	Conclusions on BAT	Applicant Assessment
5.1	For *waste incineration* BAT is considered to be:	
1	the selection of an installation design that is suited to the characteristics of the waste received, as described in 4.1.1 and 4.2.1 and 4.2.3 of the Reference Document on the Best Available Techniques for Waste Incineration	The design of the entire installation has taken into account the following elements: (a) based on Indavers experience knowledge of MSW incineration over the past 25 years (b) best industry practice and utilisation of emerging and proven technologies (c) BREF on Waste Incineration (WI) (d) Anticipated revision of BREF on WI and technology required for new BAT-AEL's (e) Regulatory requirements and local site specific considerations
2	the maintenance of the site in a generally tidy and clean state, as described in 4.1.2	(a) the use of a weighbridge management system to identify wastes received, residues dispatched and raw materials accepted on site. (b) the prevention of dust emissions from operating equipment will be implemented in the form of a fully enclosed waste tipping hall, waste bunker and bottom ash hall. (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 (e) periodic litter patrols on site.
3	to maintain all equipment in good working order, and to carry out maintenance inspections and preventative maintenance in order to achieve this	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.
4	to establish and maintain quality controls over the waste input, according to the types of waste that may be received at the installation, as described in: 4.1.3.1 Establishing installation input limitations and identifying key risks, and 4.1.3.2 Communication with waste suppliers to improve incoming waste quality control, and 4.1.3.3 Controlling waste feed quality on the incinerator site, and 4.1.3.4 Checking, sampling and testing incoming wastes, and 4.1.3.5 Detectors for radioactive materials.	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. Please refer to sections 2.1 and 2.2 of the Operational Report in attachment 4-8-1 of this licence application for details of waste acceptance and handling on site. Quality assurance will comprise: (a) Establish acceptance criteria and identify key risks, see Waste Acceptance Procedure in attachment 4-3-5. (b) Communication with waste suppliers on out of specification loads/deliveries, see Waste Acceptance Procedure in attachment 4-3-5. (c) Controlling waste feed quality in the facility site-with spot checks/visual inspections, see Waste Handling Procedure in attachment 4-8-4. (d) Checking and sampling incoming wastes, see Waste Handling Procedure in attachment 4-8-4. (e) Radioactivity detectors will be installed at the entrance to the facility.
5	the storage of wastes according to a risk assessment of their properties, such that the risk of potentially polluting released is minimised. In general it is BAT to store waste in areas that have sealed and resistant surfaces, with controlled and separated drainage as described in 4.1.4.1.	Wastes will be stored and controlled in accordance with the associated risks, in the bunker. The solid waste will be stored in the waste bunker, which will be as follows: (a) re-enforced concrete structure with sealed and resistant surface to walls and floor, (b) fully covered with roof and side walls, (c) prior to discharge into the bunker the waste will be categorised at the weighbridge either electronically. (d) drainage from potential areas of contamination (storage/loading/ transportation) will be clearly marked and can be isolated from main stormwater drains Liquid waste accepted for treatment will be stored in a tank inside in a bund. All other tanks are above ground located in bunds or are of double-skinned construction, with the exception of the floor drains wash water collection, clean water tank for process water re-use (both concrete tanks are located under the main process building) and the fire water retention tank (large scale concrete reinforced construction) located underneath the car park at the entrance to the facility.
6	to use techniques and procedures to restrict and manage waste storage times, as described in 4.1.4.2, in order to generally reduce the risk of releases from storage of waste/container deterioration, and of processing difficulties that may arise. In general it is BAT to: • prevent the volumes of wastes stored from becoming too large for the storage provided • in so far as is practicable, control and manage deliveries by communication with waste suppliers, etc.	(a) the average storage time in the bunker for most of the waste will not under normal conditions exceed ten days, (b) the bunker will have an adequate storage capacity to handle incoming waste in peak period and to mix waste in the bunker. Waste, in excess of the bunker capacity, will be avoided through detailed planning of maintenance and communication with waste suppliers, etc. The waste planner for the facility will control deliveries on a daily and weekly basis in line with the needs of the plant. Communication with waste suppliers is regular and weekly planning meeetings between the planner and the plant production staff ensure that weekly deliveries are controlled and monitored.
