the mortalities. The study suggests that the nutrient and organic conditions in the Burry Inlet are producing good growth of young cockles. With time, it is expected one of two alternatives may arise – either this new state stabilises and becomes typical for the area, or the population gradually regains its former characteristics with an increasing number of older individuals surviving to rebuild the typical age structure as suggested by more recent stock survey results.

The investigations found no single cause of the mortalities but the report makes clear there may be several, possibly interacting causes

and that the cause(s) of the initial mass mortality may differ from the cause(s) of the continuing mortalities.

The report concludes that the Burry Inlet cockle populations have gone from an apparently stable population, composed of several age classes and supporting a lucrative fishery, to one in which high recruitment produces a first-year cohort which has good growth, and gives an early and successful reproduction (spawning) but is then followed by death. The analyses indicate correlations between the mortalities and overcrowding, parasite load, energy imbalance, and/or condition loss together with a lesser influence of sedimentation. The investigation has been unable to determine the relative influences of each of these factors on total mortality or whether some are causes or merely symptoms of the problems observed.

The study, using field observations and laboratory analyses, has produced a large amount of data, information and understanding about the cockle mortalities. More robust modelling of the data collected, supported by field- and laboratory-based experiments is needed so that future management options may be more effectively focussed.

Areas of uncertainty that remain include:

- the effects of population density on cockle physiology, energy budgets, and their micro-habitat;
- the role of parasites in cockle health and mortality;
- longer-term patterns of behaviour -- future monitoring of the cockle population may highlight trends not observed during this short-term study;

Further investigations are also recommended in support of future fisheries management:

- investigate the options for dividing the Burry Inlet into management areas as this would allow each area to be managed separately (rotational harvest and bed closure) while still allowing for the management of the whole estuary;
- redesign the stock survey methodology to provide higher accuracy of overall biomass estimates. This will allow a better apportioning of the available stock to better balance the demands of the fishery and ecology;
- model the options for cockle size limits to optimise both stock sustainability and the economic return from the fishery;

- determine whether there are biosecurity issues with the movement of cockles into and out of the Burry Inlet and whether this could have contributed to genetic and health changes.

Conclusions

- During the period March to July 2009 there were high but uniform mortalities of end-of- 1st-year cockles in the Burry Inlet, i.e. there was no apparent episodic mass mortality. The mortalities were balanced by high recruitment

- There is documented evidence of a seasonally-reduced flesh condition, use of body reserves and energy, in the Burry Inlet cockles. These processes are part of the 'normal' cockle life cycle although cockles elsewhere usually survive spawning to live and spawn in successive years. In the Burry Inlet, however, these declines are correlated with spawning, after which the cockles showed increased mortalities.

- Spawning produced a high spatfall thus allowing the population to persist on an annual basis. The resulting high densities of 1-year cockles may be sufficient to cause problems linked to overcrowding, which in turn may affect the ability of the cockles to remain in the sediment.

- High levels of some internal parasites could have caused mortalities in the Burry Inlet but are unlikely to be a primary cause of death, i.e., the infections probably occur in already stressed individuals. Although these levels of parasitism may themselves stress the cockles, these are not sufficient alone to account for the mortalities. Data collected by Cefas throughout the 2000s on prevalence and intensity of parasite infections from the Burry Inlet cockle populations , however, indicate that their frequency was higher earlier in the decade than during this study. It is possible therefore, that parasites may have been more problematical prior to 2009 and less so during the recent intense field campaign.

- There was immunological evidence of stress but this occurred at all sites, both in the Dee and Burry Inlet and again the evidence was insufficient to indicate this as a cause of death. .

- Sediment changes leading to tidal elevation changes occur in all tidal flat systems. Accretion can potentially stress cockles by raising their position in the tidal range. This is considered unlikely in the Burry Inlet given cockles' normal environmental tolerances. Similarly, the remaining benthic community in the estuary (i.e., apart from cockles) did not show any adverse changes, again reinforcing the conclusions that physico-chemical factors were not the causal agents of the elevated mortalities seen in the cockle populations of the Burry Inlet.

- There were no gross changes of water and sediment quality in the Burry Inlet sufficient to stress the cockles. The Burry Inlet nutrient levels are typically in the mid-range shown for a large suite of UK estuaries, and it is of particular note that cockle mortalities were not regarded as being of concern during previous periods of elevated nutrient levels.

- With regard to contamination levels, the estuary shows higher metals concentrations than other estuaries around the UK, reflecting its industrial history. The levels are not, however, considered sufficient to cause any toxic effect in the cockles; for example, the levels of copper were shown to be significantly below the environmental quality standard (EQS, the level of a contaminant that can safely be allowed in the environment without causing ecological harm). It is also significant to note that copper levels were higher historically and yet abnormal cockle population mortalities were not recorded and the fishery was profitable.

- The study focussed on the causes of the mortality during 2009 hence it is not possible to make comparisons with "catastrophic" mortalities reported in 2005. The anecdotal evidence of the 2005 mortalities, using images made available by the cockle gatherers, suggest that the mortality level was indeed a lot higher, especially in 2005, than seen in 2009.

- Similarly, in assessing whether the mortalities are becoming less acute year on year, numbers published in the recent stock survey reports suggest that more cockles are surviving beyond the first year. It is not possible to say whether this is a trend although survey data show that the mortality levels are not increasing.

Consultation and Future Considerations

The authors of the report presented their draft findings to the Cockle Working (steering) Group and members of the Burry Inlet Management Advisory Group (BIMAG) in October 2011. These groups, which include industry representatives (both cockle gatherers and processors, who represent the petitioners) were given an opportunity to discuss and comment on the findings during the meeting and were personally invited by Professor Mike Elliott (the report's main Author) to submit their points or objections in writing so that they could be formally considered

The scientific authors of the report can only provide conclusions based on the data and analyses available. Environment Agency Wales and its partners and stakeholders are currently considering the detailed implications of the report, its conclusions and recommendations, and how these might influence future management approaches. Management approaches will be developed in consultation with the industry to maximise the chances of returning to an economically and ecologically sustainable fishery, although this desired outcome is by no means certain.

A number of ongoing independent investigations, notably the INTERREG funded SUSFISH (Shellfish Productivitiy in the Irish Sea) project, are likely to further our understanding and address some of the areas of uncertainty identified. Even so, if opportunities occur, further specifically targeted investigations (primarily modelling or experimental) will be proposed to directly improve the effectiveness of the management of the fishery.

Environment Agency Wales, as part of its two-year stewardship of the Burry Inlet Regulating Order on behalf of the Welsh Government, intends to produce a Management Plan by April 2012. This will draw on the best available scientific evidence, including the Burry Inlet Cockle Mortalities Investigation Report, to help recreate a thriving cockle fishery that supports, protects and enhances the needs of the local community and the environment on which it depends.

Environment Agency Wales written evidence to Petitions Committee on P-03-238 Pollution of the Burry Inlet

Background

The Petitions Committee is currently considering a petition calling for a public inquiry by Welsh Government into the sewage pollution of Burry Inlet and Carmarthen Bay. Concerns have also been expressed by cockle gatherers and others that discharges of sewage are implicated in the premature deaths of cockles within the Burry Inlet, which have been an annual occurrence since 2002.

In response to these concerns, in 2008 Welsh Government commissioned, through Environment Agency Wales (EA Wales), a scientific investigation to establish the causes of the mortalities. The final report on this independent investigation was completed in January 2012, a summary of which has already been provided to the Committee.

This further briefing provides information on the role of EA Wales in ensuring that the water quality within the Burry Inlet complies with the standards contained within relevant EU Directives. The briefing also summarises proposals for further improvements to provide consistent long term compliance with the required standards.

Current water quality in the Burry Inlet and Carmarthen Bay

EA Wales is responsible for ensuring that water quality in the Burry Inlet meets current EU standards, as well as tougher standards being introduced in the future. Our routine monitoring confirms that the water quality in the Burry Inlet is currently good and that the trend is improving. We have put extra monitoring in place and we are using our powers to ensure that we achieve the higher standards expected in the future.

The following findings of the recent independent investigation coordinated by the University of Hull supports the our view of the current position;

- No evidence of mortality link to water quality (other benthos is not affected).
- The Burry Inlet is a highly dynamic marine environment with good mixing.
- Elevated nutrients (phosphorous) highlighted but not unusual for this type of shallow embayment and no evidence of any adverse secondary effects.
- Elevated nutrient levels probably contributed to thriving fishery in the past.
- Metals are higher than other areas, but lower than historically (when there was no mortality problem) and below current Environmental Quality Standard limits.
- Pesticide levels are low and within statutory limits.
- Dissolved Oxygen levels are good overall and do not compromise cockle survival and growth
- No gross bacteriological contamination

We also undertake monitoring to enable reporting of compliance with EU Directives and we have regard to the required standards in these Directives in applying controls to, and regulation of discharges to the water environment.

The following Directives are of particular relevance to the Burry Inlet:

Shellfish Waters Directive

The water quality of the Burry Inlet has complied with all of the mandatory and guideline chemical standards of the Shellfish Waters Directive since 2003.

The Guideline standards also include an assessment of the concentrations of faecal coliform bacteria in shellfish flesh, which in the Burry Inlet, like many other shellfish waters, is proving challenging to meet.

Research work is ongoing to better understand the link between faecal indicators in the water column and shellfish flesh (for public health protection purposes of consumed shellfish).

Run off from land, such as from agricultural sources and point source discharges from water company assets are sources of bacterial inputs and local investigations are underway to better understand these relationships.

Habitats Directive

To have required measures in place by 2015, we have reviewed over 500 permits to assess their current impact on the marine environment of Carmarthen Bay and Burry Inlet.

We have modified the permits for waste water treatment works at Llanelli, Parc y Splott near Carmarthen and Pontyberem as well as Llannant and Gowerton in the Swansea area. This is to reduce the level of nutrients entering the Inlet.

Water Framework Directive (WFD)

The Burry Inlet and Loughor Estuary are currently achieving good chemical status under the WFD target classifications but are classified as bad/moderate for macrophytes (seaweeds). This is believed to be linked to elevated nutrients, for which reduction plans exist.

The WFD is a major opportunity to improve the whole water environment and to promote the sustainable use of water for the benefit of people and wildlife alike.

Implementation of the WFD will take place in a series of planning cycles. This will allow plans to take into account long-term environmental trends (such as climate change) and improved understanding of river basin characteristics. The first cycle must be completed by 2015. Reviews then take place every six years.

Bathing Waters Directive

There are three EU designated bathing waters around the Burry Inlet; Pembrey (Cefn Sidan), Pendine, and Rhossili. All three beaches normally achieve the strict guideline water quality standards within the current Directive. A revised Directive is being implemented from 2012 and under the new classification scheme the projected classification for Pendine and Pembrey is “good” and for Rhosilli is “excellent”.

The primary pressure on these bathing waters is considered to be diffuse pollution, mainly from agricultural activities. The beaches are located adjacent to the large three rivers estuary of the Taf, Tywi and Gwendraeth, all of which will have elevated bacteria levels following heavy rain owing to diffuse agricultural sources, and combined sewage discharges.

Urban Wastewater Treatment Directive

The Urban Wastewater Treatment Directive (UWWTD) sets minimum standards for the treatment of sewage discharges from communities around the Burry Inlet.

This has been a primary driver for a major investment programme by Dwr Cymru Welsh Water (DCWW) since the early 1990s. This investment has led to major reductions in the loadings of sewage effluents and some additional storage and treatment for excess flows of sewage from Combined Sewer Overflows during wet weather events. The drainage systems in the area, as for many urban drainage systems elsewhere, receive both wastewaters and clean surface water and these overflows are required to prevent flooding.

The UK and Welsh Governments were notified by the European Commission in June 2009 that deficiencies in the sewerage networks of Llanelli and Gowerton were possibly in breach of the requirements under the UWWTD. A complaint had been raised by concerned members of the public and the initial enquiry from Europe was in relation to comments raised.

Welsh Government instructed EA Wales to review the current situation and ensure that any risk to compliance of European Directives was tackled. Since the initial query in 2009, Welsh Government has provided regular updates to the Commission on plans and progress to improve the infrastructure in both Llanelli and Gowerton

We have been working closely with DCWW to investigate the current situation and make any necessary improvements to the sewerage networks of both catchments. Extensive sewer network monitoring has been completed by DCWW for both drainage catchments. The results of the monitoring have been fed into a computer modelling exercise and used to confirm the current operational effectiveness of all key foul drainage systems within the catchments.

We have overseen the monitoring programme. DCWW has developed new network models of the sewerage catchments and an independent auditor was appointed to oversee each stage of the model verification. A full audit trail of the process of verification has also been produced. The new models provided for both catchments provide an accurate representation of the drainage and treatment systems discharging into the waters of the Burry Inlet.

A plan has been developed to ensure that the infrastructure in both catchments is adequate to meet the current requirements and future growth. DCWW is currently developing options to reduce the predicted storm spills from all sewerage and treatment assets in Llanelli and Gowerton to 10 spills per annum. This will be in line with UK policy for discharges to Shellfish Water.

DCWW plans to use a mixture of engineering solutions such as storing storm water, and more sustainable solutions such as removing large amounts of surface water, creating more natural attenuation and promotion and development of sustainable urban drainage solutions within the catchments.

All known developments identified under the Carmarthenshire and Swansea Unitary Development Plans have been included in the options appraisal stage.

DCWW is currently undertaking 10 projects aimed at removing up to 25% of surface water within the sewerage networks by March 2015. A detailed programme for a further 180 projects is being developed for delivery within the shortest feasible time period, probably over the next 8-10 years.

Flood Risk reduction

In addition to the work being undertaken on the sewerage network, risks of flooding from surface drainage, watercourses and tidal sources are being addressed.

EA Wales has progressed a number of schemes in the Llanelli area to reduce the risk of flooding of properties and this programme is continuing, with work currently underway on a scheme at Pwll.

Given the complex interactions between foul drainage and surface drainage systems the relevant organisations are working together through the Llanelli Technical Flood Group to gather information and develop solutions to potential sources of flooding within the catchments. The Group has identified all known flood risk issues in Llanelli, highlighting current and future mitigation works and identifying potential work to reduce surface water discharges into the town's combined sewerage system.

Many of the 60 plus schemes identified by the desktop study undertaken by the group have now been incorporated into the DCWW improvement plan. The Technical Group will continue to administer the multi-agency surface water reduction programme, providing an interface between developers, local authority planners and engineers from DCWW and EA Wales to ensure the most effective solutions are adopted within all land use planning developments.

Further development within the sewerage catchments of Llanelli and Gowerton

Concerns about the frequency of spills from Combined Sewer Overflows and the need to have regard to the requirements of EU Directives has led to a precautionary approach to new developments within the Llanelli and Gowerton sewerage catchments.

Arrangements were put in place in 2008 through a Memorandum of Understanding (MoU) between Carmarthenshire County Council, the City and County of Swansea, Countryside Council for Wales, Dwr Cymru Welsh Water and EA Wales. Initially, this MoU required that for any new developments to be connected into the sewerage systems, equivalent reductions in hydraulic loading through removal of clean surface water needed to take place.

Subsequent development of the MoU has extended this approach. Carmarthenshire County Council and the City and County of Swansea have jointly funded a phosphate reduction treatment process at Llanant Sewage Treatment to enable new developments to continue

within defined limits. The current MoU now requires betterment in terms of hydraulic loading for new development, with twice as much surface water needing to be removed for any new hydraulic loads on the sewerage systems.

Summary

We understand and share the concerns of the Petitioners to safeguard the Burry Inlet. Extensive independent studies and investigations have been carried out that confirm water quality within the Burry Inlet is good. This accords with the monitoring undertaken by EA Wales in relation to the requirements of EU Directives.

There is no evidence that water quality is linked to the mortalities of cockles within the Burry Inlet and a combination of biological factors is considered to be the likeliest cause.

Considerable improvements in effluent discharges have taken place over the past 20 years through investments required of DCWW to meet EU Directive standards. Further investment will be required by 2015 to meet the requirements of the Habitats Directive.

It is accepted that further investment is required to address deficiencies in the sewerage systems of the Llanelli and Gowerton catchments and to reduce the frequency of spills from Combined Sewer Overflows. Following a comprehensive programme of drainage investigations and computer modelling, a programme of improvements has now been identified that will deliver major reductions in surface water entering foul drainage systems by 2015 (estimated 25% reduction) with a further programme of work in subsequent water company investment plans over the next 5-10 years.

The phased improvements should enable required sewage spill frequencies to be achieved, alongside accommodating planned new developments. In the meantime, the MoU between the relevant agencies will allow some development to take place alongside protection of the Burry Inlet.

The comprehensive assessments of surface drainage systems, watercourses and foul drainage will provide the foundation for integrated management and solutions to flooding problems in the area and the implementation of innovative sustainable urban drainage solutions.

Environment Agency Wales
17 April 2012

DCWW Submission to the Petitions Committee of the National Assembly for Wales

1. Summary

In 2009 the Petitions Committee received a petition from Rhys Williams which had collected 2,240 signatures in support of its case. The petition called for "*a public inquiry by the Welsh Assembly Government into the sewage pollution of the Burry Inlet and Carmarthen Bay*" and arose from concerns that pollution from combined sewer overflows (CSOs) in the Burry Inlet are adversely affecting the cockle population and may be the cause of the premature mortalities there.

The Committee visited Burry Port on the 27th February to hear from local people. Councillor Bill Thomas made a detailed presentation and submitted a large file of information to the Committee in support of his case. Due to the length of Councilllor Thomas's presentation and the limited time available, there was no opportunity to respond to the assertions raised at the meeting and DCWW welcomes the opportunity to present its case to the Committee at this hearing.

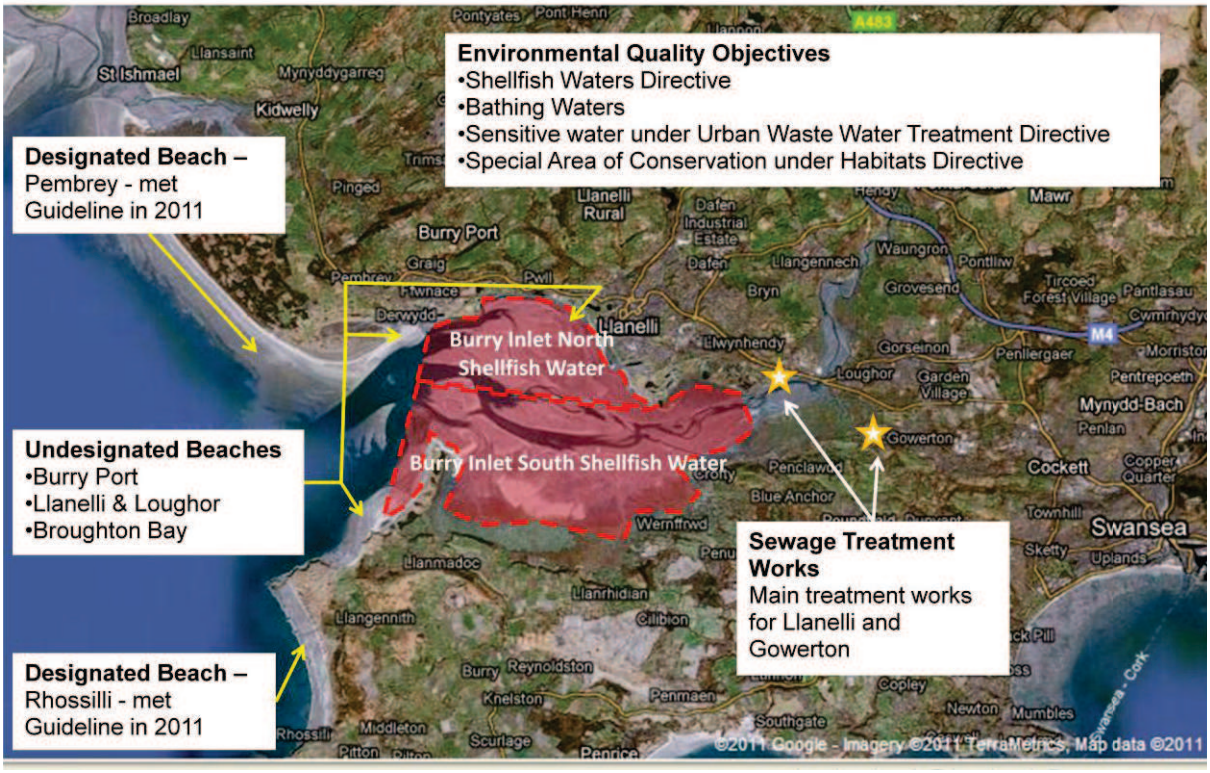
In response to the claims made DCWW would like to state that:

- The cockle mortality report has been independently produced by some of the most eminent marine biologists in the UK which gives us confidence in its findings. The report finds that a combination of biological factors is the reason for the change in cockle behaviour in the estuary and not water quality or pollution.
- DCWW has delivered huge improvements in the quality of its continuous discharges to the estuary as a result of investing £69m of customers' money on new and improved sewage treatment facilities in the 1990s and early 2000s.
- DCWW has embarked on a long term strategy of removing of surface water from the sewer network to protect customers from sewage flooding, reduce spills and allow economic development without causing detriment to water quality in the estuary. In the UK, DCWW leads the water industry in developing and implementing this form of sustainable, cost-effective surface water removal approach to improving service for customers and protecting the environment.

2. The Loughor Estuary

The River Loughor discharges via the Loughor Estuary to Carmarthen Bay. The Burry Inlet and Burry Inlet shellfish waters are situated within the estuary which is bounded to the South by the Gower peninsula and to the North by the headland containing the towns of Llanelli and Burry Port. The largest sewerage networks and waste water treatment works (WWTW) in the area are at Gowerton and Llanelli. The WWTWs and combined sewer overflows (CSOs), which contain a mixture of foul and surface water runoff, discharge either directly into the estuary or indirectly via local rivers and water courses. The estuary is an area of scientific and ecological importance and discharges are governed by a complex set of environmental quality objectives. The diagram below sets out some of the more important measures and all of these measures are brought together under the Water Framework Directive with the objective of delivering good ecological status in the water body.

Environmental Designations in the Loughor Estuary



3. Improvements in Sewage Treatment

Sewage treatment before 1997

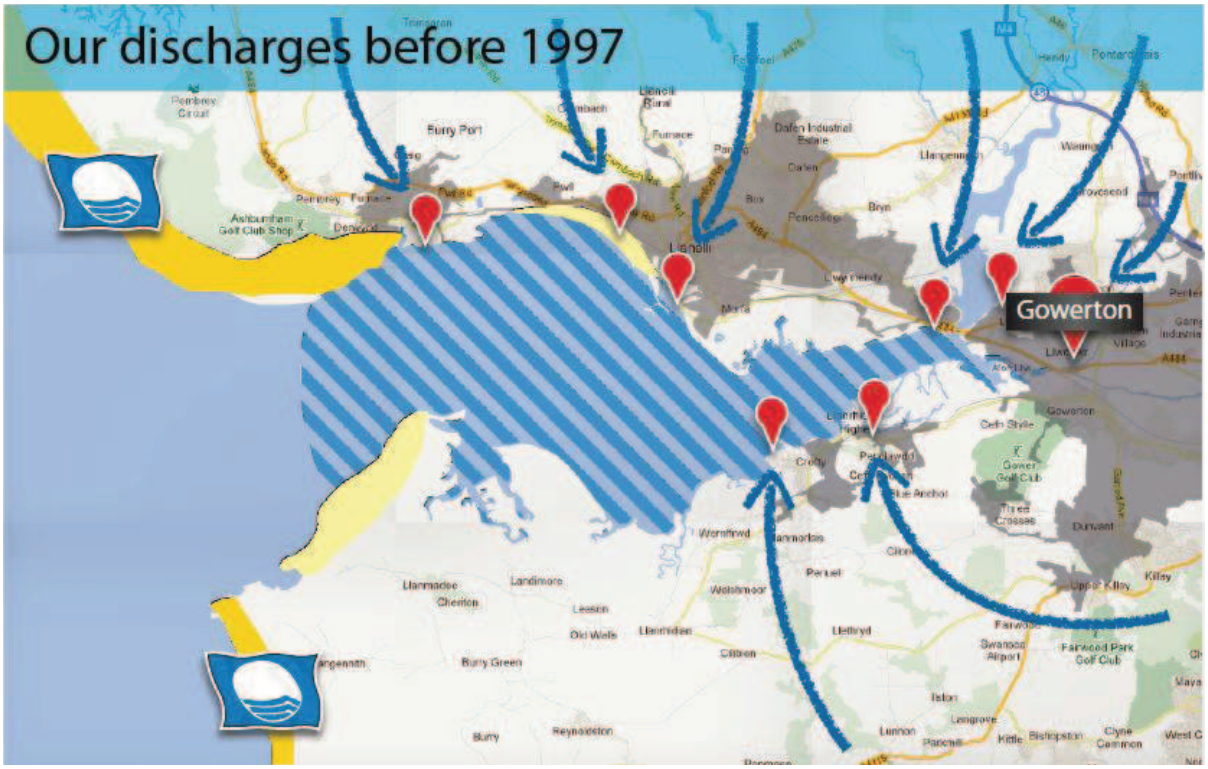
Historically, partially treated effluent arising in Llanelli was discharged from four sites at Burry Port, Pwll, Northumberland Avenue and Bynea. Sewage arising from Gowerton, Crofty and Penclawdd was treated to a somewhat better standard than in Llanelli using biological treatment before discharge but the quality from the smaller sites at was quite variable. During periods of heavy rain, the volume of sewage arising in these networks exceeded the capacity of the WWTWs so, in order to prevent customers' houses being flooded with sewage, dilute effluent was also discharged to the estuary from CSOs at all of these and other sites.

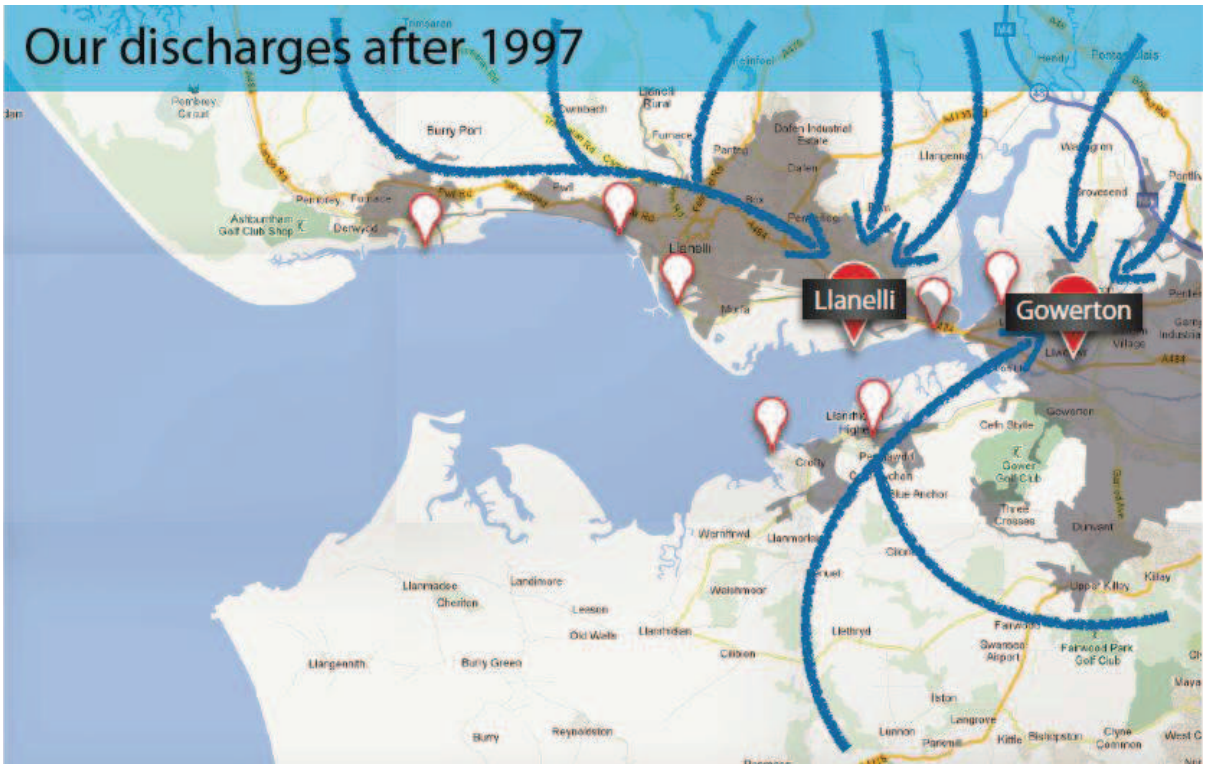
1990s Investment Programme

In the mid 1990s DCWW invested £69m of customers' money in order to meet new tighter environmental standards. The programme of work included the construction of a new WWTW at Bynea to treat sewage from Llanelli and extensions to the works at Gowerton as well as improvements at Llanant WWTW. The photograph below shows Gowerton WWTW during construction and gives an indication of the scale of the undertaking:

Gowerton WWTW

The old treatment works in Llanelli and Gowerton were converted into pumping stations and the flows transferred to the new works. The existing CSOs were improved with screening and some of the sites were also provided with storage in order to reduce the number of spills to the environment.





Waste Water Treatment Works (WWTW)

Combined Sewer Overflow (CSO)

Designing the New Sewage Treatment Works

When the new sewage treatment works were designed, the consultants went back to the drawing board and calculated the expected flows and loads based on the actual and predicted future populations in each area, trade effluent and infiltration flows (a measure of the amount of ground water that gets into the network). These calculations would have been backed up by population and property counts, impermeable area surveys (areas of roof and road drainage connected to the combined sewer network), infiltration surveys and temporary network flow monitoring. In the Llanelli catchment for example, the population served at the time was calculated at 52,301 and the new sewage treatment works was designed to cope with the biological load from a future population of 62,673.

Change in Quality of Sewage Treatment Works Discharges

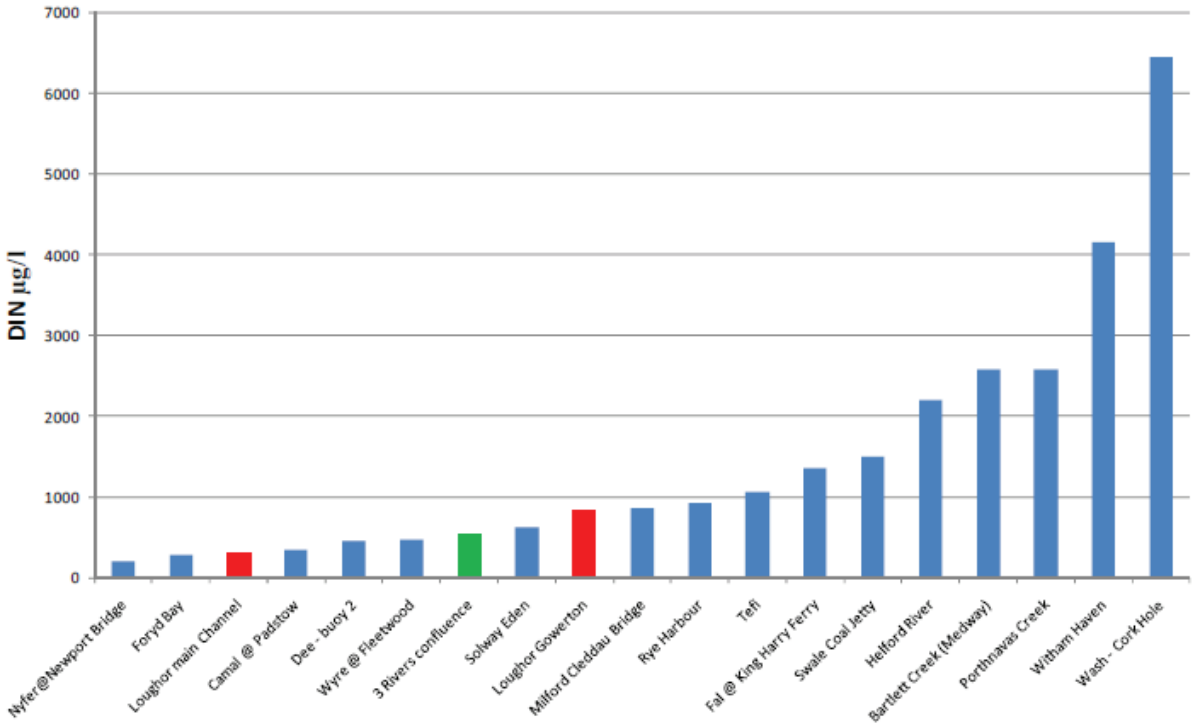
To demonstrate the improvement in the quality of discharges to the environment, the table below compares the average effluent quality from the old WWTWs between 1991 and 1993 with the average effluent quality from the WWTWs at Llanelli and Gowerton in the 3 years to the end of 2011. In fact the water quality from Llanelli WWTW is so good now that it is used by the Wildfowl and Wetland Centre to help maintain the correct nesting conditions in the sanctuary.

	% Improvement in the quality of continuous discharges from 1991-1993 to 2009-2011	
	Gowerton	**Llanelli**
Biological Oxygen Demand	64%	97%
Ammonia	40%	98%
Faecal Coliform Bacteria	Not available	99.95%

4. Cockle Mortality Report

Episodes of mass cockle die off were reported from the estuary from the early 2000s and such was the concern that Welsh Government asked the EA to manage an independent investigation into the causes of the problem. The EA asked Professor Mike Elliot, Director of the Institute of Estuarine and Coastal Studies at Hull University, to lead an experienced and highly qualified research team and their final report was published in January this year.

The report highlights a number of biological factors as the cause of the change in cockle behaviour and specifically rules out poor water quality or pollution. To support this conclusion the report showed that water quality in the Loughor compares very well with similar estuaries around the UK and the estuary will meet almost all the criteria for Good Ecological Status under the Water Framework Directive. For example the graph below (copied from the report) shows that levels of dissolved inorganic nitrogen in the Loughor compare very well with other areas around the UK coast.



The investigation team also looked at other shellfish species in the estuary with similar feeding and habitat requirements to the cockle. They found these other benthic species were behaving normally and this would not be the case if pollution was the cause of the problems.

A final point to highlight is that is that shellfish harvesting has been reported in the Loughor Estuary since Roman times. This includes the period of the industrial revolution from the late 18th to the middle of the 20th century when high levels of pollution were discharged untreated from industrial and domestic premises in an uncontrolled manner and water quality would have been significantly poorer that now. In spite of this there appear to be no similar reports of mass cockle mortalities.

5. Combined Sewer Overflows in the Loughor

The Reason for Having Combined Sewer Overflows (CSOs)

The primary function of the sewerage network is to protect public health by separating contaminated waste water from water used for drinking, washing and food preparation. However all "combined" sewer networks, such as the systems in Llanelli and Gowerton, also drain the rainfall that lands on roofs and roads and the volume of water carried by any combined system can increase enormously during wet weather, exceeding the capacity of the infrastructure to cope with it. CSOs are built into these networks to maintain protection of public health by providing "relief valves" that can discharge dilute sewage to the rivers and coastal waters during periods of heavy rainfall.

The Impact of CSOs on the Cockles

The main concern from CSOs spilling dilute effluent during heavy rainfall is that it puts additional faecal microorganisms into the environment. Heavy rainfall also causes an increase in diffuse pollution from agricultural and urban runoff and modelling shows that such background loads can have a significant impact on the environment even when CSOs are not operating.

While the faecal microorganisms do not have a detrimental effect on the shellfish themselves, it is a problem for shellfish collected for human consumption and standards have been set for the monitoring and treatment of shellfish before human consumption. Ministerial guidance and statutory regulations set minimum standards for shellfish flesh and water quality to be achieved and also set higher guideline standards that Wales should "endeavour to achieve". The EA interpreted these standards in their 2003 policy *Consenting Discharges to Achieve the Requirements of the Shellfish Waters Directive (Microbial Quality)*. Using these guidelines, DCWW worked with the EA to model the effect of our discharges on the commercial quality of shellfish in the Loughor. This led, in turn, to the installation of ultra violet (UV) dinsinfection at Llanelli, Gowerton and other WWTWs further upstream on the Loughor, some CSOs had storage added to reduce the frequency of spills and spills from Llanelli WWTW storm tanks Northumberland Avenue pumping station are also disinfected which reduces the bacterial load on the estuary still further.

CSO Spill Frequency

However it has since become clear that the frequency of CSO spills to the estuary is excessive. A recently completed modelling exercise highlighted the increasing amount of rain water entering the local networks and the table below demonstrates how severe the situation in Llanelli has become by comparing it with the much larger catchment of Swansea City:

	Swansea	**Llanelli**
Population Served	191,701	70,931
Properties Served	76,861	24,887
Area Served	57.3km^2	18.81km^2
Inflow to the main pumping stations	5,361 l/sec	4,632 l/sec

The traditional method of reducing spills is to construct concrete storage tanks that store dilute sewage during storms and return the flows to the network when the heavy rain abates. However when this approach was examined, we found that the volumes of storage required were so large as to be unaffordable for our customers, technically unfeasible to build and operate, provide no long term resilience for climate change and would not tackle the fundamental problem of too much rainwater getting into the system in the first place. For example, Llanelli WWTW storm tanks alone would have to be increased in volume by 216,000m3, the equivalent of 108 Olympic sized swimming pools or building an underground storage chamber the size of the Parc y Scarletts' stadium.

Long Term Strategy for Llanelli and Gowerton

DCWW has adopted a long term strategy of separating surface water from existing networks through a combination of sustainable urban drainage (SUDS) and changes to existing infrastructure. This will slow down, attenuate and redirect rain water in order to prevent it from getting into the sewerage system in the first place. This is a new approach for the UK and DCWW is leading other water companies in our adoption of techniques already proven abroad in cities such as Malmo in Sweden and Portland in the USA.

Using this strategy we have developed outline designs for over 150 individual projects across the two local networks that will deal with the risk of sewage flooding for customers, planning blight and excessive spills in a cost effective and sustainable way and will leave our assets better able to cope with the impact of climate change.

We have already made a start on this programme by committing £12m to 10 projects for reducing spills and another £5m to protect customers at serious risk of having their houses flooded by sewage. We are also making our designs available to others to implement in order to facilitate economic development in the area without causing environmental detriment through increased spills.

As these first projects are delivered we will monitor their impact on our customers and the environment. We plan to use a continuous cycle of *improve, monitor and review* over the coming years to determine our future programme of works in order to ensure we deliver the maximum benefit at the lowest cost to our customers.

6. Conclusion

In conclusion,

- DCWW has delivered a significant improvement in the quality of the effluent from its sewage treatment works since the early 1990s.
- The cockle mortality report clearly shows that the change in cockle behaviour is caused by a combination of biological factors and not as a result of water quality or pollution.
- Finally DCWW has developed a long term strategy, in conjunction with the EA, aimed at protecting customers from sewage flooding and improving the area they live in, removing restrictions to economic development and reducing spills by tackling the underlying problem of too much rainfall runoff entering our sewerage networks.

P-04-341 Gwastraff a Llosgi

Geiriad y Ddeiseb

Rydym yn galw ar y Cynulliad Cenedlaethol i annog Llywodraeth Cymru i:

1. adolygu'r Prosiect Gwyrdd, sy'n mynd yn groes i bolisi Llywodraeth Cymru o ddarparu cyfleusterau yn lleol a chaniatáu i'n cynghorau ddewis eu systemau caffael eu hunain ar gyfer rheoli gwastraff a thechnoleg gwastraff;
2. adolygu'r arolwg diffygiol ar wastraff yng Nghymru a oedd yn rhoi dau ddewis yn unig i bobl ynghylch gwaredu gwastraff;
3. erbyn 2020, ei gwneud yn anghyfreithlon i losgi gwastraff y gellir ei ailgylchu gan y byddai hyn yn annog cynghorau i ailgylchu.

