Appendix 4.4

Compliance with Best Available Techniques (BAT)

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A4.4.1 Introduction

The facility will be designed, constructed and operated in compliance with the requirements of the BAT Reference documents, (BREF) on Waste Incineration. The use of BAT is described below with reference to the BREF document. Note that all parenthetical references are to the BREF document. Any other references to chapters and sections are to the EIS main text.

A4.4.2 Generic BAT for all Waste Incineration (5.1)

In the design of the plant and selection of equipment, due consideration has been given to the properties of the waste to be thermally treated (5.1.1, 4.1.1, 4.2.1 and 4.2.3), as demonstrated in the description of alternatives considered, Chapter 3, section 3.4.

The Site will be maintained in a generally tidy and clean state (5.1.2, 4.1.2).

This will be achieved by:

(a) the use of a weighbridge management system to identify and locate/store wastes received.

(b) the prevention of dust emissions from operating equipment will be implemented in the form of a fully enclosed waste tipping hall and waste bunker.

(c) effective preventive maintenance by means of computerised maintenance control system identifying items requiring maintenance.

(d) scheduled cleaning procedures to secure that floors and elevated sections of the process building are kept in a generally tidy and clean state.

Equipment will be maintained in good working order, and maintenance inspections and preventive maintenance will be carried out utilising a dynamic and practical IT-based maintenance control system such as the SAP Maintenance Module. (5.1.3)

A quality assurance system will be implemented to establish and maintain quality assurance of the waste input, according to the types of waste that may be received at the Facility (5.1.4).

Quality assurance will comprise:

(a) Establishing acceptance criteria and identifying key risks (4.1.3.1),

(b) Communication with waste suppliers to improve incoming waste quality control (4.1.3.2),

(c) Controlling waste feed quality in the facility site (4.1.3.3),

Checking and sampling incoming wastes (4.1.3.4), and

(d) Radioactivity detectors will be installed on entrance to the facility (4.1.3.5).

Wastes will be stored and controlled in accordance with the associated risks (5.1.5), in the bunker. The solid waste will be stored in the waste bunker, which will be as follows:

(e) sealed and resistant surface to walls and floor (4.1.4.1),

(f) a fully covered with roof and side walls,

(g) the average storage time in the bunker for most of the waste will not under normal conditions exceed ten days (4.1.4.2),

(h) the bunker will have an adequate storage capacity to handle incoming waste in peak period and to mix waste in the bunker

(i) prior to discharge into the bunker the waste will be categorised at the weighbridge either electronically or manually (4.1.4.6)

(j) part of the combustion air will be taken from the waste bunker, which will reduce odour from the waste bunker (4.1.4.4)

(k) drainage from potential areas of contamination (storage/loading/ transportation) will be clearly marked

(l) a fire resisting wall will be provided between the bunker and the furnace hall. Furthermore, a fire extinguishing system comprising fire detection and control systems will be installed in the bunker (4.1.4.7)

The waste will absorb any water in the bunker. When the waste is incinerated, the water will be released as water vapour in the boiler. Any contamination in the water will thus be caught in the flue gas cleaning system.

The average storage time in the bunker will be managed (5.1.6) and, for solid waste will not normally exceed ten days in order to generally reduce the processing difficulties that may arise (4.1.4.2). In so far as it is practicable, waste deliveries will be controlled and managed by communicating with waste suppliers, etc.

The main volume of atmospheric air for the primary combustion will be extracted from the waste bunker and reception hall resulting in a negative pressure in these areas, preventing odour and dust from leaving the waste reception area and creating dust and odour nuisances in the surrounding areas (5.1.7, 4.1.4.4).

Waste, in excess of the bunker capacity, will be avoided through detailed planning of maintenance and communication with waste suppliers, etc.

When the waste arrives at the facility, it will be recorded electronically at the weighbridge. This will occur automatically by chip or magnetic card for waste trucks bringing only a specific sort of waste, e.g. household waste. If no chip or magnetic card system is in place, the driver will be required to report to the security (4.1.4.6).

The facility will be equipped with fire detection and fighting systems (4.1.4.7) and emergency response procedures (5.1.10). The fire detection and fighting systems and procedures are described in chapter 4. The fire detection and control system will meet the requirements of the Building Regulations in order to obtain a Fire Safety Certificate.

The waste bunker will have adequate capacity to deal with period with no deliveries e.g. long weekends and will be sufficiently large to ensure proper mixing of the waste (5.1.11, 4.1.5.1). The waste will be blended in the bunker to ensure a relatively uniform feed to the furnaces.

The bottom ash will be transported off site for pre-treatment prior to end use. As far as practicably and economically viable, ferrous metals and non-ferrous metals will be recovered from the bottom ash residues.