7	to minimise the release of odour (and other potential fugitive releases) from bulk waste storage areas (including tanks and bunkers, but excluding small volume wastes stored in containers) and waste pretreatment areas by passing the extracted atmosphere to the incinerator for combustion (see 4.1.4.4). In addition it is also considered to be BAT to make provision for the control of odour (and other potential fugitive releases) when the incinerator is not available (e.g. during maintenance) by: a. avoiding waste storage overload, and/or b. extracting the relevant atmosphere via an alternative odour control system	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. The waste in the bunker 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. Waste, in excess of the bunker capacity, will be avoided through detailed planning of maintenance and communication with waste suppliers, etc. The waste planner for the facility will control deliveries on a daily and weekly basis in line with the needs of the plant. Communication with waste suppliers is regular and weekly planning meetings between the planner and the plant production staff ensure that weekly deliveries are controlled and monitored. A specific odour abatement system will be installed to deal with the extracted air from the bunker during planned or un-planned sutdowns which includes an activated carbon fitler unit that treats the air from the process building. This activated carbon unit can also be utilised during normal operation for odour management. In addition, odour measurments will be carried out by IND staff on site quartely. This is further described in attachment 4-8-1 Operational Report to this licence application.
8	the segregation of the storage of wastes according to a risk assessment of their chemical and physical characteristics to allow safe storage and processing, as described in 4.1.4.5	Prior to acceptance at the facility, all waste streams are and will be assessed for suitability for treatment, and that the Waste Acceptance Criteria is met. (Refer to the Waste Acceptance Procedure in attachment 4-3-5). Liquid wastes will be fed into the furnace from the storage tank on site or by direct injection. Solid waste will be stored in the waste bunker and fed into the furnace by crane through the hopper. Non-conforming wastes will be stored separately in the quarantine area outside the reception hall or dispatched from the site as soon as practicable. Any other wastes generated on site will also be suitably packaged for onward treatment. All packaged waste will be clearly labelled. Hazardous wastes will bear the correct and durable labelling required by ADR and IMDG.
9	the clear labelling of wastes that are stored in containers such that they may continually be identified, as described in 4.1.4.6.	All packaged and palletised waste deliveries will be clearly labelled to ensure their proper identification for inspections as required until their introduction into the waste bunker.
10	the development of a plan for the prevention, detection and control (described in 4.1.4.7) of fire hazards at the installation, in particular for: • waste storage and pretreatment areas • furnace loading areas • electrical control systems • bag house filters and static bed filters. It is generally BAT for the plan implemented to include the use of: a. automatic fire detection and warning systems, and b. the use of either a manual or automatic fire intervention and control system as required according to the risk assessment carried out.	The facility will be equipped with fire detection and fighting systems and emergency response procedures. The fire detection and fighting systems and procedures are described in the operational report in attachment 4-8-1 and in section 9.1 of this application. The fire detection and control system will meet the requirements of Indaver's insurers and the Building Regulations in order to obtain a Fire Safety Certificate. (a) 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. (b) detection systems will include LEL detection in the bunker and UV/IR detection in the waste hopper. Fixed water cannons will be installed above the bunker and a closed dry head sprinkler system will also be installed above the bunker as backup to the water cannons. (c) the baghouse filter will be operated at approximately 145°C which will mitigate against hot spots or fires in the filter.

11	the mixing (e.g. using bunker crane mixing) or further pretreatment (e.g. the blending of some liquid and pasty wastes, or the shredding of some solid wastes) of heterogeneous wastes to the degree required to meet the design specifications of the receiving installation (4.1.5.1). When considering the degree of use of mixing/pretreatment it is of particular importance to consider the cross-media effects (e.g. energy consumption, noise, odour or other releases) of the more extensive pretreatments (e.g. shredding). Pretreatment is most likely to be a requirement where the installation has been designed for a narrow specification, homogeneous waste.	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. The waste will be blended in the bunker to ensure a relatively uniform feed to the furnace. The grate furnace technology will be modern technology, very robust and will be able to handle a variety of waste compositions with a relatively wide range of CV values (in the range of 8MJ/kg to 14MJ/kg).