Cynigwyd gan: Terry Evans

Ystyriwyd gan y Pwyllgor am y tro cyntaf: 15 Tachwedd 2011

Nifer y llofnodion: 21 (Casglwyd deiseb gysylltiedig 13,286 o lofnodion hefyd)

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: Gary.Hopkins@bristol.gov.uk
  Home phone number: 0117 985 1491

- 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: chris.cox@newearthgroup.co.uk
  Tel: 01202 812300

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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Kings Weston Lane
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BS11 8AZ

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Avonmouth

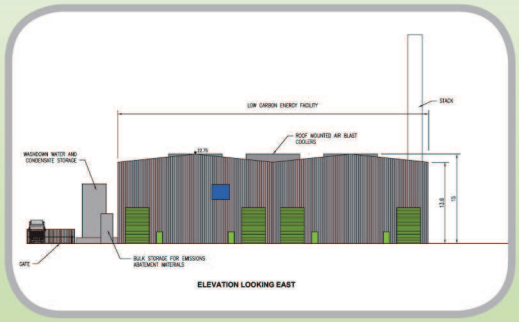
Renewable and low carbon energy facility

newEARTH ENERGY

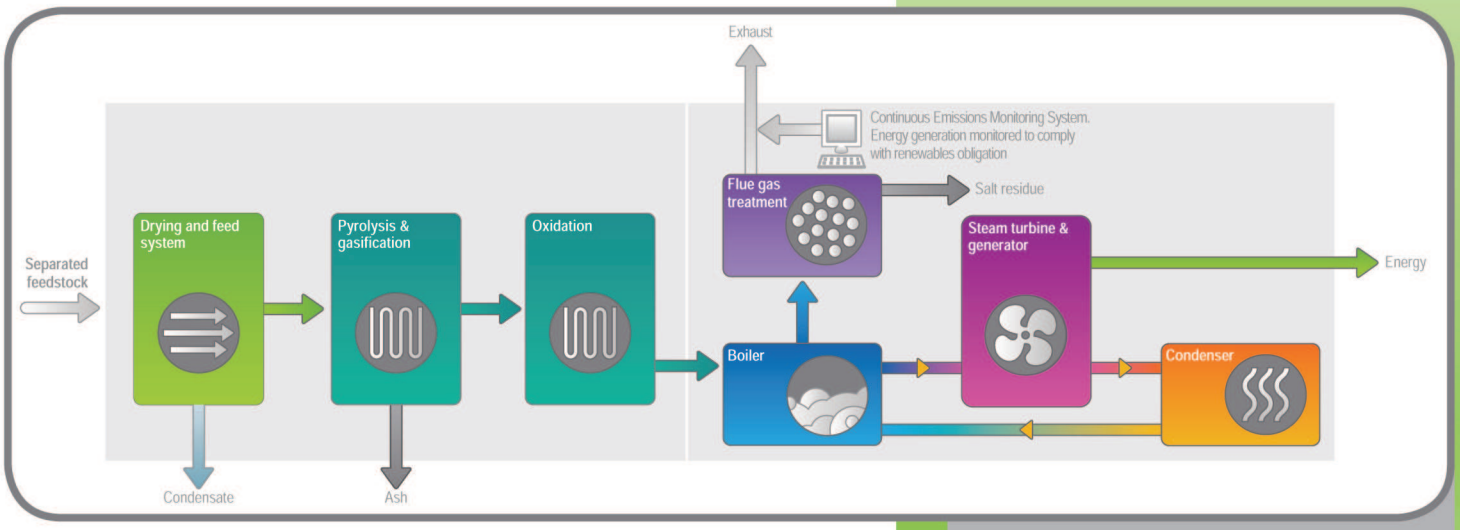
The Technology

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.

www.newearthenergy.co.uk/avonmouth

MBT process – material flows

Residual waste treatment - Indicative outputs

Planning Act 2008
Infrastructure Planning (Examination Procedure) Rules 2010

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

By
Alan Watson (C.Eng)
Public Interest Consultants

ON BEHALF OF
FRIENDS OF THE EARTH CYMRU
(FOEC)

IPC Reference Number: EN010004

September 2011

Contents

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):

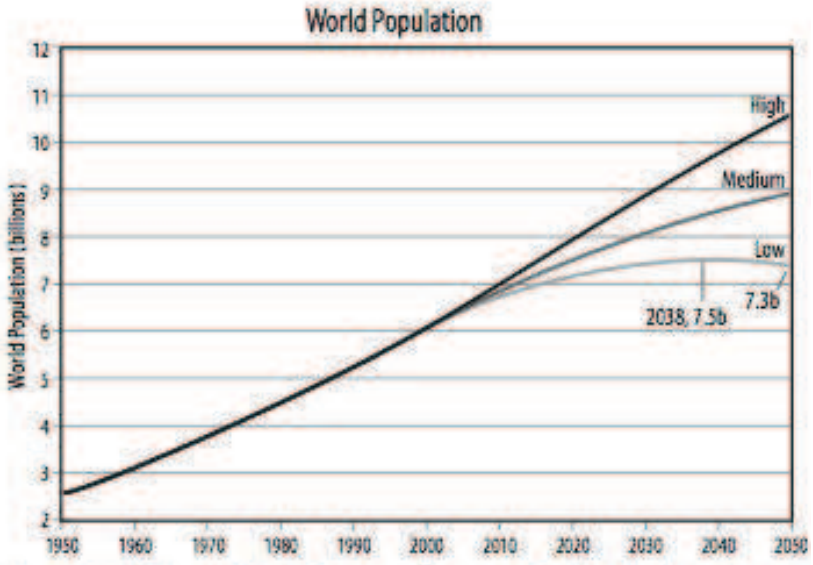


Figure 11. World population, history and forecast. Credit: United Nations Population Division, World Population Prospects

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'

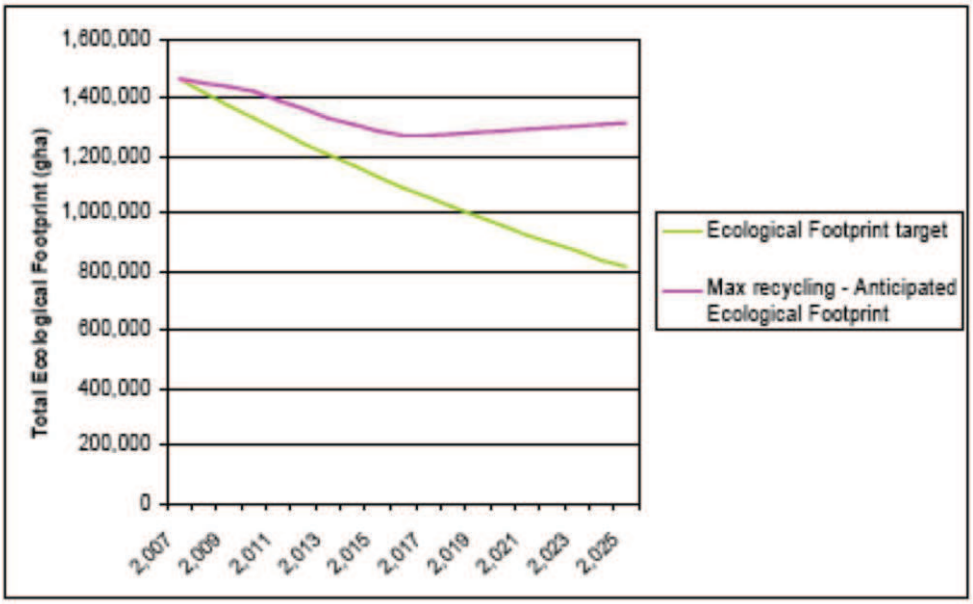
20. The report by consultants Arup assessing the ecological footprint associated with the Welsh waste strategy (Arup for Welsh Assembly Government 2009) emphasised that to significantly reduce the size of the ecological footprint:

    "*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



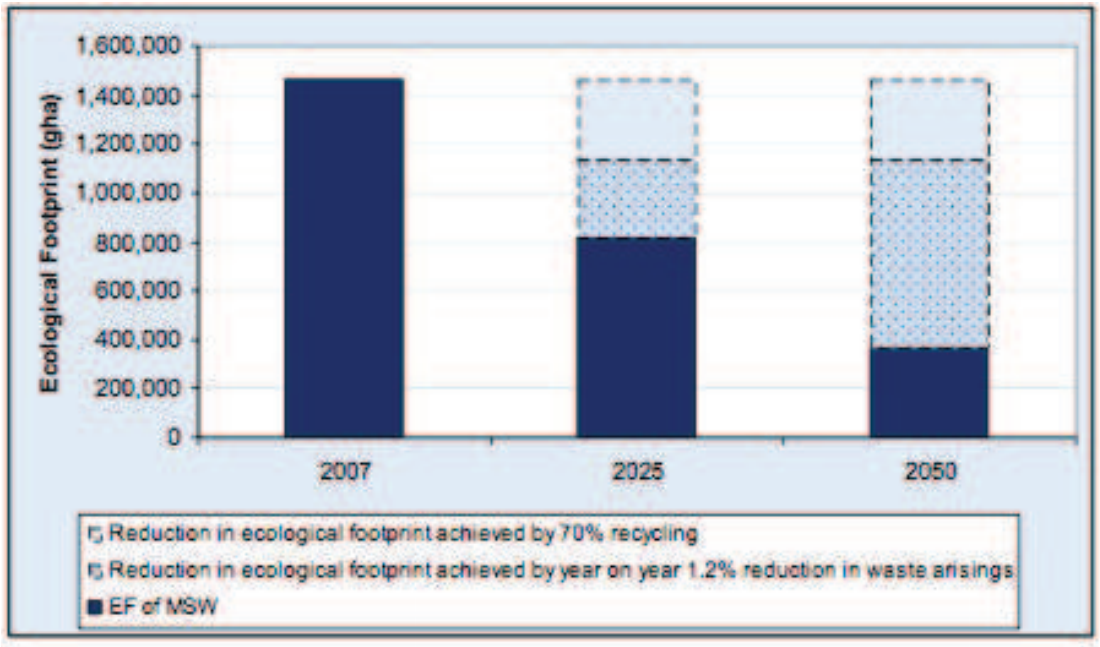
23. Furthermore this report confirms "*although the proposed recycling targets will help to reduce the EF* [Ecological Footprint] *of waste that can be recycled, research suggests that high statutory recycling targets can lead to local authorities focussing on recycling at the expense of waste prevention."*

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.

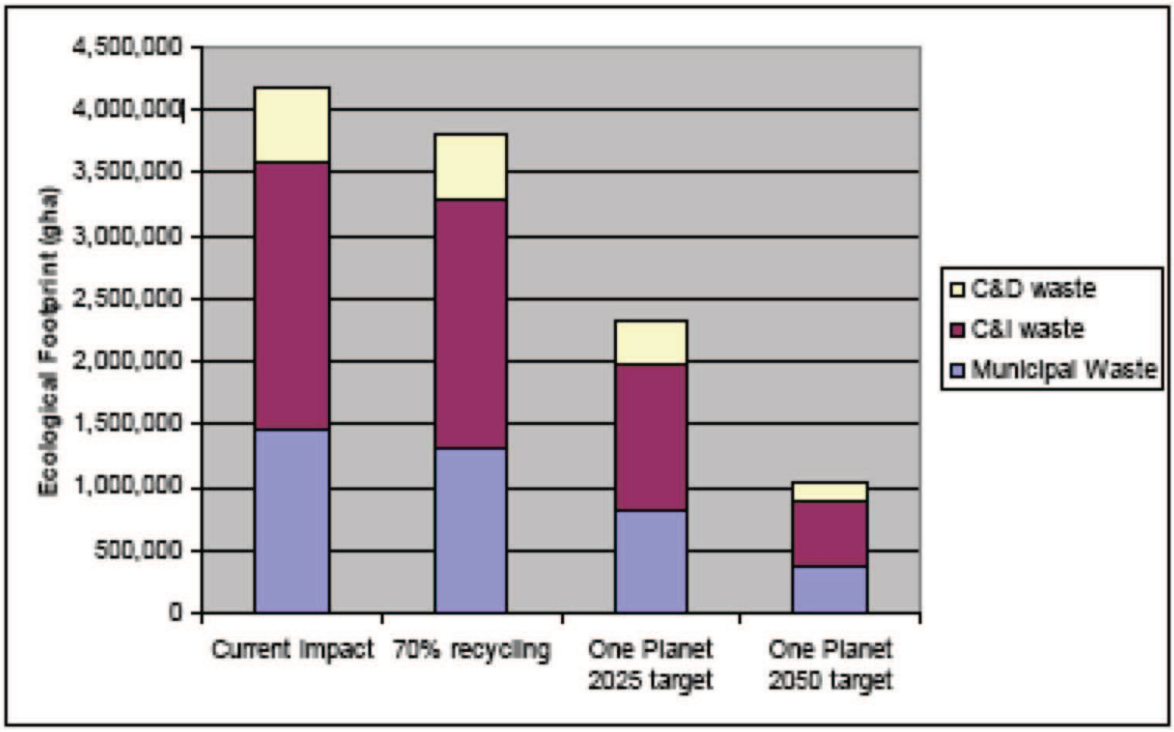
26. The targets are to be included in the sector plans and 'Towards Zero Waste' says "*we will consult on annual waste prevention targets of -1.2% for household waste, -1.2% for commercial waste, -1.4% for construction and demolition waste, and around -1.4% for industrial waste (in each case this will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

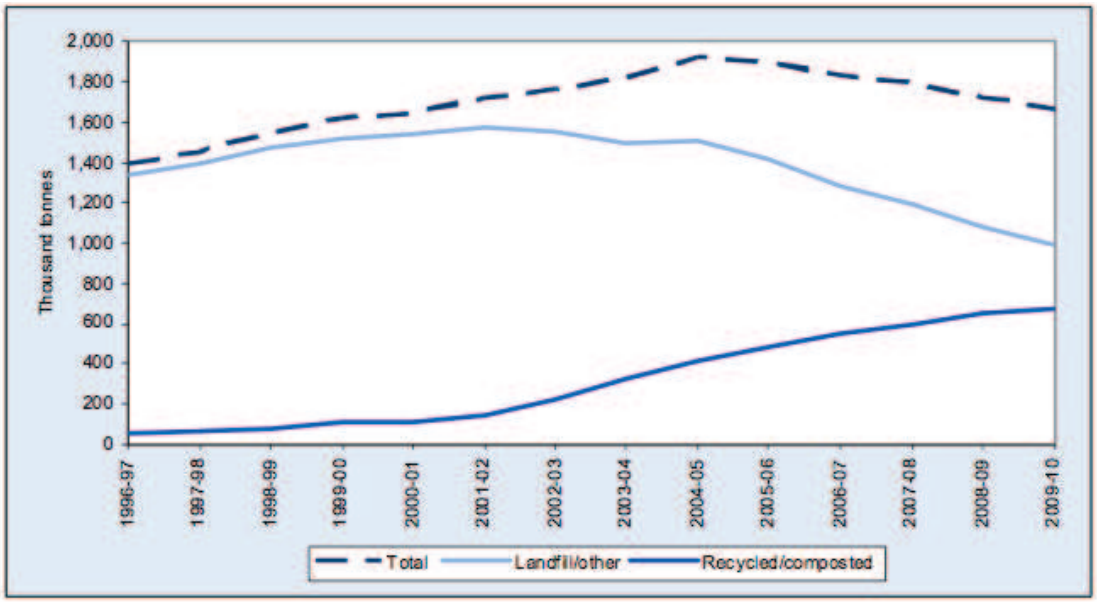
30. These figures show that the final targets are pitched lower than is likely to be required to achieve the one planet goal.

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].

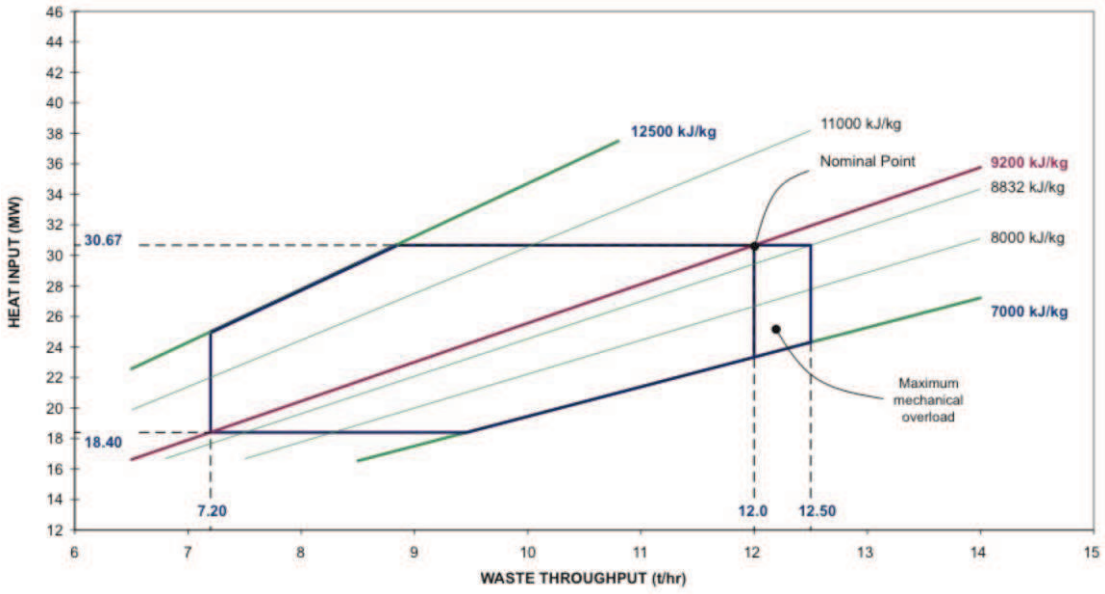
43. This landfill stream fell by 11% just between 2009 and 2010.

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.

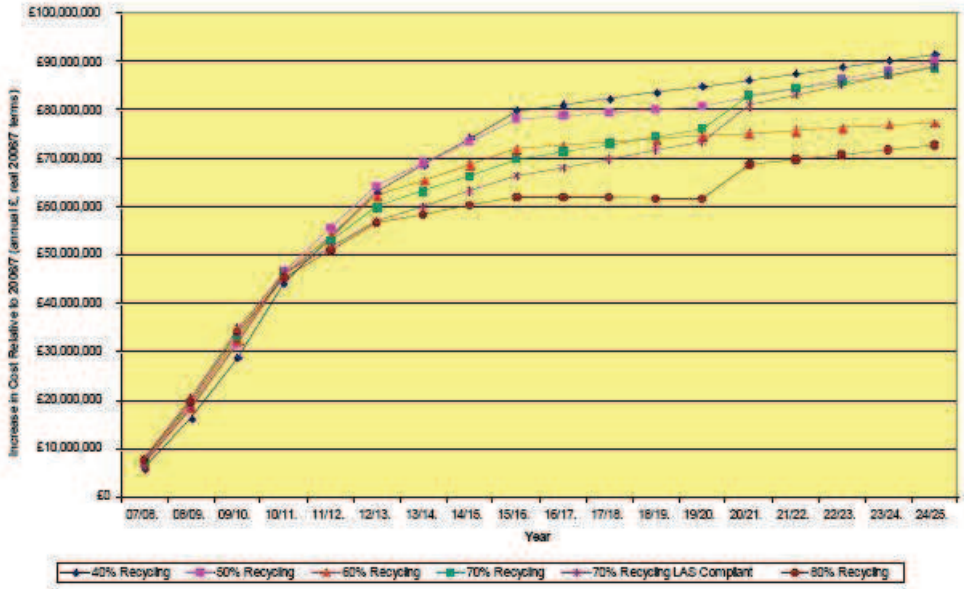
58. The current recycling targets are set as minimum targets in any case and the BPEO is likely to have higher levels of recycling than are current targeted. WRAP reports (WRAP 2010) A recent report by Environment Agency in Wales for the Welsh Assembly Government identified that up to 90% of MSW in Wales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

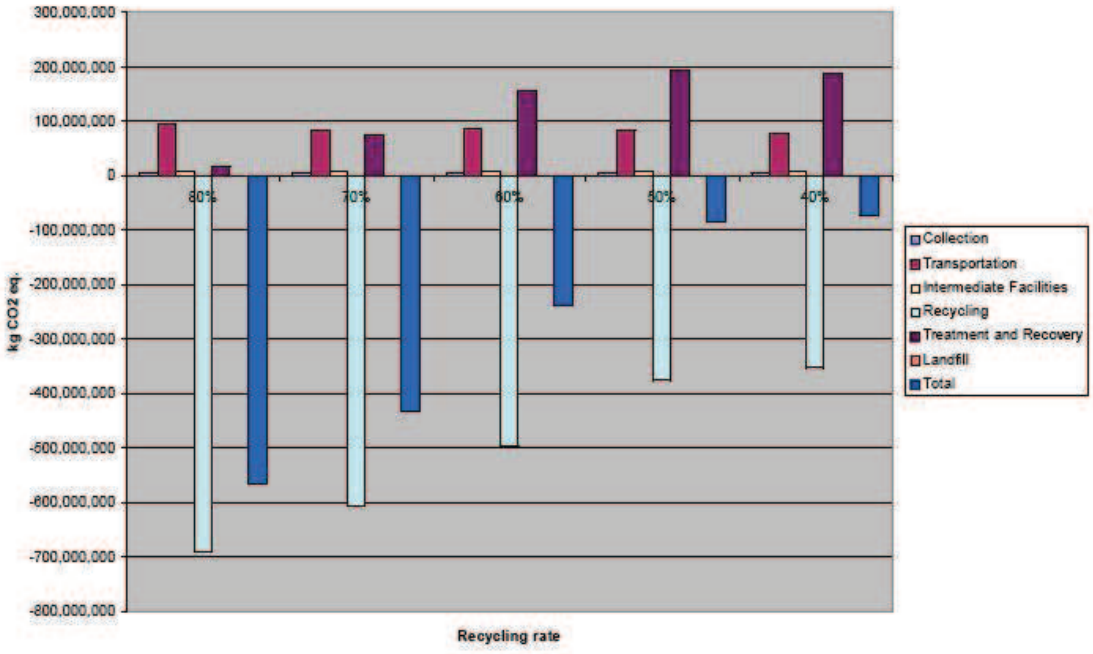


61. Again the changes in product design are likely to increase the cost effectiveness of recycling at the highest levels.

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).*

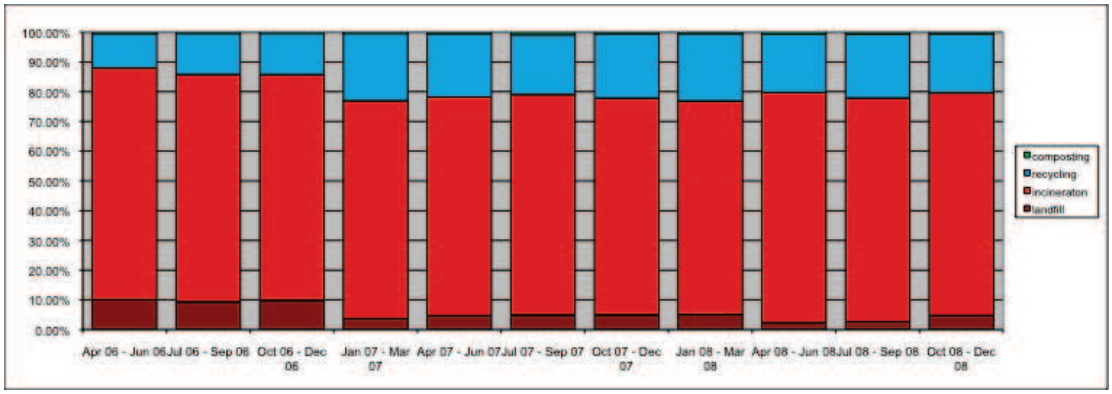
- *Incineration with energy recovery performs poorly with respect to climate change impact*, but pyrolysis appears to be an emerging option regarding all indicators assessed, though this was only analysed in two LCA studies.
- Landfill is confirmed as having the worst environmental impacts in the majority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

73. WRAP concludes that:

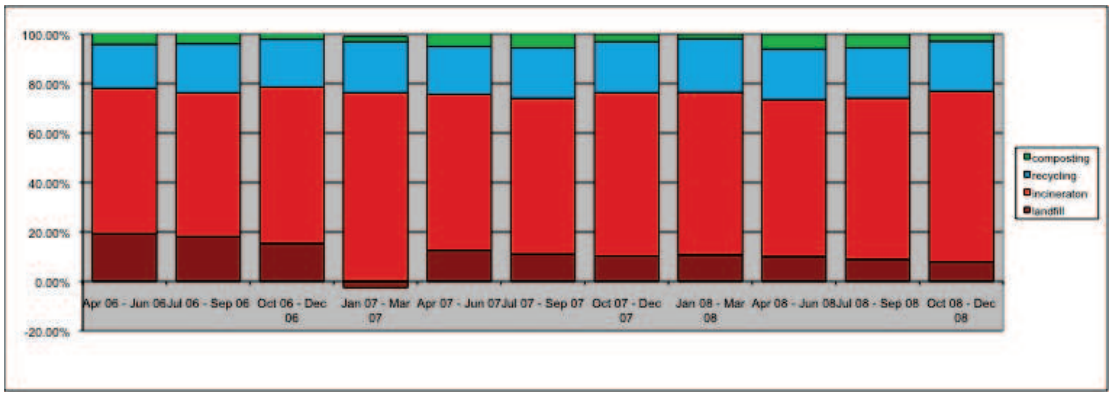
> *"Looking to the future, as the UK moves to a lower carbon energy mix, collection quality improves and recycling technology develops, then recycling will become increasingly favoured over energy recovery for all impact categories".*

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.

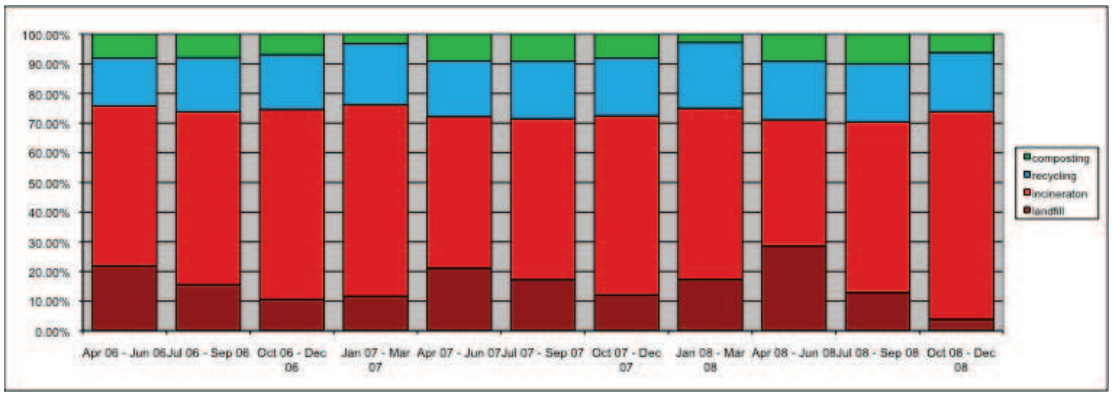
75. There is increasing evidence that higher levels of incineration undermine recycling. This is not surprising as incinerators rely particularly on paper and plastic waste to provide the homogenous waste stream with a stable calorific value that is necessary to achieve stable combustion. There is little 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 $PM_{2.5}$

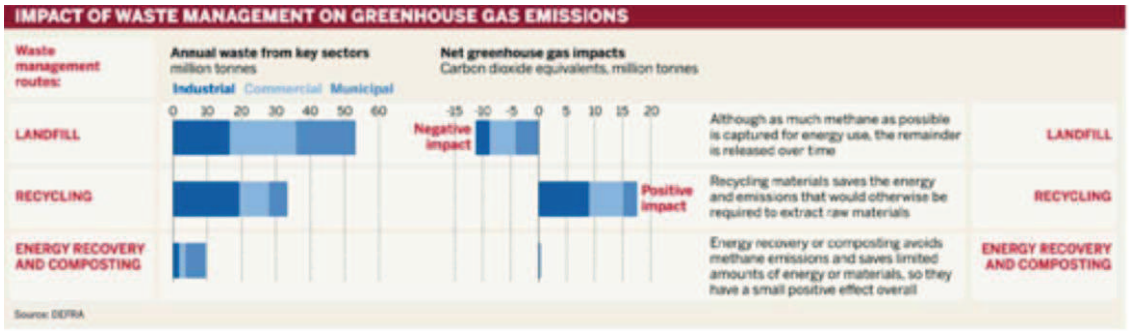
Ground 3 - Carbon Emissions and Climate Change:

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

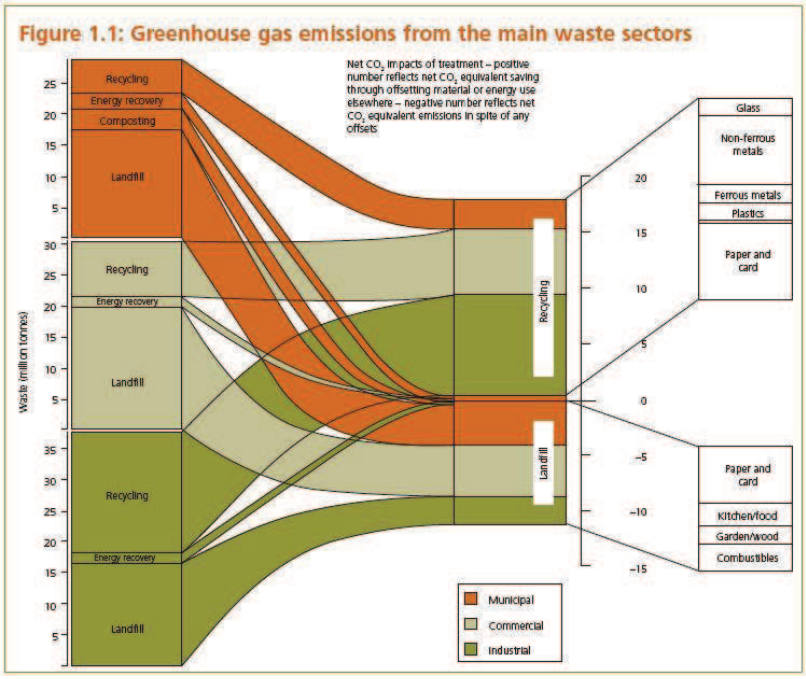
Climate Change Issues

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):



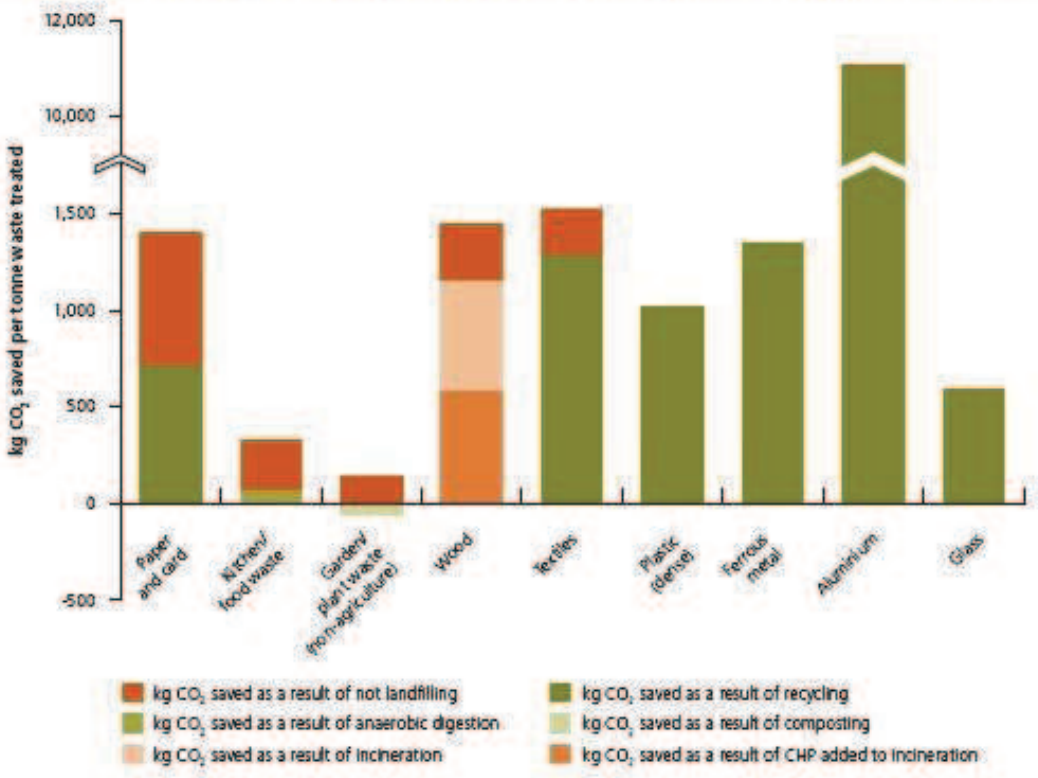
174. This can also be seen in figure 1.1 from WS 2007:



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

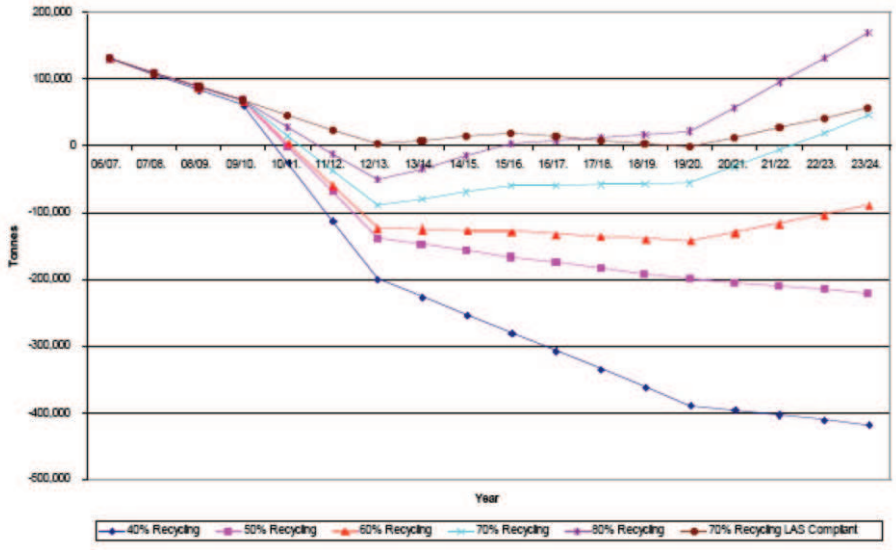


177. Similarly modelling for the Committee on Climate change report 'Building a low-carbon economy – the UK's contribution to tackling climate change' (Committee on Climate Change 2008) indicated that by far the most effective treatment strategy to reduce greenhouse gas emissions from waste was to increase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

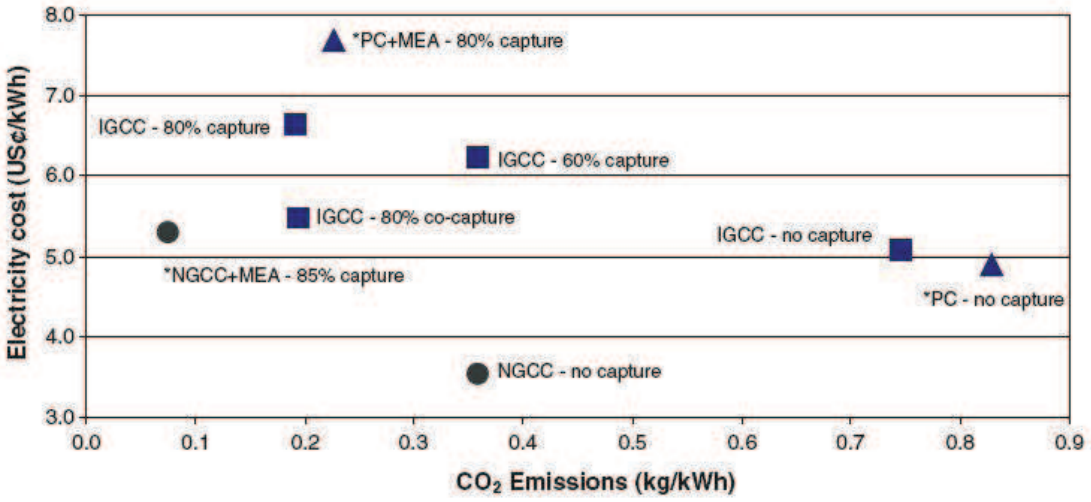
180. It would be self-defeating and inconsistent with the Welsh Government's approach to renewable energy to include options which produce more carbon than conventional fossil fuel power stations as a climate change abatement strategy.

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

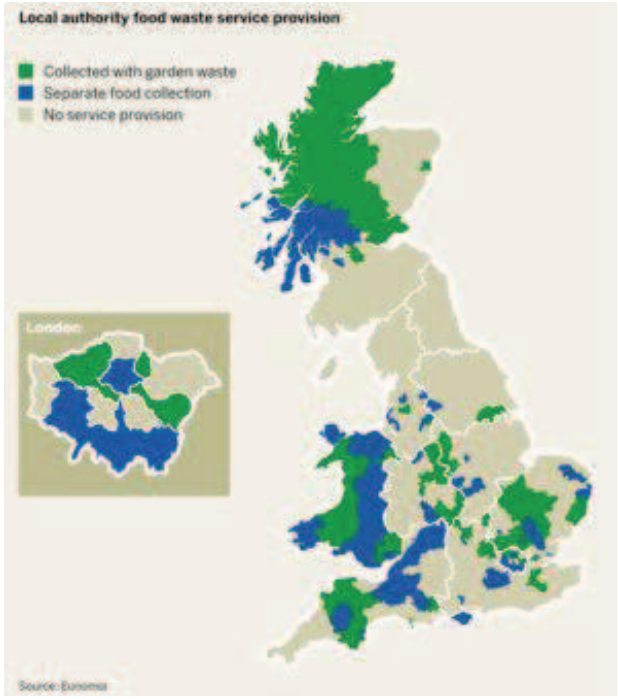
197. The approach taken by RPS in the WRATE modelling in support of the application is misleading because it takes an average of the biogenic/ biodegradable content of the MSW (and C&I) waste streams and makes no allowance for the changes in residual waste composition as recycling increases. The easiest 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.

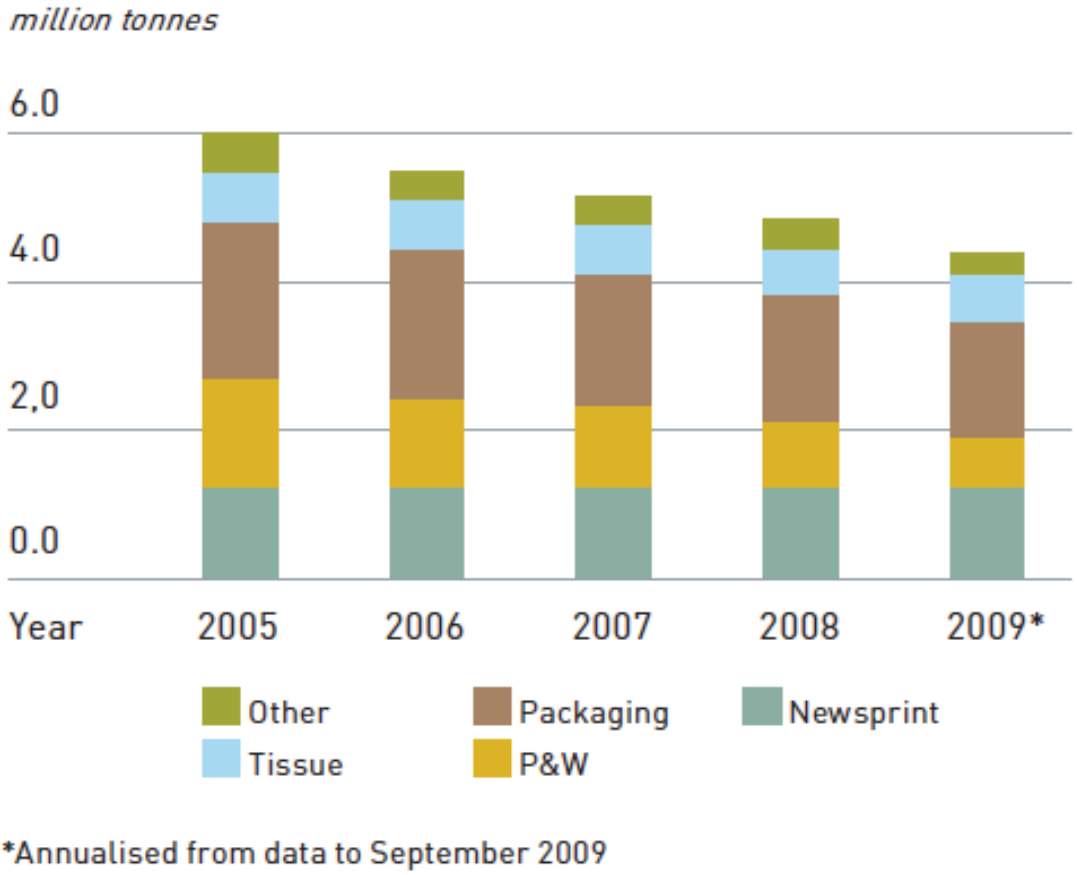
204. Little weight can therefore be placed on the claimed carbon savings attributed to the WRATE modelling.

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.

