

**TOWN & COUNTRY PLANNING (INQUIRIES PROCEDURE)  
(ENGLAND) RULES 2000**

**APPEAL REF: APP/D0840/A/09/2113075/NWF**

**Land at Rostowrack Farm, Wheal Remfry, Goonvean and  
Parkandillick Dryers, St Dennis, St Austell**

**Health Effects of Atmospheric Emissions – Summary Proof of  
Evidence of Professor Jim Bridges**

On behalf of SITA Cornwall Limited

February 2010

**RESEARCH FOR SUSTAINABILITY,  
GUILDFORD, SURREY.**



## CONTENTS

<b>Approach used to assess the risks</b>	<b>1</b>
<b>Selection of the chemicals of interest</b>	<b>2</b>
<b>Estimation of exposure to each chemical of interest</b>	<b>3</b>
<b>Identification and understanding of the relevant hazardous properties of the chemicals of interest (<i>hazard assessment</i>)</b>	<b>4</b>
<b>Calculation of a safety margin or life time risk (<i>Final risk assessment</i>)</b>	<b>5</b>
<b>Findings from the published literature</b>	<b>6</b>
<b>Views of expert bodies</b>	<b>8</b>
<b>Overall conclusion</b>	<b>8</b>



## **Approach used to assess the risks**

1. The proposal to introduce a new industrial plant into any locality inevitably gives rise to health/environmental concerns among some members of the local community. This Proof considers whether the operation of the proposed Cornwall Energy Recovery Centre (CERC) might result in health risks to the local population due to emissions from its chimney stack.

2. All chemicals both natural and man made are hazardous. It is the exposure which determines whether or not they will produce adverse effects on health. It is essential therefore to appreciate that it is not a simple matter of determining whether a particular chemical (such as dioxins or fine particulate matter) is present or absent in the emissions but what the levels and duration of exposure of members of the local population to the chemical will be. Unfortunately, lobby groups and the media usually do not make distinctions between the hazardous properties of a chemical and the risk arising from the likely levels of exposure to it.

3. It is also important to recognise that humans, both in urban and rural environments are exposed to many thousands of chemicals on a daily basis, the majority of these chemicals are of natural origin. In Cornwall, as in other parts of the UK, the air contains chemicals derived from human activities including diesel and petrol fuelled vehicles, mineral excavation, and electricity generation. In quantitative terms, chemicals emitted from the CERC chimney stack will make only a minor contribution to the air quality profile in the local area. Nonetheless, it is important to

examine the possible impact of each chemical that is identified as of potential concern (hereafter called the 'chemical of interest')

4. To assess the risk to human health from chemicals, emitted from the chimney stack of the proposed CERC, the following steps have been carried out:

- Selection of the chemicals that are most likely to be of concern to health;
- Estimation of the potential exposure to each chemical of interest. In the case of a proposed plant this is achieved by computer modelling (*exposure assessment*);
- Identification and understanding of the relevant hazardous properties of the chemicals of interest (*hazard assessment*);
- Calculation of a safety margin or life time risk (*final risk assessment*).

5. These steps, which are described in detail in Chapter 2 of my main proof, are summarised below.

### **Selection of the chemicals of interest**

6. The *chemicals of interest* are defined principally by legislation. Either through the setting of emission standards and/or by establishment of ambient air standards or guidelines. None of the chemicals of interest are uniquely produced by plants such as the proposed CERC. Thus the chemicals considered are: sulphur dioxide, nitrogen dioxide, hydrochloric

and hydrofluoric acids, carbon monoxide, fine particulate matter (often called PM10), metals, dioxins, benzo (a) pyrene and benzene.

### **Estimation of exposure to each chemical of interest**

7. It is evident from the above, that to assess the possible impacts on health of exposure to each chemical of interest one needs to have information on the levels of the chemicals of interest to which the local population could be exposed. For some chemicals it is the effects that follow shortly after a peak of exposure that need to be given particular consideration from a risk assessment perspective. These chemicals are usually referred to as having the potential to produce 'acute (short-term) health effects'. Chemicals that cause irritation to the eyes, nose, throat and/or lungs are in this category.

8. For many other chemicals, only at very high exposure levels, will any acute adverse health effects occur. These levels will only occur under extreme exposure conditions such as a chemical spillage. However, if exposure to them occurs frequently then (over time) adverse health effects may arise at lower exposure levels. These chemicals may be described as having the potential to produce 'chronic (long-term) effects'.

9. For the proposed CERC, it is clearly not possible (in advance of its operation) to make measurements of actual levels of exposure of the local population to each of the chemicals of interest. Nonetheless, the exposure can be gauged by:

- Computer modelling of the dispersal of chemicals of interest from the chimney stack of the proposed plant, based on the assumption that the plant will emit each *chemical of interest*.
- The assessment of the published scientific literature on analytical findings around existing and former incinerators.