12	the use of the techniques described in 4.1.5.5 or 4.6.4 to, as far as practicably and economically viable, remove ferrous and non-ferrous recyclable metals for their recovery either: a. after incineration from the bottom ash residues, or b. where the waste is shredded (e.g. when used for certain combustion systems) from the shredded wastes before the incineration stage.	As far as practicably and economically viable, ferrous metals and non ferrous metals will be recovered from the bottom ash residues. This will be done using separation equipment installed after the wet de-slaggers.
13	the provision of operators with a means to visually monitor, directly or using television screens or similar, waste storage and loading areas, as described in 4.1.6.1	Operators will be able to monitor the waste bunker and tipping hall areas, using CCTV. The crane operators will be able to monitor the bunker directly and the waste hopper by CCTV from overhead.
14	the minimisation of the uncontrolled ingress of air into the combustion chamber via waste loading or other routes, as described in 4.1.6.4	The waste feed hopper will be kept filled with solid waste in order to reduce air ingress into the combustion chamber during loading. The incinerator will be kept in under pressure from the waste feeding point to just before the emission point by the tail end fan. The components and ducts areconstructed to avoid false air being sucked into the system. The waste feed is effectively air tight as a result of waste being in the chute, as it acts as a plug. A minimum filling level of the chute is guaranteed by the plants control loop and interlock actions. The connection between bottom ash extractor and bottom ash storage is sealed by a water lock. Contral loops and interlocks guarantee the seal functioning. False air intake from fans out of operation is limited by automated valves closing when fans are stopped.
15	the use of flow modelling which may assist in providing information for new plants or existing plants where concerns exist regarding the combustion or FGT performance (such as described in 4.2.2), and to provide information in order to: a. optimise furnace and boiler geometry so as to improve combustion performance, and b. optimise combustion air injection so as to improve combustion performance, and c. where SNCR or SCR is used, to optimise reagent injection points so as to improve the efficiency of NOX abatement whilst minimising the generation of nitrous oxide, ammonia and the consumption of reagent (see general sections on SCR and SNCR at 4.4.4.1 and 4.4.4.2).	Flow modelling will be performed during the boiler design 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. Computed flow dynamics (CFD) modelling will be used during the design of the plant in areas were flow dynamics is key in the design. Areas where this technology is applied are furnace, post combustion chamber, boiler, reactor and bag filter. Secondary and primary air injection flows and orientation will be optimized with computed flow modelling as well as the position of the burners and liquids lances. An acoustic temperature measurement will be installed to have a reliable temperature profile in the post combustion chamber. This makes it possible to view and adjust inhomogeneous temperature in the post combustion chamber resulting in less primary NOx and CO-production. The flow of the SNCR reagent will be designed to get a full coverage of the cross section of the post combustion chamber. The boiler will be CFD modelled to obtain an equal flowpattern in order to avoid excessive local wear, corrosion or fouling. The flue gas reactor will be subject of flow testing in order to get an equal lime distribution at the injection point.
16	in order to reduce overall emissions, to adopt operational regimes and implement procedures (e.g. continuous rather than batch operation, preventative maintenance systems) in order to minimise as far as practicable planned and unplanned shutdown and start-up operations, as described in 4.2.5	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. It is recognised that periods of shut down result in fluctuations in overall emissions and continuous operation of the facility is ideal. There will be a programme of preventative maintenance carried out to reduce the likelihood of unplanned shut-downs.