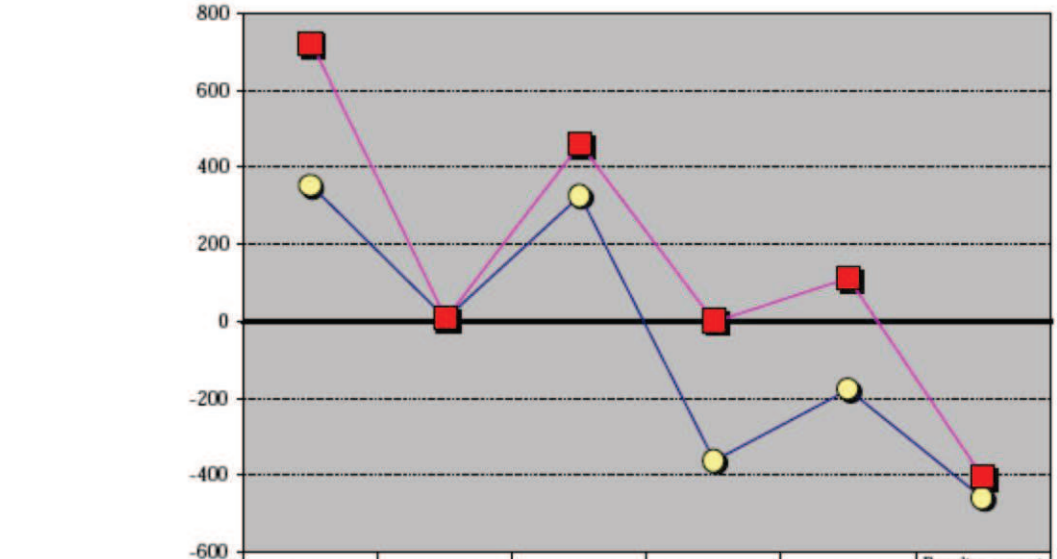
224. The total annual emissions of carbon dioxide from the proposed incinerator would be approximately 188,000 tonnes of carbon[21] (as per figure 2.3 in the WRATE assessment) but RPS has ignored c.121,700 tonnes per annum because they are claimed to be biogenic. Properly corrected for the levels of 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

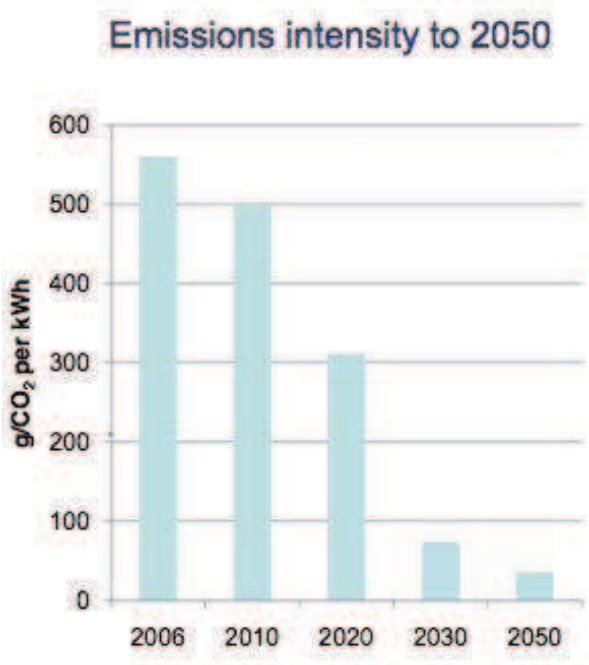
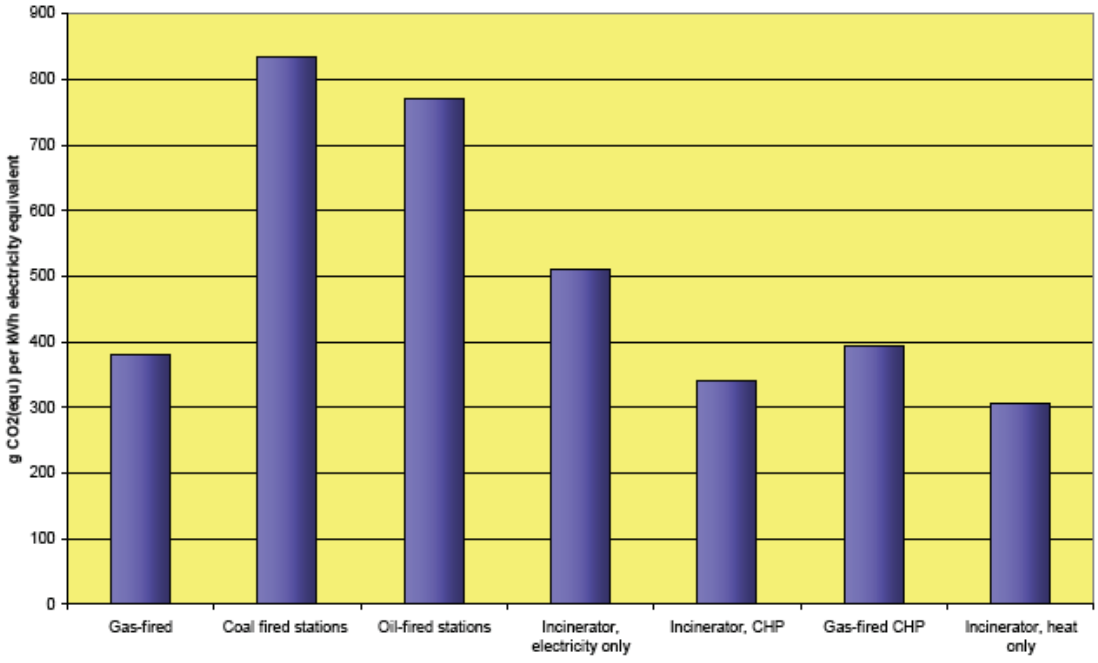


Figure: CO2 intensity per kWh of electricity generated, 2006-2050 (Committee on Climate Change 2008)

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

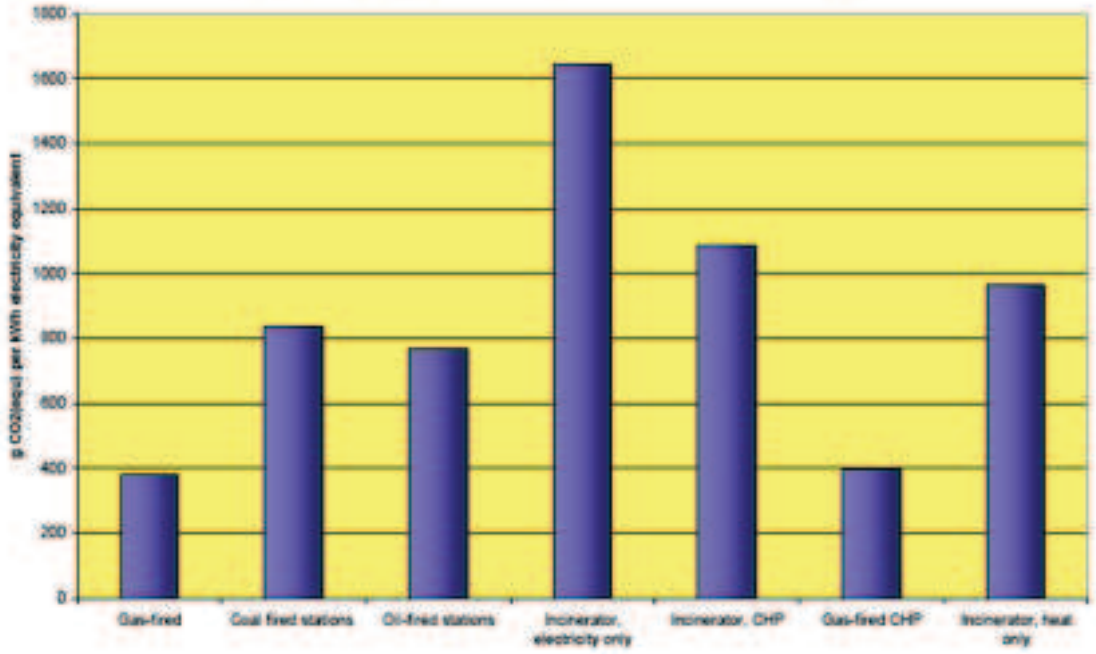


231. With higher levels of recycling the fossil fuel derived impacts are even worse. Data from the DTI (Department of Trade and Industry 2007; BERR 2008), discussed above, showed that the biogenic proportion of residual waste reduces with increased recycling. Whilst unsorted waste was calculated to derive 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.

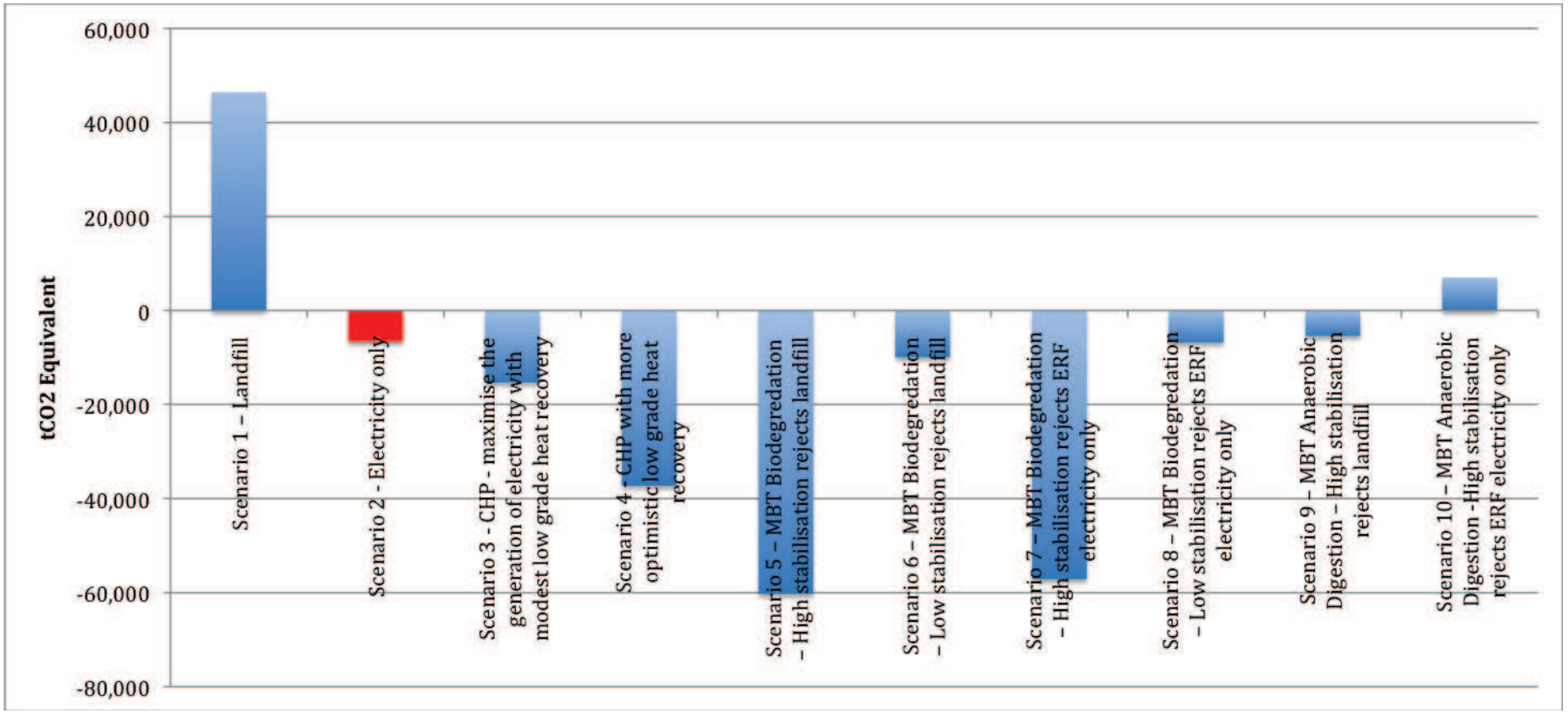
232. If biogenic carbon is included, as shown in the figure below (Hogg and Eunomia Research & Consulting Ltd 2006), then electricity only incinerators are likely to have approximately **20 times** the carbon intensity of the fuel mix required in 2030.

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:

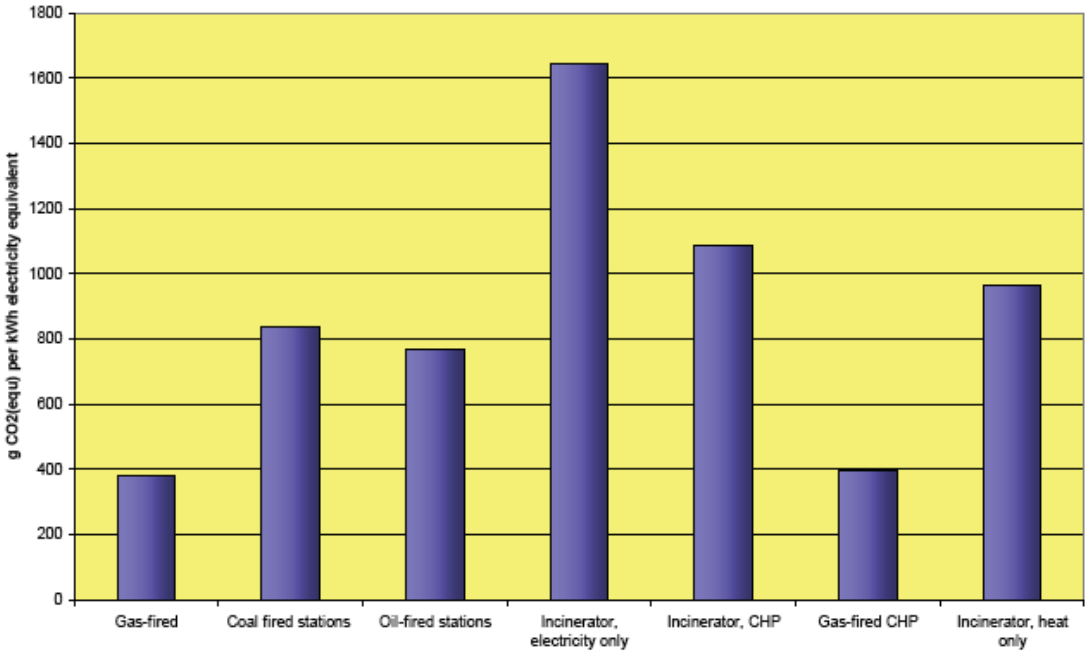
> *We estimate that EfW with CHP will produce a net environmental gain, producing additional carbon savings beyond that from electricity-only EfW plant – of between 120 kgCO_2 and 380kgCO_2 for each MWh$_{th}$ of heat produced.*

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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EDXRF characterisation of elemental contents in PM2.5 in a medium-sized Swedish city dominated by a modern waste incineration plant†

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Energy dispersive x-ray fluorescence (EDXRF) analysis of airborne particles has previously been shown to be a powerful technique for identifying key elements or elemental ratios for identification of important sources of air pollution. In the present work the technique was used for assignment of major sources of aerosol particles (PM2.5) in a medium sized Swedish city in southwestern Sweden, in which a new incinerator of household and industrial waste had recently been installed. Data on particle mass and black carbon contents in PM2.5 were also recorded together with SO_2 and NO_2 during the same study period. In spite of the small data set it was possible to identify five major sources for collected PM2.5, namely, waste incineration together with other local sources, oil incineration, biomass burning, long-distance transport and traffic emissions. Major characteristic elements for the respective sources were identified from regression analysis of the data and from information obtained in previous studies. A receptor model based on the use of trace observations was used for quantitative calculation of the source contribution to PM2.5. The relative strength of the identified sources was seen to change when the variables included in the analysis were varied in number and character, although the same sources remained. It must be noted that the quantitative contribution from the different sources may be treated only as informative at present, since the number of observations are small compared to the number of variables. Copyright © 2007 John Wiley & Sons, Ltd.

INTRODUCTION

Significant changes have occurred during the last few years regarding the attitudes towards waste and waste disposal in the EU and many other countries. The public at large has come to accept the ideas of waste separation and recycling of products and materials as an important means to create a sustainable society. Worldwide, the production of goods has increased seven fold since the 1950s, during which time the world population has doubled. Since a major part of the products ultimately end up as waste, the handling of waste is one of the crucial factors for future sustainability.

In Sweden, deposition of combustible waste on land-fills is prohibited from January 1, 2002. There is also a strong motivation to move further away from the dependence on fossil fuels and increase efficiency in the generation of heat and electricity. The city of Borås has declared itself as one of Sweden's sustainable cities and has for a long time been a pioneer in environmentally friendly waste handling and production of biogas. In order to solve the problems of handling the combustible domestic and industrial waste and at the same time decrease the dependence on fossil fuels, the city of Borås has made substantial investments recently in new technology for classification and incineration of waste in its new incinerators (bubbling fluidised bed) at the district heating plant. It has been designed for research activities on efficiency, emission control and economy and thus gives unique opportunities to conduct full-scale experiments in long-term studies under controlled conditions.[1,2]

In recent years, a large number of scientific reports on waste incineration have been published, many of which concern system studies and properties of the ashes.[3–8] Receptor modelling from waste incineration is less frequent although evidence of environmental effects is obtained as part of statistical treatment and principal component analysis (PCA) of ambient data.[9] Since incineration plants are often located in close proximity to populated areas, it is important to evaluate the impact of the activity and the additional health hazards involved. In the present work, a study has been made on the ambient air quality in the city of Borås with the aim of identifying the characteristics of aerosol particles (PM2.5) due to waste incineration. Ambient air is, however, a complex mixture of gases and particles. Some of the major polluting gases,

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for example NO_2 and SO_2, are continuously monitored in the city of Borås by the Environmental Protection Department. However, suspended particulate matter is not routinely monitored or analysed by the local health authorities.

Health effects due to small aerosol particles have been studied extensively during the last ten years,[10–13] and so far, there does not seem to be any evidence of a 'threshold' or any 'safe' level. Estimates of the number of excess deaths on a global scale due to particle inhalation have been made, and they amount to about 2 million/year and 370 000 per year within the EU.[14] The health effects are not limited to lung injuries. They also include cardiovascular diseases and cancers.

EXPERIMENTAL

Sampling location

The city of Borås with approximately 100 000 inhabitants is located in the southwestern part of Sweden. It is characterised by small and medium-size enterprises (SME). Since the aim of the project was to study the PM2.5 contribution from the waste incineration plant and other major sources to the ambient air, the place of monitoring particles was chosen to represent the general air that the citizens are exposed to. Therefore, it is not located in close proximity to any of the major activities, for example large roads. The position of the measurement location in the city is shown in Fig. 1.

On-line sampling of aerosols and meteorological data

Since the summer of 2004, the University of Borås has operated a tapered element oscillating microbalance (TEOM) instrument, which is set to determine the mass concentrations of aerosol particles of diameters < 2.5μm. The instrument is positioned in the central part of the city approximately 25 m above street level and is not in close proximity to any strong local source.

Figure 1. Map of Borås, showing the sampling position and the waste incineration plant. The distance between the two places is about 900 m.

The TEOM instrument (TEOM particulate mass monitor, Series 1400 Sensor Unit, Rupprecht & Patashnick Inc., USA) collects particles on a Teflon coated glass fibre filter heated to 50 °C. The filter is attached to the tip of a tapered, hollow, oscillating rod. The change in the oscillation frequency is used to make a direct measurement of the accumulation of mass on the filter over time. The TEOM is equipped with a PM10 inlet followed by a PM2.5 inlet (Rupprecht & Patashnick Inc) and has a flow rate of 1.0 m^3/h of which 3.0 l/min pass through the filter.

The Environmental Protection Department of Borås operates a differential optical absorption spectroscopy (DOAS) system at about 200 m distance from the aerosol station which measures NO_2, SO_2, benzene, toluene and xylene with one hour time resolution at approximately the same height.

In a previous study[15], it was found that meteorological variables (e. g. wind speed, wind direction, temperature and humidity) exert a strong influence on the particle concentrations. Results from this study showed that there was a dramatic decrease in particle concentrations when the wind velocity increased from below one to only a few m/s.

Large variations of aerosol particles as well as of ambient gases throughout the day and night can be expected from the daily activities of the city population. Changes in daily averages are not equally dramatic, but can still expose a variation of a factor of 10 between a 'clean' and a 'dirty' day. These variations are largely due to meteorological factors like precipitation, mixing height, inversion and air mass pathways across 'clean' or polluted regions.

Sampling of PM2.5 on filters

In order to study the mass, elemental and black carbon contents of the aerosol particles, a campaign with sampling of aerosol on filters was conducted from the 27th of July to the 23rd of August, 2005, in parallel with the on-line monitoring of particle mass, gases and meteorological data.

The filter sampler used for the PM2.5 aerosol sampling was an impactor manufactured by IVL Swedish Environmental Research Institute Ltd. A sketch of the sampler is shown in Fig. 2. The sampler is mounted inside an upside down plastic bucket that protects the inlet from both rain and from direct deposition of particles from the air.

The sampler in the present work has a flow rate of 1 m^3 h^{-1}. The PM 2.5 particles are collected on thin Teflon filters of 25 mm diameter with pore size of 3.0 μm (TEFLO™ R2PI025, Pall Corporation, Ann Arbor, MI, USA). These thin, high purity filters are suitable for analysis with energy dispersive x-ray fluorescence (EDXRF) technique and have a high particle retention efficiency.[16,17] The filters used in this study were selected from a batch, out of which a representative number had been pre-analysed for trace elements before sampling and found to have negligible concentrations of the studied elements. The Teflon filters were changed manually every 24 h during the sampling period.

Before and after exposure, the filters were weighed after 5 days of moisture equilibration in desiccators, using a microgram sensitive Sartorius balance at room temperature.

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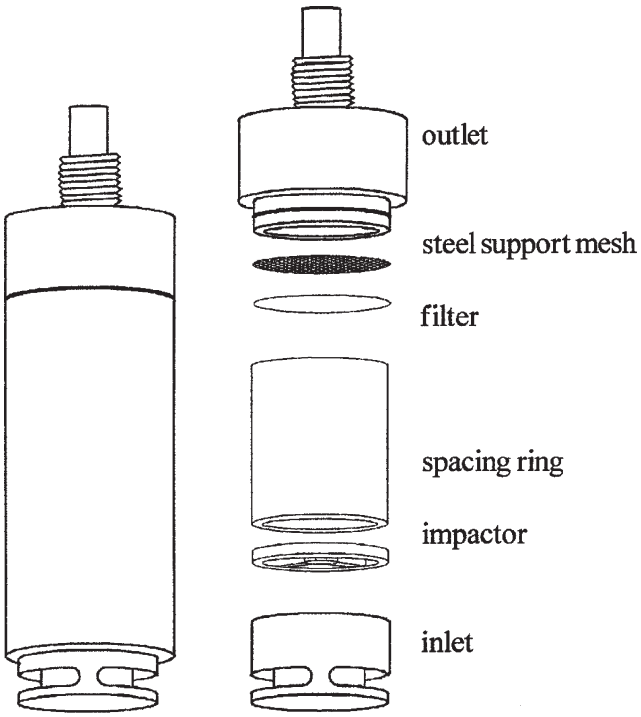

Figure 2. Schematic diagram of the IVL PM2.5 sampler. The filter diameter is 25 mm and the sampler height is 10 cm.

Thus, there was additional information on the aerosol mass during the campaign besides the information obtained by the TEOM instrument.

Analytical techniques applied to aerosol filters

Analysis of black carbon

Concentrations of black carbon (BC) can be calculated by measuring the optical absorption of the sampled aerosol on a filter with a reflectometer. An instrument from Eberline Instruments GmbH, Erlangen, was used.[18] In a previous study, it was shown that glass fibre filters, as recommended by the manufacturer, will give the same results as sampling on Teflon filters, provided that the Teflon filters are supported by a white backing during the BC measurements.[18]

The EDXRF spectrometer

The EDXRF spectrometer at the Department of Natural Sciences, University of Copenhagen was used in the present study.[19] The spectrometer is a compact, versatile and sensitive unit, using a high power Mo x-ray tube. The primary beam is monochromatised by a highly oriented pyrolitic graphite (HOPG) crystal and the detector is a Peltier cooled Si(Li) detector. The detector has an active area of 20 mm^2, FWHM at Mn Kα of 146 eV. The x-ray tube was operated at a voltage of 40 kV and a current of 40 mA in the measurements. The live time of each spectrum was 2000 s. Since the irradiation chamber of the spectrometer is evacuated, elements from Al and heavier can be detected, analysed and quantified. Minimum detection limits (DLs) for the spectrometer are shown in Table 1.

In order to calculate the concentrations of the different elements on the filters, the spectrometer was calibrated using thin film reference material from NIST (NBS SRM 1832). The x-ray fluorescence spectra were quantitatively analysed by the use of a fundamental parameter programme.[20]

Table 1. Minimum detection limits (DL) for particulate matter on Teflon filters with EDXRF technique at the Department of Natural Sciences, University of Copenhagen, Copenhagen, Denmark

Element	DL[a] ng/cm^2	DL[b] ng/m^3
Si	84.0	11.0
P	50.1	6.6
S	31.9	4.2
K	7.7	1.0
Ca	4.3	0.56
Ti	2.4	0.31
V	1.8	0.24
Cr	1.3	0.17
Mn	1.2	0.16
Fe	1.0	0.13
Ni	0.9	0.12
Cu	0.9	0.12
Zn	0.6	0.08
As	0.4	0.05
Se	0.4	0.05
Br	0.3	0.04
Pb	0.7	0.09

[a] DL is calculated as 3 times the square root of background concentration (3σ). Mo Ka:17.44 keV, V = 40 kV, I = 40 mA, collection time 2000 s.

[b] DL for particle concentrations is calculated for a sampling of 24 m^3.

PRINCIPAL COMPONENT ANALYSIS (PCA) AND MODELLING

Theory

Statistical methods are commonly used for identification of the relative importance of different sources.[9,15,18,21–23] Input data for source assignments are chemical species, analysed by many methods, for example IC, INAA, ICP-AES, GC-MS, EDXRF, PIXE, TXRF and thermooptical and light scattering methods, for total, organic and elemental carbon.

In the present approach BC, elemental concentrations and mass were used. The model by Thurston and Spengler[23] was the basis for analysing the typical species ('fingerprints'), which characterised the different sources. In addition, the SO_2 and NO_2 data together with correlations between different species were used in support of the source assignments.

The modelling of absolute source contributions is based on the receptor model approach, where the measured concentration of a particular species is the result of a linear sum of independent contributions from distinct sources. Algebraically this is formulated in the matrix equation:

$$C = P S \quad (1)$$

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Here, C is the data matrix of dimension (n,q), where n is the number of variables and q, the number of samples. P is the source profile matrix of dimension (n,p), where p is the number of distinct sources and S is the source contribution matrix of dimension (p,q). For the present receptor model, samples were collected daily and the variables are elemental concentrations in ng/m^3 and the mass of PM2.5 in μg/m^3.

Once the number of distinct sources is determined, P and S are derived from a PCA analysis giving the relation:

$$Z = L\,F \tag{2}$$

Where a row in Z corresponds to the autoscaled variable of the same row in C:

$$z_{i,j} = (c_{i,j} - \mu_i^c)/\sigma_i^c \tag{3}$$

μ_i^c and σ_i^c are mean and standard deviation of variable i. L and F are the loading matrix and the score matrix and may be found by traditional PCA. The problem is to rescale L and F to the physical meaningful matrices P and S. This is done in two steps: First a 'tracer' sample,[21] with sample number q+1, having all variables set equal to zero is included in the dataset, then a PCA is used to determine the score matrix F in which the rows are treated as autoscaled values of the rows in the source matrix S. Hence, using the result for the 'tracer' sample, the f values are transformed to a scaled source matrix. In the case of the PM2.5 variables the introduction of the 'tracer' sample states:

$$s_{i,q+1} = 0 \tag{4}$$

and for the autoscaled row variable in F:

$$f_{i,j} = (s_{i,j} - \mu_i^s)/\sigma_i^s \tag{5}$$

μ_i^s and σ_i^s are mean and standard deviation of source i and in the case of the ''tracer'' sample:

$$f_{i,q+1} = (s_{i,q+1} - \mu_i^s)/\sigma_i^s \tag{6}$$

Combining (4) and (6) gives:

$$\mu_i^s = -f_{i,q+1} \times \sigma_i^s \tag{7}$$

and in turn combining (5) and (7):

$$s_{i,j} = \sigma_i^s (f_{i,j} - f_{i,q+1}) \tag{8}$$

Secondly, the knowledge of the sample mass is used in a mass balance calculation to transform the scaled score matrix into the unscaled source matrix by regression of the transformed f values on the mass-variable $c_{PM2.5}$. The source matrix PM2.5 values must be related to the experimental mass values, $c_{PM2.5}$ by the relation:

$$c_{PM2.5,j} = \Sigma_i s_{i,j} = \sigma_i^s (f_{i,j} - f_{i,q+1}) \tag{9}$$

The coefficients σ_i^s are found by regression of $(f_{i,j} - f_{i,q+1})$ on $c_{PM2.5,j}$. The elements in the source matrix are now given by Eqn (8) and they describe the daily variation of the PM2.5 mass-variable of the source in ng/m^3. Finally the source profile matrix is calculated:

$$P = C\,S^T (S\,S^T)^{-1} \tag{10}$$

It must be noted that in order to obtain physical meaningful results, negative values in S and L are truncated to zero before further calculations.

Table 2. Average concentrations of elements, BC and mass of PM2.5 particles in the city of Borås

	Mean ng/m^3	Median ng/m^3	Lowest—highest ng/m^3
Si	35.22	24.21	11.7–142.2
P	29.54	24.52	9.9–66.9
S	515.03	454.68	154.9–1139.5
K	36.23	22.98	13.6–181.0
Ca	15.58	12.12	4.7–43.1
Ti	1.01	0.70	0.3–26.4
V	1.73	1.80	0.3–3.3
Cr	0.68	0.48	0.2–1.7
Mn	0.73	0.56	0.3–2.7
Fe	26.00	24.22	10.3–72.7
Ni	0.71	0.77	0.2–1.6
Cu	1.02	0.92	0.5–2.4
Zn	4.16	3.24	1.2–14.6
As	0.60	0.51	0.2–1.3
Se	0.35	0.15	0.1–2.3
Br	1.41	1.42	0.6–2.5
Pb	0.98	0.59	0.1–2.7
BC	0.60×10^3	0.53×10^3	$(0.35–1.17) \times 10^3$
Mass	5.7×10^3	5.4×10^3	$(2.4–13) \times 10^3$

Calculation

Twenty-seven samples of the PM2.5 filters were analysed for 20 elements (ng/m^3), BC (μg/m^3) and particle mass of PM2.5 (μg/m^3). Also the daily mean content of NO_2 and SO_2 (μg/m^3) were measured and used in correlation analysis, but not included in the PCA modelling. Due to severe peak overlap and/or bad counting statistics, the concentrations for Al, Cl and Sr were omitted in the following calculations. Missing values were found for some of the elemental concentrations. There are different ways of treating missing values. In the present study, missing values were set equal to half the value of the DL. The correlation matrix between variables was the key for determining the number of sources.

RESULTS AND DISCUSSION

Concentrations of elements, black carbon, mass and gaseous components

Concentrations of elements, BC and mass of the PM2.5 aerosol are shown in Table 2. The median values are shown in the table because the means will generally have a large influence from extreme values during a few days, and a comparison between means and medians may give information on to what extent the values are influenced by extreme conditions. The STDs for the elemental EDXRF measurements on this instrument are in the order of about 10%.[19]

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As seen from Table 2, the BC contents of PM2.5 are in the order of 10% of the mass. For coarse particles, PM(2.5–10), the contribution of BC has been found to be of the order of one percent of the total mass in this fraction.[18] The mass concentrations, on the other hand, are of similar magnitude in PM2.5 and PM(2.5–10) in Swedish urban environment.[15,24] The mean concentration of 6 μg/m^3 for PM2.5 as listed in Table 2 is rather close to that found in other urban locations, provided that measurements are not performed in close proximity to strong sources.[15,24,25]

The median concentrations of NO_2 and SO_2 for the same period were 10.9 and 2.08 μg/m^3 respectively.

In regression analysis of all data on elements, mass, BC and the gaseous components NO_2 and SO_2, the information was used to support the source assignments for the factors obtained in the PCA. It was noted that the correlation coefficient between V and Ni is very high, 0.94, and that the only other significant correlation coefficients are for Br and S (>0.50). Thus, it is highly likely that V and Ni have at least one common source. The close connection between the two elements is illustrated in Fig. 3 for the study period. Many metals, for example Cu and Fe, are highly correlated to the blackness (BC) of the aerosol particles. Another observation is that many of the metals have high correlations between them, again indicating that they have one or more common sources.

Source assignment from PCA modelling

In the principal component analysis several runs were made in which the number of factors were varied, and varimax as well as promax rotations were performed. However, since the pollution sources are independent of each other and because varimax gave the most consistent results when the number of factors was varied, varimax was chosen for the final source assignments.

The Scree plots from principal component analysis using different subsets of variables indicated the number of significant factors to be 4 or 5. Also a hierarchical clustering calculation based on the correlation matrix, in which the variables are observations and the correlation coefficients are variables, indicated a substructure of the dataset based on 5 factors. A dataset of 27 daily observations is small in order to precisely estimate the correlation structure for five sources and therefore stable results are not expected. Nevertheless, calculations based on the previous equations were carried out for different subsets of variables and the percent source contributions to PM2.5 were calculated. The results are shown in Tables 3 and 4.

Thus the following five main factors were identified:

- Incineration of domestic and industrial waste in the city of Borås together with other local sources, with signatures of many metals, for example Pb.
- Oil incineration from small scale oil burning and major refineries in the region. Signatures are in particular V and Ni, as already dicussed.[26]
- Biomass burning occurs in the Borås region in private houses but also in the incineration plant. Previously found signatures are those of K and the K/Zn ratio.[15,24]
- Long distance transport (LDT) to Sweden, mainly from the European continent. LDT has been proved to bring a substantial amount of sulphate into the country. The main indicator is therefore S.[27,28]
- PM2.5 in traffic usually contains a contribution from street dust, but traffic is also known to give rise to gaseous pollutants which may be transformed into particles by gas-to-particle conversion. In the present case we have utilised the positive correlation coefficients (R>0.5) between NO_2 and in particular Fe and Cu as indicators of traffic. It should be noted that NO_2 has few positive correlation coefficients with other metals than the two mentioned and

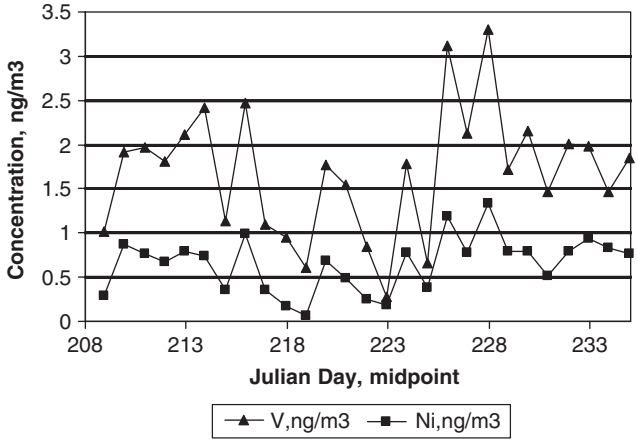

Figure 3. Daily variations of V and Ni during the period of the study.

Table 3. Set of variables used in the calculations of source contributions

19 variables	Si, P, S, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, As, Se, Br, Pb, BC, mass
14 variables	P, S, K, Ca, Ti, V, Mn, Fe, Ni, Cu, Zn, Br, Pb, mass
8 variables	S, K, V, Fe, Ni, Zn, Pb, mass
6 variables	S, K, V, Fe, Pb, mass

Table 4. Estimated percent contributions of PM2.5, normalised to 100%, for the different sets of variables listed in Table 3

	Waste incineration and local sources	Oil incineration	Biomass burning	Long distance transport (LDT)	Traffic emissions
19 variables	32	33	18	16	1
14 variables	28	29	9	23	12
8 variables	17	21	7	41	14
6 variables	24	11	8	51	6

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the soil derived elements (Si, Ca, Ti and Mn), although the latter are at a lower level ($R = 0.3$).

Quantification of source influence by the choice of the numbers of variables

Since the measurements were conducted during a limited time period, which gave rise to a limited number of samples, the statistical analysis was also conducted by varying the representative variables. Reduction of variables gives better statistical significance, but it will have to be done considering the available knowledge of the typical fingerprints of the respective sources. In the choice of variables, knowledge from correlation coefficients and from previous work was also used.[15,16,18,27–29]

In the modelling efforts the variables in the dataset were used in the following way:

At first, all species in Table 2 were used in a common dataset. This means that the aerosol, containing both particles and gases, were analysed with respect to listed species. Since the daily variations of all species are very large due to meteorological factors (mixing height, inversion, rainfall, wind direction, wind-speed, air mass trajectory movements etc.) this analysis is highly affected by meteorological factors and the number of variables increase drastically if meteorological factors are included. This approach was however abandoned, not only because of the many variables but also because we were interested in the sources of the PM2.5 particles. These sources can be point sources, or area sources as for traffic emissions, biomass burning and oil incineration in close proximity to the sampling site or at a long distance.

Thus, we turned to the problem of finding the sources for the actual PM2.5 particles and used only the variables, dependent on the composition of the PM2.5 in the aerosol. Thus, the gases were not taken into account, and the element and BC concentrations were normalised to relative concentrations (ng/μg of mass).

In order to study the influence of the number of variables on the source contribution to the sampled PM2.5, the variables in the dataset were varied in number from 19, 14, 8 and down to 6. In the reduction of variables, the character of the main sources remained, but the relative contribution from the different sources varied significantly.

An illustration of the relative strengths of the respective sources as obtained when the number of variables is reduced is shown in Tables 3 and 4 for the different cases. The reason for the large differences for the outcome in the different approaches is not clear but will have to be studied more in detail. It is obvious that too few variables may affect the outcome, but it is also important to choose the best signatures.

CONCLUSIONS

It is satisfying that the same characteristic elements appear in the factors describing the major sources for the PM2.5 aerosol, although some crucial questions remain to be solved regarding how many and which variables should preferably be used in statistical analysis for obtaining quantitatively consistent results on source contributions. This is not a trivial question, because there are many species not studied in the present work, especially chemical organic components. If these species are included in the databases, together with all meteorological variables, the problem of source identification would probably be too cumbersome.

One should also remember that the source strengths vary throughout the year and this is especially pronounced in Nordic countries with a big difference in heating and also work activities between the summer and winter periods. Thus, source strengths are not expected to be the same during the year and also a larger database would need to be broken down into activity-related periods. Also, for these cases it seems unrealistic to obtain a sufficient amount of statistically significant data if all possible variables are to be included in the modelling. Therefore, we find it even more relevant to look for elemental signatures is that are characteristic for the major sources. Elements have the advantage that they are not transformed in chemical reactions in the atmosphere during transport from source to receptor site.

A crude test of the modelling presented in this work can be seen in Fig. 4. In this figure the experimental particle mass is plotted each day together with the modelled mass for the case of using 8 variables as illustrated in Table 3. The results in Fig. 4 show that the PCA method can be used with some confidence, although details in the roles played by the different variables will have to be studied further.

Particle concentrations in winter and in summer only differ slightly: During winter the particle mass concentration as measured by the TEOM is 8.7 ± 4.5 μg/m^3 and in summer 7.7 ± 2.6 μg/m^3. From this relatively small difference we draw the conclusion that, even if our measuring campaign covers a relatively short period during the summer, the source assignments should be valid for other parts of the year as well, although the relative contributions from the respective sources will vary depending on season. The main difference in activities between the summer and winter half of the year is that during winter, heating is needed. In Boras, the additional district heating is then provided through biomass burning. Also, many single-family homes are heated with biomass in the form of wood pellets.

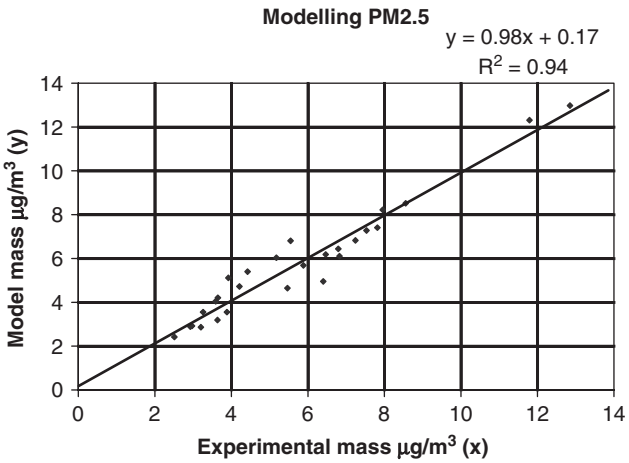

Figure 4. Comparison between model mass and experimental particle mass.

X-Ray Spectrom. 2007; **36**: 104–110
DOI: 10.1002/xrs

X-RAY Spectrometry

In our future work, however, more experimental data will be collected and analysed for making a more detailed analysis of the relative contribution to the levels of PM2.5 when the incinerable waste is varied in composition.

Acknowledgements

The authors want to thank the Carl Trygger Foundation and The Royal Society for Arts and Sciences in Göteborg (KVVS) for financial support. We also thank the IAEA for I. J. Kwame Aboh's fellowship.

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19 November 2011

THE PETITIONS COMMITTEE
National Assembly for Wales
Cardiff Bay, CARDIFF CF99 1NA

Dear Committee

FURTHER TO MY SUBMISSION OF 18 November 2011, I OMITTED TO WRITE A RESPONSE TO YOUR ADVICE NOTE. I WOULD BE DELIGHTED TO SUPPLEMENT MY WRITTEN SUBMISSION WITH ORAL EVIDENCE IN PERSON, WHICH WILL ALLOW EXPLANATION OF MAPPED ONS & PCT DATA AND RESPOND TO ANY QUESTIONS FROM THE COMMITTEE. I AM PREPARED FOR THE COMMITTEE TO PUBLISH MY REPORT IN FULL.
Yours sincerely

Dr. Dick van Steenis MBBS

BELOW IS MY COVERING LETTER OF 18 NOVEMBER 2011 SENT BY RECORDED DELIVERY.

Regarding your letter of 16 November 2011 requesting response to the petition concerning waste management in Wales, I wish to professionally reply with my findings on this matter. I lectured in the Assembly in 2011 at the request of Mark Isherwood AM and my own AM Mr Ramsay and dealt there with the science, public health and financial costings of the dire foolhardy current program. I am published in the current recent Environment Audit Committee Report (published Nov 2011).

I attach my 4 page summarised report on the Llanwern incinerator proposal with 360 scientific references. I explained how installation of plasma arc units around Wales of smaller size would keep waste management fairly local and produce effectively free some 240megawatts of electricity. See the new Teeside plasma unit passed which will produce 49megawatts of electricity some two and a half times more electricity from the same waste as an UK-style energy from waste incinerator. .Siting these at a fraction of the cost of incinerators would mean the windfarm proposals & 106 miles of new grid etc for Powys & Pontardawe could be scrapped and savings to NHS & DSS in removal of incinerator illness & deaths costs would save the National Assembly for Wales £5 BILLION. The current Prosiect Gwyrdd is economic and health suicide and breaches 6 UK laws including EC/98 of Dec 2010, Human Rights laws, EC/50 of June 2010 re PM2.5 limits etc.

Answers to your questions.

1. The best method of disposal of non-recyclable waste is plasma arc gasification which produces gravel, electricity, and also if required—hydrogen & bio-kerosene at a fraction (about a sixth) of the total cost of EFW UK incinerators. THERE IS NO COMPARISON. In Finland & Sweden high quality incinerators have been built but these still produce lots of flyash and bottom ash and some emissions. Typical emissions of UK incinerators are 120 times higher meaning 120 times the illnesses and deaths as proven by ONS and NHS PCT data my colleague and I possess. Other options like MBT cost far more and produce a toxic end product, which needs landfill or incineration or plasma gasification.

