



Specialist Environmental Consultancy for Air  
Quality, Odour & Environmental Noise



**Summary Proof of  
Evidence by Steve Fraser**

**Air Quality Impacts from  
Proposed Biomass Power  
Plant, Bishop's Castle,  
Shropshire.**

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## **SUMMARY PROOF**

### **Qualifications and Experience**

1. My name is Steve Fraser, an independent environmental consultant. I am a Chartered Environmentalist, and hold full memberships for the Institute of Acoustics and the Chartered Institute of Wastes Management.
2. I have specialised in air quality assessment for most of my professional career. My recent air quality project experience includes: conducting assessments for MSW Energy from Waste (EFW) plants, large-scale biomass EFW processes, and smaller scale combined heat and power biomass projects for industrial and domestic applications. I have presented technical papers on issues relating to atmospheric dispersion at national conferences organised by the Chartered Institute of Water and Environmental Management (CIWEM) in 2002, 2004, 2005 and 2006, the HARMO conference in 2007 and the ADMS 4 dispersion model user (peer) group conference in 2008.

### **Scope of Evidence**

3. I appear at this Inquiry on behalf of Bishop's Castle Biomass Power Ltd as expert witness on potential adverse air quality impacts from the proposed development. I will also refer to the potential health-related impacts from residual pollutants.
4. In my experience it is good practice to agree the scope and methods for assessment with regulatory agencies, where the level of detail required for assessment is proportionate to the scale of development. In some cases, where the process is relatively small, it is acceptable to base the assessment on a screening model. This is accepted practice for environmental regulation within the UK e.g. both the Environment Agencies Guidance on Environmental Assessment<sup>1</sup> and DEFRA's Technical Guidance<sup>2</sup> on local air quality management (LAQM) include screening models as part of the assessment process.

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<sup>1</sup> Environment Agency 2003 H1 Horizontal Guidance Environmental Assessment and Appraisal of BAT.

<sup>2</sup> DEFRA 2003. Technical Guidance Local Air Quality Management TG03

5. Screening models are designed to be simple, robust tools and are designed to over-predict to ensure a conservative approach. Screening models are not site specific, so an effective screening model must include worst case dispersion factors for any location. The aim of a screening model approach is to help “*screen out*” processes that are unlikely to have significant adverse impacts. Thus if a screening model indicates that the impacts are acceptable, it is usually unnecessary to proceed further and conduct a more detailed site specific assessment.

### **Potential Air Quality Impacts**

6. The process is relatively small and falls well below the threshold for regulation under European IPPC regulation. The appellant has advised me that the process will have a maximum design capacity of 13MW net rated thermal input and consume up to 2.5 dry tonnes of biomass fuel per hour (~20,000 dry tonnes per annum). I have been advised by the appellant that the process will not use waste materials as fuel. The main pollutants of interest for this type of process are typically oxides of nitrogen (NO<sub>x</sub>) and particles.
7. I have been advised that the appellant has specified maximum emission limits for the proposed plant for both NO<sub>x</sub> and particles as part of the procurement process. I have also been advised that the combustion process will be designed to ensure that combustion gases will be oxidised in a secondary chamber for two seconds at above 850°C. This should ensure the effective destruction of organic compounds.
8. I have conducted an air quality impact assessment of the proposed scheme. The aim of my assessment is to provide an independent objective report to help inform the planning process. The dispersion modelling assessment submitted to the Inquiry is based on an assumed steady state emission at maximum throughput. The detailed assumptions are set out in my technical report.<sup>3</sup>
9. In my opinion the overall capacity for significant harm to arise is relatively low due to the small scale of the proposed development, the process design and the characteristics of the fuel. However, emissions from the process have the potential to affect the health of local residents and

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<sup>3</sup> The Airshed 2<sup>nd</sup> February 2009. Air Quality Impact Assessment Biomass Energy Plant Bishop's Castle Shropshire.

people using the adjacent cycle park, the allotment and adjacent footpaths. These impacts are considered within my technical report.

### **My Evidence**

10. The main thrust of my evidence is that:
- properly designed and operated biomass plants such as the one proposed here have a low potential for causing harm;
  - the biomass plant as proposed by the appellant does not involve the use of recycled materials or waste products, further reducing the potential for harm;
  - the main air quality impacts are likely to occur relatively close to the process within an established industrial estate, so that significant adverse impacts are highly unlikely;
  - the process can be controlled by appropriate planning conditions in accordance with Guidance within PPS 23 and that these conditions are likely to ensure effective means of preventing potential air quality impacts; and
  - the impact from the proposed process is likely to be acceptable at sensitive receptors in terms of national and international environmental standards.
11. The nearest dwellings are approximately 250m from the proposed stack. These are relevant when considering long-term, annual mean exposures e.g. for PM<sub>10</sub>, PM<sub>2.5</sub> and NO<sub>2</sub>. People using public open space such as the adjacent allotments and the cycle park and pedestrians on pavements and footpaths may be exposed to short-term air pollution. These impacts have been assessed in accordance with UK Air Quality Objectives and Environment Agency Guidance.
12. The fuel feedstock is likely to contain trace elements of some metals. These may deposit on the ground either on the adjacent allotments or within private gardens. The significance of these impacts has been assessed using Environment Agency benchmarks. I have assessed the

likely significance of dioxins and furans in terms of World Health Organisation and UK Department of Health guidance.