17	the identification of a combustion control philosophy, and the use of key combustion criteria and a combustion control system to monitor and maintain these criteria within appropriate boundary conditions, in order to maintain effective combustion performance, as described in 4.2.6. Techniques to consider for combustion control may include the use of infrared cameras (see 4.2.7), or others such as ultra-sound measurement or differential temperature control	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. The combustion control will be fully automated. The operator will enter a setpoint for the thermal plant load. Supported from a heat and mass balance simulation, preset parameters will be generated by the control system expecting to obtain the plant running conditions as per simulation. A number of combustion parameters will be measured. These include oxygen, waste flow, primary and secondary air flow, steam flow, DeNOx reagent flow, flue gas compostion (CEMS), temperature and pressure and will measured and intergrated in the control loops to adjust setpoints. The control loops have a process range and an interlock range. The process range allows for a smooth continuous process control and will be built in a robust way to deal with a variety of the waste properties. The interlock range will alarm for any unwanted process conditions and act to force the plant back into wanted and safe conditions. The temperature will be measured by either an infra red or acoustic system. This gives a 2D temperature profile in a horizontal cross section of the post combustion chamber.
18	the optimisation and control of combustion conditions by a combination of: a. the control of air (oxygen) supply, distribution and temperature, including gas and oxidant mixing b. the control of combustion temperature level and distribution, and c. the control of raw gas residence time. Appropriate techniques for securing these objectives are described in: 4.2.8 Optimisation of air supply stoichiometry 4.2.9 Primary air supply optimisation and distribution 4.2.11 Secondary air injection, optimisation and distribution 4.2.19 Optimisation of time, temperature, turbulence of gases in the combustion zone, and oxygen concentrations 4.2.4 Design to increase turbulence in the secondary combustion chamber	The excess oxygen control is done by matching the total air flow to the thermal input of the waste. Mismatches result in the excessive variaion of the oxygen concentration in the flue gas leaving the boiler. The oxygen concentration is continuously monitored. Control loops will mainly act on the waste supply and the incoming air flows. The primary air flow will be controlled in function of the visual observation of the fire and the quality of ashes. The total flow will be rather stable. The primary air is supplied through the grate; The grate is subdivided is about 10 sections where the flow can be controlled independently. The secondary air flow will be controlled so that the excess oxygen is close to its set point. Secondary air injection will be done through a set of nozzles. The arrangement of the nozzles will be optimised by means of computed flow dynamics to obtain a good mixing of the flue gas from the furnace and the secondary air. The air velocity in the nozzles will be high to get turbulence up to the center of the post combustion chamber. The orientation of the nozzles will create a swirl to increase the mixing effect.
19	in general it is BAT to use those operating conditions (i.e. temperatures, residence times and turbulence) as specified in Article 6 of Directive 2000/76. The use of operating conditions in excess of those that are required for efficient destruction of the waste should generally be avoided. The use of other operating conditions may also be BAT – if they provide for a similar or better level of overall environmental performance. For example, where the use of operational temperatures of below the 1100 °C (as specified for certain hazardous waste in 2000/76/EC) have been demonstrated to provide for a similar or better level of overall environmental performance, the use of such lower temperatures is considered to be BAT.	The combustion temperature (ca 930°C) is determined by the optimum for non catalytic NO_x reduction. This is safely higher than the 850°C as required by law and thus provides a good margin to avoid startup of burners on fossil fuel during normal operation. A higher temperature will be avoided as this increases the consumption of ammonia. The turbulence for good mixing of the fue gases after the last injection of fuel or waste is created by the smart injection of secondary air. The injection velocity of secondary air will be sufficiently high to have an effect in the center of the cobustion chamber. The orientation and arrangement of the secondary air nozzles will create swirls to enhance intensive mixing. This secondary air injection will be designed with CFD (computed flow dynamics calculation and simulation). The acoustic 2D temperature measurement will make it possible to check the temperature homogenity as a result of good turbulent mixing in a horizontal plane above the secondary air injection. The residence time in the post combustion chamber will be between 2 and 3 seconds to make sure that it is at least 2 seconds in the most critical situation.
20	the preheating of primary combustion air for low calorific value wastes, by using heat recovered within the installation, in conditions where this may lead to improved combustion performance (e.g. where low LCV/high moisture wastes are burned) as described in 4.2.10. In general this technique is not applicable to hazardous waste incinerators.	In conditions where it may lead to improved performance, the primary combustion air will be preheated using heat recovered within the installation. The proposed range of waste types are anticipated to have a variety of higher calorific values and the wastes will be well mixed in advance of feeding to give a homogeneous feed. However, if required, primary air will be pre-heated to between 120 and 150°C before injection into the furnace by steam from the turbine extraction.