2 Incineration in the UK. A typical medium size plant would cost the NHS c.£280 million over the contract, would poison people & soil & animals for 15 miles downwind, would increase infant mortality by 8 per 1000 births for 15 miles downwind, cause 750 deaths pa needlessly after some years, cause heart attack and cancer deaths to roughly double for 15 miles downwind, cause depression rates to rise 9 times, suicides to rise, lower IQ causing worse education results meaning poor job prospects downwind, cause chronic illnesses leading to lower productivity & DSS bills etc etc The total effect is 11 years off lifespan as stated by PCT in Essington (Wolverhampton). There are few local jobs. THERE ARE NO ADVANTAGES WHATSOEVER of UK incinerators only expensive disadvantages.

3. I consider local authorities must force health boards to produce disease maps by electoral ward to first assess the current situation as has been done by Michael Ryan using ONS data. The WHO ordered this in 1997 but Wales has not complied at all. The WHO said it is impossible to form public health judgments & policies without this form of data. Local authorities can then be taught about plasma gasification by people like myself, not as at present totally misled by spin and misinformation by lobbyists & HPA heeding vested interests like Broomfield & Enviros. After mapping, local authorities must instal BAM type PM2.5 monitors in wards with worst health, siting them not on roads but at primary schools. They will then learn the true current situation. In coming months they will be fined if PM2.5s exceed the EC current law here. In Wales at present there are only six PM2.5 monitors , all TEOMs which are typically fiddled downwards, all sited on busy roads instead of in the affected communities—4 are on M4, 1 on A48 Chepstow & 1 in Wrexham. These must be resited. At present Public Health Wales, HPA, EA & Health Boards are ignorant of the facts above and should be banned from seeing incinerator industry lobbyists.

In conclusion I mention how Canadian Dept of Health & Queensland ministers among others have acted upon my advice and my data and evidence. WAG needs to follow.

Yours sincerely

Dr. Dick van Steenis MBBS

Enclosure - LEGAL ISSUES

LAWS RE INCINERATORS BROKEN BY WELSH ASSEMBLY GOVERNMENT

1. 19 November 2008/98/EC on WASTE put into UK law Dec. 2010. –MUST USE LATEST SAFEST TECHNOLOGY TO PROTECT PUBLIC HEALTH ie plasma gasification as used in USA, France, Japan etc & 2 passed in England 2011.
2. Same 2008/98/EC law states public must be involved in discussion/planning FROM OUTSET. This is not happening. Lobbyists & politicians determine junk quality incinerators not remotely like plasma gasification or incinerators in Finland
3. Environment Protection Act 1990 & IPPC. Environment Agency must prevent emissions from harming health. Not done. Only PM10 monitored which do not enter the lungs or affect health. Must monitor PM2.5s (35% escape through filters says EA 2010 & 2011) & PM1s (90% escape through filters agrees EA 2010 & 2011). These are the ones that damage health.
4. Human Rights Act. Regulators must not kill. Councils have duty of care.
5. Human Rights Act. Regulators must not make ill (torture) Councils have duty of care.
6. Human Rights Act article 8. Regulators & councils must not affect family life.
7. PM2.5 Air quality industrial emissions directive EC 2008 put into UK law 7 July 2010. Orders urban areas eg Cardiff to be below 25ug/m3 by 2010 & 20ug/m3 by 2015. Balance of UK to be below 25ug/m3 by 2015. Why has there not been PM2.5 beta monitors (BAM) been installed in Cardiff, Merthyr & Newport yet? Newport & Merthyr refuse as they know the readings will exceed the legal limit now. Merthyr will be very high now with Ffos-y-Fran.

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18 November 2011

THE PETITIONS COMMITTEE
National Assembly for Wales
Cardiff Bay, CARDIFF CF99 1NA

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In conclusion I mention how Canadian Dept of Health & Queensland ministers among others have acted upon my advice and my data and evidence. WAG needs to follow.

Yours sincerely

Dr. Dick van Steenis MBBS

 EVIDENCE OF DR. DICK VAN STEENIS MBBS 7 November 2011.

SHOULD REGULATORS ALLOW DEATHS & ILLNESS in NEWPORT & BEYOND?

An incinerator burning waste is proposed for Llanwern. Incineration of waste results in shortening of lifespan of about 11 years in Belgium & the UK, often in the prime of life, by increasing a range of diseases especially low birth weight, infant mortality, heart attacks, COPD, strokes & cancers. A university led study in Belgium detailed diseases and deaths caused during years 1 to 5, 6 to 10 and 11 to 20, ending up with a 480% rise in cancer incidence, yet that St. Niklaas incinerator was operating under the EC WID of 2000, like those in the UK. The proposed chimney will spread the damaging PM1 and PM2.5 particle emissions locally in NEWPORT and downwind to Caldicott, Magor,Chepstow etc.- Resulting in hundreds of needless deaths annually (after lead-in period) with huge NHS costs.

To properly break down incinerated items requires 1250C. This will not happen as the EA normally stipulates only 850C . The EA wrote to 2 separate individuals in 2010 and repeated in 2011 in the South London Press, that UK bag filters allow about 90% of PM1s & 35% of PM2.5s out into the air you breathe, these being the most dangerous emissions. Even a bag filter manufacturer agrees & RWDI consultants in a HIA August 2011. This plant's emissions will hence contain mostly unmonitored PM1 and PM2.5 particles, which go into the deepest part of your lungs. The PM1 & PM2.5s are not measured downwind of incinerators in the UK. In Wales the 6 PM2.5 monitors are sited as follows—4 along the M4 motorway, one on the busy A48 and the other in Wrexham. All are TEOMs, which have been admitted have their "readings" adjusted downwards hence being meaningless and totally irrelevant.

PM2.5 come under the EC directive, in UK law June 2010. PM1s & PM2.5s will add to current pollution sources eg forthcoming Splott (CARDIFF) & Severn Beach incinerators, Avonmouth & Uskmouth.

Your health can be put at risk for 2 days just from an hour's exposure to PM2.5s. Interaction of gasses and ultrafine particles from these other installations will form secondary PM2.5 particles, increasing the proposed unit's effects on health downwind. Wind direction, speed and temperature inversions are crucial factors. When you inhale PM1 or PM2.5 particulates the soluble fraction gets into the blood and your cells including brain, , while the insoluble bits are dealt with by macrophages & T-lymphocytes, eing walled off in the lungs to cause COPD. The resultant inflammatory process can cause asthma, heart attacks, higher blood pressure, strokes, clinical depression & other brain damage including lower IQ and advancing Alzheimer's dementia. Recent research has confirmed depression, drop in IQ & heart damage even in rats from these industrial PM2.5s. In the cells, mutations will occur in mitochondria & genes, caused by heavy metals, PAHs, dioxins or other POPs leading to altered function, defects & cancers. In Australia & USA schoolchildren had 20% loss of lung peak-flow from PM1 & PM2.5 emissions. Unlike USA, where PM2.5s have been monitored & heavily regulated since 1997, in the UK generally only PM10s (PM10 to PM4—none of which gets into the lungs) are measured mostly using instruments that can be adjusted to minus eg Brighton during June 2007 where PM2.5s read fraudulent minus 106uG/m3 Thus there is no effective regulation in the UK whatsoever to protect the public. The May 2008 issue of Journal of the American Medical Assoc. proved (UK) PM10s have no relevance to heart or lung disease-- only PM1s & PM2.5s count. Incinerator emissions also would contain carbon doxide, carbon monoxide, nitrogen oxides including NO2 .The source of problems is sorted by mapping out health data as demanded by the WHO 1997.In the UK fake modelling without measured data is used to allegedly claim safety, while mapping of NHS data reveals the extent of deaths & illnesses caused. The 1997 WHO (Rome) & USEPA reports, demand mapping of health data then measuring and analysing PM2.5 CONTENT to identify every individual cause of the relevant emissions.. Further verification comes from autopsy results, GP & hospital records, soil analysis & food analysis, all done at various locations. The MILAGRO study of Mexico City smog PM2.5 particulate content published 5 Sept. 2008 confirmed the smog arose from the municipal waste incinerator and PM1s were found in brains & red blood cells in autopsies of those who died downwind but not in bodies of those clear of the incinerator emissions. Analysis of the incinerator emissions included lead while blood lead levels in the children downwind were raised with no other possible cause and blood levels were not raised upwind. If data of low birth weight babies, infant mortality, childhood asthma, stroke deaths, heart attack deaths, cancer deaths or age-standardised mortality are mapped out at electoral ward level as Michael Ryan & others

have done, comparing upwind with downwind as stated in the E.A. 2001 CLARINET report, matters become very clear. PCT ward maps of Wolverhampton of infant mortality, heart attack deaths, & cancer deaths are attached. The rise in all 3 parameters is obvious. The infant mortality westwards to the Irish Sea across South Shropshire and mid Wales is ZERO in comparison. The PCT also admitted 11 years off lifespan in Essington just to the NE, reveal the scale of deaths caused by that incinerator. Michael Ryan has mapped out ONS data in 28 locations . The maps of Coventry, Kirklees and London are damning. Michael Ryan has mapped ONS data in London covering low birthweight babies, infant mortality, heart attack deaths, stroke deaths and SMRs of all causes. All reveal remarkably high zones downwind of the London incinerators, and very low zones upwind (consistent with the expected windrose) and to a distance consistent with Harvard measurements namely 7 miles per 100 ft. of chimney height. The Heathrow effect lifts the particulates causing them to land a few miles further downwind. When the Colnbrook incinerator caught fire and was closed for about a year, the infant mortality in a Harrow ward dropped from 19.1/1000 live births in 2003-2005 to 2.3/1000 in 2007-2009 with the excess presumably caused by Hillingdon & Northwick Park hospital incinerators. Very high infant mortality rates have existed in Epping Forest downwind of Edmonton, Harrow as described and Southwark which is mostly affected by SELCHP. The health parameters in Newham improved until 1994 then deteriorated consistent with SELCHP. SMRs of total deaths around SELCHP are around 160 where we also find the highest rate of birth defects in London. The deprivation map of London bears no resemblance to these ONS maps. ONS & PCT data mapped out cannot be "peer-reviewed" as they are the NHS data.

The UK-IPPC law was downgraded by Mr. Prescott in 2000 to "anything will do". Far worse, the Health Protection Agency refuse to do the required studies, even trying to stop others from doing proper studies (Hansard Nov.2009). Advisors & lobbyists have serious conflicts of interests. The DEFRA 2004 review was written by a lobbyist for incinerator companies who works with FoE. It was just delusion. Without knowledge of toxicology or use of available data & relevant measurements, the PCT, HPA & EA only heed "spin", "reviews", "diktat" & fake "modelling" without peer-reviewed journal evidence. I have 360 journal references as evidence. The public health directors, who the GMC says must know the subject, and listen to & protect the public have failed. The total NHS cost of unregulated UK industrial air pollution is c.£60 billion pa including losses to education, invalidity, productivity & crime. USEPA has recently published a report calculating £855 billion savings to the USA taxpayers from reductions of PM2.5s under the Clean Air Act mostly since 2001, some 30 times the cash cost. The UK is doing the opposite by refusing to regulate PM2.5s or PM1s with extremely serious financial consequences.

There will be cumulative impacts in the body from the proposed incinerator. PAHs from the proposal within PM1s will interact with your blood fatty acids to increase risk of a heart attack plus causing mutations leading to asthma & cancers. PAHs also lower IQ. (Perera & Fonken articles). Experiments on rats recently repeated the drop in IQ and depression caused by these PM2.5s. Rats exposed to PM2.5s developed heart damage only with a NE wind carrying incinerator emissions, and note USA incinerators that remain after most had been closed, are of higher standard than those in the UK. With PM2.5s, it only requires 8.5 ug/m3 to reduce FEV1 by 60ml or 25ug/m3 for 2 hours to increase heart attack incidence by 46%. Remember the incinerator proposed will emit around 21 ug/m3 at ground level, not 0.05ug/m3 as foolishly claimed, plus existing levels over the downwind zone.. Measurements in Sweden in 2006/7 revealed incinerator emissions were 32% of total PM2.5s, the oil refinery 33%, traffic 17%, domestic heating 14% & others 4%. This shows up UK "modelling" by RPS & advocated by Bridges as a complete fantasy not based on reality. Health services cannot afford the consequences so are forced to ration treatments due to disregard for public health in signing consent for these installations in breach of the EC directive & UK laws. The ONLY safe way to handle this waste is PLASMA GASIFICATION, which is BAT, operates on electricity, produces vitrified gravel, (hydrogen) & electricity & ethanol or bio -kerosene–all for sale- and has very low emissions at less than one sixth the total incinerator 25 year cost, when health damage is factored in. The EC directive on waste 2008/98/EC of 19 Nov.2008, (in UK law Dec.2010) insist member states use best available technology (Plasma gasification). The EC BREF law limits emissions to max. 1-5mg/m3 but UK EA allows 10 to 30 mg/m3. Why let the regulators break EC PM2.5 law in the EC Industrial Emissions Directive passed into UK law on 7 July 2010? Read Popular Science, March 2007. Other plasma gasification plants are built or passed in China, Wales,

Peterborough, Teeside, Belgium, France, Florida, Michigan, New York, 11 others in USA, Puerto Rico etc. Veolia are running the Michigan plant while fobbing off the UK with inferior incinerators. Even DEFRA admit in their July 2007 report that PM2.5s CAUSE illnesses and CAUSE premature deaths but so far have not acted on their new-found discovery which has been law in USA since 1997 & also Canada & Japan. Rates of the main diseases in USA (compare with list below) dropped 6% in 2005/5. The Infant Mortality in New York is now at an all time low. The Harvard long-term follow-up found just 1ug/m3 PM2.5s represented 3% of deaths of all causes. That will indicate needless premature deaths if the proposal is passed of hundreds pa after a lead-in period. Exposure is what counts, not passive smoking or socio-economic alleged excuses. The EC urban air directive demands maximum 25ug/m3 annual average by 2010, dropping to 20ug/m3 by 2015. The USA already knew about PM1 dangers in 1943 The WHO & USEPA insist on mapping health data to determine policy. This proposal could damage farmland, crops & animals in addition to maiming and killing innocent victims, in breach of the Human Rights Act. The dioxin contamination of food in Newcastle UK is an example.

The range of illnesses caused by inhaling PM1 & 2.5 particulates from waste burning include----
Birth defects, low birth weight babies (in direct proportion to PM2.5 levels) and stillbirths.
Premature deaths of babies, infants and adults. eg. London's infant mortality in zones downwind of the incinerators is 7 times higher than in wards upwind. (9.0 cf 1.3/1000 - ONS data 2003/5--M.Ryan) Four wards downwind of the Wolverhampton incinerator including Essington had average infant mortality of 15.3 per1000 births. Average infant mortality downwind of UK incinerators is raised by some 8 per 1000 births based on ONS data downwind of 28 installations whether old or newer.
T-lymphocyte diversion to lungs hence with depletion, affects ability to handle vaccines or infections causing SIDS, cot deaths, autism, MS, GBS, frequent childhood infections, worse ability to handle hospital bugs. Nitrogen dioxide damages T-lymphocytes in the lungs aggravating the problem.

Attention deficit and other behaviour problems, some leading to crime (majority of teenage killing 2008 was within 2 miles of the London incinerators. Recent riots also occurred near incinerators. The process begins with lower IQ in direct proportion to PAH levels as proved by Perera, , bad handling of vaccines, clinical depression by age 4 years, more days off ill, child obesity, truancy, poorer educational achievement, worse GCSE grades, choosing bad company then lastly crime or difficulty getting a job The reports by Perera, Michigan & Fonken reveal the mechanisms. The social cost becomes vast. Even obesity rates in 2011 are markedly higher downwind of the UK incinerators.
Asthma, COPD, respiratory & other infections (especially boys) and infant bronchiolitis.
Coronary heart disease, heart attacks, arteriosclerosis, hypertension, strokes, SADS.
Diabetes-- Dioxins, arsenic, cadmium, lead & mercury are implicated- all emitted by incinerators.
Contents of PM2.5s cause mutations & gene function changes in mitochondria.
Endometriosis & gastroschisis can arise from dioxin exposure, as seen in Wales.
Allergies, eczema & arthritis can arise from nickel, cobalt etc. (eg Bacton)

ME, CFS, Hypothyroidism with low T3 level (adding to obesity). ME results from retrovirus exposure (from vaccine contamination or community spread) when immune system is compromised.
Clinical depression & suicides. The Bridgend suicides coincided with emissions of the East Swansea incinerator, occurring at the same time as a dioxin induced gastroschisis outbreak. When the incinetrator was closed in 2010 the suicides dropped to one from 33 in 2007

CANCERS—non-Hodgkins lymphoma, brain, breast, colon, lung, prostate, kidney, liver etc.
Breast cancer for example can be caused by faulty genes (2%), HRT (5%) radiation, OP pesticides & herbicides, and from incinerator emissions—cadmium, dioxins (& similar POPs), & PAHs
Journal reports of incinerator health damage and analysis of dioxins (including blood tests showing downwind populations had levels over WHO limit), heavy metals, PAHs reveal none were safe.
Analysis of 9 health outcomes in Telford by ward in 2005 revealed increases in illnesses, SMR (64 in ward upwind & 149 in a ward downwind). You can check www.ukhr.eu for maps & details.

Politicions, Lobbyists, Drug Companies, Quangos & False Propaganda. DEFRA has twice allowed

lobbyists to write major fictitious reports for them to publicize. The RPS report falsely alleges emissions cease at 3km while DEFRA alleged 1km in 2004 based on the Enviros report which consisted of estimates from the wicked fairy instead of hard measurements. RPS has no idea of PM2.5 emissions in their HIA report. Glaxo paid Southampton University £1 million to wrongfully promote house dust mites which were not the real cause of asthma, hence keeping asthmatic patients ill by hiding the truth. Most COMEAP members about 10 years ago admitted receiving annual money from Glaxo. The BMJ editor has just admitted receiving money from Glaxo & Merck, then published matter to protect their products. The owner of the Lancet was made a director of Glaxo, then removed a key report. The government in 1955 ordered the MRC to cover up deaths from pollution in London. The MRC controls research grants so is now politically controlled. In mid November 2005 the HPA held a secret meeting with Eon, EA, PCT & Council just to cover up excess deaths & illnesses from emissions from Eon' s coal fired co-incinerator. The DEFRA lobbyist's fictitious misinformation is being passed around to HPA, PCT, EA and incinerator companies just to promote incinerators by deceiving the decision makers & public, like "pass a parcel" with a claim rather similar to allegations years ago that the earth was flat. The Belgian government were in possession of 2 proper studies of public health being damaged by their incinerators, so stopped allowing any more, instead awarding a large contract for plasma gasification. USA has only allowed one permit for an incinerator since 2006, instead building many plasma gasification plants. The UK is years out of date due to the above conflicts of interest The current Llanwern proposal is extremely unsafe and hence disobeys the EC/UK directive on waste and other laws, so refusal of permission must be essential. It is best to instal a plasma gasification plant, which can produce hydrogen, electricity & bio-kerosene.

The other damaging effect of PM1 emissions is to cause "dimming" by the fraction rising in the atmosphere. This cuts ultraviolet light, so reduces vitamin D production in the body by some 48% leading to rickets in the worst areas such as Southampton. Bottom ash disposal is often unsafe also, so it should go to landfill.

 GLOSSARY— COPD = Chronic Obstructive Pulmonary Disease PAH- Polycyclic-Aromatic Hydrocarbons CFS= Chronic Fatigue Syndrome IPPC = Integrated Pollution & Prevention Control USEPA = USA Environmental Protection Agency SADS = Sudden Adult Death Syndrome

FINE PARTICULATES (PM2.5s).

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The Impact on Health of Emissions to Air from Municipal Waste Incinerators

Advice from the Health Protection Agency

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Contents

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Summary

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.

The Agency's role is to provide expert advice on public health matters to Government, stakeholders and the public. The regulation of municipal waste incinerators is the responsibility of the Environment Agency.

This paper by the Health Protection Agency reflects understanding and evaluation of the current scientific evidence as presented and referenced in this document. It was first published on the HPA website in September 2009 as an HPA position statement and has now been reproduced in this series of advisory documents for convenience of access and citation.

Introduction

1 The use of incineration for waste disposal in the UK is increasing. Applications for permits to build and operate incinerators give rise to local concerns about possible effects on health of emissions. Responsibility for the environmental permitting of municipal waste incinerators lies with the Environment Agency. The Health Protection Agency (HPA) has a statutory responsibility to advise Government and Local Authorities on possible health impacts of air pollutants.

2 The operators of modern waste incinerators are required to monitor emissions to ensure that they comply, as a minimum, with the limits in the EU Waste Incineration Directive (2000/76/EC), which sets strict emission limits for pollutants. This Directive has been implemented in England and Wales by the Environmental Permitting (EP) (England and Wales) Regulations 2007 (note that from April 2008 these replaced the Pollution Prevention and Control (PPC) (England and Wales) Regulations 2000).

3 Under the EP Regulations, the operator is required to apply for an environmental permit. Consideration of this application will include such issues as health effects and organisations such as the local Primary Care Trust (PCT); the HPA and Food Standards Agency (FSA) are usually consulted. The permit itself will set out strict operating requirements which must be complied with, this will include monitoring. Should a breach of the permit occur, action may be taken by the regulator.

4 Applications to build and operate incinerators invariably include an assessment of likely emissions to air. Modern incinerators emit only small amounts of chemicals to air (see para 16) in comparison with older incinerators and, although no absolute assurance of a zero effect on public health can be provided, the additional burden on the health of the local population is likely to be very small. Studies published in the scientific literature showing health effects in populations living around incinerators have, in general, been conducted around older incinerators with less stringent emission standards and cannot be directly extrapolated with any reliability to modern incinerators (see paras 6 and 26).

5 The incineration process can result in three potential sources of exposure, (1) emissions to the atmosphere, (2) via solid ash residues, and (3) via cooling water. Provided that solid ash residues and cooling water are handled and disposed of appropriately, atmospheric emissions remain the only significant route of exposure to people. This paper is thus concerned only with the health effects of emissions to air.

6 The comparative impacts on health of different methods of waste disposal have been considered in detail in a report prepared for the Department of Environment, Food and Rural Affairs (Defra 2004). This work was undertaken by a group of consultants led by the independent consultants Enviros and included experts in the air pollution field. The report was reviewed by The Royal Society and its comments were incorporated by the authors of the report. This report is the most extensive available in the field and concludes that well managed, modern incinerators are likely to have only a very small effect on health. Since the evidence base has not changed significantly since 2004 it would be an inefficient use of resources to repeat the work undertaken by Enviros

(see above) for Defra when applications to build and operate individual incinerators are being considered. The HPA's view is that the study undertaken for Defra by Enviros can be relied on although, like all scientific findings, it may be subject to revision if new data were to emerge.

7 Concerns about possible effects on health of emissions to air tend to focus on a few well known pollutants: particles, polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzo-*p*-furans (commonly referred to as "dioxins") and other carcinogens such as the polycyclic aromatic hydrocarbons (PAH). Much is known about the effects on health of these compounds. Detailed reports prepared by expert advisory committees are available: these include reports by the Department of Health's Committee on the Medical Effects of Air Pollutants (COMEAP) on particulate matter (COMEAP, 1995, 1998, 2001a, 2009); by Defra's Expert Panel on Air Quality Standards (EPAQS) on benzene, 1,3-butadiene (reports 1 and 2), particles (reports 1 and 2), PAH compounds, and metals and metalloids[1] (Department of the Environment, 1994a,b, 1995; Department of the Environment Transport and the Regions, 1999, 2001; Department for the Environment, Food and Rural Affairs, 2002, 2009) and the Committee on the Toxicity of Chemicals in Food, Consumer Products and the Environment's statement on dioxins and dioxin-like polychlorinated biphenyls (Committee on Toxicity, 2001).

Particles

8 Questions are often asked about the possible effects on health of particles emitted by incinerators. The Committee on the Medical Effects of Air Pollutants (COMEAP) has published a series of statements and reports on the effects of air pollutants on health in the UK. It is accepted that exposure to current levels of common air pollutants damages health. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland seeks to reduce concentrations of air pollutants. Where concentrations of air pollutants are raised, Air Quality Management Areas are defined and plans to reduce concentrations are developed by Local Authorities. Details of the Air Quality Strategy can be found on the Defra website: http://www.defra.gov.uk/environment/airquality/strategy/index.htm

9 Both long-term exposure and short-term increases in exposure to particles can damage health. This is widely accepted (World Health Organization, 2006). Long term exposure affects the risk of mortality, especially from cardiovascular disease and from lung cancer (COMEAP, 2009, COMEAP, 2006; Health Effects Institute, 2000). Short-term increases in concentrations cause cardio-respiratory effects including an increase in deaths from heart attacks and from respiratory disease, increased hospital admissions for treatment of these disorders and increases in related symptoms. No thresholds of effect can be identified for either the effects of long-term exposure or for the effects of short-term increases in concentrations. Thus, any increase in particle concentrations should be assumed to be associated with some effect on health. The critical step in assessment of

1 Arsenic, chromium, nickel and beryllium

effects on health is not simply making the correct assertion that some effect is possible but in estimating the size of that effect. This is discussed below.

10 Evidence of the effects of particles on health comes, in the main, from epidemiological studies. For the effects of long-term exposure attention has been focused on $PM_{2.5}$; for the effects of short-term increases in concentrations both $PM_{2.5}$ and PM_{10} have been extensively used as metrics of the ambient aerosol. PM_{10} is defined as the mass of particles of less than (about) 10 microns in diameter per cubic metre of air. $PM_{2.5}$ is an analogous measure: in this case, the mass of particles of less than about 2.5 microns in diameter per cubic metre of air. The exact definitions are given in the recent Defra report on ambient particles (Defra, 2005). The exact mechanisms of effect of particles on health are incompletely understood but several plausible hypotheses are being pursued; the generation of free radicals in the respiratory system and more widely in the body, the induction of an inflammatory response in the lung, effects on clotting factors in the blood, effects on the rate of development of atherosclerotic plaques in coronary arteries and effects on the regulation of the heart beat are all being studied intensively. It is possible that metals found in association with particles play an important role. It is also possible that the ultrafine component of the ambient aerosol plays an important role. These, and other, possibilities are not yet proven.

11 The lack of a complete understanding of the mechanisms of effects of particles does not prevent prediction of the effects on health of increased concentrations of particles monitored as PM_{10} and/or $PM_{2.5}$. Meta-analytical techniques have been applied to the results of primary studies and summary coefficients linking PM_{10} and $PM_{2.5}$ with effects on health have been derived (COMEAP, 1998, 2009; World Health Organization, 2006). If these coefficients are applied to the small increases in concentrations of particles produced, locally, by incinerators, the estimated effects on health are likely to be small. This is because the coefficients themselves are small, the increase in concentration due to operation of the incinerator is likely to be small, and so is the size of the potentially exposed local population.

12 It is sometimes claimed that the "wrong particles" are considered when estimating the possible effects on health of emissions from incinerators. It should be understood that impact calculations of the effects on health of emissions from incinerators are done by using the coefficients derived from epidemiological studies. Because we do not know with certainty the active components of the ambient aerosol, coefficients linking effects on health with changes in mass concentrations (PM_{10} and/or $PM_{2.5}$) are used in the impact calculations. At present we have no clear epidemiological evidence to distinguish between the toxicity of samples of particles collected for PM_{10} or $PM_{2.5}$ measurements in different areas. National policy (Defra, 2007a,b) and the EC Directive on Ambient Air Quality and Cleaner Air for Europe (European Parliament and Council of the European Union, 2008) are based on the assumption that particles collected for PM_{10} and $PM_{2.5}$ measurements do not differ in their effects on health from place to place. In this context it is worth noting that PM_{10} and $PM_{2.5}$ samples from around the world can vary substantially in their chemical composition and size distribution but nonetheless exhibit similar concentration-response coefficients in time-series epidemiological studies. It is accepted that this view could change and that monitoring of chemical characteristics of the ambient aerosol (for example, its

metallic components), the number of particles per unit of volume of air, the total surface area of particles per unit volume of air, or the capacity of particles to generate free radicals could prove more valuable than measurements of mass concentrations (PM_{10} and $PM_{2.5}$). But none of this is yet well established and international and national regulations are currently framed in terms of mass concentrations. It seems reasonable that these regulations and the approaches upon which they are based should be applied to considerations of the effects on health of particles emitted by incinerators. It may be asked why studies of the specific impacts on health of the small increases in local concentrations of particles produced by incinerators are not done routinely. The main reason for this is that the concentration increment produced by incinerators is likely to be too small to allow an impact on health to be identified in the local population.

13 It is sometimes claimed that PM_{10} measurements ignore particles most likely to be deposited in the lung, or, more specifically, in the gas exchange zone of the lungs. This is incorrect and stems from a misunderstanding of the term PM_{10}. Tapered element oscillating microbalance (TEOM) monitors are equipped with a sampling head that selects essentially all particles of less than 10 μm aerodynamic diameter. PM_{10} measurement is designed to collect effectively all those particles small enough to pass the upper airways (nose, mouth, pharynx, larynx) and thus of a size that allows a chance of deposition in the lung. $PM_{2.5}$ is intended to represent that fraction of the aerosol with a high probability of deposition in the gas exchange zone of the lung in vulnerable individuals. It will be obvious that PM_{10} includes $PM_{2.5}$ and that $PM_{2.5}$ cannot exceed PM_{10} in any given sample of air.

14 It is sometimes, further, claimed that PM_{10} or $PM_{2.5}$ do not include nanoparticles present in the air. This is also incorrect. Nanoparticles are efficiently collected by PM_{10} and $PM_{2.5}$ samplers but make only a small contribution to the results expressed as PM_{10} or $PM_{2.5}$. If particles of less than 100 nm diameter alone were collected from a known volume of air and weighed, the resulting concentration could be expressed as $PM_{0.1}$ (100 nm = 0.1 microns). In a sample of air collected in a UK urban area on a typical day we might expect results similar to those given below:

PM_{10}	20 μg/m^3
$PM_{2.5}$	13 μg/m^3
$PM_{0.1}$	1-2 μg/m^3

PM_{10} includes and exceeds $PM_{2.5}$ which in turn includes and exceeds $PM_{0.1}$.

15 It is quite correct to say that nanoparticles make a large contribution to the number of particles per unit volume of air. Particles of less than about 500 nm in diameter dominate the number concentration of ambient particles. It might be correctly suggested that if a specified source, for example an incinerator, produced mainly nanoparticles, changes in local mass concentrations (PM_{10} and to a lesser extent $PM_{2.5}$) would not reflect the increase in numbers of particles in the air. We do not, however, know how to interpret measurement of number concentrations of particles in health terms. Work in this area is developing. It may be that, although the evidence is as yet weak in comparison with that relating to mass concentrations, particle numbers will link with some effects on health better than mass concentrations. No generally accepted coefficients that allow the use of number concentrations in impact calculations have yet been defined. As stated above, regulations are currently framed in terms of mass concentrations and it is unreasonable to

expect local health professionals to interpret number concentrations in quantitative health terms when national experts have not yet judged that the evidence is sufficient to do so. COMEAP will be looking at whether quantification of the effects of particle number concentrations is possible as part of its work on the quantification of the health effects of air pollution. No Air Quality Standards are defined in terms of number concentrations of particles.

16 The contribution made by waste incineration to national emissions of particles is low. Data provided by Defra (National Emissions Inventory www.naei.org.uk) show that 2007 national emissions of PM_{10} from waste incineration are 0.02% of the total compared with 18% and 22% for road transport and industry (production processes) respectively[2]. This low proportion is also found at a local level – the Environment Agency have informed HPA of one incinerator modelling study that found a modelled ground level increment in PM_{10} of 0.0005 $\mu g/m^3$ as an annual average (Environment Agency, 2009). The increment in $PM_{2.5}$ could not exceed this, and would be likely to be lower. In addition, Defra is expanding its general $PM_{2.5}$ monitoring and will scrutinise this to see if any individual sources make a noticeable addition to measured concentrations.

17 Questions are often asked about the effects of air pollutants, including those emitted by waste incineration, on children's health. The World Health Organization (WHO) in its 2005 report on Air Pollution and Children's Health and Development, concluded that there was an association between air pollution and infant mortality that appeared to be mainly due to particulate air pollution. COMEAP, in a 2008 statement on Air Pollution and Children's Health, endorsed WHO's general conclusions although the COMEAP statement does not comment on which pollutant is likely to be responsible. Annexes to the statement indicate that, of the studies published since the WHO report, some find effects of particulate air pollution and some do not. Metrics of particulate air pollution used in these studies included PM_{10} and total suspended particulates, as well as $PM_{2.5}$. The size of the effects reported in these studies relates to large changes in $PM_{2.5}$, larger than would be expected to be caused by the operation of an incinerator. Given the small effects of incinerators on local concentrations of particles, it is highly unlikely that there will be a detectable effect of any particular incinerator on local infant mortality.

18 When carrying out studies which investigate health effects around point sources of pollution such as incinerators, or when mapping health effects around such sources, it is important to control for other factors which can influence the health outcomes under investigation before drawing any conclusions. So when investigating the effect of a source of $PM_{2.5}$ emissions on infant mortality rates, it would be important to control for other sources of $PM_{2.5}$ emissions, and for factors which are known to influence infant mortality rates, for example, socio-economic factors or ethnicity. Maps showing death rates or levels of morbidity are useful in raising hypotheses, but they do not supply evidence of cause and effect.

2 National Atmospheric Emissions Inventory PM_{10}. These figures are updated compared with those in the HPA's Position Statement on Incinerators published 2nd September 2009 on the HPA website, which applied to 2006. The NAEI 'Detailed Emissions' table for PM_{10} in 2007 (http://www.naei.org.uk/emissions/emissions.php) provides more information on the calculation. The entries for 'Incineration MSW' (municipal waste incineration with no recovery of heat or electricity) (0 kilotonnes), 'Miscellaneous industrial/commercial combustion MSW' (MSW incinerated to produce heat) (<0.01 kilotonnes) and 'Power stations MSW' (MSW incinerated to produce electricity) (0.031 kilotonnes) are added and expressed as a proportion of the total emissions of PM_{10} in 2007 (135.455 kilotonnes).

Carcinogens

19 Chemicals which cause cancer are described as carcinogens. For risk assessment purposes, carcinogens are divided into two groups depending on their mechanism of action:

(a) Genotoxic carcinogens: these induce cancer by a mechanism that involves the compound itself, or a metabolite, reacting directly with the genetic material of cells (DNA), producing a mutation. This process is called mutagenicity. It is theoretically possible that one "hit" on DNA may produce a mutation that can eventually develop into a tumour. The assumption is thus made for genotoxic carcinogens that they do not have a threshold and that any exposure is associated with an increase in risk, albeit this may be very small. Most of the known human chemical carcinogens are in this group, e.g. aflatoxins, benzene, 1,3-butadiene, 2-naphthylamine, polycyclic aromatic hydrocarbon (PAH) compounds.

(b) Non-genotoxic carcinogens: these induce cancer by mechanisms that are not based on mutagenicity. These chemicals give negative results in the well recognised tests for mutagenicity. Unlike the genotoxic carcinogens, which are characterised by a common mechanism, there are a number of different mechanisms involved. Examples include sustained cell proliferation in a sensitive tissue (resulting in expression of a spontaneous mutation) due to cytotoxic effects, hormonal stimulation or immunosuppression. These effects have a threshold based on the precursor toxicological effect such as cytotoxicity, i.e. there is a level of exposure below which they do not have an effect. Examples of such compounds are oestrogens and 2,3,7,8-tetrachlorodibenzo-para-dioxin (TCDD or "dioxin").

20 In the air pollution field, genotoxic carcinogens are the major focus of interest. In the following discussion, the term "carcinogens" is used to represent genotoxic carcinogens.

21 The carcinogenic effects of PAH compounds can be identified by means of studies in experimental animals only at very much higher concentrations than occur in ambient air. These high exposures are necessary because practical limitations regarding the number of animals used in these tests mean that they cannot reliably detect increases in tumour incidence below a few percent. However, for public health purposes, the principal concern is about effects that occur at a much lower incidence in the human population, but are undetectable in animal studies. The calculation of cancer risk at low environmental exposures from mathematical modelling of the results from the high dose animal data presents great difficulty. The expert advisory committee, the Committee on the Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (COC) has consistently expressed concern at the use of such modelling to extrapolate to levels of exposure that are orders of magnitude lower than the observed range. This was most recently stated in the 2004 guidelines. (The reasons are based on the fact that the various models available do not take into account the biological complexity of the carcinogenesis process, the extrapolations are based on a few data points over a very narrow and high dose range, and very wide variations in risk estimates are produced depending on the models used.

Their use gives an impression of precision that cannot be justified). The COC does not recommend their use for routine risk assessment.

22 In some cases, carcinogenic effects have been demonstrated in epidemiological studies in humans. Such studies have almost always involved occupational exposure where workplace levels in the past may have been much higher than those in ambient air. It is difficult to demonstrate the effects of exposure to ambient concentrations of carcinogens (the concentrations are so low that vast numbers of people would need to be studied to produce clear results) but such effects are assumed to be possible, on the grounds that there is no threshold for the effects of many of these compounds. If good quality epidemiological studies are available it is possible to derive models of the relationship between exposure and effect that allow prediction, with some confidence, of likely cancer incidence at ambient concentrations. It should be noted, however, that the actual accuracy of such predictions cannot be assessed and such extrapolations still involve some considerable uncertainty and should be used with caution.

23 The Expert Panel on Air Quality Standards (EPAQS) has recommended air quality standards for benzene, 1,3-butadiene and PAH compounds using a different approach from that used by the World Health Organization (WHO), which is based on quantitative risk assessment. This is because of the concerns of the COC regarding the use of mathematical models to estimate cancer risk. Indeed, the COC endorsed the approach used by EPAQS. This involved the application of Uncertainty Factors to the results of studies of the effects on man of exposure to high concentrations of the carcinogens specified above. Standards derived in this way do not offer a complete guarantee of safety (this is impossible with non-threshold compounds) but do define concentrations at which the risks to health are likely to be very small and unlikely to be detectable. If it is found that incinerators emit the carcinogens considered by EPAQS, it is reasonable to compare the augmented local concentration (i.e. the local background concentration plus the increment contributed by the incinerator) with the EPAQS standard. If this is not exceeded it may be reasonably assumed that the additional risk imposed by the emissions is minimal. If, on the other hand, the emissions cause the local concentrations to exceed the EPAQS standard(s), the appropriate regulator would need to decide whether the additional risk posed by the incinerator was a cause for concern and what further reductions may be necessary.

Dioxins

24 It is recognised that there are particular concerns about emissions of dioxins from incinerators. The HPA and DH are advised on the health effects of such compounds by the independent expert advisory committee, the Committee on the Toxicity of Chemicals in Food, Consumer Products and the Environment (COT). The COT has recommended a tolerable daily intake (TDI) for dioxins, which is the amount which can be ingested daily over a lifetime without appreciable health risk. This TDI is based on a detailed consideration of the extensive toxicity data on the most well

studied dioxin, TCDD, but may be used to assess the toxicity of mixtures of dioxins and dioxin-like PCBs by use of Toxic Equivalency Factors, which allow concentrations of the less toxic compounds to be expressed as an overall equivalent concentration of TCDD. These toxicity-weighted concentrations are then summed to give a single concentration expressed as a Toxic Equivalent (TEQ). The system of Toxic Equivalency Factors (TEFs) used in the UK and a number of other countries is that set by the World Health Organization (WHO)[3], and the resulting overall concentrations are referred to as WHO-TEQs (van den Berg, 2006). Thus, the COT has recommended a tolerable daily intake for dioxins of 2 picograms WHO-TEQ/kg body weight/day based on the most sensitive effect of TCDD in laboratory animals, namely, adverse effects on the developing fetus resulting from exposure *in utero*. As this was the most sensitive effect it will protect against the risks of other adverse effects including carcinogenicity. The advice of the other sister committees, COC and the Committee on Mutagenicity of Chemicals in Food, Consumer Products and the Environment (COM), informed the conclusion, namely that dioxins do not directly damage genetic material and that evidence on biological mechanisms suggested that a threshold based risk assessment was appropriate. The full statement is available (COT, 2001).

25 The majority (more than 90%) of non-occupational human exposure to dioxins occurs via the diet, with animal-based foodstuffs like meat, fish, eggs, and dairy products being particularly important. Limited exposure may also occur via inhalation of air or ingestion of soil depending on circumstances. Regarding emissions from municipal waste incinerators, the current limit for dioxins and furans is 0.1 nanogram per cubic metre of emitted gases. A nanogram is one thousand millionth of a gram. Inhalation is a minor route of exposure and, given that Defra has calculated that incineration of municipal solid waste accounts for less than 1% of UK emissions of dioxins[4], the contribution of incinerator emissions to direct respiratory exposure of dioxins is a negligible component of the average human intake. However, dioxins may make a larger contribution to human exposure via the food chain, particularly fatty foods. Dioxins from emissions could also be deposited on soil and crops and accumulate in the food chain via animals that graze on the pastures, though dioxins are not generally taken up by plants. Thus the impact of emissions on locally produced foods such as milk and eggs is considered in deciding whether to grant a permit. These calculations show that, even for people consuming a significant proportion of locally produced foodstuffs, the contribution of incinerator emissions to their intake of dioxins is small and well below the tolerable daily intake (TDI) for dioxins recommended by the relevant expert advisory committee, Committee on Toxicity of Chemicals in Food, Consumer (see http://cot.food.gov.uk/cotstatements/cotstatementsyrs/cotstatements2001/dioxinsstate).

3 Note: The Waste Incineration Directive (2000/76/EC) sets Air Emission Limit Values for dioxins using a slightly different system of TEQs i.e. international- or I-TEQs, which vary slightly from WHO-TEQs.

4 Review of Environmental and Health Effects of Waste Management: Municipal Solid Waste and Similar Wastes. Extended Summary. Enviros, University of Birmingham and Defra. May 2004.