13. In principle the impacts may be prevented or minimised by appropriate location, design and engineering and the adoption of best practice measures. These adverse impacts are amenable to control. In practice this process may be controlled by appropriate planning conditions. The proposed abatement techniques are discussed in my technical report.<sup>5</sup>

14. My evidence is structured as follows:

- Relevant planning Guidance, environmental protection legislation and assessment standards are summarised in Section 2;
- In Section 3 of my evidence I have reviewed the process description, discussed the potential sources of air pollution, the methods for mitigation and the likely impacts at the nearest receptors; and
- In Section 4 I have drawn conclusions about the likely impacts from the proposed operation.

#### **Process Emissions**

15. The proposed process will have a maximum fuel use of 2.5 tonnes per hour. The emissions arise from an elevated point source release under controlled conditions:

- A 16m high stack with an efflux velocity of 15m/s at 180°C;
- Emissions from the process are based on supplier estimates for combustion gases and will control NO<sub>x</sub> and particles.
- Fugitive emissions of dust from ash handling will be prevented or minimised by the adoption of sealed ash hoppers.

16. The methods used to estimate the emissions from the process are set out in detail in the Air Quality Impact Assessment for the project.<sup>5</sup> [Refer to Tables 3.1 and Table 3.2] This assessment considers two emission Scenarios:

- Scenario 1 is based on the emission limits agreed with SSDC for NO<sub>x</sub> and particles; and
  - Scenario 2 is based on plausible worst case emissions.
17. The local authority has agreed maximum emission concentrations for NO<sub>x</sub> and particles. This proposes short-term concentration limits for emissions, which if exceeded would trigger the controlled shutdown of the plant. Scenario 1 assesses the impacts for the process on the assumption that these short-term transient concentrations occur at all times.
18. As discussed above, the operator proposes that the plant will be subject to stringent performance requirements as part of the procurement process. Scenario 2 assesses the upper range of what I consider likely to be emitted from the process, taking account of typical industry performance and the proposed design. This is mainly relevant when considering the long term impacts of process emissions.

### **Predicted Impacts**

19. I have used an advanced dispersion model to predict the likely pollution concentrations around the site, based on meteorological data from a range of sources and local topography. The dispersion model used is widely validated for industrial point sources and is recognised by the Environment Agency and DEFRA as an appropriate atmospheric dispersion model, subject to its proper use. The assessment includes a detailed model sensitivity analysis. This examines the significance of a range of model variables on process contribution.
20. However, bearing in the findings of the screening assessment, it is unlikely that these impacts would be significant. This is supported by the results from the model sensitivity analysis for meteorological data which shows that the model is unlikely to under predict the annual mean or short-term EQS, either due to lower wind speeds or increased periods of calm weather. This is considered in more detail within my technical report. This sensitivity analysis indicates that impacts would actually reduce if lower wind speeds are assumed.
21. The main dispersion mechanism affecting the predicted annual mean ground level concentrations at this site is mechanical turbulence caused by

building downwash effect. These mechanical turbulence effects reduce with lower wind speeds.

22. To provide further confidence in the predictions, I have used other Meteorological Office supplied data based on the worst case year (2002), including data from Credenhill, Ringway and local NWP meteorological data for Bishop's Castle. This confirms that the Coleshill data is quite pessimistic compared to these other data sets. As expected, due to lower wind speeds, the predicted annual mean is lower when Bishop's Castle NWP meteorological data is used. The predicted annual mean is actually ~50% lower at the worst case receptor considered in the study. Short-term impacts are not affected significantly either way.
23. The basis of the assessment criteria used is set out in Table 1 of my technical report. The results are summarised in Table 8 and their significance assessed in Table 9.

#### **Short-term Air Quality Standards**

24. Based on these predictions, the worst case concentration at any sensitive receptor for the most prominent pollutant, NO<sub>2</sub>, is predicted to be less than 10% of the air quality standard, taking worst case meteorological and surface roughness conditions into account. There are some uncertainties in the short-term concentration of background for NO<sub>2</sub>. In practice these uncertainties are not important since the short-term air quality standard is unlikely to be exceeded even assuming that all the emitted NO<sub>x</sub> were present as NO<sub>2</sub>.

#### **Annual Mean Air Quality Standards**

25. The model predicts that the annual mean impacts are well within the relevant standards and are either of marginal significance or insignificant in terms of the assessment criteria.

#### **Dioxins and Furans**

26. The results from the USEPA HHRAP model indicate that dioxin and furan impacts are insignificant i.e. 1/100<sup>th</sup> of 1% of the World Health Organisation and UK Department of Health advisory limits. These results are summarised in Table 6 within the text of my report and detailed in

## **CONCLUSIONS**

28. The process is relatively small, the character of the fuel relatively benign and the proposed design is to a high standard. The potential for significant harm is therefore relatively low.
29. A conservative approach to assessment has been adopted and full account taken of model uncertainties. This demonstrates that the process is highly unlikely to significantly affect air quality.
30. The results from the source-pathway-receptor study confirm that the impacts from dioxins and furans are likely to be insignificant in terms of UK and international standards.
31. The mitigation proposed by the appellant represents best practice to prevent or minimise the release of emissions for this scale of plant.
32. The proposed design and mitigation measures should ensure that air quality impacts will be of marginal significance or insignificant at the nearest receptors.
33. The potential air quality impacts can be effectively controlled by appropriate planning conditions.