21	the use of auxiliary burner(s) for start-up and shut-down and for maintaining the required operational combustion temperatures (according to the waste concerned) at all times when unburned waste is in the combustion chamber, as described in 4.2.20	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 and maintain the required operational combustion temperatures. The plant is designed to operate autothermal with waste only. The auxiliary fuel burners are thus only seldom in operation.
22	the use of a combination of heat removal close to the furnace (e.g. the use of water walls in grate furnaces and/or secondary combustion chambers) and furnace insulation (e.g. refractory areas or other lined furnace walls) that, according to the NCV and corrosiveness of the waste incinerated, provides for: a. adequate heat retention in the furnace (low NCV wastes require higher retention of heat in the furnace) b. additional heat to be transferred for energy recovery (higher NCV wastes may allow/require heat removal from earlier furnace stages) The conditions under which the various techniques may be applicable are described in 4.2.22 and 4.3.12	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, which provides for: (a) adequate heat retention in the furnace, (b) additional heat to be transferred for energy recovery. The furnace will be installed under the first pass of the boiler. The post combustion chamber is part of the boiler. The area where 2s residence time at minimum 850°C (T2S) will have refractory lined boiler walls. The refractory will reduce the heat transfer in order to keep the T2S with medium to high calorific waste. With low calorific waste the primary air will be preheated to guarantee the minimum 850°C during 2 seconds. The combination of the reduced heat transfer by the refractory lining and the primary air preheating will result in no excessive excess oxygen is required and hence the energy efficiency is optimized.
23	the use of furnace (including secondary combustion chambers etc.) dimensions that are large enough to provide for an effective combination of gas residence time and temperature such that combustion reactions may approach completion and result in low and stable CO and VOC emissions, as described in 4.2.23.	The boiler 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 . The flue gas will have a residence time of at least 2s and at least 850°C to guarantee a good burnout. Most of the time the residence time will be significantly higher because the 2s and 850°C need to be guaranteed also in the worst case conditions. The flue gas temperature will generally be controlled around 930°C because this is the optimum temperature for the SNCR. The secondary air injection will be designed to obtain a good mixing and hence a good burnout of combustible volatile components and ash.
24	When gasification or pyrolysis is used, in order to avoid the generation of waste, it is BAT to: a. combine the gasification or pyrolysis stage with a subsequent combustion stage with energy recovery and flue-gas treatment that provides for operational emission levels to air within the BAT associated emission ranges specified in this BAT chapter, and/ or b. recover or supply for use of the substances (solid, liquid or gaseous) that are not combusted	Not applicable
25	in order to avoid operational problems that may be caused by higher temperature sticky fly ashes, to use a boiler design that allows gas temperatures to reduce sufficiently before the convective heat exchange bundles (e.g. the provision of sufficient empty passes within the furnace/boiler and/or water walls or other techniques that aid cooling), as described in 4.2.23 and 4.3.11. The actual temperature above which fouling is significant is waste type and boiler steam parameter dependent. In general for MSW it is usually 600 – 750 ºC, lower for HW and higher for SS. Radiative heat exchangers, such as platten type super heaters, may be used at higher flue-gas temperatures than other designs (see 4.3.14).	The flue gas will be cooled down in empty boiler passes until the temperature is lower than the temperature where ashes are sticky. The temperature of the flue gas before the first tube bundle in the flue gas path will be 700°C. Ashes are not sticky any more at this temperature. Water shower cleaning will be provided in the empty boiler passes to control the fouling. This cleaning system is able to deal with sticky ashes. In the first tube bundle water is evaporated. This means that the steel temperature flue gas side remains low, so that fouling by hot ashes is well under control. Pneumatic fixed installed hammer will be operated to keep this tube bundle clean. In the tube bundles further downstream steam will be superheated. The flue gas is sufficiently cooled down to avoid fouling that cannot be control by fixed installed pneumatic hammers and also to minimize corrosion. Finally the flue gas is cooled to around 160°C in the economizer tuble bundles. The boiler cleaning in the economizer will be done by soot blowers, and/or fixed installed explosive boiler cleaning. The boiler is of the waste type boiler which means that the design is done with all particularities that are common in waste to energy boilers.