Epidemiological studies: municipal waste incinerators and cancer

26 The COC has issued two statements on the cancer epidemiology of municipal waste incinerators. The initial statement followed a review of a large study by the Small Area Health Statistics Unit which examined cancer incidence between the mid 1970s and the mid 1980s in 14 million people living within 7.5 km of 72 municipal solid waste incinerators in Great Britain[5] (Elliott et al, 1996; COC, 2000). Prior to this there had been very few studies of cancer mortality around municipal waste incinerators and none in the UK. The incinerators studied by Elliott et al (1996) were the older generation operating prior to introduction of strict emission controls and were more polluting than modern incinerators. After considering this study, the COC concluded that: "any potential risk of cancer due to residency (for periods in excess of 10 years) near to municipal solid waste incinerators was exceedingly low, and probably not measurable by the most modern techniques" (COC, 2000).

27 In 2008, the Committee reviewed seven new studies on cancer incidence near municipal solid waste incinerators which had been published since 2000 (Comba et al, 2003; Floret et al, 2003; Knox E, 2000; Viel et al, 2000; 2008a and 2008b; Zambon et al, 2007). All had studied the older generation of incinerator and three studies were of an incinerator for which emissions of dioxins were reported to have exceeded even the older emission standard. There were problems interpreting most of these studies due to factors such as failure to control for socio-economic confounding or inclusion of emission sources other than municipal waste incinerators. The COC concluded that "Although the studies indicate some evidence of a positive association between two of the less common cancers i.e. non-Hodgkin's lymphoma and soft tissue sarcoma and residence near to incinerators in the past, the results cannot be extrapolated to current incinerators, which emit lower amounts of pollutants. ... Moreover, they are inconsistent with the results of the larger study ... carried out by the Small Area Health Statistics Unit." It concluded that there was no need to change its previous advice but that the situation should be kept under review (COC, 2009).

Conclusions

28 Modern, well managed incinerators make only a small contribution to local concentrations of air pollutants. It is possible that such small additions could have an impact on health but such effects, if they exist, are likely to be very small and not detectable. The Agency, not least through its role in advising Primary Care Trusts and Local Health Boards, will continue to work with regulators to ensure that incinerators do not contribute significantly to ill-health.

5 These included all known municipal incinerators which opened before 1976. Incinerators starting from 1976 were excluded, to ensure an appropriate lag period for development of any cancer associated with the emissions.

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Glossary

Aflatoxins Naturally occurring toxins produced by the fungus *Aspergillus sp.*

Aerodynamic diameter The actual diameter of a spherical particle of unit density with the same terminal velocity as the particle under consideration. The term aerodynamic diameter allows particles of differing densities and shapes to be compared in terms of their likelihood of depositing in the lung.

Air Quality Standard (AQS) The concentration of a pollutant (expressed, generally, as mass per unit volume) and qualified by an averaging time, regarded as acceptable by an Expert Group or other standard setting body. Air Quality Standards do not provide an absolute guarantee of safety for health.

Ambient aerosol An aerosol is a suspension of fine particles or liquid droplets in a gas. Ambient refers to the surroundings. In the air pollution context, this refers to the suspension of fine particles in the general outdoor air.

Atherosclerotic plaques The discrete lesions of the arterial wall in atherosclerosis i.e., disease of the blood vessels involving the accumulation of fatty material in the inner layer of the arterial wall resulting in narrowing of the artery. These fatty deposits are known as plaques.

1,3-butadiene An industrial chemical used in the production of synthetic rubber. It is also produced by the combustion of petrol and diesel. It is efficiently removed by catalytic convertors.

Carcinogens Agents that cause cancer. Chemical carcinogens are chemicals that may produce cancer.

Cell proliferation An increase in the number of cells as a result of cell growth and cell division.

Clotting factors Substances (proteins) in blood that act in a complex series of reactions to stop bleeding by forming a clot.

Coefficients A constant multiplication factor. For example, a health effect might increase by 0.5% for every unit increase in the concentration of a pollutant. This can be derived as the slope from a graph relating health effects and pollutant concentrations.

Coronary arteries The network of blood vessels that supply heart muscle with oxygen-rich blood.

Cytotoxic Toxic to cells.

Dioxins This refers to a large group of chemicals with similar chemical structure (chlorinated dibenzo-p-dioxins and chlorinated dibenzo-p-furans). They vary greatly in toxicity, some being very toxic, others showing a similar pattern of toxicity but of lower potency. They are not produced commercially but are formed in small amounts in most forms of combustion (fires etc.). The most studied compound in this series is the highly toxic TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin).

Dioxin-like PCBs Polychlorinated Biphenyls (PCBs) are another group of substances, some of which have similar biological activity to dioxins. These are referred to as Dioxin-like PCBs. There are many other PCBs that do not have dioxin-like properties.

Epidemiological studies Studies of the distribution and the aetiology (causes) of disease in humans.

Free radicals Highly reactive chemical structures (due to the presence of a chemical species that has lost an electron and thus contains an unpaired electron in the outer shell of the molecule). They are unstable and can react in biological systems with nearby substances such as lipids, proteins or DNA producing damage.

Furans Chemicals related to furan. Furan contains carbon, hydrogen and oxygen with the carbon atoms and an oxygen atom forming a 5 sided ring.

Gas exchange zone The part of the lung in which oxygen diffuses from the air to the blood and carbon dioxide diffuses from the blood to the air. The alveoli, alveolar ducts and respiratory bronchioles make up the gas exchange zone.

Immunosuppression Suppression of the immune system.

Incidence New occurrence of a disease over a specified time period.

In utero In the uterus (womb).

Larynx Dilated region of the airway above the upper end of the trachea or windpipe. The vocal cords lie within the larynx.

Mass concentration of particles The mass of particles per unit volume of air. Usually expressed as $\mu g/m^3$ (micrograms per cubic metre).

Metabolite Chemicals that enter the body can be changed by processes in the body into different chemicals. These are described as metabolites of the original chemical.

Metalloid An element that is not clearly a metal or non-metal but has some intermediate properties in terms of malleability, ductility, conductivity and lustre. The following elements are generally considered to be metalloids: boron; silicon; germanium; arsenic; antimony; tellurium; polonium.

Meta-analysis In the context of epidemiology, a statistical analysis of the results from independent studies which aims to produce a single estimate of an effect.

Metric A measure for something. PM_{10} is a measure (or metric) of the concentration of particles in the air.

Microgram (μg) One microgram is 1×10^{-6} g. There are 1,000,000 (1 million) micrograms in a gram.

Micron (μm) This is a unit of length that equals one thousandth of a millimetre.

Mortality Deaths.

Mortality rate The number of deaths in a population.

Morbidity Ill health.

Mutation A permanent change in the amount or structure of the genetic material (DNA) in a cell or organism which can result in a change in its characteristics. A mutation in the germ cells of sexually reproducing organisms may be transmitted to the offspring, whereas a mutation that occurs in somatic cells may be only transferred to descendent daughter cells.

Nanogram (ng) One nanogram is 1×10^{-9} gram. There are 1,000,000,000 ng in one gram.

Nanoparticles These are usually considered to be particles of less than 100 nanometres diameter. One nanometre is a millionth of a mm. To put into some context this is about a ten thousandth of the width of a human hair.

2-naphthylamine A chemical used in the past in the manufacture of dyes. It is made up from 2 benzene rings with a nitrogen and hydrogen side chain.

Non-Hodgkin lymphoma A type of malignant cancer of the lymphatic system or lymphoid tissue. Most lymphoma are of this type (as opposed to being Hodgkin lymphoma).

Number concentration of particles The number of particles found in a specified volume of air, usually 1 cubic metre.

Pharynx The throat and back of the nose.

Point sources Sources of pollution from a fixed point in space e.g. an industrial site. The term is used in contrast to mobile sources of pollution e.g. cars.

Polycyclic aromatic hydrocarbons (PAHs) These are a group of structurally related organic compounds that contain 2 or more fused rings. They are formed as a result of combustion/pyrolysis.

PM_{10}, $PM_{2.5}$ The concentration (expressed in $\mu g/m^3$) of particles generally less than 10 μm and 2.5 μm respectively[6]. The terms PM_{10} and $PM_{2.5}$ are sometimes used to describe particles of diameter of less than 10 and 2.5 μm respectively but this is not strictly correct: the terms refer to the concentrations of particles and not to the particles themselves.

Picogram (pg) A picogram is 1×10^{-12} gram. There are 1,000,000,000,000 pg in one gram.

Spontaneous mutation A mutation that occurs as a result of natural processes in cells, as opposed to those that arise because of interaction with an outside agent or mutagen.

Soft tissue sarcomas These are a rare type of cancer that develop from cells in the soft, supporting tissues of the body such as muscle, fat and blood vessels. They may occur in limbs, chest, abdomen or pelvis and less commonly in head and neck.

TCDD The most studied dioxin, and the one that is used as a reference compound when considering the toxicity of mixtures of dioxins, is often referred to simply as TCDD. This is an abbreviation of its full chemical name, 2,3,7,8-tetrachlorodibenzo-p-dioxin. It is considered the most toxic dioxin.

TEOM Tapered Element Oscillating Micro-balance. An instrument used to measure the mass concentration of particles in the air. Particles are collected on a vibrating rod: the mass deposited affects the frequency of vibration of the rod and this, being recorded, allows the mass of particles in the air to be calculated.

Tolerable Daily Intake (TDI) An estimate of the amount of contaminant, expressed on a body weight basis (e.g., mg/kg body weight) that can be ingested daily over a lifetime without appreciable health risk.

Total suspended particulates A measure of particles derived by collecting particles of approximately 100 μm or less in a sampler. This includes particles that are too large to enter the lung. The measurement method has generally been superseded by measurement of PM_{10}.

Toxic Equivalency Factor (TEF) A measure of the relative toxicological potency of a chemical compared to a well characterised reference compound. TEFs can be used to sum the toxicological potency of a mixture of chemicals which are all members of the same chemical class, having common structural, toxicological and biochemical properties e.g. dioxins. In the case of dioxins the reference compound is TCDD.

Toxic Equivalent (TEQ) This is a method of comparing the total relative toxicological potency within a mixture using TEFs (see above). It is calculated as the sum of the products of the concentration of each chemical multiplied by the TEF.

Ultrafine component The component of particles less than about 100 nm in diameter.

Uncertainty factors Value used in extrapolation from experimental animals to man (assuming that man may be more sensitive) or from selected individuals to the general population; for example, a value applied to the No Observed Adverse Effect Level (NOAEL) to derive a TDI. The value depends on the size and type of population to be protected and the quality of the toxicological information available.

6 Strictly, particles that pass a sampler entry with 50% efficiency at 10 micrometres or 2.5 micrometres respectively.

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To: Ms Abigail Phillips
Clerk to the WA Petitions Committee

Welsh Assembly Petitions Committee - P-04-341 Waste and Incineration

FURTHER SUBMISSION ON BEHALF OF ABERGAVENNY & CRICKHOWELL FOE
by Rod Walters

April 20th 2012

1. Evidence of Welsh Government bias towards Energy from Waste

The Petitions Committee was told on 27th March by John Griffths, Minister, Jasper Roberts & Andy Rees, civil servants, that waste policy and advice to the Minister has been 'technology neutral'.

On the contrary, there is compelling evidence of bias which has had the effect of affording every advantage to 'energy from waste' incineration and every disadvantage to alternative technologies:

1) EFW incineration is unambiguously specified in 'Towards Zero Waste' (2010): *"In respect of projects receiving Welsh Assembly Government funding support, the reference solution for dealing with municipal waste is to meet the recycling/composting targets set in Towards Zero Waste, treat the separated food waste via AD and recover energy from the residual waste at an energy from waste (EfW) plant."*
2) Funding is made readily available for EFW but not for MBT, its main rival:
   - FOE were told in a meeting with civil servants (2007) that MBT was ineligible for funding on the grounds it comprised an 'intermediate treatment';
   - Both the Caerphilly MBT plant and the proposed Hirwaun MBT plant have had difficulty in obtaining Welsh Government funding;
   - By contrast, the Welsh Government's 'Making the Connections Programme' has funded LA partnerships such as Prosiect Gwyrdd which favour the building of large 'EFW' incinerators and the proposed Prosiect Gwyrdd incinerator will receive a grant of 25% or £9,124,000 pa.
3) It is known that the thermal efficiency of waste incinerators, and thereby their energy generation, is optimum if they operate in CHP mode, able to supply large amounts of heat to year-round users nearby. Despite this being most achievable in small /medium-sized plants, the Welsh Government visited Covanta in the USA, who proposed an incinerator at Merthyr so large it could take waste from the whole of Wales and neighbouring parts of England. So keen was the Welsh Government on this incinerator that it undertook to provide information "on forecasted rail improvement programmes for North, Mid & South Wales to allow Covanta the ability to assess the waste capture from these areas' and to 'prepare a position paper on EfW making references to Covanta.'
4) The Welsh Government wants to categorise use of incinerator bottom ash as 'recycling', which would flatter the 'green' credentials of incineration. The Government of Scotland (SEPA) states:
   "Using the bottom ash from incineration in construction products (such as aggregate and road beds) does not count towards the household waste recycling target. Incinerating resources such as paper, card, plastic and food and using the ash is not the same as 'closed loop' recycling of those same materials into new products."
   Welsh Government civil servants are aware of this ruling but choose to pursue their own path, which will have the further regrettable consequence of compromising national recycling figures.
5) The Welsh Government has promoted waste incineration to the public in every way, for example:
   - in conferences, e.g. in the "Energy from Waste in Wales 2009" conference in Cardiff (9/7/09), where Dr Andy Rees, Head of Waste Strategy Branch, Welsh Government, spoke on "The Role of Energy from Waste in Wales" sharing a platform with Malcolm Chilton, Managing Director Covanta, speaking on "the Benefits of Energy from Waste for Wales".

- in the dubious Public Attitudes to Waste 'research' carried out in Aug 2010 by Waste Awareness Wales (an arm of the Welsh Government), which claimed in its report that that people in Wales were 'in favour of waste incineration' when the research had only presented two options to respondents, 'burn or bury' and had ignored respondents' concerns over pollution from incineration – urging instead that these should be 'assuaged'.

2. Prosiect Gwyrdd bias towards Energy from Waste.

The Petitions Committee were also told that Prosiect Gwyrdd had been 'technology neutral'.

There is evidence to the contrary:

1) **Prosiect Gwyrdd visited an incinerator LA partnership before even the formal memorandum of understanding had been signed:** The formal Memorandum of Understanding was signed in July 2007. The Prosiect Gwyrdd Steering Committee had already visited Project Integra in Jan 2007 – an 'energy from waste' LA partnership in Hampshire having Veolia (shortlisted by Prosiect Gwyrdd) as their contractor.
2) **Cardiff, short of landfill space, in July 2007 specifically connected Prosiect Gwyrdd to 'Energy from Waste':** "It is recommended that Prosiect Gwyrdd... is taken forward to deliver the alternative residual waste treatment solution"..."This conclusion confirms that the principles of the benefits and solutions offered by the proposed EfW have been recognised by the Council." (Executive Business Meeting Minutes 5th Jul 2007)
3) **At the same time, Viridor announced its plans for a Cardiff incinerator:** Whether by coincidence or not, plans were revealed by Viridor at the same time for "a new plant that turns waste into energy" at Cardiff Bay, which Dan Cooke, external affairs manager for Viridor, said would "take waste from five local authorities – Cardiff, the Vale of Glamorgan, Newport, Caerphilly and Monmouthshire." (South Wales Echo Sept 2007.)
4) **Prosiect Gwyrdd's Outline Business Case was based on waste incineration:** Prosiect Gwyrdd's Outline Business Case, submitted to the Welsh Government to secure funding, was based on 'energy from waste' as its reference technology.
5) **Prosiect Gwyrdd made an all-incinerator short-list, rejecting all alternatives:** In December 2010, Prosiect Gwyrdd revealed its all-incinerator short list. To account for the absence of alternative technologies, Prosiect Gwyrdd has either denied that such technologies came forward with bids or criticised the technologies concerned. There are at least thirty waste treatment plants in the UK other than incinerators which are operational or with planning permission, some of whom unsuccessfully applied for Prosiect Gwyrdd (see sec 6.)

3. "Waste incineration has a positive carbon footprint"

It was claimed to the Petitions Committee that Waste Incineration 'has a positive carbon footprint.'

1) Such a claim rests on assumptions made by the Environment Agency's Waste and Resources Assessment Tool for the Environment (WRATE). The fallibility of such assessment tools is well documented. A Eunomia and EnviroCentre study carried out for the Greater London Authority in 2008 came to precisely the opposite conclusion: "incineration scenarios modelled were amongst the worst performing" in climate change terms." Which is right, the WRATE assessment or the Eunomia & EnviroCentre study? It clearly depends on what assumptions are fed into the model.
2) Confidence in the WRATE model is undermined by the fact that the Environment Agency openly supports 'Energy from Waste' as can be seen in its web-site:

   The main route for municipal waste disposal in the UK has traditionally been landfill. ……We must urgently find affordable ways of managing municipal waste that cannot be recycled, and maximise its

use as a resource. We believe that recovering energy from waste can contribute to a balanced energy policy. http://www.environment-agency.gov.uk/research/library/position/103220.aspx (Feb 2012)

3) The central consideration in assessing carbon footprint ought to be carbon emissions. Here, the facts are unambiguous. Without including biogenic carbon, incinerators emit more CO2 than an average fossil fuel power station, typically between 0.7 and 1.3 tonnes of CO2 equivalent per tonne of waste. Is this acceptable at a time of increasing concern over climate change?
4) Incineration supporters (and WRATE) claim that incinerator emissions are offset by energy generated, which 'replaces the burning of fossil fuels'. Even if one grants the validity of discounting emissions in this way, the actual amount of 'offsetting' would hinge on whether, additional to electricity, outlets can be guaranteed for the majority of the heat generated. Outside areas such as Scandinavia that have a high demand for heat, this can be problematic. Proposed incinerators make expansive promises in this direction, but only one or two incinerators in the UK have actually done so. The offsetting claim is further contradicted by the fact that, by 2025, Wales aims to be producing 100% of its electricity through renewable sources. Over the 25-year life of an incinerator contract, therefore, the 'displacing fossil fuels' claim is increasingly nullified.
5) Waste incineration has arrogated to itself the term "Energy from Waste" implying that it is especially able to recover energy from waste. In fact, incinerators do not generate energy efficiently. This is because incinerators use steam turbines from which a lot of heat is lost. Unless they operate in CHP mode and are able to find guaranteed year-round customers for the heat, efficiency will be low. Indeed, the Minister's statement to the Petitions Committee on 27th March that the energy efficiency of incinerators is 'on track' implies that improvements are needed.
6) An MBT plant at Avonmouth will use pyrolysis & gasification to generate energy. Unlike mass-burn incineration, pyrolysis & gasification will treat only the final residues ("refuse-derived fuel") of the MBT process. The pyrolysis stage involves heating the fuel in the absence of oxygen, converting it into a 'syngas' and carbon-rich char. The char is then gasified using high-temperature steam with the controlled addition of air. The gas from pyrolysis & gasification can generate energy more efficiently than incineration since it uses a gas engine (& potentially a fuel cell). Energy can also be efficiently generated using the biogas obtained from anaerobic digestion.

4. "Incineration does not threaten Waste Reduction & Recycling"

"25-year contracts to feed incinerators in Wales would not threaten waste reduction and recycling programmes" it was claimed to the Petitions Committee on 27th March,

1) Promoters of waste incineration produce one set of figures from Europe to justify their claim that waste reduction and recycling programmes would not be affected and opponents of incineration supply an opposite set of figures to contradict it. However, published UK Municipal Solid Waste statistics in Nov 2010 showed clearly that none of the top five UK incinerator authorities rank in the top 100 recycling authorities.
2) Councils locked into long (typically 25-year) contracts to supply incinerators have seen recycling directly suffering:
   - In 1995, Cleveland County Council signed a contract for an incinerator. A 'shortfall' in the first year led to penalties of £147,000. A representative was quoted as saying "essentially we are into waste maximisation… constrained from doing even a modest amount of recycling."
   - "Project Integra" in Hampshire, visited by Prosiect Gwyrdd, has three incinerators. It was reported in 2006 that the contractor Veolia was topping them up with recyclables to help meet shortfalls in intake of household waste. "We do take material from household waste recycling centres if there is a shortfall of black bag waste" admitted Project Integra Director, Steve Read. [News item in: www.letsrecycle.com]
3) To attain high thermal efficiency incinerators need combustibles like paper and plastics in the feedstock. Incineration is thereby in clear conflict with waste reduction and recycling programmes which aim to remove these substances.

4) Incinerator-building companies claim they only burn 'non-recyclable waste'. But until Wales's 70% 2025 recycling target is met and even after it has been reached, quantities of recyclable municipal waste would inevitably be fed into incinerators if built. Incinerators can in any case burn recyclables in commercial and industrial waste which comprises approximately one quarter of all waste and is as yet lightly regulated compared to municipal waste.
5) Contrary to modular technologies like MBT, incinerators do no recycling other than recovery of some metals from their bottom ash. As seen in section 1(4) above, the Welsh Government want to categorise use of incinerator bottom ash in construction as recycling. It is correctly stated by the Scottish Government that "incinerating resources such as paper, card, plastic and food and using the ash is not the same as 'closed loop' recycling of those same materials into new products."

5. "No significant health impact"

The authorities state that "*adverse health effects from modern, well regulated municipal waste incinerators are likely to be very small, if detectable"….. and that emissions "make only a very small contribution to local concentrations of air pollutants".*

UK authorities have historically had a tendency to deny health impact or risk from an industrial process until it is proven beyond all doubt. Is one therefore to have confidence in the above statement?

1) The statement would seem to contain an implication that modern incinerators do not breach emission standards. In fact, modern incinerators have frequently done so since 2006, including those at Wolverhampton, Hanford, Dudley, Dundee, Nottingham, Sheffield & Stoke to name but a few. In 2006 the Staffs CC Hanford incinerator breached its emission limits 40 times. In 2006 the incinerator at Dudley had over 50 emission breaches. In Nov 2007, the Dundee incinerator was in breach of emission limits for particulates, dioxins, furans & metals. The next year it again breached limits for dioxins & furans. To such cases could be added Covanta (courted by the Welsh Government and shortlisted for Prosiect Gwyrdd) which was reported to have been fined for releasing cancer-forming chemicals in 2009 and again in 2011.
2) The statement would also seem to admit that older generations of incinerators did pollute, which does not increase one's confidence in the UK authorities, since predecessors of the Environment Agency would have been responsible for permitting and regulating them.
3) Emissions from 'modern incinerators' have almost certainly been worse, since the breaches refer only to those substances that <u>were monitored and measured</u>. Until recently, monitoring did not specifically extend to fine & ultra-fine particles [PM2.5s & PM0.1s]. Such finer particles are acknowledged even by Veolia in their Newport planning application (chapter 6) to be a health risk. They were not until recently, however, separately monitored. The Environment Agency had been saying previous to this that there was little or no escape of fine and ultra-fine particles and no health risk. Now they have conceded there is a health risk and have started to measure PM2.5s should we believe them when they say fine and ultra-fine particles are being accurately monitored and well regulated? Have they the equipment to reliably do so?
4) When FOE (in connection with the Covanta incinerator) asked the Environment Agency in Wales in 2011 what proportions of PM2.5s (fine particles) and PM0.1s (ultra-fine particles) are captured by standard incinerator pollution abatement equipment, they replied "it was difficult to give firm figures because of variable factors and that if FOE was concerned about the efficiency of the filters at the Covanta plant they could contact the operator and request plant-specific data." In other words, they didn't know and didn't seem over concerned that they did not know.
5) We understand that regulation depends partly on monitoring provided by the incinerator company. Granted that the monitoring should in theory meet stringent standards, does it do so in practice? Is there a possibility that an incinerator company can manipulate the data? A whistle-blower at an incinerator in Greater Manchester (now owned by Viridor) alleges 'routine falsification of pollution-monitoring records'.

6) Research has shown that emissions increase substantially as equipment ages, during break-down and during start-up and shut-down of incinerators. Is the Environment Agency sure that accurate monitoring data is recorded at these times**?**

7) The authorities assure the public that any fine & ultra-fine particulate matter escaping from incinerators makes "a very small contribution to local concentrations of air pollutants". Research carried out at a town in Sweden in 2007 flatly contradicts this. It identified a new incinerator as the single most significant source of PM2.5s using x-ray technology *"The research used dispersive x-ray fluorescence analysis of airborne particles which has previously been shown to be a powerful technique for identifying key elements or elemental ratios for identification of important sources of air pollution."* Did the research quoted by the authorities use such technology?

8) As well as emissions to air, concern has been expressed about handling, transport & disposal of incinerator ash – particularly flue ash, known to contain highly toxic substances such as dioxins and heavy metals. Disposal of this toxic fly ash has a record of being poorly regulated. Pollutants buried in landfill sites have been known to seep out, polluting local water sources. Accidents are also a possibility when moving toxic ash on lengthy road journeys to special landfill sites. The Environment Agency are responsible for monitoring such sites and in theory for monitoring transport. In 2008 toxic dust was found to have been escaping from the Wingmoor Farm Hazardous Waste disposal Site at Bishops Cleeve after initial denials by the site operators and the Environment Agency. Has the Welsh government considered that if waste incinerators are to be built in Wales, they must provide for such hazardous waste disposal sites in Wales?

6. Other technologies

Civil servants and Prosiect Gwyrdd 'rubbish' alternative technologies.

The best available alternative to mass-burn incinerators may currently be modular waste plants containing mechanical or autoclave modules to recover recyclables, biological modules to treat organic waste streams and advanced thermal modules to recover energy from residues. Such plants would be flexible – able to respond to changes in waste volume and composition – would have much lower carbon and toxic emissions and would be able to deliver energy from waste more efficiently than incineration.

MBT was identified by the UK Committee on Climate Change (Dec 2008) as having "significant potential" to reduce greenhouse gas emissions. It is incomprehensible why civil servants responsible for waste policy in Wales are so hostile towards it.

We understand that the MBT plant at Avonmouth has cost a fraction of an incinerator to build and has only a 10-year contract. At the end of 10 years it will be able to restructure and incorporate latest technologies such as plasma gasification. Why should Local Authorities tie themselves in 25-year minimum contracts to mass-burn incinerators, to technology that, as well as being an environmental hazard and threatening waste reduction and recycling programmes, will quickly become obsolete?

At present, there are more than 100 MBT plants with a throughput of about 10 million tonnes per year operational in Italy. Venice, Florence, Rome and Naples are the most prominent cities using MBT systems. In the last two cities, new large-scale facilities have been constructed. In all, some 25% of MSW is handled via MBT in Italy.

In the UK, there are at least 30 waste plants other than incinerators operational or with planning permission in the UK. They include:

Newcastle	*MBT*	*Operational (SITA)*

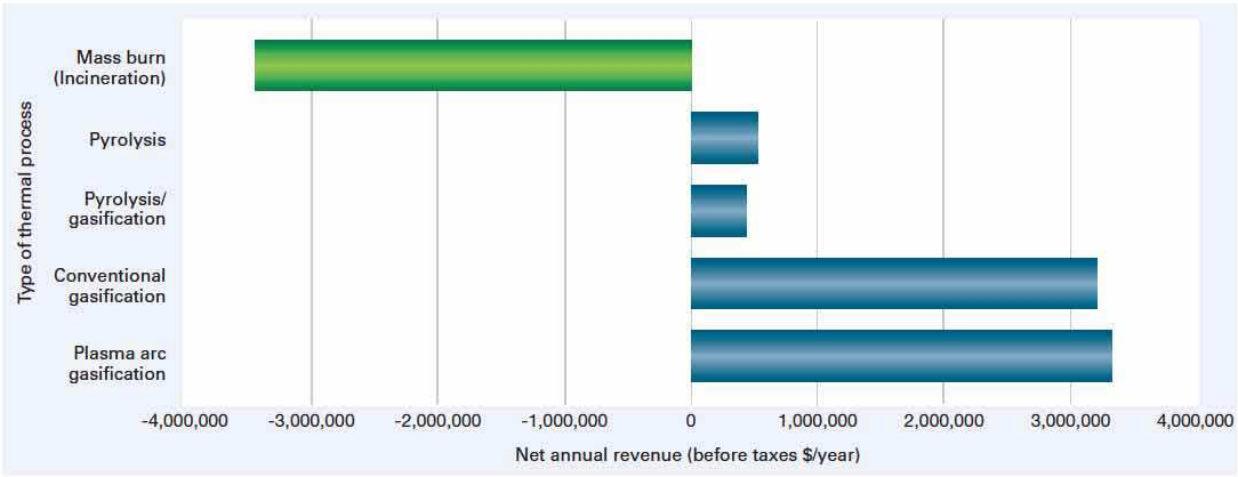
Carlisle	*MBT*	*Under construction (SHANKS)*
Dumfries & Galloway	*MBT*	*Operational (SHANKS)*
Rainham	*MBT*	*Operational (SHANKS)*
Cheshire	*MBT*	*Planning Approval (VIRIDOR)*
Westbury, Wiltshire	*MBT*	*Under construction (HILLS)*
Avonmouth	*MBT*	*Operational (NEW EARTH)*
Southwark	*MBT*	*Planning Approval (VEOLIA)*
Leicester	*MBT*	*Operational (BIFFA)*
Leyland, Lancashire	*MBT*	*Operational (GLOBAL RENEWABLES)*
Thornton, Lancs	*MBT*	*Under Construction (GLOBAL RENEWABLES)*
Colchester, Essex	*MBT*	*Planning Approval (GENT FAIRHEAD)*
Greater Manchester	*MBT*	*Operational (VIRIDOR LAING)*
Western Isles	*MBT*	*Operational (EARTH TECH)*
Sutton, South London	*MBT*	*Under construction (VIRIDOR)*
West Sussex	*MBT*	*Contract signed (BIFFA)*
Barrow	*MBT*	*Under construction (SHANKS)*
Newham	*MBT*	*Operational (SHANKS)*
Canford, Dorset	*MBT*	*Operational (NEW EARTH)*
Cambridgeshire	*MBT*	*Operational (DONARBON)*
Durham	*MBT*	*Operational (PREMIER)*
Dargavel, Dumfries	*Gasification*	*Operational*
Huyton, Merseyside	*Autoclave & MBT*	*Operational*
Widnes	*MBT*	*Planning Permission (NEW EARTH)*
Avonmouth	*Pyrolysis & Gasification*	*Planning Permission (NEW EARTH)*
Fermanagh	*MBT*	*Planning Permission*
North Lanarkshire	*MBT*	*Planning Permission (WRG)*
Falkirk	*MBT*	*Contract signed (OAKTECH)*
Newport, Gwent	*Gasification*	*Planning Permission (BIOGEN)*
Irvine, Ayrshire	*Gasification*	*Planning Permission (BIOGEN)*
Isle of Wight	*Gasification*	*Operational (ENERGOS)*
Knowsley, Merseyside	*Gasification*	*Planning Permission*
Dagenham	*Gasification*	*Under construction (BIOSSENCE)*
Hirwaun	*MBT including AD & Plasma Gasification*	*Planning Permission (ENVIROPARKS)*

END

Stop Newport Incinerator Campaign Response to Evidence Received at 27 March Meeting.

Being aware of the plethora of information, the following, few short paragraphs focus on emerging evidence since 27 March. They are presented in the same chronology as they arise in the transcripts of that day and with those paragraph numbers.

1. **Para 127et seq** US Waste Industry - These two illustrations from http://www.waste-management-world.com substantiate the argument that mass burn incineration is on the decrease and is less thermally efficient. It is noteworthy that the Mayor of New York, Michael Bloomberg invited tenders last month for "waste-to energy" facilities ***which specifically exclude mass-burn incineration*** on health and environmental grounds. It is difficult to comprehend why WG Ministers and Prosiect Gwyrdd have reached the opposite conclusion for the next 25 years.



Type of Thermal Process Technology	Net Energy Production to Grid
Mass Burn (Incineration)	493 kWh/tonne MSW (544 kWh/ton MSW)
Pyrolysis	518 kWh/tonne MSW (571 kWh/ton MSW)
Pyrolysis/Gasification	621 kWh/tonne MSW (685 kWh/ton MSW)
Conventional Gasification	621 kWh/tonne MSW (685 kWh/ton MSW)
Plasma Arc Gasification	740 kWh/tonne MSW (816 kWh/ton MSW)
Note: Except for plasma arc gasification, these processes present environmental issues in the disposing of ash and slag.	

Table 1. Thermal Process Technology(s)

2. **Para 197 Flue Gases** http://ec.europa.eu/environment/integration/research/newsalert/pdf/271na1.pdf If **Mr Farrow** quoted from this document with regard to '99.99%' closer examination reveals that finer particles still escape and have a higher proportion of heavy metals than the larger particles collected by the fabric filters.
3. **Para 234 HPA's demise –** separate correspondence to the Minister and copied to the committee.

4. **Para 245 Market Forces** The recent reports and statements from the Welsh Government and the Wales Audit Office that support the segregation of household waste for kerbside collection, in line with the clear legal requirement under EU law that waste must be sorted into 4 categories – metals,

plastics, paper and glass– for recycling are surely a market force which will impact on both the quality and volume of feedstock available to EfW.

[127] **William Powell:** We now move to our consideration of P-04-341, the waste and incineration petition. I welcome our first panel of contributors this morning. We have Mr Rob Hepworth, Mr Haydn Cullen Jones and Mr Tim Maddison. Mr Hepworth, I believe that you are going to do a short presentation ahead of our scrutiny questions on this matter. Is that correct?

[128] **Mr Hepworth:** Yes, and perhaps another very short one from Haydn, as well, if you can accommodate it.

[129] **William Powell:** Absolutely. Apologies for the delayed start of this item. We had a packed early agenda but we are with you now. Apologies for your having to wait upon us.

[130] **Mr Hepworth:** Bore da. As petitioners, we very much applaud your decision to take further evidence on this, because, although our petition focused on south-east Wales, the issue of mass burn waste incinerators is of countrywide importance. Although there are constant protestations about being neutral on the technology, senior officials in the Welsh Government, agencies such as the Environment Agency Wales, and some local authorities—those who set the policy agenda and the financial playing field for waste disposal—are strongly predisposed towards incineration. Their intention and that of the multi-national waste companies who will win the contracts is that each region of Wales will have one or more mass burn incinerators. These will transform all the black bag waste in Wales, as we would see it, into airborne chemicals and ash for the next 25 years and beyond, while producing surprisingly small amounts of energy. Prosiect Gwyrdd is simply the first in the line.

[131] We are aware that the Petitions Committee has some, but obviously limited, powers, in this area. We would just like to venture two suggestions at the outset. The first suggestion is that you might want to encourage Ministers to consider commissioning further research on the implications of incinerators for health, recycling and greenhouse gas emissions. Secondly, you might want to consider whether mechanical and biological treatment, which has far lower upfront costs, should be supported as the right interim response to Wales's residual waste over the next 10 years until the results of further research and technical innovations, such as plasma gasification, are available.

[132] You will have seen our written submissions and we have set out our case that the evidence does not support incineration in at least five areas: health, cost, recycling, employment and climate change. We stick to our case, and we would point out that as new studies of research emerge they tend to cast more doubts, particularly on the words that come from rather anonymous officials in bodies such as the Health Protection Agency, behind which I think that many of the political decision-makers on this try to shelter.

[133] We would just re-emphasise two of the most recent studies today. The first is the new Italian research by Dr Candela, published in November last year, which is part of a series studying the impacts on the local population of six modern waste incinerators in Italy. Italy, of course, is subject to the same European legislation on air quality and incinerators as Wales. That particular study shows significant relationships between exposure to incinerator emissions and stomach, pancreas and other forms of cancer. There is a steady flow of such findings. The Health Protection Agency's own volte-face in January this year on area studies—in January it said it was going to commission new work on birth events around UK incinerators, having previously said that it did not think further studies of that type were worth conducting—tends to suggest that even bodies such as the HPA are beginning to wonder whether there are real risks to the public. One is reminded, perhaps, of the steady flow

of evidence on the damage, some years ago, of smoking on health, which were initially resisted officially, but eventually accepted in full.

[134] Secondly, and we might come back to this, we once more draw the committee's attention to the SNIFFER—Scotland and Northern Ireland Forum for Environmental Research—report on particle emissions, which was published by a partnership of the relevant agencies in the four UK countries in December 2010. I will not say more than that because we have emphasised it twice in our evidence.

9.45 a.m.

[135] However, we feel that it is important that that report is looked at properly, because of the evidence that it shows about millions of lives being shortened by particle emissions. These include particles from incinerators. We do not accept the argument that, because there are different sources of particles and other processes in incineration, we should somehow not worry about incinerators, especially when alternatives to incinerators exist, such as mechanical and biological treatment.

[136] Finally, before handing over to Haydn, I would just like to draw the committee's attention to one fact: the United States of America has not built a new incinerator since 1995, 17 years—

[137] **Russell George:** Sorry, but some of us cannot hear you. I think your microphone is not working. Could you just pause a moment?

[138] **Mr Hepworth:** Yes. Would you like me to go back?

[139] **William Powell:** Yes. The microphone just failed at the end there.

[140] **Mr Hepworth:** I would just like to draw the committee's attention to a final point, which is that the USA has not built a new incinerator since 1995. That is 17 years, and hundreds of incinerators in the US have closed in that period. That is a major statement from one of the world's biggest economies and waste producers. Very tough legislation in the USA has certainly improved the health of thousands of people and may indeed have saved their lives. I would now like to hand over to my colleague, Haydn Cullen Jones.

[141] **William Powell:** Mr Hepworth, could we come in with a couple of questions here?

[142] **Mr Hepworth:** Of course.

[143] **William Powell:** You have addressed what I wanted to ask you about regarding the concerns that you expressed in your written evidence about the Welsh Government's current approach. However, I know that Joyce wants to take up a couple of issues to do with the evidence base.

[144] **Joyce Watson:** Thank you, Chair. A lot of this has also been addressed.

[145] Mr Hepworth, what feasible alternative methods of waste disposal would you recommend to allow local authorities to dispose of non-recyclable municipal waste? That is my first question. I also want to address your statement about the USA closing incinerators. Does this refer to like-for-like incinerators? In other words, are the incinerators being proposed the same as the ones that are being closed?

[146] **Mr Hepworth:** Perhaps I can answer the second part first and then ask my colleague to answer the first part. On the question of US incinerators, my understanding is that they are

more or less like for like and that the companies that are tendering in Prosiect Gwyrdd and elsewhere will—if you press them—accept that the incinerators that they are proposing for Wales would not be acceptable under US legislation.

[147] **Mr Jones:** As regards an alternative, MBT is the preferred solution from our point of view, principally because it is not so long term. In the context of the precautionary principle as far as finance is concerned, we would be committing ourselves to what the former Minister, Jane Davidson, admitted was an interim solution to the landfill problem, for 25 years. That would effectively cap our recycling targets in Monmouthshire, in terms of how they are presented at the moment, at 76%. So, in the remaining seven years, from 2043 to 2050, if we are going to get to zero waste by 2050, we would have to make up the other 24%, which seems like an amazing way to proceed with what is an interim solution.

[148] **William Powell:** I know that Bethan is coming in with a question in a moment. Mr Maddison, would you like to add something?

[149] **Mr Maddison:** Yes. There is an additional thing that may be happening, although we see no evidence of it. I think that everyone would agree that landfill taxes have been hugely successful. So, why are you not introducing rapidly escalating taxes on residual waste, over a period of, say, five years? The problem would then be gone.

[150] **Bethan Jenkins:** My question is on Prosiect Gwyrdd. The evidence that you have given us shows clearly that the councils have all come together in a democratic way to put forward these ideas. You seem to disagree by stating that this is not a localised way forward for this type of development. We have had evidence from Terry Evans stating that 25-year contracts for incineration can be problematic because you are tied in for so many years when new concepts and technologies could be coming forward. What is your view on Prosiect Gwyrdd, and the fact that it has been a democratic process?

[151] **Mr Hepworth:** I have less experience of it than my colleagues, so they may want to add to what I say, because they have seen Prosiect Gwyrdd emerge. I am a community councillor and have been working on it for about a year, but my experience of it has not been very favourable. The difficulty with such partnerships is that the line of responsibility is difficult to pin down. That means that, to a large extent, the officers drive these partnerships forward. They seem to have been driving it forward with one agenda, namely the 25-year contract. On ending up with a 25-year contract for incineration—and I will leave this point hanging because Tim Maddison may want to say something on it—would you be willing to commission a commercial service like that for 25 years while technology is developing? There are clear doubts about a number of aspects, not just in relation to health, but also the effect on recycling and carbon emissions. The alternative technology, mechanical biological treatment, in particular, is cheaper and more flexible and does not involve 25-year contracts.

[152] **Mr Maddison:** I think that you have covered it.

[153] **Bethan Jenkins:** The other part of my question was about the fact that the Environment Agency and the Welsh Local Government Association have stated that no study has shown conclusively that there is a link between incinerator emissions and public health. You mentioned briefly that independent health assessments have so far not shown a clear link. What is your view on that? You have mentioned what is happening in Italy, but if they are saying that they already have enough robust evidence then what would you say in response?

[154] **Mr Maddison:** In the Scotland and Northern Ireland Forum for Environmental Research report in 2010, on, I think, pages 5 and 6, it is made clear that some people—it estimates 10% of the population—will lose between five and 10 years of their lives due to particulate matter less than 2.5 micrometres in diameter. That equates to six million people

and does not account for the years before they die, when they are ill. Therefore, there is a massive cost, which is one of the reasons why American incinerators have been closed down by the environmental protection agency in America. The SNIFFER report is independent and without bias. The Environment Agency was part of that committee and it is quite adamant. Is it not madness to add to the load of those particles? It may be only a small amount coming from the incinerators, but it is a deadly amount.

[155] **Bethan Jenkins:** So, you would say that the Government needs to commission research and that you would want it to be fully independent. Who would you want to carry out new and independent research in this area?