10. Computer modelling of the dispersal of chemicals from a point source such as a chimney stack is a very common practice, accepted by the UK and other regulatory authorities. The purpose of the model is to predict ground level concentrations of each chemical of interest i.e. levels to which people might be exposed. To minimise the possibility of under estimates of exposure, the modelling is based on a worst case assumption (that is an assumption that in practice is most unlikely to occur) that: each chemical of interest is emitted continuously from the chimney stack, at the maximum legally permitted limit for that chemical. In practice such a plant would inevitably have many exceedences and would lose its licence to operate.

**Identification and understanding of the relevant hazardous properties of the chemicals of interest (*hazard assessment*)**

11. The hazardous properties of each of the chemicals of interest have been extensively researched and consequently are well understood by scientists.

12. For each chemical of interest an ambient air standard or guideline has been set by regulatory authorities, based on their hazardous properties

and potency. Some of these chemicals (such as hydrogen fluoride) have only a short term standard (to protect against short term effects) but for most a long term standard or guideline value (to protect against long term effects) has also been set.

**Calculation of a safety margin or life time risk. (*Final risk assessment*)**

13. A safety margin may be calculated once the appropriate standard/guideline value has been selected and an exposure level estimated by dividing the standard by the exposure level (see appendix 3).

14. In this Proof of Evidence a tiered method has been used. In tier 1 to assess the safety margin(s) the worst case scenario is adopted, in which the maximal hypothetical exposure and the strictest standard are selected as the basis for calculation of safety margins.

Based on these values for short-term exposure, if the safety margin is greater than 10 (termed the safety margin threshold), no further assessment is required (See Appendix 4). For long-term exposure, if the safety margin is greater than 100, no further assessment is required.

15. For all the *chemicals of interest* the worst case modelled data show that these additional very conservative threshold safety margins are met. Thus for short term exposure the lowest safety margin is 30.3 for nitrogen dioxide. All the other values are at least one order of magnitude above the further assessment value of 10 and most are two or more orders of

magnitude higher.

16. The safety margins for each chemical of interest are also all above the long term threshold value for further consideration of 100. The lowest safety margins are 125 for arsenic, 227 for cadmium and 308 for nitrogen dioxide. The majority of the chemicals of interest are at least an order of magnitude above the 100 safety margin threshold. It can be concluded that a risk to the health of the local population from airborne exposure to these chemicals from the CERC alone is very unlikely.

### **Findings from the published literature**

20. A further way of assessing the risks from the operation of the proposed CERC is to evaluate the published literature on waste to energy plants/incinerators. In my Proof, as a worst case scenario, the literature on older as well as modern incinerators is considered.

#### Environmental contamination

21. Seventy years ago incinerators had a bad polluting record because their emissions caused environmental contamination. Historically they were also identified as a major source of dioxins. Over the past thirty years, strict legislation on permitted levels of airborne emissions has been introduced to prevent such pollution. As a result, incinerators are now a minor source in the UK of any environmental contaminants. As indicated above data on very modern plants, such as the proposed CERC, are limited partly because there is anticipated to be no detectable changes in either depositions in the environment nor in the health impacts.

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Many studies have however measured the levels of either metals or dioxins in the vicinity of older incinerators of various types and locations. Measurements have been performed in soil, plants and animals (particularly sources of human food) and in the blood of members of local populations.

22 For modern waste to energy plants, that use comparable technologies to the proposed CERC and which comply with the EU/UK regulatory emission levels, no detectable increases in levels of either metals or dioxins have been found in humans, in local food or in soil and other plants. The literature also identifies that background levels of dioxins and metals in such samples have been falling for a number of years.

#### Studies of health effects

23. The possibility that individuals, who live close to an incinerator, may suffer various adverse effects has been investigated by many researchers (epidemiological studies). However, although there have been some indications of adverse effects on some members of local communities living in the vicinity of the oldest incinerators there is no evidence of any adverse effects occurring in populations around more recently built incinerators. This difference is not surprising when one considers that the oldest incinerators were emitting dioxins and metals at a hundred or more times the levels currently permitted.

### **Views of expert bodies**

24. Expert committees of various national and international organisations have reviewed the health risks from the operation of modern waste to energy plants. Their conclusions are rather similar, namely, that health risks are at most, very small (for example, the UK Health Protection Agency Statement, 2009) but that further investigations are advised to confirm this. This cautionary remark would of course also apply to the risk assessment most other human activities. It is noted that recent Public Inquiries in the UK on proposed waste to energy plants have, without exception, concluded that there are no important direct health issues.

### **Overall conclusion**

25. Based on the published scientific literature, the views of expert bodies and air quality modelling data, it is concluded that it is very unlikely that airborne emissions of the *chemicals of interest* from the operation of the proposed CERC will result in any significant adverse effects on the health of the surrounding population.