26	the overall optimisation of installation energy efficiency and energy recovery, taking into account the techno-economic feasibility (with particular reference to the high corrosivity of the flue-gases that results from the incineration of many wastes e.g. chlorinated wastes), and the availability of users for the energy so recovered, as described in 4.3.1, and in general: a. to reduce energy losses with flue-gases, using a combination of the techniques described in 4.3.2 and 4.3.5 b. the use of a boiler to transfer the flue-gas energy for the production of electricity and/or supply of steam/heat with a thermal conversion efficiency of: i. for mixed municipal waste at least 80 % (ref. Table 3.46) ii. for pretreated municipal wastes (or similar waste) treated in fluidised bed furnaces, 80 to 90 % iii. for hazardous wastes giving rise to increased boiler corrosion risks (typically from chlorine/sulphur content), above 60 to 70 % iv. for other wastes conversion efficiency should generally be increased in the range 60 to 90 % c. for gasification and pyrolysis processes that are combined with a subsequent combustion stage, the use of a boiler with a thermal conversion efficiency of at least 80 %, or the use of a gas engine or other electrical generation technology	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. 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%. The boiler efficiency will be approx. 85 %. The energy efficiency is optimized in different ways : Excess air is around 6% and is as low as technically possible leading to less stack heat losses. Lower than 6% is generally not recommended to avoid corrosion in the boiler and CO-peaks. Primary air preheating will be installed to allow low excess oxygen over the whole range of caloric values of the waste. Boiler cleaning devices are installed on many places on the boiler to reduce the boiler fouling. Steam parameters are maximized. A higher temperature is not possible as this would cause high temperature corrosion in the boiler. The pressure is also maximized. A higher pressure will cause less steam condensation at the outlet of the turbine and less power production.
27	to secure where practicable, long-term base-load heat/steam supply contracts to large heat/steam users (see 4.3.1) so that a more regular demand for the recovered energy exists and therefore a larger proportion of the energy value of the incinerated waste may be used	Not applicable. Feasibility study is being prepared as part of planning compliance obligations.

28	the location of new installations so that the use of the heat and/or steam generated in the boiler can be maximised through any combination of: a. electricity generation with heat or steam supply for use (i.e. use CHP) b. the supply of heat or steam for use in district heating distribution networks c. the supply of process steam for various, mainly industrial, uses (see examples in 4.3.18) d. the supply of heat or steam for use as the driving force for cooling/air conditioning systems Selection of a location for a new installation is a complex process involving many local factors (e.g. waste transport, availability of energy users, etc) which are addressed by IPPC Directive Article 9(4). The generation of electricity only may provide the most energy efficient option for the recovery of the energy from the waste in specific cases where local factors prevent heat/steam recovery.	The plant design is done for an optimized production of electrical power. However, potential future plans for heat distribution were taken into account during the design of the plant. The steam turbine will have an allowance to extract an additional 10 MW for feeding a district heating network or other heat demands.
29	in cases where electricity is generated, the optimisation of steam parameters (subject to user requirements for any heat and steam produced), including consideration of (see 4.3.8): a. the use of higher steam parameters to increase electrical generation, and b. the protection of boiler materials using suitably resistant materials (e.g. claddings or special boiler tube materials) The optimal parameters for an individual installation are highly dependent upon the corrosivity of the flue-gases and hence upon the waste composition.	The steam parameters for the waste-to-energy facility are approximately 52 bar/420 °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. To reduce corrosion, part of the boilers will be protected against corrosion by means of nickel/chromium alloy cladding.