[156] **Mr Maddison:** None of us here is a medical specialist. You will want to take further advice on that. We are aware of people who are capable of conducting this kind of research, and people who are capable of doing so in Wales. There is quite an issue, because the Health Protection Agency, as I understand it, has just been abolished under Mr Lansley's Act. You might want to look at that. My understanding is that the HPA's responsibilities in England will be exercised by Mr Lansley's ministry. In Wales, there is a question mark. I am not sure what the position is in Wales. However, it all points to the fact that, within Wales, it is vital that research is done, particularly if, despite the evidence we are giving, the Government is intent on building energy-from-waste incinerators throughout the country. This is an opportunity to conduct research rather than relying on an agency that has been abolished and the future shape of which is uncertain.

[157] **William Powell:** Thank you very much. We have captured all of that. Russell, I believe you have a final quick question. Apologies again for the pressure on time.

[158] **Russell George:** I was going to touch on another area, but I will skip that as I know we are pressed for time. However, could you expand on your evidence paper with regard to your concerns about the disposal of ash from incineration? Perhaps you could also say what you see as the alternative to sending ash to landfill.

[159] **Mr Hepworth:** Ash is a very important issue that sometimes gets lost in the debate because people talk about incineration as though it is the ultimate solution and that is the end of it. Quite apart from the fact that there is stuff going into the air, 25% to 30% of it is still ash, either as incinerator bottom ash or as the much more dangerous flue ash or chimney ash. That very small proportion of the ash—about 3%—is toxic, and that will have to be disposed of elsewhere. There is an issue there again for Wales because there is not a suitable disposal site in Wales, so, as it stands, it will have to go to England. I think that there is one site in Cheshire, but it will have to be transported over substantial distances, and there are obviously concerns about that process. However, the vast majority of the ash is the bottom ash, which can be toxic and which must be subject to batch testing by the EPA to check what is in it. Allegedly, that is going to be reused for aggregate, but there seems to be a surplus of ash to meet demand. There is every prospect that, whatever companies may say when they are bidding for contracts, a substantial proportion of this ash is going to end up in landfill. I do not know whether either of my colleagues have anything to add on ash.

[160] **William Powell:** Mr Hepworth, I am extremely grateful for the focused way in which you have approached the questions today. Perhaps we can get back in touch if we have further questions. We have an additional three panels of witnesses this morning to address the issues you have raised in the petition. We have found the session extremely helpful. We also have an additional evidence session on this on 1 May, which will include Friends of the Earth and other health experts. I hope that you will feel that this matter is being dealt with thoroughly. I apologise again for the pressure on time this morning, but we have the opportunity to get back in touch with you. We are extremely grateful to you for coming here this morning to answer our questions so comprehensively.

[161] **Mr Hepworth:** Thank you. We are very pleased to have been here.

[162] **William Powell:** I welcome our next witnesses. Thanks very much for joining us this morning. Tim, may I ask you to introduce the rest of the panel please? We look forward to asking our specific questions on this important petition.

[163] **Mr Peppin:** Thank you very much. I am joined this morning by Rob Quick, who is the director of environmental and economic regeneration for the Vale of Glamorgan council and the senior reporting officer for Prosiect Gwyrdd, and Mike Williams, who is the project manager for Prosiect Gwyrdd.

[164] **William Powell:** Excellent. Thank you very much indeed. I will kick off straight away as I am conscious of the pressure on time this morning. How do you respond to the view expressed by the petitioners that Prosiect Gwyrdd and its preferred proposals for incineration are based on a faulty evidence base?

10.00 a.m.

[165] **Mr Peppin:** In what areas are they saying that the evidence is faulty?

[166] **William Powell:** They are disputing some of the data. We will clarify the detail of their assertions in a moment. In the meantime, we will turn to Joyce Watson's question on waste technology.

[167] **Joyce Watson:** Why do you say that the Welsh Government has limited your choice of waste technology?

[168] **Mr Peppin:** We have said that the Welsh Government has issued guidance and recommendations on its preferred way forward. What it has put forward is in line with European directives that govern the way that everyone has to operate on this issue. The position that the Welsh Government has taken is that in light of all available evidence it has come up with a blueprint, which it believes is the best way of dealing with this issue. It has told local authorities, 'We would like you to adopt these ways of working. If you think that there are better ways of doing it, we are happy to listen to those proposals, but we would need to be satisfied that what you are proposing is at least as good as what we have in our blueprint'.

[169] **William Powell:** Coming back to the issue that I sought to raise earlier, one of the key issues that I was alluding to was the petitioners' assertion that incinerators will exacerbate carbon issues rather than reduce them. Do you accept that criticism or do you seek to rebut it?

[170] **Mr Peppin:** This issue needs to be looked at in the round, alongside all of the proposals for dealing with waste. The position is that we are aiming to recycle 70% of waste. So, 70% of the waste stream will be taken out and recycled, which is obviously a much better way of dealing with waste materials than sending them to landfill or burning them. The 30% that is left is what cannot be recycled or composted. Under the proposals, the food waste will be taken out and sent to anaerobic digestion plants. Once you take 70% of the waste out, you have 30% left, which is what is proposed to be dealt with, in this case, via the energy-from-waste scheme, which has a high level of energy efficiency when the waste is burned. So, it will be a highly energy efficient solution. Analysis has shown that to be a carbon efficient method of dealing with waste. If you were taking all of the waste to be incinerated, it would be a different thing altogether. It is a question of looking at the entire solution, and not just at incineration, and asking how it stacks up.

[171] **William Powell:** Thank you for that clarification. Bethan, I think that you wanted to explore the situation in Caerphilly.

[172] **Bethan Jenkins:** Yes and, once again, I will make reference to the letter that we have received from Terry Evans on behalf of the United Valleys Action Group. He insinuates in his letter that Caerphilly County Borough Council was financially pressurised into joining Prosiect Gwyrdd, despite it being nine months into the procurement process for MBT technology. What is your opinion on that?

[173] **Mr Peppin:** It would be for Caerphilly council to detail why it decided to change course. My understanding is that, having investigated the MBT route that it was pursuing and having looked at the affordability of it, the council changed course. It had gone out early in search of a one-authority solution; we are now seeing authorities collaborating on their waste proposals. By working with other partners, there was a more affordable way forward that spread the risks. By working together, they achieve economies of scale and can share risks. In light of all the available evidence, rather than carrying on down the route it was on, Caerphilly identified that there was a more affordable solution working with other authorities.

[174] **Bethan Jenkins:** I am asking on a general basis because I thought that Prosiect Gwyrdd included other local authorities and that you would have had discussions with Caerphilly regarding this issue.

[175] **Mr Quick:** May I respond to that, Chair? You are right that Prosiect Gwyrdd comprises five authorities: Caerphilly, Vale of Glamorgan, Cardiff, Monmouth and Newport. Your quotation seemed to indicate that Caerphilly was forced into joining that consortium. The point that I would stress this morning is that all five authorities voluntarily entered the collaboration that is Prosiect Gwyrdd, and the progress of the project is reported back regularly to the parent authorities. So, all key decisions are not made by Prosiect Gwyrdd, but by the parent authorities. When we get to the stage of choosing a preferred tender for the project, it will go back to each council to consider individually. There is a joint committee of members on which there are two members from each authority and it has regular reports as the project goes through. So, any implication that, once this project gets going, it has no democratic control or proper governance is not true. Part of my job and part of the job of my colleagues on Prosiect Gwyrdd is to go back continually to the parent councils to ensure that they are fully aware of the risks and advantages of any decisions they are making.

[176] **William Powell:** Is there officer and member involvement in that governance?

[177] **Mr Quick:** In a sense, it is both. The primary governance is the joint committee, which is a member committee. There are two councillors from each authority on the joint committee, and they tend to represent the finance and the environment portfolios, so they are important members within the administrations and the executives of their councils. There is also an important parallel scrutiny system. We have a joint scrutiny committee, again with representatives from all five authorities. Only two weeks ago, it looked in detail at some of the issues that were raised by the petitioners today about energy from waste and other technologies. Again, it will be interesting to see what comes out of that process. I am mentioning this to Members because it is another indication of the transparency of the process that has been adopted in Prosiect Gwyrdd.

[178] **Bethan Jenkins:** For the record, the United Valleys Action Group says that Caerphilly council's process of choosing MBT was 'stopped by the Welsh Assembly'. So, that is not true; it was a voluntary process for it to park that to one side and progress by other means.

[179] **Mr Quick:** I cannot comment on that, because I do not know what the circumstances

were. They were well before my involvement and, to be honest, only Caerphilly could answer that directly. None of the representatives at the table are from Caerphilly council so, in all fairness, I do not think that we could answer that. The point I am trying to make to Members is that it is a voluntary set-up and there are clear governance and democratic controls as the project progresses.

[180] **Bethan Jenkins:** The other issue is that you have stated in evidence:

[181] 'It is misleading to suggest, however, that there are alternatives to landfilling that do not involve burning.'

[182] Can you expand on that?

[183] **Mr Peppin:** The survey asked for views on landfilling and on burning, and the petitioners suggested that we should have asked about more options there. There are ways of dealing with waste other than incineration, such as MBT, advanced heat treatment, pyrolysis or gasification and so on. However, in all those alternative treatments, an element of burning is involved. With MBT, for example, after you have done the churning around to take out the stuff that, in actual fact, we are already taking out in Wales, because the recyclate and the compost come out, you are left with a residual fuel source that then goes for burning. So it still involves an element of burning. To suggest that there was another question to be asked is misleading.

[184] **Russell George:** I want to ask about the modelling tools. There are some questions about the accuracy of the modelling tools used. The petitioners believe that the waste and resources assessment tool for the environment modelling that you have used is only 30% accurate when predicting pollutant levels. How do you respond to that?

[185] **Mr Williams:** Any model deals only with the inputs. It has some embedded assumptions, and it will deal with inputs that you feed in at one end; it processes them and gives you the outputs. So, all models have an element of assumption and an element of error embedded. The tool that you refer to is WRATE; it was developed by the Environment Agency and it is regularly updated. Its use in the UK waste sector is regarded as best practice. So, there will be others who would want to put forward other models, but, generally, WRATE is seen as the best in class.

[186] **William Powell:** Moving to the wider issue of public understanding, the Welsh Local Government Association in its evidence paper suggests that, despite the overall instincts that the public has in relation to this, there is still a quite big information gap in this area. What could usefully be done to address this and to improve the public's overall understanding of the options available?

[187] **Mr Peppin:** Going back to what I said earlier, when we look at information for the public, we need to look in the round at the whole waste issue we are dealing with. First and foremost, there is information that needs to be conveyed to the general public about waste prevention. The top of the hierarchy is stopping waste being created in the first place. There is then the encouragement of recycling. There is excellent performance in terms of residents taking part in recycling schemes, and we want to see as high a level of recycling as possible. Then there is the issue of public understanding of why waste treatment facilities are needed. If there are concerns about health issues, it is important that the messages are conveyed and that people's minds are put at rest on why these facilities are needed and why the particular sets of solutions that we are going forward with have been chosen. There is a range of messages that we must get across, which are about the whole treatment of the waste process. As I say, the really important message is about changing behaviour. It is about encouraging people to recognise that high consumerism is the root cause of much of the high levels of waste created.

We need to start looking at that in a different way. There is short-term purchasing, with people throwing stuff out and expecting councils to take it away and deal with it. Part of this is about stopping that waste being created in the first place. If we can tackle that end of things—

[188] **William Powell:** We need a culture change.

[189] **Mr Peppin:** Yes.

[190] **Joyce Watson:** You are the second set of witnesses, and I want to explore some of the things that were said by the first set of witnesses. There were two things that I feel everyone would gain from an understanding of. It was claimed, by evidence apparently, that the USA is closing down its incinerator plants because of the high health risks. I asked the previous witnesses whether we were talking about like for like, and they said that we were, so I would like you to answer that criticism, because it is hugely important. The other point that was made was about the residual ash from the incinerator process, and the fact that it is toxic, it would have to be shipped out to be dealt with in England and all that goes with the shipping of allegedly unsafe toxic ash. We really to know the answers to those two critical questions.

[191] **Mr Williams:** On what is happening in the US, we are not aware that incinerators are being closed down in the US, and we understand that that is not the case. I cannot give any specifics about whether it is a like-for-like basis or whether it is a case of old ones that do not meet newer standards being closed down.

10.15 a.m.

[192] During the process, we had a US company working on this, and it referred to all its plants in the States that were active and not being shut down. Apart from that, I cannot give you any more information. I do not know whether colleagues can.

[193] On the residual ash, there are two elements. One is the bottom ash, and our aim with that is to ensure that we have 100% recycling, meeting the appropriate standards. That will meet civil engineering standards and be utilised in road construction as a substitute secondary aggregate. We are confident that that will be achieved safely and in an environmentally friendly way. The other element is fly ash, which is about 3% or so. That is hazardous due to its alkalinity. Lime is added as part of the process to neutralise some of the acid gases, and then it goes through a filter so that the majority of the material that comes out is lime, but it also contains the majority of the particulates that would otherwise go into the environment. That is classed as hazardous; not by nature of its toxicity, but by nature of its residual alkalinity. So, it would be labelled as caustic material.

[194] We want to see all materials recycled, so we are pushing hard for recycling and have just put a recycling clause in for this material. The current proposals are that it is likely that this material will be packaged and taken to a Cheshire salt mine to be stored. What we are looking to put into the process is this: if it is stored, it will be stored in such a way that, when recycling technologies become available, we might be able to recycle it. The idea is that it will be subject to transport and all those issues, but it is a small amount of material and we are pushing to ensure that it is recycled for maximum environmental benefit.

[195] **Joyce Watson:** You say that it is a small amount, but we have to seek as much information as we can about what a ‘small amount’ is. What are we talking about? These are the issues that are really worrying people out there, and it is our job to address those concerns.

[196] **Mr Williams:** It is 3% of the material. I could do a fag-packet calculation, but I would probably get it wrong. I can get back to you on that with the actual tonnage figures.

[197] **Joyce Watson:** That would be useful. If you can get back to us with the information on the US incinerators that are operating, that would be useful, too.

[198] **William Powell:** We have a final question from Bethan.

[199] **Bethan Jenkins:** Yes, and it is a very short question. We heard in earlier evidence of a call for new independent research into the health impact. You have said that the health impact assessments show that it did not have a significant impact on health, but you also say that the risk to health cannot be ruled out totally. Do you think that there would be a benefit in having further studies into this?

[200] **Mr Peppin:** A number of studies have been done, and they all say that it is virtually impossible to make that link, because of the nature of other risks present in the environment. You cannot categorically show what is causing what. Equally, you cannot categorically rule out a health risk. So, the studies have been unable to come to a definitive conclusion as to the impact. What they have said, however, is that because it is so difficult to make that link, they cannot see any—what is the term?

[201] **Mr Williams:** The term that we got from the Health Protection Agency was that there is no detectable impact on local health. They cannot detect it, but just because they cannot detect it, it does not necessarily mean that it is not there, which is where the science confuses the language.

[202] **William Powell:** I thank you for keeping your answers so succinct this morning and for agreeing to follow up a number of the issues raised—there may be others that we have cause to reflect on and come back to you on in light of sessions still to come. Thank you very much indeed for your time this morning; we will be back in touch.

[203] I now welcome Julie Barratt, the director of the Chartered Institute of Environmental Health, and Matthew Farrow, the director of policy for the Environmental Services Association. Good morning, both. Would you like to make an opening statement or shall we proceed straight to our questions? How would you like to proceed?

[204] **Ms Barratt:** I am more than happy, subject to the document that we have written being available, to proceed straight to the questions.

[205] **William Powell:** Excellent. That is what we will do.

[206] In your view, is there any validated scientific evidence that an incinerator plant operating within the UK's established regulatory framework can cause harm to human health? This question just pursues the issue that we were addressing at the end of our previous session.

[207] **Ms Barratt:** The Chartered Institute of Environmental Health has no evidence of its own—I should make that clear. We rely on the evidence of the Health Protection Agency, provided in a paper that I think I have forwarded to you on the impact on health of emissions into the air from municipal waste incinerators. That paper was dated September 2009 and was reviewed in 2011. We share the view of the Health Protection Agency that a modern incinerator, properly run, and subject to the statutory regulation regime of the environmental protection regulations on emissions, poses no detectable risk to health. As Tim said earlier, the absence of evidence is not evidence of absence, but it is as close as we can get. The current state of science and technology would suggest that there is no detectable risk to health.

[208] **William Powell:** Are there any international comparisons? Is there any evidence available from the United States of America, where there has been quite a lot of use of this technology?

[209] **Mr Farrow:** The short answer to your opening question is that we are not aware of any evidence that shows any health impacts. It is important that the debate about health—and I can understand why you are keen to explore it—is based on science. I should make it clear that the ESA, my organisation, is not a scientific organisation. We represent the waste management sector. I am conscious that people might be dubious about assertions made by a trade body. So, we thought that the best contribution we could make to the debate, particularly bearing in mind that the project scrutiny panel is undertaking a specific inquiry into health impacts, was to commission an independent consultancy, AEA Technology, to review all the latest evidence it could find in terms of any association. I think that, in my letter to the clerk, I referred to our report, which was submitted to the scrutiny panel. If you do not have a copy, I am very happy to submit one.

[210] If you are receiving further evidence, I am very happy for the author of that study to give oral evidence, as he did to the project scrutiny panel. In the study, he looked at evidence from the UK and across the world, from countries such as Brazil, Italy and Japan. He found that, first of all, emissions from modern energy-from-waste plants make up only a tiny proportion of background emissions. So, for particulates, the studies that are out there seem to show that EfW plants contribute around 0.04% of particulates in the atmosphere. I think that, for dioxins, it is about 2%. He also found studies showing that, in modern EfW plants, the filters on the flue gases capture 99.99% of all particulates. In terms of any link with health impacts, he could not find any robust, peer-reviewed studies that showed an identifiable link between an EfW plant and health impacts nearby.

[211] He found one study in Japan from around 10 years ago that showed an association, but that was for an incinerator emitting dioxins at a level that was 800 times higher than the permitted levels under the European regulatory system. So, certainly, we could not find any evidence that suggested a link. I am very happy to send you a copy of that report and to ask the author to come to give evidence to you if you felt that that was appropriate.

[212] **William Powell:** Thank you very much for that. To what extent have there been advances in recent years in terms of the safety record? You referred to a study from 10 years ago; do the changes relate to advances in technology or other issues?

[213] **Mr Farrow:** That particular study was a study of a plant in Japan, where they have a different regulatory system, and, quite clearly, although I do not know whether it was an old incinerator, the emission levels were 800 times higher than would be allowed in the UK. It is important to distinguish between current and historical evidence. If you go back to the 1960s, for example, there was very little regulation of incineration in the UK and so it is reasonable to assume that emission levels were much higher in those days, whereas today, there is very tight European regulation. Again, the evidence that was scrutinised by AEA Technology—the consultancy firm we used—found, for example, that modern EfW plants are emitting about one tenth of the particulates allowed under European law. The limit is set in European law and modern incinerators and EfW plants emit 10% to 20% of that limit, so well below what the European Union sees as a safe limit.

[214] **Joyce Watson:** Following on from previous evidence this morning, I will ask the same questions in the name of fairness. You have talked about particulates and we have evidence that supports everything that you have said, which is fine. The other issue that was raised this morning that I cannot see mentioned in anybody's report is the issue of residual ash and its transportation and safe removal and everything else that goes with it. We now know it exists. People want us to ask you whether it is going to be removed safely, if that can

be done, and if it is going to be safe in transit to wherever it is going.

[215] **Mr Farrow:** There are two types of ash, as some of your previous witnesses were saying. First, there is the ash from the filters that filter out contaminates from the flue gasses and that is hazardous and would be transported to a hazardous landfill site. I am not involved in the project myself or the bids, so I cannot give you the data on that. I think the previous witnesses said that they might come back to you with data, but I would certainly assume that any local authority procuring an energy-from-waste plant would require assurances that that hazardous ash would be dealt with under Environment Agency permits and taken to a hazardous waste landfill site. That ash is only 1% perhaps of the material that goes into the plant. The bulk of the ash is what is called bottom ash—what is left over at the bottom of the furnace—and that has to be tested to ensure it does not contain any toxic contaminants. Again, there are European and Environment Agency guidelines and methods for testing that. As a trade association, we have worked with our members to ensure that they test that in a robust way. Provided it can be demonstrated through the testing that the ash is not hazardous, it is often used as an aggregate substitute. So, in London, for example, bottom ash from an EfW plant called the Riverside plant is being used as a foundation for the M25 road-widening project. Again, that is a fully licensed, permitted process, and that is displacing virgin aggregate, so it means that you have to dig up less aggregate out of the ground somewhere else and transport it because you can use the bottom ash.

[216] I noticed that one of your witnesses said that they felt that the market for this ash was saturated and that there was no demand for it. That is not our understanding. When talking to some of our member companies who are involved in processing that ash so that it can be used as aggregate, they say that they see quite a large market for that. As I say, that is, in a sense, recovery reuse because you are using the ash instead of digging up virgin aggregate from the ground.

[217] **Ms Barratt:** I would like to supplement that by commenting on the way in which hazardous material generally is transported around the country. Obviously, you want to restrict the amount of hazardous material that is transported, if you can; we would like to keep it off the roads. Having said that, it is subject to a fairly strict regime, with transfer notes recording the volume that has been moved, so that you know how much left a site, where it is going, in whose hands it is and how much arrives at the site, so you can be quite certain how much left and how much arrived and that you have the same volume. There is no leakage or loss in transportation. The carriers also have to be registered so that the Environment Agency is sure of who is dealing with what and how it is being dealt with, because there are obviously risks to individuals as well as risks from the material. The regime around hazardous waste transport is quite rigid. A lot of hazardous waste is moved, but it is generally done safely.

10.30 a.m.

[218] **Bethan Jenkins:** You stated that you have already carried out research. I am sure that will inform decisions, but we received information from the first group of witnesses that there is new evidence from Italy that there are relationships between exposure to incinerator emissions and stomach, pancreatic and other forms of cancer. Have you had a chance to look at that research? Do you have any comments to make on that?

[219] **Mr Farrow:** I am not a scientist, so I have not gone through all the data myself. The research we commissioned, which was a literature review of all the latest research, was carried out in November and December last year, specifically to submit to the project scrutiny panel. Therefore, I would have thought that it would have looked at that. Certainly, the report contains two and a half pages of academic footnotes, which include a great deal of evidence from Italy. The consultant who did the work could not find any robust evidence showing any association. However, I am very happy to speak to the consultant to check whether he has a

view on that piece of research.

[220] **Bethan Jenkins:** In its response, Friends of the Earth stated that, because these contracts will last between 25 and 30 years, this may go against any efforts to recycle or reduce waste, given the heavy financial penalties for contractors that do not provide the incinerator with enough waste to burn. Do you concur with that evidence? Do you disagree?

[221] **Ms Barratt:** It is not really something we can comment on. We are not party to the contract between the parties. Obviously, as we say in our evidence, we would far rather start from the point of reducing waste at source so that you do not generate waste. That being the case, we are where we are, and it is speculation to say that, in 30 years, we will not have enough waste to keep an incinerator going. I would suggest that what we will have is enough waste to keep efficient incinerators going.

[222] **Mr Farrow:** Recycling should be the priority. As an industry, we support the Welsh Government's statutory targets, and we are on record as saying that the Department for Environment, Food and Rural Affairs in England should have had similar targets in its waste review. Being quite honest about it, my members, including the companies involved in this project bid, make good money out of recycling, so it is very important for the industry. Clearly, in theory, there could be a conflict. If you had a contract that said that half of all the waste had to go to an EfW plant, you would never get beyond 50% recycling. However, in Wales, there are statutory recycling targets, and it should not be too difficult to ensure—and I assume that this has been done, although I have not seen any of the contracts—that the bidders would be required to agree to the amount of waste going into the EfW plants, only to levels that should not threaten those statutory targets.

[223] **Bethan Jenkins:** That is something I would appreciate knowing. I would like the researchers to find out whether information is available on whether, if recycling targets are met, the need for incineration would decrease and what, therefore, the impact would be on those contracts. I appreciate that you are saying you do not want to comment on that, but the contracts are long term and perhaps incineration will not be as necessary in future. I would appreciate it if some research were undertaken on that.

[224] **Russell George:** I want to ask a question about public perception. In other parts of Europe, energy-from-waste plants seem to be far more accepted. Why do you think that is the case? What are your views on that?

[225] **Mr Farrow:** That is a good question. When I am talking to my industry counterparts in other parts of Europe, I often find that they are quite surprised when I explain to them the level of concern you sometimes find here when EfW plants are proposed. I think that it is because we have traditionally had a landfill culture in the UK. Almost all of our waste has gone to landfill. Only 10 years ago, 80% of our waste was going to landfill. In many northern European countries, landfill was not used very much, partly for geological reasons—there were not available sites. On the continent, particularly in northern Europe—we are talking about countries such as Denmark and Germany, which we in Britain tend to see as examples of good environmental practice—they have long used energy-from-waste plants and it is perfectly accepted. In the UK, until the 1960s, incineration was not used very much in the UK. As we were saying earlier, there was no real regulation of those plants in the 1960s. Perhaps that is why people tend to be sceptical about it. I have been told by the Environment Agency that when an energy-from-waste plant is being proposed, it often gets high levels of concerns and objections from the community. When a plant is running, it gets very few complaints, as compared with landfill sites. When they are operational, people seem to get used to them and seem to be fairly comfortable with them being in their communities, again compared with landfill sites.

[226] **Russell George:** Given what you have said, what is your view on changing public perception, if that is the case?

[227] **Mr Farrow:** I think that it is probably a long-term process. There is an onus on my industry to be as open as it can be. Many large members of the ESA have open days and arrange school visits to plants. The large companies in my membership, including the two bidders for the project, operate all types of waste treatment plants, including mechanical biological treatment plants—which I would like to say a bit about, if I may—and landfill and energy-from-waste plants. So, there is an onus on them to explain how the plants work. I would then hope that sessions such as this one, where we can debate the evidence in an open way, will reassure people.

[228] **Ms Barratt:** I would add to that by saying that there is great value to local authorities publishing the results of their ongoing air monitoring and so on, so that people can see the sort of results they are getting there and take some comfort from them. They point to the Rechem plant in Torfaen, where there was an open policy of publishing all the results of air, water and soil sampling, which tended to allay the majority of the fears, because there was no evidence to support the fears that had originally been there. You have to look back and say that, historically, particularly in Wales, industry has been a bad neighbour development. The fear that industry will be a bad neighbour persists, although industry has got progressively cleaner. Take Anglesey as an example, where you had a nuclear power plant and Anglesey Aluminium. Both were traditionally very bad neighbours, but they co-existed well on the island because of the way in which they were run and people understanding that they were clean industries. People get used to stuff quite quickly, and, as Matthew says, there are ongoing problems with landfill, such as bird or pet problems, vehicle movement, dust and smell problems and all the rest, which are not there with a closed industry.

[229] **William Powell:** Mr Farrow, you said that you would value the opportunity to speak a little more about mechanical biological treatment.

[230] **Mr Farrow:** Yes, if I may, because I am conscious that other witnesses have talked about MBT as an alternative. To make it clear, MBT is an important technology, say my members, including the two companies involved, who run MBT plants. The point I wanted to make is that there is no perfect solution to dealing with black bag waste. All technologies have their pros and cons. What we tend to find with MBT is that it is not a full solution. With an MBT plant, you can normally get out around 10% recyclates from the waste that goes in. You are left with a number of residues, one of which is an organic residue known in the trade as compost-like output, or CLO. It is called that because it does not meet the quality standards of normal compost; it has some contaminants in it. There is a debate about the best use for that residue. In England, it is often spread to land, but is not allowed to go on food-producing land, and the Environment Agency takes it on a case-by-case basis. So, there is a debate about what is the best thing to do with that residue.

[231] The other residue is often either landfilled itself—so, you are still using landfill—or, in some cases, turned into fuel for other EfW plants. In Essex, for example, which has recently gone for an MBT strategy, the plan is that the residue will be turned into what is called refuse-derived fuel, or RDF, and preferably sold to other parts of the country that have EfW plants. So, it does not fully solve the problem. The other issue with MBT that needs to be factored in is that it is quite an energy-intensive process. Energy-from-waste plants produce energy to heat homes or to produce electricity. For an MBT plant, you require electricity to run the processes. So, if you are interested in the carbon impact, you have to factor that in. Also, you often get similar levels of public opposition. In north London, the North London Waste Authority is commissioning a mechanical biological treatment plant, to which there is huge public opposition, with people saying, ‘We do not want this plant in our community—it is not the right plant at all, and we do not like this technology’. Again, there

are some debates about the health impacts of MBT. It is an alternative up to a point—you are still left with those residues, and you have to either burn them or landfill somewhere else. Like all technologies, landfill, energy from waste, and MBT have their strengths, but also have challenges.

[232] **William Powell:** I thank you both for giving us such full and authoritative answers. If there are issues that we need to come back to you on, we would appreciate being able to do that. Thank you for joining us this morning and for answering so fully.

[233] We will now invite our next witnesses into the room. Good morning, Minister. Would you be kind enough to introduce your team?

[234] **The Minister for Environment and Sustainable Development (John Griffiths):** Certainly. On my left is Jasper Roberts, who is head of waste for the Welsh Government, and Andy Rees works with Jasper in that department.

[235] **William Powell:** I will kick off with the initial question. We have had a number of different panels this morning, the second of which was led by the WLGA and Tim Peppin. In its paper to us, the WLGA states that it holds the view that

[236] 'the Welsh Government has limited the choice of local authorities in terms of waste technology'

[237] for dealing with residual waste. How do you respond to that assertion?

[238] **John Griffiths:** I would say that we have been technology-neutral in our approach, and we have made that clear in a number of documents, such as our collections blueprint, which is part of our waste strategy and our waste policy. Of course, the WLGA is part of our programme board and steering group, so it has been integrally involved in the development of this policy, and we work in close partnership. I think that we have been quite clear, actually, that we are technology-neutral in these matters.

[239] **William Powell:** One other issue that was quite prominent in our discussion with the WLGA was around public understanding of waste-related issues. Do you feel that we should be doing more work in this area so as to gain the trust and understanding of the public in taking forward new solutions?

[240] **John Griffiths:** We fund Waste Awareness Wales to engage with the public and communicate effectively around our waste policy, which would include these matters of energy from waste. I guess that there is always more that can be done, but we do provide funding and sponsor that body to do just that job of work. We always need to look at these matters, because it is vital that communities are effectively informed, understand the issues and feel that they can have their say. Those are matters that we need to continue working on.

[241] **William Powell:** One theme that came through in the most recent evidence session was the value of openness and transparency in the monitoring that is going on. That is a message that we as a committee would accept also. Bethan, you have indicated that you wanted to lead on some of the health issues.

[242] **Bethan Jenkins:** Yes. One of the big themes of the session so far has been the health impacts, and it would be useful for us to understand whether you have any validated scientific evidence that an incinerator plant operating within the UK regulatory framework could cause harm to human health.

10.45 a.m.

[243] **John Griffiths:** There are bodies that are tasked with providing advice on public health, and Government has to respect their opinions and statements. So, the Health Protection Agency has a position statement on energy from waste, which states that there are no significant adverse health impacts. We have to take the advice of bodies with the expert opinion and scientific knowledge that are tasked with protecting public health. We considered the Health Protection Agency to have stated the position.

[244] **Bethan Jenkins:** We have heard in evidence that the results of a study published in Italy recently show a significant relationship between exposure to incinerator emissions and stomach, pancreatic and other forms of cancer. Have you or your officials had the time to look at this research or have you seen any other European research that indicates that there are health risks?

[245] **John Griffiths:** Again, agencies such as the Health Protection Agency make sure that they are up to date with all the latest research and evidence. If they consider that anything that is published or any new evidence warrants them to re-evaluate their position, then they would do that. So, again we are guided by the Health Protection Agency in line with its statutory role.

[246] **Bethan Jenkins:** We were told earlier that the Health Protection Agency could be abolished under the current system. Do you know what will happen when that takes place? In terms of people having faith in the system, a lot of the evidence we have received suggests that people have been unhappy with some of the work that the agency has done. Who would take over that work in Wales?

[247] **John Griffiths:** I am not aware of the Health Protection Agency's imminent demise, as it were, but there is a role and function that has to be fulfilled. If the Health Protection Agency was to go out of existence, then whatever successive body fulfilled that role would provide us with its advice and opinion in a way that the Health Protection Agency currently does. However, given that it is the HPA that has that role at the moment, then we take its advice and abide by it.

[248] **William Powell:** Joyce, I think you wanted to ask the next question.

[249] **Joyce Watson:** Good morning, Minister. I am going to ask about energy from waste versus recycling. How do you respond to the claim that building major incinerators will discourage further improvement in waste reduction and recycling?

[250] **John Griffiths:** We have a very good record on recycling. We are ahead of the other countries in the UK and that is where I think all of us would want to be. We are driving forward towards the 70% figure for recycling of municipal waste in accordance with our zero waste policy 'Towards Zero Waste'. We are on track for that. So, in setting that very ambitious target of 70%, we have limited the feed stock, as it were, for energy from waste to the 30% figure.

[251] If we look at the best performance in the European Union, the figures for Flanders for example—I visited Flanders—are around 70% recycling and 30% energy from waste. We are setting our performance at the top level of performance in the European Union. If we do that and drive towards that 70% recycling of municipal waste, then effectively we will limit the feed stock for energy from waste.

[252] **Joyce Watson:** In the name of fairness and equality, we have been made aware this morning—

[253] **Bethan Jenkins:** May I ask about this issue, before you carry on to another issue—

[254] **Joyce Watson:** It is connected.

[255] **Bethan Jenkins:** I just wanted to ask about the contract.

[256] **Joyce Watson:** Yes, okay.

[257] **Bethan Jenkins:** My question feeds directly into this. I appreciate what you are saying about the 30% and the 70% targets, but if you have 25 or 30-year contracts, they could limit your flexibility in terms of switching from energy from waste. What would you say to that?

[258] **John Griffiths:** Well, that is an issue. Whichever way you deal with residual waste will in part be determined by the market that is there, by the commercial operators and by their requirements in terms of their own operations. So, there are many factors that come into play. That is the nature of the market with which we have to contend, no matter what policy we have for residual waste.

P-03-295 Gwasanaethau Niwroadsefydlu Paediatrig

Geiriad y ddeiseb

Rydym ni, sydd wedi llofnodi isod, yn galw ar Gynulliad Cenedlaethol Cymru i annog Llywodraeth Cymru i gydnabod ac i ddarparu gwasanaethau ar gyfer adsefydlu plant sydd wedi cael anafiadau i'r ymennydd. Ar hyn o bryd, nid oes cyfleuster yng Nghymru i ddarparu'r gwasanaeth hanfodol hwn. Er gwaetha'r ffaith bod ysbyty penodol ar gyfer plant yn cael ei adeiladu yng Nghaerdydd, nid oes darpariaeth o hyd wedi'i chynnwys yng nghynllun yr ysbyty hwnnw.

Cynigwyd gan: Kyle's Goal

Ystyriwyd y ddeiseb am y tro cyntaf: Mis Mehefin 2010

Nifer y llofnodion: Cynigwyd y ddeiseb gan Kyle's Goal. Casglwyd 9,128 o lofnodion gan ddeiseb gysylltiedig.

Submission from P-03-295 Paediatric Neuro Rehabilitation Petitioner

Health Board	No. of Cases
Abertawe Bro Morgannwg University Health Board	192
Aneurin Bevan Health Board	345
Betsi Cadwaladr University Health Board	98
Cardiff & Vale University Health Board	208
Cwm Taf Health Board	31
Hywel Dda Health Board	41
Powys Teaching Health Board	0
	915

GIG CYMRU NHS WALES
Bwrdd Iechyd Cwm Taf Health Board

Your ref/eich cyf:
Our ref/ein cyf: CTHB_457_11
Date/Dyddiad: 1 December 2011
Tel/ffôn: 01443 744835
Fax/ffacs:
Email/ebost: Corporate Services
Dept/adran:

Private & Confidential

Freedom of Information Request: Our Reference CTHB_457_11

Thank you for your request for information received on 17 November 2011 regarding hospital admissions. Please find the response from Cwm Taf Health Board set out below:

You asked:

Can you please let me know how many young people (0-18 years old) have been admitted with acquired brain injury to the local health board's hospitals within last five years?

Our response:

Clinical data within the Health Board is categorised using a coding system. To collate the information you have requested we have searched using the category of "Intercranial Injury". Based on this category there have been 31 admissions of patients between the ages of 0–18 during the period April 2006 – March 2011.

Under the terms of the Health Board's Freedom of Information policy, individuals seeking access to recorded information held by the Health Board are entitled to request an internal review of the handling of their requests.

If you would like to complain about the Health Board's handling of your request please contact me directly at the address below. If after Internal Review you remain dissatisfied you are also entitled to refer the matter to the Information Commissioner at the following address:

Information Commissioner's Office
Wycliffe House
Water Lane
Wilmslow
Cheshire
SK9 5AF

Tel: 01625 545 745 or fax: 01625 524510.

I trust that this provides the information that you require. You should note, however, that the Information Commissioner would normally expect you to have exhausted our internal complaints procedures before dealing with such an application. Further guidance may be found on the Information Commissioner's website http://www.informationcommissioner.gov.uk.

The Information Commissioner recommends that all public authorities should publish a disclosure log. Such logs allow the public and other interested parties to see questions which have already been asked and answered and to quickly identify

information of interest. Please note that Cwm Taf Health Board routinely publishes details of all Freedom of Information Act requests received in its disclosure log. The Disclosure Log can be found at www.cwmtafhb.wales.nhs.uk .

Please do not hesitate to contact me if you have any queries

Freedom of Information Act Request –Acquired Brain Injury (ABI) Data

Request specifics - Can you please let me know how many young people (0-18 years old) have been admitted with acquired brain injury to Cardiff and Vale UHB hospitals within last five years?

For clarification, the acquired brain injury could be caused by:

- Near-drowning
- Encephalopathy
- Cardiac arrest
- Meningitis
- Encephalitis
- Assault
- Brain tumour
- Road traffic accident
- Stroke
- Arterio-venous malformations
- Other

Response: Using the identifying codes relating to "Intercranial Injury" Cardiff and Vale UHB has admitted a total of 208 patients between the ages of 0–18 during the time scale indicated in your request.

GIG CYMRU NHS WALES
Bwrdd Iechyd Prifysgol
Betsi Cadwaladr
University Health Board

Ein cyf / Our ref: 330/11/FOI
Eich cyf / Your ref:
☎: ext
Gofynnwch am / Ask for: Lisa Parry
Ffacs / Fax:
E-bost / Email: lisa.parry2@wales.nhs.uk
Dyddiad / Date: 6th December 2011

Mr Chris Wools

Dear Mr Wools

Further to your request for information dated 17th November, I am pleased to provide the following in response to your request.

You asked us:

Can you please let me know how many young people (0-18 years old) have been admitted with acquired brain injury to the local health board's hospitals within last five years?

For clarification, the acquired brain injury could be caused by:

- Near-drowning
- Encephalopathy
- Cardiac arrest
- Meningitis
- Encephalitis
- Assault
- Brain tumour
- Road traffic accident
- Stroke
- Arterio-venous malformations
- Other

Our Response:

Financial Year	
2006/07	17
2007/08	16
2008/09	28
2009/10	14
2010/11	23
Grand Total	**98**

Bwrdd Iechyd Prifysgol
Betsi Cadwaladr
University Health Board

Please note, the information we have supplied to you is copyrighted to Betsi Cadwaladr University Health Board and continues to be protected by the Copyright, Designs and Patents Act 1988. You are free to use it for your own purposes, including any non-commercial research you are undertaking and for the purposes of news reporting.

If you are dissatisfied with the way the Health Board has handled your request for information, you can request a review by writing to:

Freedom of Information Office
Betsi Cadwaladr University Local Health Board
Ysbyty Gwynedd, Penrhosgarnedd, Bangor LL57 2PW

If you remain dissatisfied with the handling of your request or complaint, you have a right of appeal to the Information Commissioner at:

The Information Commissioner's Office,
Wycliffe House, Water Lane, Wilmslow, Cheshire SK9 5AF.
Telephone: 08456 30 60 60 or 01625 54 57 45 Website: www.ico.gov.uk

There is no charge for making an appeal.

If you require any further assistance, please do not hesitate to contact me on 01248 385353.

Yours sincerely

Lisa Parry
Information Governance Manager

GIG CYMRU NHS WALES | Bwrdd Iechyd Aneurin Bevan Health Board

Our Ref: AG/DD/11222
Your Ref:

Direct Line: 01495 765475
Email: Dianne.dainton@wales.nhs.uk

18 January 2012

Mr C Wools

Dear
Thank you for your request for information under the Freedom of Information Act received on 22 December 2012, reference number **FOI 11222.** Please find attached the information requested in respect to:

How many young people (0-18 years old) have been admitted with acquired brain injury to the Local Health Board's hospitals within last five years? The acquired brain injury could be caused by:
Near drowning
Encephalopathy
Cardiac arrest
Meningitis
Encephalitis
Assault
Brain tumour
Road traffic accident
Stroke
Arterio-venous malformations
Other

Please find attached our response for your information.

I trust that the information provided satisfies your request. If you are not satisfied that all of the information has been provided, or because of the way your request has been handled, you have the right to request a review.

This would be dealt with in accordance to the Health Board's Appeals Procedure. Please contact Richard Bevan, Board Secretary, in the first instance if you wish to pursue this option.

Aneurin Bevan Local Health Board
Bloc A
Ty Mamhilad
Ystad Parc Mamhilad
Pontypwl
Tor-faen NP4 0YP
Ffon: 01495 765016

Aneurin Bevan Local Health Board
Block A
Mamhilad House
Mamhilad Park Estate
Pontypool
Torfaen NP4 0YP
Tel: 01495 765016

If you are still dissatisfied at the end of the review, you have the right to take your complaint directly to the Information Commissioner, who can be contacted at the following address:

Information Commissioner's Office - Wales
2nd Floor,
Churchill House,
Churchill Way,
Cardiff,
CF10 2HH

Telephone: 029 2067 8400
fax: 029 2067 8399
email: wales@ico.gsi.gov.uk

In the meantime if you have any other queries please do not hesitate to contact Richard Bevan, Board Secretary, Aneurin Bevan Health Board, Block A, Mamhilad House, Mamhilad Park Estate, Pontypool, NP4 0YP. Email: Richard.bevan3@wales.nhs.uk

Yours sincerely

Dr Andrew Goodall
Prif Weithredwr/Chief Executive

Acquired brain injuries
Can you please let me know how many young people (0-18 years old) have been admitted with acquired brain injury to the local health board's hospitals within last five years?