Operators will be able to monitor waste storage areas and loading areas, directly or using television screens or similar (5.1.13, 4.1.6.1).

The waste feed hopper will be kept filled with solid waste in order to reduce air ingress into the combustion chamber during loading (5.1.14, 4.1.6.4).

Flow modelling will be performed during the boiler design (5.1.15, 4.2.2) in order to:

(a) optimise furnace and boiler geometry so as to improve combustion performance

(b) optimise combustion air injection so as to improve combustion performance

(c) optimise reagent injection points of the SNCR system so as to improve the efficiency of NOx abatement whilst minimising the generation of nitrous oxide, ammonia and the consumption of reagent

Operations will be continuous and the equipment will include the latest techniques and materials such as Inconel cladding and online cleaning in order to obtain/achieve maintenance intervals in excess of the standard 12-month maintenance interval thus reducing the number of start-ups and shutdowns over the lifetime of the facility (5.1.16, 4.2.5).

The waste feed rate, the supply of primary and secondary combustion air and the combustion processes will be controlled by an advanced combustion control system which will measure flow rate, flue gas oxygen and combustion temperature in order to obtain the best possible operational conditions (5.1.18, 4.2.6 to 4.2.9, 4.2.11 and 4.2.19).

The facility will be operated as specified in article 50 of Directive 2010/75/EU or as subsequently amended by future legislation (5.1.19).

In conditions where it may lead to improved performance, the primary combustion air will be preheated using heat recovered within the installation (5.1.20, 4.2.10).

Auxiliary burner(s) for start-up and shutdown and for maintaining the required operational combustion temperatures will be installed and operated at all times when unburned waste is in the combustion chamber, if necessary in order to reach the required operational combustion temperatures (5.1.21, 4.2.20).

The boiler will be equipped with water-cooled panel walls. The boiler will be equipped with adequate internal/external insulation, appropriate to the calorific value and corrosiveness of the waste, (5.1.22, 4.2.22 and 4.3.12) which provides for:

(a) adequate heat retention in the furnace,

(b) additional heat to be transferred for energy recovery.

The boilers will be equipped with three empty vertical passes and one convection pass. This will limit operational problems that may be caused by high temperature sticky fly ashes, as the boiler design allows flue gas temperatures to drop to a suitable level before the convective heat exchange bundles will be encountered (5.1.25, 4.2.23 and 4.3.11).

The facility will be designed and optimised to achieve a very high overall energy efficiency and energy recovery, taking into account the technical and economic feasibility and the availability of users for the energy recovered (5.1.26). The feasibility of a district heating system is being studied. The facility is designed to optimise the power output. The design of the turbine thus results in a power output of 21 MW equivalent to a power efficiency of approximately 25% (4.3.1, 4.3.5, 4.3.5).

The boiler, which will transfer the flue gas energy to the production of steam, will have a thermal conversion efficiency of at least 80% (table 3.46).

The steam parameters for the waste-to-energy facility are approximately 41 bar/400 °C were selected based on the additional maintenance cost of higher steam parameters compared to the limited value of the additional electricity produced due to the relatively modest power prices in Ireland (5.1.29, 4.3.8). To reduce corrosion, part of the boilers will be protected against corrosion by means of nickel/chromium alloy cladding.

The turbine design is selected in order to optimise the power output and thus the electricity supply regime, as no heat supply regime is in place at present (5.1.30, 4.3.7).

The in-house energy demand has been minimised taking into consideration the costs and advantages of each design decision (5.1.32, 4.3.6).

The boiler will be cleaned using a combination of online and offline boiler cleaning techniques to reduce dust residence and accumulation in the boiler (5.1.34, 4.3.19).

Under normal operating conditions, emissions from the facility will comply with the limits in Table 5.2. (5.1.35)

The list of general factors given in 4.4.1.1 to 4.4.1.4 have been considered in the selection of the flue gas cleaning systems**.** (5.1.36)

The design of the flue gas cleaning systems has taken into account the general selection criteria provided in Table 5.3. (5.1.37)

The flue gas cleaning reagent consumption will be optimised and thus the flue gas cleaning residue minimised (5.1.39). The quantity of reagent(s) injected will be adjusted and controlled in order to meet the requirements for treatment of the flue gas such that the target final operational emission levels are met.

The use of primary (combustion related) NO_x reducing and secondary NO_x reduction is achieved by using a SNCR system (5.1.40).

The reduction of overall PCDD/F emissions to all environmental media will be provided as follows (5.1.41):

(a) Well-controlled combustion secured by means of flow modelling (5.1.15) at the design stage, and an advanced combustion control system (5.1.17, 5.1.18) to aid the reduction of PCDD/F and its precursors.