30	the selection of a turbine suited to: a. the electricity and heat supply regime, as described in 4.3.7 b. high electrical efficiency	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. The turbine is optimized with steam parameters at the inlet being as high as possible. The combination of steam pressure and steam temperature will be matched to obtain an as high as possible condensation of steam at the outlet of the turbine. 11 to 12 % condensation is expected. A higher condensation percentage will cause damage by impact on the turbine blades. The pressure at the outlet of the turbine is optimized as well. The steam/water from the outlet of the turbine will be condensed by mean of an air cooled condenser. Air cooling is selected as it is more environmentally friendly than cooling with water. Water cooling would required flowartes of up to 4000m3/h. The treatment of saltwater for cooling purposes is very costly. Therefore, air cooling was selected. The condensing temperature/pressure in the air coled condenser is ca 90 mbara/50°C. These process conditions are high enough to avoid frost problems in winter. Lower process conditions are not recommended as the increased power production would be too much consumed by the increased power demand of the air condensor fans.
31	at new or upgrading installations, where electricity generation is the priority over heat supply, the minimisation of condenser pressure, as described in 4.3.9	See BAT 30 directly above.
32	the general minimisation of overall installation energy demand, including consideration of the following (see 4.3.6): a. for the performance level required, the selection of techniques with lower overall energy demand in preference to those with higher energy demand b. wherever possible, ordering flue-gas treatment systems in such a way that fluegas reheating is avoided (i.e. those with the highest operational temperature before those with lower operational temperatures) c. where SCR is used; i. to use heat exchangers to heat the SCR inlet flue-gas with the flue-gas energy at the SCR outlet ii. to generally select the SCR system that, for the performance level required (including availability/fouling and reduction efficiency), has the lower operating temperature d. where flue-gas reheating is necessary, the use of heat exchange systems to minimise flue-gas reheating energy demand e. avoiding the use of primary fuels by using self produced energy in preference to imported sources	The in-house energy demand has been minimised taking into consideration the costs and advantages of each design decision. The plants own energy consumption is minimised. SNCR was selected over SCR because of the better overall balance between emission reduction and energy consumption. Electrical motors are of the high efficiency type. The larger motors are frequency drive controlled where variable motor power is requested by the process. Pressure drops of the fluids through ducting, valves and pipes are reduced to the economical optimum. The plant complexity is optimized. The plant is designed to operate without support fuel during operation on waste Internal heat demand is taken from internal heat sourced at an as low as possible energy level. Therefore the steam turbine is equipped with 2 extraction tap points at a low and very low pressure.
33	where cooling systems are required, the selection of the steam condenser cooling system technical option that is best suited to the local environmental conditions, taking particular account of potential cross-media impacts, as described in 4.3.10	Cooling systems are driven on air (reasoning see BAT 30 above). The air coolers will be designed to an optimized ratio between heat exchanger surface and fan power. The fan will be controlled with step motors or frequency driven motors. Air cooling systems will be closed systems to avoid consumption of water and the need for purging brine. The temperature requirement of the cooling does not show a need of the use of open cooling towers.
34	the use of a combination of on-line and off-line boiler cleaning techniques to reduce dust residence and accumulation in the boiler, as described in 4.3.19	The boiler will be cleaned using a combination of online and offline boiler cleaning techniques to reduce dust residence and accumulation in the boiler. The boiler is equiped with fixed boiler cleaning devices. The goal of these devices is to allow at least 8,000 operating hours (1 year) boiler operation without any manual cleaning interventions. Shower cleaning will be used in the empty passes. This is state-of-the-art and proven technology. Pneumatic hammers will be used in the boiler section with tube bundles in the hotter flue gas flow. Explosive and/or soot blowers will be installed for cleaning tube bundles in the colder flue gas flow. All cleaning devices will be fixed installed.