For clarification, the acquired brain injury could be caused by:

- Near-drowning
- Encephalopathy
- Cardiac arrest
- Meningitis
- Encephalitis
- Assault
- Brain tumour
- Road traffic accident
- Stroke
- Arterio-venous malformations
- Other

Aneurin Bevan Health Board, Emergency admissions for Acquired Brain Injuries (Primary or secondary diagnosis)

Condition	Financial Year					
	2006/07	2007/08	2008/09	2009/10	2010/11	Apr-Dec 2011
Intracranial Injury	16	10	16	21	7	9
Drowning and submersion	3	1	1			
Encephalopathy	4	5	5	6	1	
Cardiac arrest	1		1		1	
Meningitis	24	11	11	14	19	8
Encephalitis	2	3	2	4	5	1
Anoxic brain damage due to asphyxiation				1		
Arteriovenous malformation		2			1	
Brain tumour		1			2	1
Cerebral Cysts				2	2	
Intracranial abscess and granuloma				1	3	3
Intracranial and intraspinal phlebitis and thrombophlebitis			3	1		1
Stroke (Non traumatic haemorrhage or infarction)	1	1	2	3	1	1
Previous Stroke			1	1	1	
Anoxic brain damage (not specified as due to current injury or disease)	48	26	22	1		
Total	**99**	**60**	**64**	**55**	**43**	**24**

* Conditions such as cardiac arrest, drowning, meningitis and encephalitis have been included but the patients may not have had any brain injury as a result of these.

* If a patient does have a brain injury as a result of the conditions specified it is highly likely that these patients would be transferred to one of the specialist centres such as UHW. In some cases they may go straight from A&E to these centres and so will not be included in these figures.

Information Services - Informatics
Aneurin Bevan Health Board

Cyfarwyddiant Cyllid
Pencadlys y Bwrdd Iechyd
Y Plasty, Bronllys
Aberhonddu, Powys
LD3 0LS
Ffôn: 01874 712 721
Ffacs: 01874 712 554

Finance Directorate
Health Board Headquarters
Mansion House, Bronllys
Brecon, Powys
LD3 0LS
Phone: 01874 712721
Fax: 01874 712 554

GIG CYMRU NHS WALES
Bwrdd Iechyd Addysgu Powys
Powys Teaching Health Board

Our ref: RR/CP/FOI/11.R.224 17 November 2011

Dear Mr Wools

Request under Freedom of Information Act 2000

Thank you for your request for information which we received on 17 November 2011. Please find enclosed leaflets giving guidance on our procedure for dealing with such requests should they fall within the Freedom of Information Act 2000 and the process of review and complaint which is laid down within the Act.

Your request

Can you please let me know how many young people (0-18 years old) have been admitted with acquired brain injury to the local health board's hospitals within last five years?

For clarification, the acquired brain injury could be caused by:

- Near-drowning
- Encephalopathy
- Cardiac arrest
- Meningitis
- Encephalitis
- Assault
- Brain tumour
- Road traffic accident
- Stroke
- Arterio-venous malformations
- Other

Powys response

In accordance with S.1(1)(a) and S.(1)(6) of the Act we are required to formally confirm or deny whether we hold the information you requested. I regret to inform you that we do not hold the information you requested as we do not admit children to any of our community hospitals.

If you need any further assistance, please do not hesitate to contact us at the address below.

I trust this information is helpful to you. If you are dissatisfied, with the way your request has been dealt with by the teaching Health Board (tHB), you have the right to request a review in which case you should write to:

Andrew Cottom
Chief Executive
Powys Teaching Health Board
Mansion House
Bronllys
Brecon
Powys
LD3 0LS

If you are still dissatisfied at the end of the review, you may complain to the Information Commissioner, who can be contacted at the following address:

Information Commissioner's Office
Wycliffe House
Water Lane
Wilmslow
Cheshire
SH9 5AF

Yours sincerely

Rebecca Richards
Director of Finance / Executive lead for FOI

GIG CYMRU NHS WALES
Bwrdd Iechyd Prifysgol
Abertawe Bro Morgannwg
University Health Board

Dyddiad/Date: 12th December 2011

☎ (01639) 683328
FOIA.Requests@wales.nhs.uk
Ref: 11-K-019

Chris Wools

Corporate Administration
ABM Headquarters
1 Talbot Gateway
Baglan
Port Talbot, SA12 7BR

Dear Mr Wools

I refer to your Freedom of Information Act Request acknowledged by ourselves on 16th November 2011. Your request sought information relating to young people (0-18 years old) who have been admitted with acquired brain injury. You clarified on the 17th November 2011 that you would like the information for the last 5 years:

Diagnosis	2006/07	2007/08	2008/09	2009/10	2010/11
Intracranial Injury (elective & emergency)	49	35	51	30	27

I hope this information is helpful. If you require anything further please contact us at FOIA.Requests@wales.nhs.uk.

Under the terms of the Health Board's Freedom of Information policy, individuals seeking access to recorded information held by the Health Board are entitled to request internal review of the handling of their requests. If you would like to complain about the Health Board's handling of your request please contact me directly at the address below or register your complaint via FOIA.Requests@wales.nhs.uk.

If after Internal Review you remain dissatisfied you are also entitled to refer the matter to the information commissioner at the Information Commissioner's Office (Wales), 2nd Floor, Churchill House, Churchill Way, Cardiff, CF10 2HH. Telephone Number: 029 2067 8400.

Yours sincerely

Steve Combe
Board Secretary

Chris Wools

From: Charlotte Beare (Hywel Dda Health Board - Carmarthenshire Locality Office) [Charlotte.Beare@wales.nhs.uk]
Sent: 13 April 2012 11:31
To: Chris Wools
Cc: Julie Cole (Hywel Dda Health Board - Pembrokeshire Locality Office); Joanne Wilson (Hywel Dda Health Board - Assistant Director of Corporate Governance)
Subject: RE: FOI/346

Hi Chris

The total number of young people (0-18 years old) who have been admitted with acquired brain injury to the local health board's hospitals within last five years is 41.
I trust this provides you with the information you require.

Once again I would like to apologise for the delay in providing this information and if I can be of further assistance, please let me know.
Many thanks

Regards,
Charlotte Beare
Corporate Governance Business Manager
Corporate Services Directorate
Bwrdd Iechyd Hywel Dda/ Hywel Dda Health Board
13 Heol Goring / 13 Goring Road
Llanelli
Sir Gaerfyrddin/ Carmarthenshire
SA15 3HF

Rhif Ffôn / Telephone Number: 01554 779518 (WHTN 0 1874 518)
E-bost: Email: charlotte.beare@wales.nhs.uk

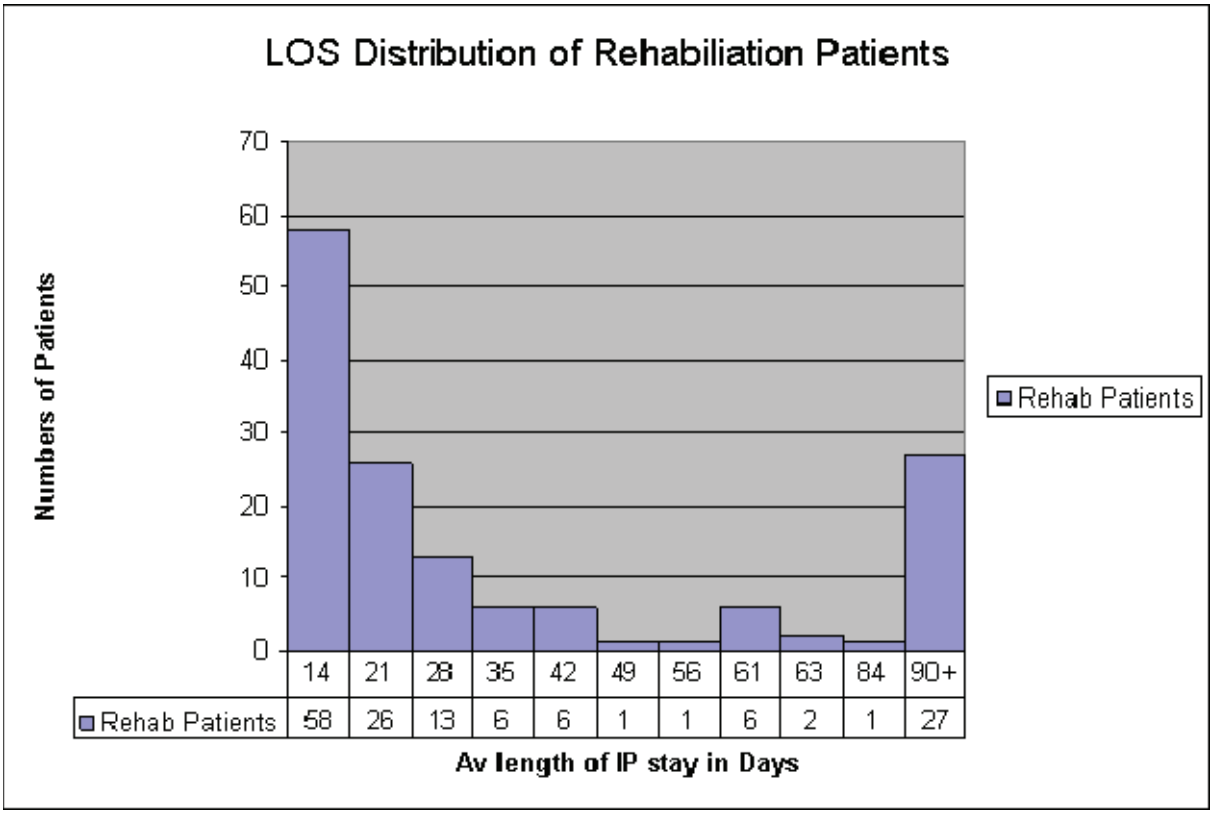
Annual Patient Numbers

Year	Annual numbers of Patients requiring Specialist Rehabilitation
2009	55
2010	47
2011 to date (8/12)	43
2011 projected	64

Monthly Distribution of Specialist Rehabilitation Patients

Numbers of Patients Requiring Rehabilitation Input each Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Calendar Year 2009	7	9	10	11	7	5	6	5	4	4	6	10	84
Calendar Year 2010	3	7	8	9	9	7	6	11	10	10	8	11	99
Calendar Year 2011	17	10	10	9	14	12	12	13					97
Increase in years between 09 &11	10	1	0	-2	7	7	6	8					15
% Increase over 09	143	11	0	-18	100	140	100	160					

the graph below shows length of stay of patients in UHW.
There are a lot of patients (84) requiring short stay ie 14-21 days and then a second peak of long stay patients.
I think this reflects the fact that if you're going to make a good recovery from brain/spinal injury you do so in the first 6 weeks.
If you don't recover well in this time you are likely to have long term problems therefore length of stay is much longer.
However even the short stay patients may have longstanding emotional/behavioural/educational difficulties which we are unable to detect without a neuropsychologist.


LOS Distribution of Rehabiliation Patients
Numbers of Patients
70
60
50
40
30
20
10
0
Rehab Patients
14 21 28 35 42 49 56 61 63 84 90+
Rehab Patients 58 26 13 6 6 1 1 6 2 1 27
Av length of IP stay in Days

Headway state that “the number of injuries received in childhood are significantly lower than those in certainly early adulthood, when more risky behaviours begin i.e. driving, drinking, drugs, resulting in assaults, falls and RTA's and also suicide attempts.

Acquired brain injury is the highest caused of death in young men between the ages of 15 – 29”

Headway

Headway Cardiff

10th January 2012

William Powell AM
Chair, Petitions Committee
National Assembly for Wales
Cardiff Bay
Cardiff
CF99 1NA

Dear William Powell,

Headway Cardiff is a registered charity that provides support and services to adults affected by acquired brain injury (ABI), their families and carers throughout south east Wales.

The survivors we assist are adults, but many sustained their injury during childhood and have experienced paediatric neuro-services first hand.

Firstly it is important to acknowledge the lack of accurate statistics relating to ABI due to a combination of shortfalls in the coding system and in the case of minor brain injury, non-identification or mis-diagnosis.

It is also important to not wholly focus on those who are classified as having a severe brain injury. Those with a moderate or even a mild classification have complex, life-long difficulties, that impact on their ability to live an independent life.

Beyond the acute setting, it is vital that children receive a period of specialist neurological intervention. Appropriate, timely specialist intervention can greatly improve the level to which individuals recover and the speed in which this happens.

As the input of the family is crucial at this stage and throughout recovery, this service needs to be as accessible to the family as possible and offer as flexible and as personalised a programme as possible.

Following this intensive period of rehabilitation, a long term community based specialist multi-disciplinary team should be available until the child reaches adulthood and then in theory, there is a seamless transition to specialist adult services.

Headway Cardiff
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ARIENNIR GAN Y LOTERI
LOTTERY FUNDED

It is in the area of community services that the biggest gap appears in adult specialist neuro- services and it is vital that this area is considered in the development of any paediatric service.

Community services in Wales have not kept pace with acute services and the piecemeal nature of services has left many survivors feeling isolated and unsupported leading to crisis and family breakdown. Many of the gains they make in the immediate aftermath are lost due to the lack of ongoing therapy and support.

For those children whose impairments are severe enough to warrant a placement in a specialist educational establishment, ongoing treatment such as Occupational Therapy, Speech and Language Therapy and Physiotherapy is available.

What then happens to those with moderate and mild difficulties, who frequently go undiagnosed, unrecognized or whose difficulties are attributed to behavioral problems?
Who then supports them as the child reaches each new stage of development?
Who then provides the individual with ongoing rehabilitation and strategies?
Who supports the family in ensuring the child's educational needs are recognized and they are statemented correctly?

Headway Cardiff wholeheartedly endorses the Petition to the Welsh Government to recognize the need for and to deliver specialist services for the rehabilitation of brain injured children within Wales.

Yours sincerely

Julie Smith

Julie Smith
General Manager

GIG CYMRU NHS WALES
Pwyllgor Gwasanaethau Iechyd Arbenigol Cymru (PGIAC)
Welsh Health Specialised Services Committee (WHSSC)

Your ref/eich cyf: P-03-295
Our ref/ein cyf: ML/NJ/CR- KB
Date/dyddiad: 12th December 2011
Tel/ffôn: 01443 443443
Fax/ffacs: 02920 869534
Email/ebost: debra.davies5@wales.nhs.uk

William Powell AM
Chair, Petitions Committee
National Assembly for Wales
Petitions Committee
Cardiff Bay
Cardiff
CF99 1NA

Dear Mr Powell

RE : P -03-295 Kyle Beere – Paediatric Neuro Rehabilitation Services

Thank you for your letter dated 23rd November 2011, requesting the number of children requiring admission to Tadworth over the last 10 years.

I can confirm that since the 1st of February 2002 to date, 8 children have required admission to The Children's Trust, Tadworth.

I hope this answers your request. If I can be of further assistance, please do not hesitate to contact me.

Yours sincerely

Cerilan Rogers

Dr Cerilan Rogers
Director of Specialised & Tertiary Services

Welsh Health Specialised Services Committee
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Chair/Cadeirydd: *Professor Mike Harmer*
Director of Specialised and Tertiary Services/Cyfarwyddwr Gwasanaethau Arbenigol a Thrydyddol: *Dr Cerilan Rogers*

Presentation to
National Assembly for Wales
Petitions Committee

Noise from Wind Turbines

Trinity College
Carmarthen

28 February 2012

Prepared by
A S Fitzgerald B.Sc., M.Sc.

I am grateful for the opportunity to speak at today's meeting of the Petitions Committee on the subject of Noise from Wind Turbines and the need for control.

I have no expertise in this matter but I want to refer the Committee to the work of Dr Magda Havas, an Associate Professor at Trent University in Ontario, Canada. She teaches and conducts research on the biological and health effects of electromagnetic and chemical pollutants. That summary is taken from her CV but I want to emphasise that she is a leading authority in her subject area.

Last year she joint authored a paper entitled Wind Turbines Make Waves: Why some Residents Near Wind Turbines Become Ill. Her co-author was David Colling who works at the Ryerson Polytechnical Institute in Toronto and has used his electrical engineering knowledge to conduct electrical pollution testing on homes and farms including those in the vicinity of wind turbines.

The paper was published in the Bulletin of Science, Technology and Society and can be down loaded off the Internet at a cost of $25. However in view of the relevance of this paper to the issue under discussion here today Dr Havas has supplied me with a free copy of her report with the comment that *It can be submitted for this hearing.*

I will leave a copy with the Committee but in order that those present in the hall today can appreciate the concerns raised in the paper I would like to present a very brief overview of the paper. In doing so I have, of course, been selective otherwise I would have had to read the entire 13 page report.

We are all well aware that wind has received a great deal of attention from two main sources -

- those communities earmarked for wind turbines, and
- those communities that have experienced wind turbines first-hand.

Some people who live near wind turbines report difficulty sleeping and various symptoms of ill health and attribute these problems to noise and shadow flicker - as these are the two elements that they can perceive. Indeed the U.S. National Research Council identify noise and shadow flicker as the two key impacts of wind turbines on human health and well-being.

So what aspects of wind power generation are responsible for the adverse health effects experienced by those who live near wind turbines?

Dr Haves maintains that the simple answer is that *wind turbines make waves.* They make pressure waves and electromagnetic waves and it is the pressure waves - or sound waves - generated by the moving turbines that can be heard as noise and/or perceived as infrasound.

The audible range for the human ear is between 20 and 20,000 Hz. Frequencies below 20 Hz are referred to as "infrasound," and, although they cannot be heard, they can still have an effect on the body. Infrasound can travel much greater distances than higher frequency sound waves so consequently it could potentially reach and affect a much larger population.

In support of this view, Dr Haves then cites the French National Academy of Medicine which, in 2006, issued a report which makes four specific points:

1 People living near the towers, the heights of which vary from 10 to 100 meters, sometimes complain of functional disturbances similar to those observed in syndromes of chronic sound trauma . . .

2 The sounds emitted by the blades being low frequency, which therefore travel easily and vary according to the wind . . . constitute a permanent risk for the people exposed to them . . . . . .

3 sound levels 1 km from an installation occasionally exceeded allowable limits. . . .

4 the Academy recommends halting wind turbine construction closer than 1.5 km from residences

Repetitive noise, especially at night, can be disturbing when sounds seem amplified and has been associated with an increase in stress hormones leading to hypertension, stroke, heart failure, and immune problems.

I will now return to the issue of infrasound as the pressure waves at levels outside the range of human hearing, as already stated, can also have unpleasant side effects.

Resonance may explain why infrasound is harmful at low intensities. Different parts of the human body have different resonance frequencies. When the external frequency generated by a wind turbine approaches the resonance frequency of a part of the human body, that body part will preferentially absorb the energy and begin to vibrate.

According to a report by the U.S. Air Force Institute for National Security Studies, acoustic infrasound can have dramatic and serious effects on human physiology

In another paper known as "The Darmstadt Manifesto," published in September 1998 by the German Academic Initiative Group and endorsed by more than 100 university professors in Germany, the German experience with wind turbines is described as follows:

> there is a growing number of complaints about symptoms such as pulse irregularities and states of anxiety, which are known to be from the effects of infrasound

Infrasound is influenced by topography, distance, and wind direction and differs from home to home and room to room because each room is a distinct cavity with its own resonant frequency. Whether a door is open or closed can alter the effect. The biological effects of low-frequency noise (20-100 Hz) and infrasound (less than 20 Hz) are a function of intensity, frequency, duration of exposure, and direction of the vibration.

In other words - and these are mine - the whole subject matter of noise, and

infrasound is extremely complex and precautions need to be taken.

Dr Haves concludes her paper by asserting that to *to minimize adverse biological and health effects for those living near wind turbines* an obvious step is to eliminate or reduce exposure to the agent(s) causing the illness.

So in relation to noise and exposure to infrasound, she maintains that the following steps should be taken:

a. Wind turbines should be placed as far away as possible from residential areas and quotes the French National Academy of Medicine as recommending a distance of 1.5 km.

b. Buffers can be constructed to disrupt pressure waves and to absorb or deflect sound waves in areas where turbines are closer to homes **or where problems have been documented,**

I wanted you to have this overview as it may shed some new light on the subject and to show that residents' fears of adverse health effects resulting from wind turbine noise (be it audible or not) are well founded.

A S Fitzgerald
[redacted]

Tel: [redacted]

e-mail: [redacted]

Bulletin of Science, Technology & Society
http://bst.sagepub.com/

Wind Turbines Make Waves: Why Some Residents Near Wind Turbines Become Ill

Magda Havas and David Colling

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Wind Turbines Make Waves: Why Some Residents Near Wind Turbines Become Ill

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Magda Havas[1] and David Colling[2]

Abstract

People who live near wind turbines complain of symptoms that include some combination of the following: difficulty sleeping, fatigue, depression, irritability, aggressiveness, cognitive dysfunction, chest pain/pressure, headaches, joint pain, skin irritations, nausea, dizziness, tinnitus, and stress. These symptoms have been attributed to the pressure (sound) waves that wind turbines generate in the form of noise and infrasound. However, wind turbines also generate electromagnetic waves in the form of poor power quality (dirty electricity) and ground current, and these can adversely affect those who are electrically hypersensitive. Indeed, the symptoms mentioned above are consistent with electrohypersensitivity. Sensitivity to both sound and electromagnetic waves differs among individuals and may explain why not everyone in the same home experiences similar effects. Ways to mitigate the adverse health effects of wind turbines are presented.

Keywords

wind turbine, dirty electricity, power quality, ground current, contact current, electrohypersensitivity, noise, infrasound, vibroacoustic disease, wind turbine syndrome

Introduction

With growing concern about climate change, the carbon budget, depletion of fossil fuels, air pollution from dirty coal, radiation from nuclear power plants, and the need for a secure energy supply, more attention and funding are being diverted to renewable energy. Among the various types of renewable energy, wind has received a lot of attention due, in part, to opposition from communities earmarked for wind turbines and from communities that have experienced wind turbines firsthand.

Some people who live near wind turbines report difficulty sleeping and various symptoms of ill health and attribute these problems to noise and shadow flicker—two elements they can perceive. Indeed the U.S. National Research Council (Risser et al., 2007) identify noise and shadow flicker as the two key impacts of wind turbines on human health and well-being.

Not all health agencies, however, recognize that sound waves from wind turbines may cause adverse health effects. Following a review of the literature, the Chief Medical Officer of Health for Ontario (2010), concluded

> that while some people living near wind turbines report symptoms such as dizziness, headaches, and sleep disturbance, the scientific evidence available to date does not demonstrate a direct causal link between wind turbine noise and adverse health effects. The sound level from wind turbines at common residential setbacks is not sufficient to cause hearing impairment or other direct health effects, although some people may find it annoying.
>
> Low frequency sound and infrasound from current generation upwind model turbines are well below the pressure sound levels at which known health effects occur. Further, there is no scientific evidence to date that vibration from low frequency wind turbine noise causes adverse health effects.

What specifically is responsible for the illness reported near wind turbines is controversial; while some of this controversy is scientifically valid, some of it is politically motivated (Phillips, 2010).

It is intriguing that not everyone in the same home experiences symptoms, and the symptoms are not necessarily worse for those nearest the turbines. Indeed, the situation may be much more complex than noise and shadow flicker.

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Why do some people who live near wind turbines become sick while others feel no ill effects? What aspects of wind power generation and distribution are responsible for the health problems? What can be done to minimize adverse human biological and health effects? These are some of the questions addressed in this report.

Wind Turbines Make Waves

What aspects of wind power generation and distribution are responsible for the adverse health effects experienced by those who live near wind turbines?

The short answer to this question is that *wind turbines make waves*. They make pressure waves and electromagnetic waves. The pressure waves (or sound waves) generated by the moving turbines can be heard as noise and/or perceived as infrasound. The electromagnetic waves are generated by the conversion of wind energy to electricity. This conversion produces high-frequency transients and harmonics that result in poor power quality. These high frequencies can flow along the wires (dirty electricity) and along the ground, thereby causing ground current. These four types of waves—noise, infrasound, dirty electricity, and ground current—and shadow flicker are each likely to contribute to ill health among those who live near wind turbines.

Characteristics of Sound Waves and Electromagnetic Waves

Sound waves are longitudinal waves that require a medium for transport. They travel at the speed of sound (340 meters/second) through air and are much slower than electromagnetic waves that travel at the speed of light (300,000,000 meters/second) and can travel through a vacuum. Both sound waves and electromagnetic waves have a frequency (cycles per second) and an intensity (amplitude of the wave).

Frequency refers to the number of waves or cycles per second and is known as pitch for sound. The A above middle C, for example, is set to a frequency of 440 cycles per second (hertz, abbreviated as Hz). The audible range for the human ear is between 20 and 20,000 Hz. Frequencies below 20 Hz are referred to as "infrasound," and, although they cannot be heard, they can still have an effect on the body. Infrasound can travel much greater distances than higher frequency sound waves and could potentially reach and affect a much larger population.

The frequencies of electromagnetic waves, generated by wind turbines, fall within two ranges of the electromagnetic spectrum: extremely low frequency (ELF), below 1,000 Hz; and the lower range (kilohertz [kHz] to megahertz [MHz]) of the radio frequency radiation (RFR) band. Electromagnetic waves can enter homes by various paths: through the air, along wires, through the ground, and via plumbing and other metal structures. Electromagnetic waves travelling across the ground contribute to ground current.

Intensity is measured by the amplitude of the wave and, for sound, is measured in decibels (dB). Vibrations with the same frequency but different amplitude will sound the same, but one will be louder than the other. The decibel scale is logarithmic. A quiet bedroom is at 25 dB, conversation is around 60 dB, a rock group is at 110 dB, and the human threshold of pain is at 140 dB.

The intensity of electromagnetic waves is measured in various ways: electric field, magnetic field, voltage, current, and power density. The biological effects of electromagnetic energy are a function of frequency, intensity, and both the manner and the duration of exposure.

Pressure Waves: Noise

Most people who live near wind turbines and complain of ill effects blame the effects on the noise generated by the turbines (Frey & Hadden, 2007).

> Everything changed . . . when the wind turbines arrived . . . approximately 700 metres away from our property . . . Within days of the windfarm coming into operation we began to hear a terrible noise . . . The noise drove us mad. Gave us headaches. Kept us awake at night. Prevented us from having windows and doors open in hot weather, and was extremely disturbing.
>
> This noise is like a washing machine that's gone wrong. It's whooshing, drumming, constant drumming, noise. It is agitating. It is frustrating. It is annoying. It wears you down. You can't sleep at night and you can't concentrate during the day . . . It just goes on and on . . . It's torture . . . [4 years later] You just don't get a full night's sleep and when you drop off it is always disturbed and only like "cat napping." You then get up, tired, agitated and depressed and it makes you short-tempered . . . Our lives are hell.

The French National Academy of Medicine (Chouard, 2006) issued a report that concludes,

> People living near the towers, the heights of which vary from 10 to 100 meters, sometimes complain of functional disturbances similar to those observed in syndromes of chronic sound trauma . . .
>
> The sounds emitted by the blades being low frequency, which therefore travel easily and vary according to the wind . . . constitute a permanent risk for the people exposed to them . . .
>
> . . . sound levels 1 km from an installation occasionally exceeded allowable limits.
>
> . . . the Academy recommends halting wind turbine construction closer than 1.5 km from residences. (Translated from French)

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Noise, especially at night, has been associated with an increase in stress hormones leading to hypertension, stroke, heart failure, and immune problems. It is discussed in greater detail elsewhere in this journal.

Pressure Waves: Infrasound

Repetitive noise can be disturbing, especially at night, when sound seems amplified. However, pressure waves at levels outside the range of human hearing can also have unpleasant side effects.

In Nova Scotia, one family was unable to remain in their home and blamed their loss of sleep and headaches on vibrations from 17 turbines (Keller, 2006).

> The d'Entremont family complained of noise and low frequency vibrations in their house after the wind turbines began operation in May 2005. The inaudible noise deprived his family of sleep, gave his children and wife headaches, and "made it impossible for them to concentrate." They now live nearby; if they return to their home, the symptoms return.
>
> Natural Resources Canada, which oversees funding for wind farm projects, found no problems with low-frequency noise or infrasound. The government report concludes that the measurements:
>
> indicate sound at infrasonic frequencies below typical thresholds of perception; infrasound is not an issue. (cited in Frey & Hadden, 2007)

Gordon Whitehead, a retired audiologist with 20 years of experience at Dalhousie University in Halifax, conducted tests and found similar results but came up with a different conclusion:

> They're [Natural Resources Canada] viewing it from the standpoint of an engineer; I'm viewing it from the standpoint of an audiologist who works with ears . . . The report should read that (the sound) is well below the auditory threshold for perception. In other words, it's quiet enough that people would not be able to hear it. But that doesn't mean that people would not be able to perceive it.
>
> " . . . low-frequency noise can affect the balance system of the ear, leading to a range of symptoms including nausea, dizziness and vision problems. It's not perceptible to the ear but it is perceptible. It's perceptible to people with very sensitive balance mechanisms and that's generally people who get very easily seasick.

Resonance may explain why infrasound is harmful at low intensities. Different parts of the human body have different resonance frequencies. When the external frequency generated by a wind turbine approaches the resonance frequency of a part of the human body, that body part will preferentially absorb the energy and begin to vibrate. For example, frequencies that affect the inner ear (between 0.5 and 10 Hz) can interfere with balance, cause dizziness or vertigo, contribute to nausea, and be experienced as tinnitus or ringing in the ears. According to the International Standards Organization (ISO Standards 2631), frequencies for the eye are between 20 and 90 Hz, head 20 and 30 Hz, chest wall 50 and 100 Hz, abdomen 4 and 8 Hz, and spinal column 10 and 12 Hz. Some of the symptoms documented at infrasonic frequencies (between 4 and 20 Hz) include general feeling of discomfort, problems with breathing, abdominal and chest pain, urge to urinate, lump in throat, effect on speech, and head symptoms (Frey & Hadden, 2007).

According to a report by the U.S. Air Force, Institute for National Security Studies, acoustic infrasound can have dramatic and serious effects on human physiology (Bunker, 1997).

> Acoustic, infrasound: very low frequency sound which can travel long distances and easily penetrate most buildings and vehicles. Transmission of long wavelength sound creates biophysical effects, nausea, loss of bowels, disorientation, vomiting, potential organ damage or death may occur. Superior to ultrasound because it is "inband," meaning it does not lose its properties when it changes mediums such as air to tissue. By 1972 an infrasound generator had been built in France, which generated waves at 7Hz. When activated it made the people in range sick for hours.

In a paper known as "The Darmstadt Manifesto," published in September 1998 by the German Academic Initiative Group and endorsed by more than 100 university professors in Germany, the German experience with wind turbines is described as follows (cited in Frey & Hadden, 2007):

> More and more people are describing their lives as unbearable when they are directly exposed to the acoustic and optical effects of wind farms. There are reports of people being signed off sick and unfit for work, there is a growing number of complaints about symptoms such as pulse irregularities and states of anxiety, which are known to be from the effects of infrasound [sound frequencies below the normal audible limit].

Infrasound is influenced by topography, distance, and wind direction (Rogers, Manwell, & Wright, 2006) and differs from home to home and room to room because each room is a distinct cavity with its own resonant frequency. Whether a door is open or closed can alter the effect.

The biological effects of low-frequency noise (20-100 Hz) and infrasound (less than 20 Hz) are a function of intensity, frequency, duration of exposure, and direction of the vibration.

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Wind Turbine Syndrome and Vibroacoustic Disease

Exposure to low-frequency noise and infrasound may produce a set of symptoms that include depression, irritability, aggressiveness, cognitive dysfunction, sleep disorder, fatigue, chest pain/pressure, headaches, joint pain, nausea, dizziness, vertigo, tinnitus, stress, heart palpitations, and other symptoms. Not everyone has the same sensitivity. Those who experience motion sickness (car, boat, plane), get dizzy or nauseous on carnival rides, have migraine headaches, or have eye or ear problems may be particularly susceptible to low-frequency vibrations.

Two different "diseases" have been associated with low-frequency noise exposure and infrasound. They are wind turbine syndrome—coined by Pierpont (2009) in her book by the same name—and vibroacoustic disease (VAD). VAD is a whole-body, systemic pathology characterized by the abnormal proliferation of extracellular matrices and caused by excessive exposure to low-frequency noise (Castelo Branco & Alves-Pereira, 2004). These two "diseases" differ as described by Pierpont (2009).

> Wind Turbine Syndrome, I propose, is mediated by the vestibular system—by disturbed sensory input to eyes, inner ears, and stretch and pressure receptors in a variety of body locations. These feed back neurologically onto a person's sense of position and motion in space, which is in turn connected in multiple ways to brain functions as disparate as spatial memory and anxiety. Several lines of evidence suggest that the amplitude (power or intensity) of low frequency noise and vibration needed to create these effects may be even lower than the auditory threshold at the same low frequencies.
>
> Vibroacoustic Disease, on the other hand, is hypothesized to be caused by direct tissue damage to a variety of organs, creating thickening of supporting structures and other pathological changes. The suspected agent is high amplitude (high power or intensity) low frequency noise. (p. 13)

VAD seems to be dose dependent, with symptoms becoming progressively worse with continued exposure. Three stages have been identified based on 70 aircraft technicians who, presumably, were exposed to much higher intensities of low-frequency noise than those who live near wind turbines (Castelo Branco, 1999, Castelo Branco & Alves-Pereira, 2004).

Stage 1: Mild, 1 to 4 years, slight mood swings, indigestion, heartburn, mouth/throat infections, bronchitis

Stage 2: Moderate, 4 to 10 years, depression, aggressiveness, pericardial thickening, light to moderate hearing impairment, chest pain, definite mood swings, back pain, fatigue, skin infections (fungal, viral, parasitic), inflammation of stomach lining, pain during urination, blood in urine, conjunctivitis, allergies

Stage 3: Severe, more than 10 years, myocardial infarction, stroke, malignancy, epilepsy, psychiatric disturbances, hemorrhages (nasal, digestive, conjunctive mucosa), varicose veins, hemorrhoids, duodenal ulcers, colitis, decrease in visual acuity, headaches, severe joint pain, intense muscular pain, neurological disturbances

Whatever name is given to the symptoms, the symptoms are real and can be caused by low-frequency sound waves and infrasound.

Electromagnetic Waves

One undesirable consequence of wind-generated electricity is poor power quality due to variable weather conditions, mechanical construction of the towers, and the electronic equipment used (Lobos, Rezmer, Sikorski, & Waclawek, 2008). Electricity in North America has a frequency of 60 Hz and is a sine wave when viewed on an oscilloscope (Figure 1). When a wind turbine generates electricity, the frequency must be converted to 60 Hz by power converters; that conversion generates a large spectrum of current and voltage oscillations leading to poor power quality (Lobos et al., 2008). Wind turbines can generate a wide range of frequencies—from less than 1 Hz (Lobos et al., 2008), with the majority of the frequencies in the kHz range associated with power conversion.

Dirty Electricity

High-frequency transient spikes that contribute to poor power quality, also known as dirty electricity, can flow along wires, damage sensitive electronic equipment, and adversely affect human and animal health.

After wind turbines were activated in Ripley, Ontario, several of the residents complained of ill health. Residents suffered from headaches, poor sleep, elevated blood pressure (requiring medication), heart palpitations, itching, ringing and pain in the ears, watering eyes, and pressure on the chest causing difficulty breathing. These symptoms disappear when the residents leave the area. Some residents were forced to move out of their homes because the symptoms were so severe. Locals complain of headaches and poor radio reception when they drive near these power lines.

One of the authors (DC) measured the power quality near several residences where people were unwell. The primary neutral-to-earth voltage (PNEV) is the electrical potential difference between the earth and the neutral wire on the primary distribution line, as shown in Figure 2. Measurements taken before wind turbines were installed and after they were installed and operating (Figure 3) clearly show the distortion (spikes on the waveform) generated by the wind turbines.

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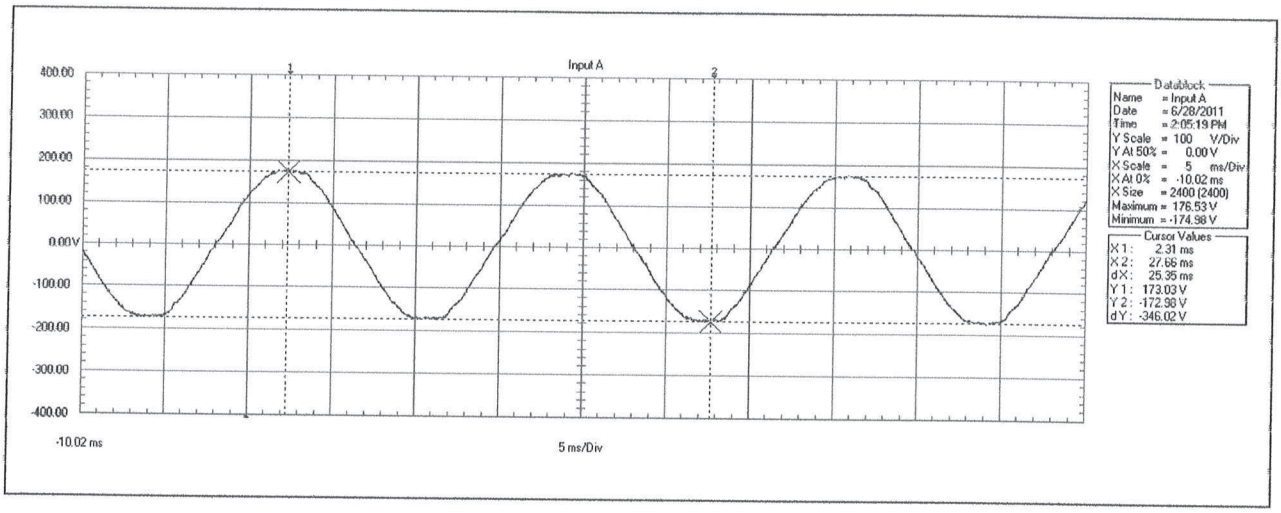

Figure 1. Good power quality exemplified by the 60-Hz sine wave

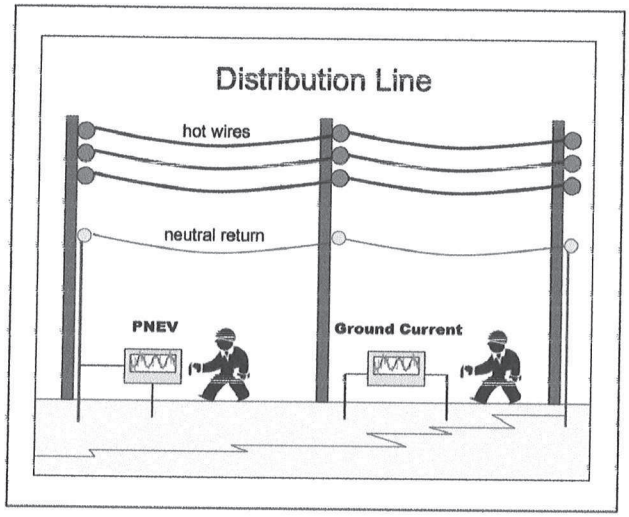

Figure 2. Diagram demonstrating how primary neutral-to-earth voltage (PNEV) and ground voltage measurements are taken

In this area, wind turbines are variable speed and are interconnected. The collection lines connecting the wind turbines to the substation are attached to the same utility pole as the home owners' lines.

According to one of the authors (DC; September 30, 2008),

> We had four families move out of their homes and now if I spend too much time in these homes I get the same symptoms, which is ear aches, ringing in the ears and pressure in the ears. [name removed] eventually buried a portion of the line but have only isolated the lines by insulators so it is better, however there is still some high frequency coming into the houses. The three families that now have buried lines are back in their homes, but things are far from ideal.

Dirty electricity in the kHz range affects human health; this has been shown in schools and homes in both Canada and the United States. Power quality can be improved both on electrical wires by using power line filters (Ontario Hydro, 1998) and inside buildings by using special surge suppressors or power filters that dampen the voltage spikes (http://www.stetzerelectric.com).

In one Wisconsin School that had "sick building syndrome," once power quality was improved, the health of both teachers' and students' improved. According to the school nurse, both staff and students have more energy, fewer allergies, and fewer migraine headaches, and asthmatics rely less on their inhalers (Havas, 2006a).

In a Toronto School, improvements in power quality were accompanied by improvements in teachers' health and students' behavior. Teachers were less tired, less frustrated, less irritable; they had better health and more energy; they had a greater sense of satisfaction and accomplishment; they were more focused and experienced less pain. Students' behavior also improved especially in the elementary grades (Havas, Illiatovitch, & Proctor, 2004). Similar results were reported in a placebo-blinded study in three Minnesota schools (Havas & Olstad, 2008).

Dirty electricity has been associated with increased risk of various types of cancers among teachers in a California school (Milham & Morgan, 2008), with higher blood sugar levels among diabetics, and with exacerbation of tremors and difficulty walking among those with multiple sclerosis (Havas, 2006b). People who are adversely affected by dirty electricity are classified as electrically hypersensitive.