(b) During normal operation, the temperature in the three empty passes of the boiler will be above 600 °C. When entering the convection pass, the flue gas is cooled very rapidly due to the large heat convection surfaces. This reduces the dust-laden gas residence time in the temperature zone from 450 to 250 °C, in which zone PCDD/F is likely to reform (the de-novo synthesis).

(c) Adsorption by injection of activated carbon or other reagents at a suitable reagent dose rate, followed by bag filtration.

The absorbed PCDD/F may then subsequently be released, causing an increased PCDD/F emission. This is known as the “memory effect”. The memory effect mainly occurs if the injection of activated carbon for some reason fails during combustion of waste. In order to prevent the build-up of any memory effect, flow monitoring of the activated carbon dosage will be implemented in the overall DCS system (5.1.42).

Re-burning of flue gas cleaning residues is not applied. (5.1.43)

The activated carbon or activated clay injected before the baghouse filter will reduce the emission of particle bound Hg (5.1.44, 5.1.45).

Water is re-circulated where feasible for use in the cooling sectionor wet deslaggers

The TOC value in the bottom ash will be below 3 wt %. The TOC value will typically be between 1 and 2 wt %, which will be ensured by (5.1.49).

(a) a combination of furnace design, furnace operation and waste throughput rate that provides sufficient agitation and residence time of the waste in the furnace at sufficiently high temperatures, including any ash burn-out areas

(b) applying furnace designs that, as far as possible, physically retain the waste within the combustion chamber).

(c) using techniques for mixing and pre-treatment of the waste, as described under 5.1.11 above.

(d) optimising and controlling combustion conditions, including air (oxygen) supply and distribution, as described in 5.1.17 and 5.1.18 above.

Bottom ash, fly ash and flue gas cleaning residues will be managed separately to avoid contamination of bottom ash and improve the potential for bottom ash recovery (5.1.50).

The ferrous and non-ferrous metals from bottom ash will, as far as practicably and economically viable, be separated from the bottom ash on-site (5.1.52).

To the extent required in order to meet the requirements for its use or the specifications of the receiving treatment or disposal site, bottom ash will be treated off-site (5.1.53).

Flue gas cleaning residues will be treated off-site to the extent required in order to meet the acceptance criteria of the waste disposal option selected (5.1.54).

The following noise reduction measures will be implemented to meet local noise requirements (5.1.55):

(a) An enclosed waste tipping hall will significantly reduce the noise from unloading of waste.

(b) Noisy process equipment will be located inside the building.

An Environmental Management System will be implemented in the facility (5.1.56). Indaver's facilities in Ireland and elsewhere operate environmental management systems certified to ISO 14001.

A4.4.3 Specific BAT for Municipal Waste Incineration (5.2) and Specific BAT for Pretreated or Selected Municipal Waste Incineration (5.3)

The incoming solid waste will be stored in the waste bunker, which will be made of reinforced concrete, thus having a sealed surface and the bunker will be within a building (5.2.57, 5.3.64).

The bottom ash consisting of inert materials from the combustion process such as glass, metal, earth and other fractions will be stored in a separate bottom ash hall with sealed surfaces.

The flue gas cleaning residues will be stored in one or more steel silos designed for this specific purpose. The steel silos have sealed surfaces.

Waste will not be stockpiled in the facility outside the waste bunker. The waste will be stored in such a manner that risks of odour, vermin, litter, fire and leaching will be effectively controlled. (5.2.58, 5.3.65).

In case of high calorific waste the main combustion grate sections will be air / water cooled which will allow for optimisation of primary air to the combustion without regard to the cooling requirements of these sections (5.2.60).

The facility will as an annual average generate in excess of 0.65 MWh electricity/tonne waste received (5.2.62), (5.3.66). The facility has however been designed to allow for steam/district heating supply in the future. If the steam/district heating option are implemented the electricity/tonne waste received will decrease slightly, but the over all energy efficiency will increase.

The installation electrical load will generally be below 0.15 MWh/tonne of waste processed as an annual average. (5.2.63, 5.3.68)

A4.4.4 Specific BAT for Hazardous Waste Incineration (5.4)

Specific systems and procedures will be used, using a risk based approach according to the source of the waste, for labelling/identifying, checking, sampling and testing of the waste to be stored and treated (5.4.69). Analytical procedures will be managed by suitably qualified staff using appropriate techniques. The sources and origins of the waste will be known.

The waste will be mixed, blended and or pre-treated as appropriate to improve its homogeneity, combustion characteristics and burn out. A fire extinguishing system will be provided. Waste will be mixed in the bunker compartment in accordance with the procedures specified by the furnace supplier. (5.4.70)

Solid hazardous waste will be mixed as described above. As the waste will be hazardous, the pre-treatment handling will be limited to what is necessary for the combustion system.. The system will ensure a continuous feed rather than batch feeding. (5.4.71) liquid waste will be directly injected in the roof of the furnace just above the waste grate.