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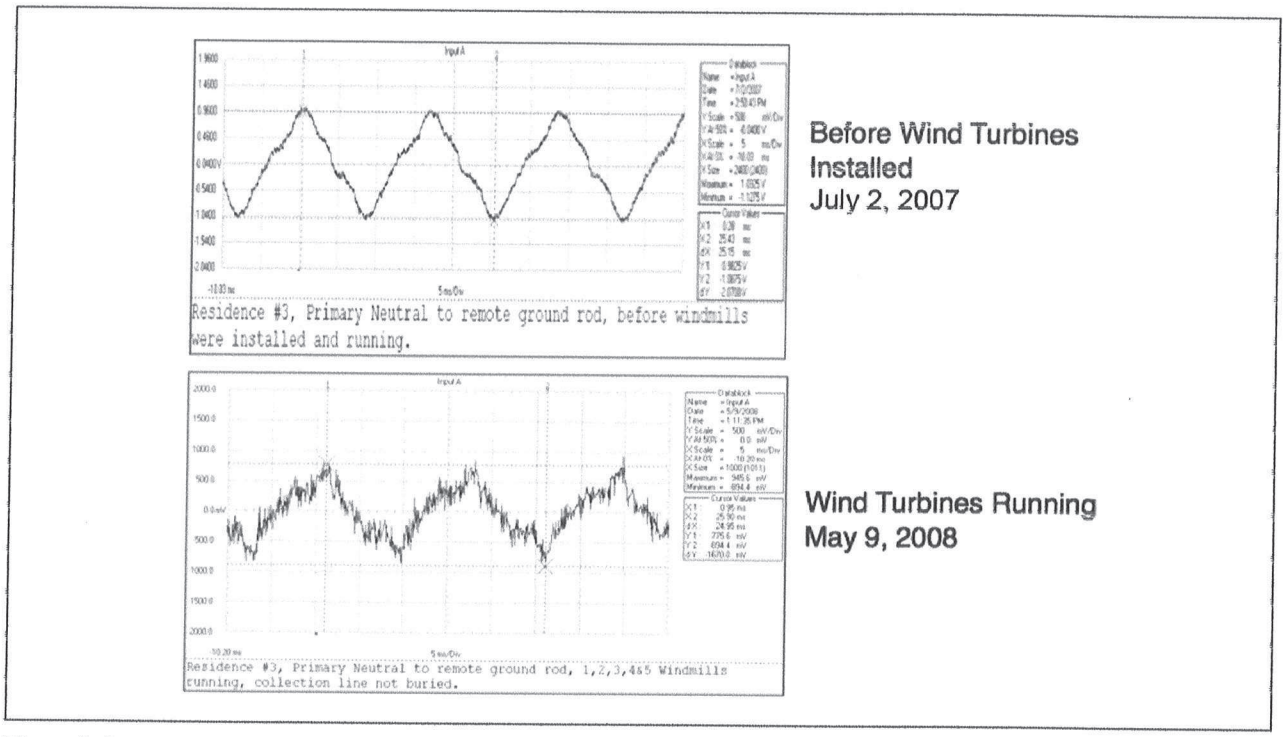

Figure 3. Primary neutral-to-earth voltage (PNEV) at Residence No. 3 in Ripley, Ontario, before wind turbines were installed (July 2, 2007) and when five wind turbines were operating (May 9, 2008)
Note. Collection line was not buried.

Ground Current

Just as dirty electricity can flow along wires, it can also flow along the ground resulting in ground current. Ground current (often measured as voltage and called stray voltage or tingle voltage) is a serious problem in certain locations and has been shown to adversely affect the health of farm families and the health and productivity of farm animals, especially dairy cattle.

The Ontario Federation of Agriculture (2007) provides information on symptoms experienced by farm animals, pets, and people who are exposed to tingle voltage as follows:

> Farmers and their families who suffer from immune disorders such as allergies or rheumatoid arthritis find their symptoms worsen or go into remission in close coordination with livestock symptoms. Periods of fatigue increase. Sleep disorders may increase.
>
> Cats leave the farm, become ill, cease to bear litters or have small, unhealthy litters, or die; coats are usually dull and shaggy and eyes are runny.
>
> Horses may paw the ground and shy away from watering or feeding troughs; behaviour and handling becomes more difficult.
>
> Pigs often take to ear and tail biting; mastitis and baby pig scours are common; piglet mortality may increase.
>
> Cattle lap water from the trough or bowl; feed in the bottom of the manger is not cleaned up; milk out is slow and uneven; cows are reluctant to enter the milk parlour and quick to leave; slow growth in calves and heifers; somatic cell counts are high; unexplained spontaneous abortions of calves; bulls become markedly more irritable.

According to the *National Electrical Safety Code (NESC) Handbook* (Clapp, 1997),

> When the earth returns were used in some rural areas prior to the 1960's, they became notorious offenders in dairy areas because circulating currents often cause both step and touch potentials.
>
> In some cases, they have adversely affected milking operations by shocking the cattle when they were connected to the milking machines, and have affected feeding. (p. 152)

According to Lefcourt (1991) in the U.S. Department of Agriculture book titled *Effects of Electrical Voltage/Current on Farm Animals: How to Detect and Remedy Problems*:

> The effect of a transient voltage superimposed on the regular power voltage (dc or ac) is to cause a momentary

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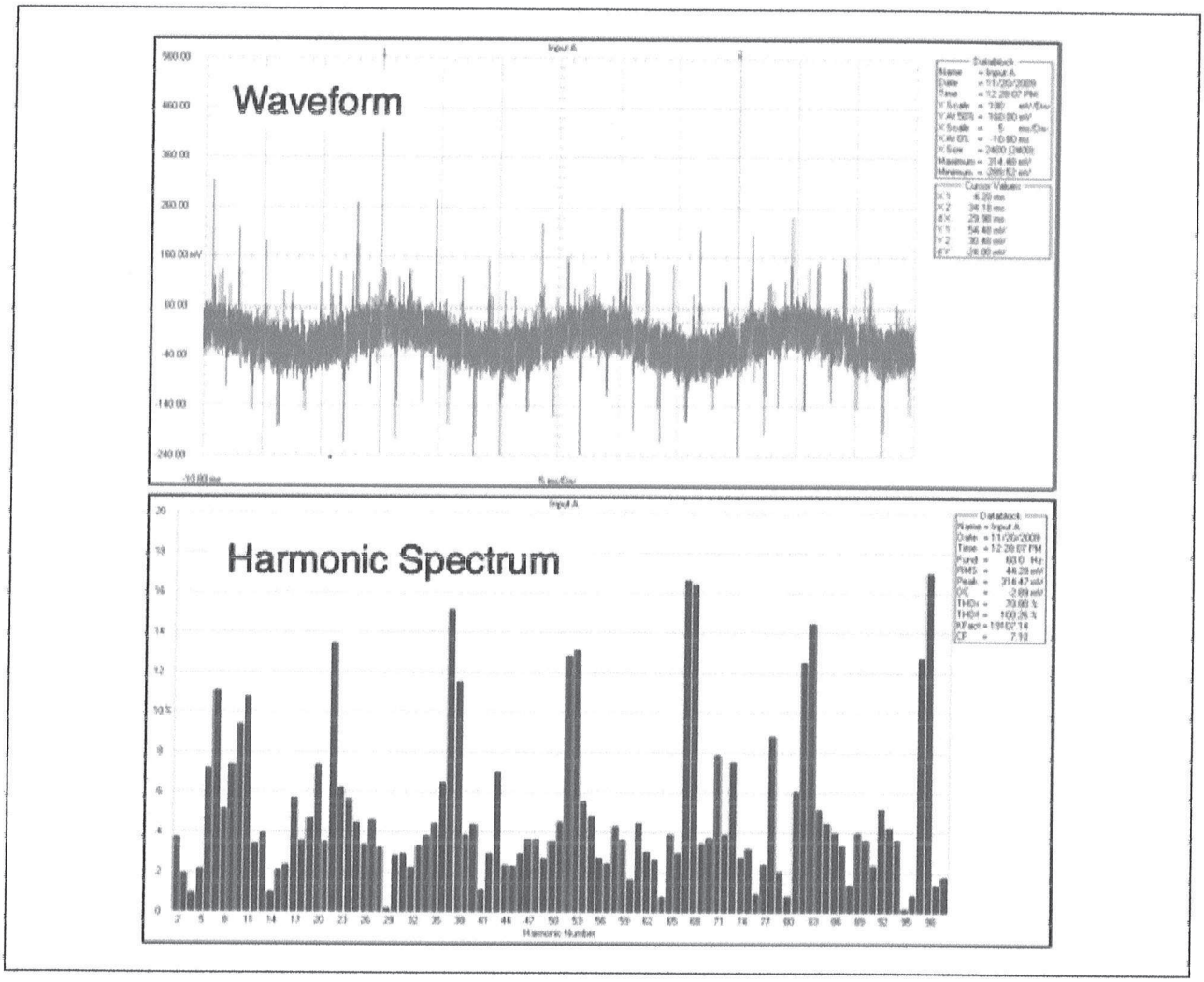

Figure 4. Ground voltage measured at the Palm Springs wind farm in California using 50 feet of copper wire attached to two metal rods in the earth

Note. The top graph shows the distorted 60-Hz waveform, and the bottom graph shows the harmonic frequencies. Data courtesy of Dr. Sam Milham.

change in the waveform. When the transient causes the momentary voltage to be greater than normal, it may cause a transient current to flow in an animal. If the transient waveform has sufficient energy (magnitude and duration), there may be an animal response. (p. 63-64)

Indeed, dirty electricity flowing along the ground may be more harmful to farm animals than the 60-Hz ground current (Hillman et al., 2003):

> Cows were sensitive to harmonic distortions of step-potential voltage, suggesting that utility compliance with IEEE standards on dairy farms may need to be addressed.
>
> Power quality varied greatly from farm to farm and day to day. Milk production responses to changes in power quality varied inversely with the number of transient events recorded with event recorders, oscilloscope, and power quality meters. Harmonics often gave better estimates of electrical effects on milk production than voltage *per se*. (p. 19)

Do wind turbines generate ground current? They can if proper safeguards are not taken. Generally, this is a problem with power distribution once the energy leaves the turbine.

Figure 4 shows the waveform of ground voltage near an industrial wind farm in Palm Springs, California (as shown in Figure 5 photographs). The waveform distortion in Figure 3 and 4 are considerable when compared with Figure 1.

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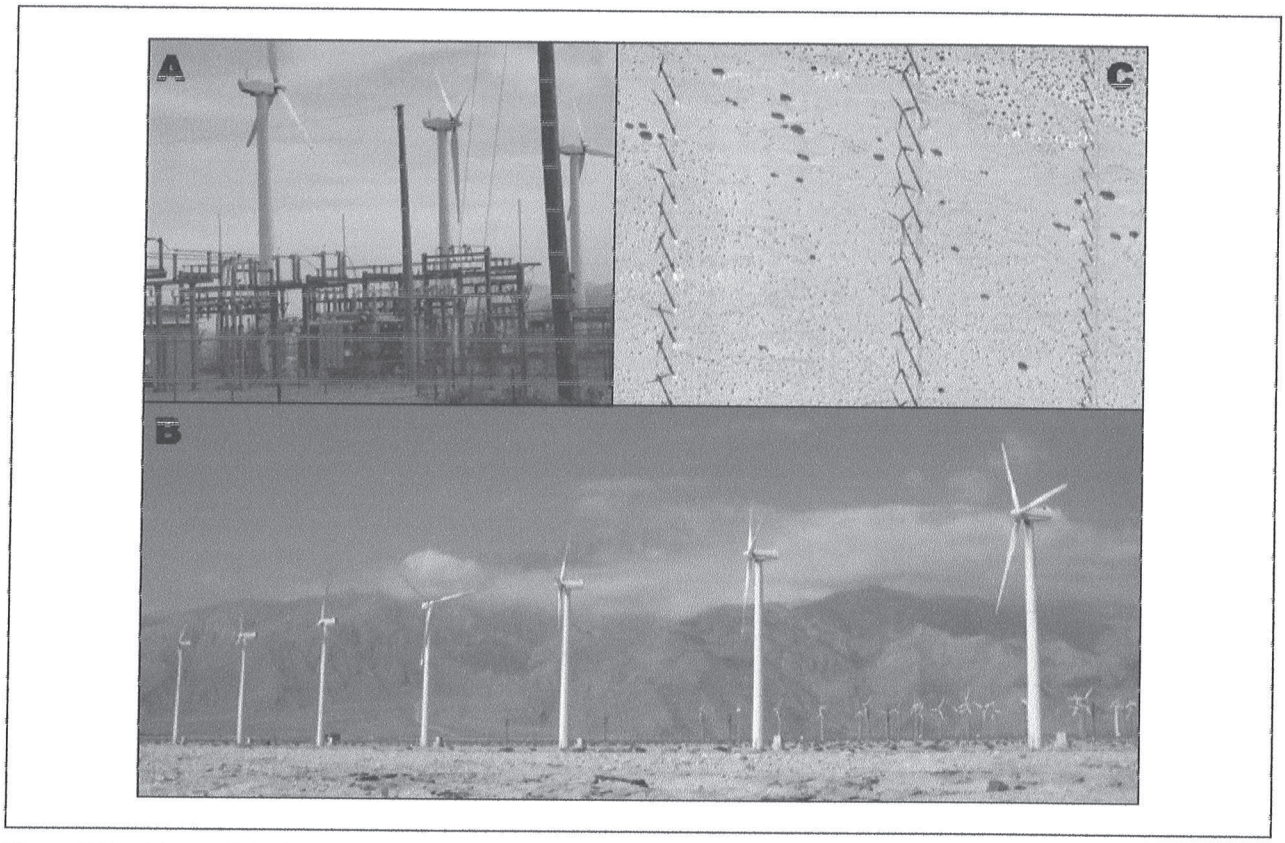

Figure 5. Wind farm in Palm Springs, California, showing (A) location of ground voltage readings; (B), view of wind turbines from the ground; and (C) view of wind turbines from the air
Note. Photograph A from Dr. Sam Milham. Photographs B and C from Google maps.

Burying the collection line may not eliminate the ground voltage but can improve power quality, as shown in Figure 6.

Just as animals are adversely affected by dirty ground current, so are people. If ground current enters a home via the plumbing, touching any part of the plumbing (e.g., faucet) induces a current in the body, known as contact current.

In one Ripley home, the frequency fingerprint (relative intensities of various frequencies) on the plumbing (sink to floor measurement) was similar to the PNEV, indicating that the source of the ground voltage was the wind turbines' collection line (Figure 7). In this home, the sink to floor contact current was calculated to be 400 microamperes (peak to peak based on 200 millivolts and 500 ohms), and this value is 22 times higher than levels associated with cancer according to Kavet, Zaffanella, Daigle, and Ebi (2000).

> "The absolute (as well as modest) level of contact current modeled (18 micro Amps) produces average electric fields in tissue along its path that exceed 1 mV/m. At and above this level, the NIEHS Working Group [1998] accepts that biological effects relevant to cancer have been reported in "numerous well-programmed studies." (p. 547)

Wertheimer, Savitz, and Leeper (1995) documented the link between ground current and cancer in Denver, Colorado. They found that leukemia risk increased by 300% among children exposed to elevated magnetic field from ground current that enters the home through conductive plumbing.

Electrohypersensitivity (EHS)

Why do some people who live near wind turbines become sick while others feel no ill effects?

Exposure to both pressure waves and electromagnetic waves is highly variable—spatially and temporally—as is sensitivity to these vibrations. Not everyone in the same home is going to have the same exposure or the same sensitivity. People who have balance problems, experience motion sickness, or have ear or eye problems are more likely to react to low-frequency sound vibrations. Those who are electrically hypersensitive are more likely to suffer from dirty electricity

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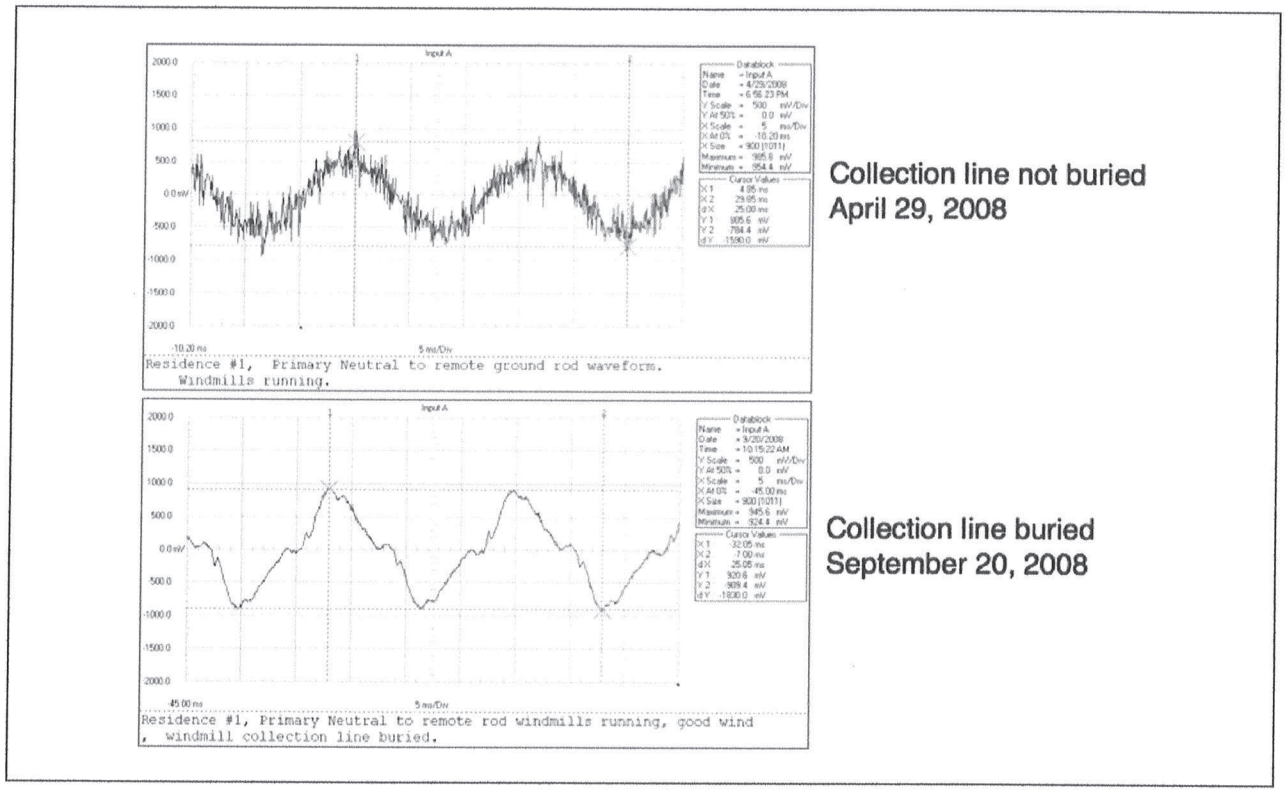

Figure 6. Primary neutral-to-earth voltage (PNEV) at Residence 1 in Ripley, Ontario, when wind turbines were operating
Note. Collection line from wind turbines was buried on September 20, 2008 (bottom graph), but not on April 29, 2008 (top graph).

and contact current. As a result, people living in the same home may have very different sensitivities and may respond differently to these vibrations.

At the Working Group meeting on EMF Hypersensitivity in Prague, the World Health Organization (2004) described electrosensitivity as

> a phenomenon where individuals experience adverse health effects while using or being in the vicinity of devices emanating electric, magnetic, or electromagnetic fields (EMFs).
>
> Whatever its cause, EHS is a real and sometimes a debilitating problem for the affected persons, while the level of EMF in their neighborhood is no greater than is encountered in normal living environments. Their exposures are generally several orders of magnitude under the limits in internationally accepted standards.

Symptoms include cognitive dysfunction (memory, concentration, problem solving); fatigue and poor sleep; body aches and headaches; mood disorders (depression, anxiety, irritability, frustration, temper); nausea; problems with balance, dizziness, and vertigo; facial flushing, skin irritations, and skin rashes; chest pressure, rapid heart rate, and altered blood pressure; ringing in the ear (tinnitus); and nosebleeds. A comprehensive list of the symptoms is provided in Table 1.

In Sweden, EHS is recognized as a functional impairment (not as a disease). Between 230,000 and 290,000 Swedes (about 3% of the Swedish population) may be electrohypersensitive (Johansson, 2006). The number of people complaining of EHS seems to be increasing as is the medication sold to deal with the symptoms of insomnia, pain, fatigue, depression, and anxiety. By 2017, as many as 50% of the population may experience these symptoms (Hallberg & Oberfeld, 2006).

Some individuals may have a predisposition to EHS. Those who have experienced physical trauma to their nervous system (whiplash), electrical trauma in the form of multiple shocks or several severe shocks, and/or chemical exposure to mercury or pesticides are likely to be more electrically sensitive. Children, the elderly, and those with impaired immune systems are also likely to be more electrically sensitive.

It is not possible to determine which factors are contributing to ill health until appropriate monitoring is conducted and steps are taken to reduce exposure to the offending agents. Monitoring of both electromagnetic waves and pressure waves in homes where people report ill health is highly recommended as are the mitigation techniques mentioned below

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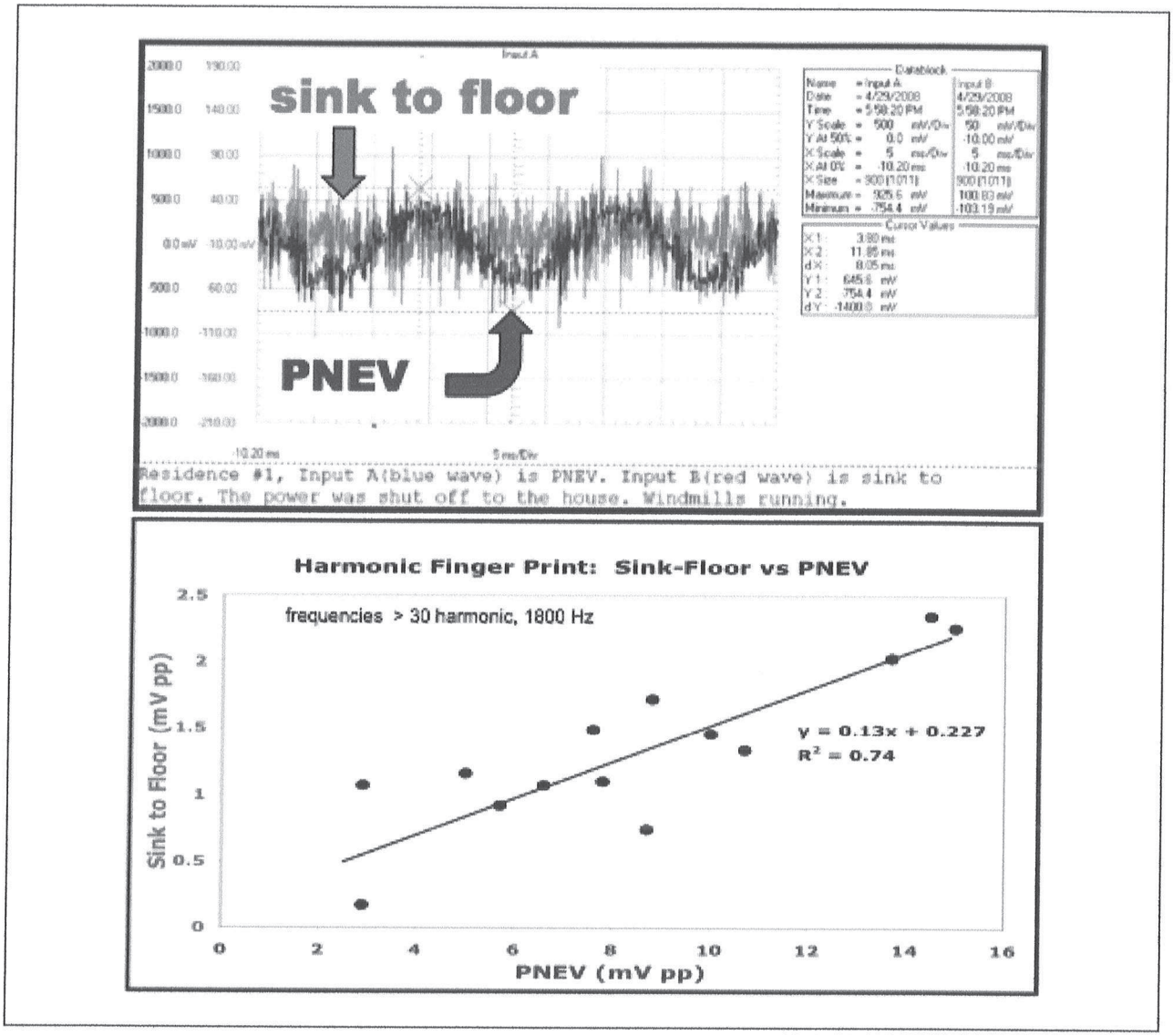

Figure 7. The primary neutral-to-earth voltage (PNEV) and the sink-to-floor voltage for Residence 1 in Ripley, Ontario (top graph), and the harmonic figure print for these voltages (bottom graph).

Recommendations

What can be done to minimize adverse biological and health effects for those living near wind turbines?

One obvious step is to eliminate or reduce exposure to the agent(s) causing the illness.

1. To minimize noise and exposure to infrasound, the following steps should be taken:
   a. Wind turbines should be placed as far away as possible from residential areas. The French National Academy of Medicine (Chouard, 2006) recommends 1.5 km from residential areas.
   b. Buffers can be constructed to disrupt pressure waves and to absorb or deflect sound waves in areas where turbines are closer to homes or where problems have been documented,
2. To improve power quality, the following steps should be taken:
   a. The electricity should be "filtered" at all inverters before it leaves the wind turbine. Ontario Hydro (1998) provides information on power line filters and other ways to improve power quality.
   b. The collector lines from the wind turbines should be attached to utility poles that do not provide power to homes.
   c. Power from the substation supplied by the wind turbines should be filtered before it is distributed to customers.

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Table 1. Comprehensive List of Electrohypersensitivity (EHS) Symptoms (Bevington, 2010)

Auditory

earaches,
imbalance,
lowered auditory threshold,
tinnitus

Cardiovascular

altered heart rate,
chest pains,
cold extremities especially hands & feet,
heart arrhythmias,
internal bleeding,
lowered/raised blood pressure,
nosebleeds,
shortness of breath,
thrombosis effects

Cognitive

confusion,
difficulty in learning new things,
lack of concentration,
short / long-term memory impairment,
spatial disorientation

Dermatological

brown 'sun spots',
crawling sensations,
dry skin,
facial flushing,
growths & lumps,
insect bites & stings,
severe acne,
skin irritation,
skin rashes,
skin tingling,
swelling of face/neck

Emotional

anger,
anxiety attacks,
crying,
depression,
feeling out of control,
irritability,
logorrhoea,
mood swings,

Gastrointestinal

altered appetite,
digestive problems,
flatulence,
food intolerances

Genito-urinary

smelly sweat / urine,
urinary urgency,
bowel urgency

Musculoskeletal

aches / numbness
pain / prickling
sensations in:
bones, joints & muscles in:
ankles, arms, feet
legs, neck,
shoulders, wrists,
elbows, pelvis,
hips, lower back,
cramp / tension in:
arms, legs, toes,
muscle spasms,
muscular paralysis,
muscular weakness,
pain in lips, jaws, teeth with amalgam fillings,
restless legs,
tremor & shaking

Neurological

faintness, dizziness,
'flu-like symptoms,
headaches,
hyperactivity,
nausea,
numbness,
sleep problems,
tiredness

Ophthalmologic

eyelid tremors/'tics',
impaired vision,
irritating sensation,
pain / 'gritty' feeling,
pressure behind eyes,
shiny eyes,
smarting, dry eyes

Other Physiological

abnormal menstruation,
brittle nails,
hair loss,
itchy scalp,
metal redistribution,
thirst / dryness of lips, tongue, eyes

Respiratory

asthma,
bronchitis,
cough /throat irritation,
pneumonia,
sinusitis

Sensitisation

allergies,
chemical sensitivity,
light sensitivity,
noise sensitivity,
smell sensitivity

d. Wind power electrical substations that require power from an external source (electrical distribution network) must ensure that the power quality of this eternal source is not affected as this can result in power quality problems for customers connected to the same external power source.
e. Nearby home owners may need to install power line filters in their homes if levels of dirty electricity remain high.

3. To reduce ground current/voltage, the following steps should be taken:
   a A proper neutral system (possibly a five-wire system) should be installed to handle the high-frequency return current in overhead lines (Electric Power Research Institute, 1995).
   b. Insulators can be placed between the neutral line and the grounding grid for the wind turbine.
   c. The collection lines from the wind turbine to the substation should be buried if the other techniques to minimize dirty ground current are ineffective.
   d. Local home owners may need to install stray voltage isolators near their transformers until the electric utility can resolve the problem (Hydro One, 2007).

If these steps are taken, improved quality of life and a feeling of wellness may return to some of the people adversely affected by nearby wind turbines.

Conclusions

A subset of the population living near wind turbines is experiencing symptoms of ill health. These symptoms are likely caused by a combination of noise, infrasound, dirty electricity, ground current, and shadow flicker. These frequencies can be highly viable spatially and temporally and are affected by distance; terrain; wind speed and direction; shape, size, and type of dwelling; type of power converters used; state of the electrical distribution line; type and number of grounding systems; and even the type of plumbing in homes. Furthermore, not everyone has the same sensitivity to sound and electromagnetic radiation nor do they have the

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same symptoms. The following symptoms seem to be quite common: sleeplessness, fatigue, pain, dizziness, nausea, mood disorders, cognitive difficulties, skin irritations, and tinnitus. To help alleviate symptoms in areas where wind turbines have been erected, remediation is necessary to reduce or eliminate both sound waves and electromagnetic waves. More research is required to help us better understand the relative importance of the various factors contributing to poor health. This type of information will enable a healthy coexistence between wind turbines and the people living nearby.

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Bios

Magda Havas, PhD, is an associate professor at Trent University where she teaches and conducts research on the biological and health effects of electromagnetic and chemical pollutants. She received her BSc and PhD at the University of Toronto and did postdoctoral research at Cornell University on acid rain and aluminum toxicity.

David Colling has applied his electrical engineering studies at Ryerson Polytechnical Institute and his specialized training in electrical pollution to conduct electrical pollution testing for Bio-Ag on farms, homes, and office buildings. Some of the homes tested are located in the environs of industrial wind turbines.

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Mrs Claire Dugdale

Dear Sirs,

I write with regards the petition to be heard on the 28th February, regarding noise from wind turbines, specifically those at Alltwalis in Carmarthenshire.

I live approximately 1.5km from the wind turbines at the above site. I moved to my farm in June 2011, and so was totally aware of the 10 turbines in existence, all of which are visible from my property. My husband and I came with no preconceptions about wind turbines, if you'd of asked us what we thought about them, we would have held neither a negative or positive view about them, they were there and so we just had to get used to them- or so we thought.

As we are renovating our farmhouse, we have slept in every room in the house at somepoint in the last 8 months. In our first few weeks here, I started to complain at night about being able to hear an engine running constantly, and found myself getting out of bed to look for the car or tractor that I thought was intruding on our land. I then thought it was our new fridge, the electricity meter box, the water heater…all with no result. I could hear this noise almost every night when I went to bed, and I would spend at least 30 minutes after lights out trying to work out what it was that I could hear.

It was only on one hot, still night in late summer, that my husband told me to open the window, and listen. We could both hear the thudding pulsing noise of the blades turning. Quite a novelty to start with, as we were surprised that we could hear them at all. We began spending more time outside once our sheep arrived in August 2011, and hence became more and more aware of this thud, along with the humming, engine noise that I then realised was the noise I had been hearing at night.

The noise changes depending on which way the wind is blowing, and how much atmospheric pressure there is. At times, we have opened our front door only to be "hit" by this noise, it has been so loud. When out in the fields, it is almost frightening when everything else around you is so quiet, to hear this industrial, slightly surreal thudding and whooshing.

I am in no doubt that my sleep has been affected by this noise. I grew up next to a dual-carriageway, under an MOD flight path, and next to an abattoir, and yet none of these things has ever disturbed my sleep in such a manner. Once you are "tuned in" to the noise, there is no escaping it, and my husband has remarked how my description of it is similar to what he experiences from his tinnitus.

In the next month, we will be lambing here, and are dreading how much noise we are going to have to endure whilst we are either out in the fields, or trying to rest in between shifts. We can also only begin to imagine how much of a negative impact the proposed developments surrounding Alltwalis would have on our health, sleep, and enjoyment of this wonderful part of Wales.

It is not just noise we experience here either, at certain times of the day in certain weather conditions, we are subjected to light flicker from the turbines, both outside as we work, and also in all of the rooms at the front of our farmhouse. Again, this is something we would never have imagined having to endure when we moved here.

I would urge the committee to take a step back from the policies and guidance that relate to wind turbine noise, and listen to those who have to live with it, as they work and live in the area. We are still surprised by the amount of disturbance and noise caused by the turbines, and believe that many other people would be sceptical unless they had witnessed it for themselves.

Thank you for considering my submission,

Regards,

Mrs C Dugdale

Paper to Note 4

This is a statement written by Gwen Burkhardt about her experience of living near Blaenbowi Wind Farm in 2001.

After three wind turbines were up and running 900 metres from my home I began to suffer ill health.

The symptoms I suffered were as follows, a churning in my head, irregular heart beats, a racing pulse, slight stomach nausea accompanied by a feeling of unease through the day, a lack of concentration and disturbed sleep patterns. These symptoms were with me nearly all the time on a daily basis and it was only when I was away from my home that I began to realise that I was feeling normal again but the ill health and symptoms returned when I arrived home.

Our home was a family farm where we had lived for twenty eight years, where we had worked hard, bought up children, planted a large area of woodland and built a retirement home where we were very happy.

Reluctantly the decision was made that we would have to move away and we put our home on the market. The decision to sell caused me a great deal of personal stress and a sense of guilt since I was the only member of the family to suffer ill health caused by the low frequency noise from the turbines. Added to that was the worry that no one would be willing to buy our "sick" house. When buyers were found I felt that I should and did explain to them why I was moving away.

Since I moved away my health has returned to normal with no sign of the symptoms, thankfully ! I am now worried that the proposed Wind Farm for Llanllwni mountain will again impact on my health and the health of others living nearer to the proposed sight. In my opinion after my experience of suffering ill health no wind turbines should be placed near people's home.

Paper to Note 5

Testimonial on Noise from Wind Turbines

I received an email awhile ago saying that you are collecting statements from people who are suffering from the effects of noise from wind turbines. I am contacting you on behalf of my wife, Beverley, who is particularly sensitive to low frequency noise.

I hope I am not too late in submitting the following statement since I forgot about the draft email I did back in January.

Following is our account for the Petitions Committee.

Executive Summary:
Beverley is particularly sensitive to low frequency noise (LFN). She has been hearing LFN near Cwmdu, Carmarthenshire ever since the winter of 2006, especially when the wind directions are from the S-SE. The LFN was measured in our home by an Environmental Health Officer, so we know the noise is not imaginary.

An Excel summary of the recorded data is attached. It shows that the loudest average noise (green bars) is in the low frequency end of the noise spectrum, esp. 12.5-20 Hz bands. We know another person who started hearing LFN at about the same time but unfortunately he passed away about 18 months ago.

Beverley also hears the noise in many elevated areas in East Carmarthenshire - on top of Mynydd Llanllwni (before Alltwallis wind farm was built), near Cwmman Television transmitter mast, and even on the mountains around Myddfai.

We think the source of the noise recorded at our home is a wind farm nearly 25 miles from our home as the crow flies. We cannot conclusively prove that the suspect wind farm is the source of the noise since we do not have the funds or the equipment to carry out the necessary tests.

However, the observations we have made over the last 5 years indicates that the suspect wind farm could be the source of the LFN Beverley continues to hear when the wind blows from that direction.

Beverley frequently hears the LFN. Most of the time she finds it more of an annoyance since we live in such a quiet location. Occasionally she will hear it very loudly and can have some difficulty sleeping on those occasions. Sometimes she can't stay in the house since the LFN seems to build up a pressure in her head.

We wish to request that the Welsh Assembly Government commission a detailed independent study of wind farm noise to determine how far LFN can travel and how it affects the health of people and livestock. The wind farm industry has no vested interest to carry out such a study.

Background:
We live in a very rural part of Carmarthenshire and don't even have any mains electricity within a kilometre of our home, so electromagnetic pollution is not the source of the LFN. Solar PV panels supply

most of our electricity from March to Sept. We can't even see any wind turbines from our home since the hills obscure nearly all our distant views.

Beverley only hears the LFN when the wind blows from a SW to SE direction, and particularly loud when winds come from a S-SE direction. She can't hear any LFN when winds come from a northerly direction.

For 2 years we had no idea what the source of the noise might be, until we were told it might be a wind farm. When we investigated this possibility, we found that the start of the LFN problem coincided with the commissioning of a wind farm nearly 25 miles SE from our home.

An environmental health officer took a snapshot recording in June 2009 when the noises were particularly loud during a spell of hot dry weather. We were told that the frequency was far too low to be traffic noise - the nearest main road (the A40) is at least 5 miles away. The officer making the recording even suggested that the noises may be produced by something like a wind farm.

Summary observations relating to LFN:
1) The LFN is loudest when winds come from a S-SE direction. It can be heard in any direction from W through to E
2) No LFN is heard when winds come from a northerly direction (NW-NE).
3) The LFN started in autumn or winter of 2006, coinciding with the commissioning of a wind farm about 25 miles away.
4) The recorded noise is loudest in the low frequency range (10-50 Hz) - far too low for traffic.

All these observations suggest that the suspect wind farm might be the source of the LFN which has been recorded at our home.

Since LFN can cause serious health problems, particularly to those who are very sensitive to LFN, detailed independent noise and health studies should be carried out, as a matter of urgency, on existing wind farms to assess what adverse health effects LFN may have on people, livestock, pets and wildlife.

There should be a moratorium on the building of further wind farms until independent noise studies are carried out and the data analysed.

I hope the Welsh Assembly Government will take this issue seriously and commission proper research on this matter.

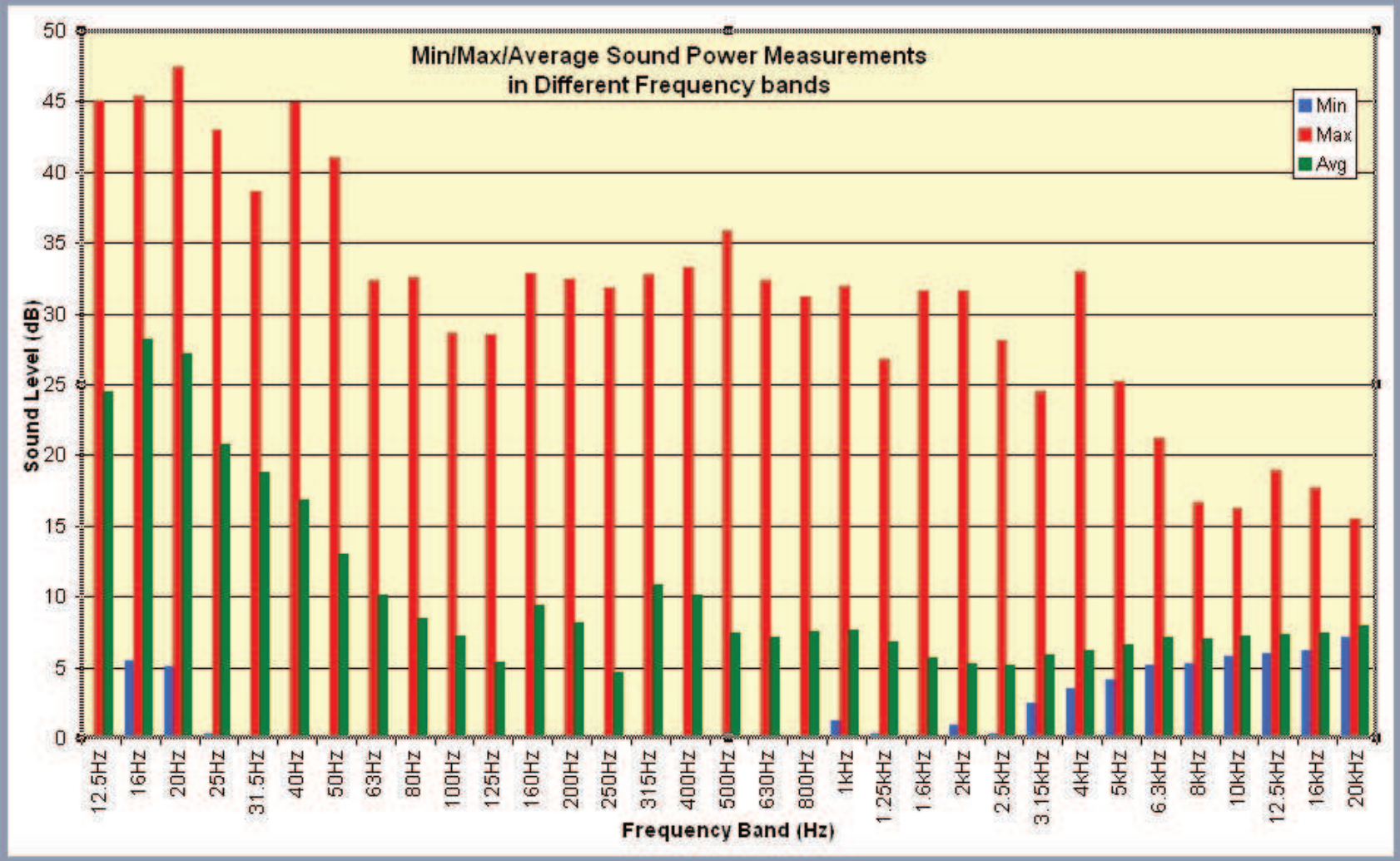
Microsoft Excel - Excell summary of noise recording.xls

File Edit View Insert Format Tools Chart Window Help

Type a question for help

97%

Plot Area



Notes | Analysed Raw Data | Averages | **Averages on Frequency Bands** | LeqA | Fast A | Fast Max A | Peak C | VLFN bands | 12.5 Hz | 16 Hz | 20 Hz | 25 Hz | 31.5 Hz | 40 Hz | 50 Hz

Ready