35	the use of an overall flue-gas treatment (FGT) system that, when combined with the installation as a whole, generally provides for the operational emission levels listed in Table 5.2 for releases to air associated with the use of BAT.	Under normal operating conditions, emissions from the facility will comply with the limits in Table 5.2 specified in the BREF. The flue gas cleaning will be of the "conditioned dry" type. This means that fluegas will be treated with dry lime. The recirculated flue gas cleaning residue will be humidified before entering the reactor again. The humidification reactivates the lime in the residue without becoming a slurry. This is BAT compliant and proven technology for achieving IED emission limits and the limits as proposed in the future BREF. Wet flue gas cleaning was not selected because the added value in overall performance does not justify the additional investment and energy consumption. Semi-wet systems are not possible because the flue gas temperature at the outlet of the boiler. The increase of boiler efficiency results in the flue gas temperature in the reactor to be lower than the acid dew point due to the water evaportion of the milk of lime. The flue gas cleaning equipment would as a result of this, corrode at an unacceptable rate. The lime consumption of conditioned dry flue gas systems is nowadays similar or even lower than for semi-wet system due to recent technological developments.
36	when selecting the overall FGT system, to take into account: a. the general factors described in 4.4.1.1 and 4.4.1.3 b. the potential impacts on energy consumption of the installation, as described in section 4.4.1.2 c. the additional overall-system compatibility issues that may arise when retrofitting existing installations (see 4.4.1.4)	See BAT 37 directly below. 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.

37	when selecting between wet/ semi-wet/ and dry FGT systems, to take into account the (non-exhaustive) general selection criteria given as an example in Table 5.3:	The selection and design of the flue gas cleaning system was based on the criteria in the Table 5.3 of the BREF on WI. "Conditioned dry flue gas system" is, however, not in the table because this technology was not yet available at the moment of publication of the BREF. Conditioned dry means that the reagents are used in dry form and that flue gas residue recirculation is performed after having humidified the residue by means of steam or water. This is equal or better performing than the semi-wet or semi-dry flue gas cleaning systems. Wet flue gas cleaning was not considered as advantages in lower emissions, lower consumption of reagent, lower residue production did not compensate the disadvantages of higher investment and higher energy consumption as the negative. A salt purge from a wet flue gas cleaning system was not possible. Hence the salt of the wet scrubbers should be evaporated. Therefore, the flue gas temperature at the outlet of the boiler should have been spptox. 30°C higher with less power production as a consequence. Evaporated salts from wet flue gas cleaning are more difficult to manipulate and more complex to get landfilled in salt mines. The flue gas pollutants are not as high so that wet flue gas cleaning is mandatory or most cost effective. Semi-wet or semi-dry flue gas cleaning was not selected because the flue gas temperature at the boiler outlet did not allow it. Pressure on energy performance (R1) pushes the flue gas leaning temperature at the boiler outlet to 160°C. This leaves a difference to the operating temperature of a semi-wet FGC to 20°C. 20°C is not enough to evaporate the water used in semi-wet or semi dry flue gas cleaning systems. The choice for lime is determined by the limited possibilities of disposal of the residue, the variable price of the reagent and the overal higher cost of sodium bi-carbonate. Lime was the more secured solution for the site. The *claimed recycling* possibility of sodium bicarbonate is not available. It would require additional equipment such as a second bag filter.
38	to prevent the associated increased electrical consumption, to generally (i.e. unless there is a specific local driver) avoid the use of. two bag filters in one FGT line (as described in 4.4.2.2 and 4.4.2.3)	The plant will have 1 bagfilter.
39	the reduction of FGT reagent consumption and of FGT residue production in dry, semiwet, and intermediate FGT systems by a suitable combination of: a. adjustment and control of the quantity of reagent(s) injected in order to meet the requirements for the treatment of the flue-gas such that the target final operational emission levels are met b. the use of the signal generated from fast response upstream and/or downstream monitors of raw HCl and/or SO2 levels (or other parameters that may prove useful for this purpose) for the optimisation of FGT reagent dosing rates, as described in 4.4.3.9 c. the re-circulation of a proportion of the FGT residues collected, as described in 4.4.3.7 The applicability and degree of use of the above techniques that represents BAT will vary according to, in particular: the waste characteristics and consequential flue-gas nature, the final emission level required, and technical experience from their practical use at the installation.	See explanation in BAT 35 The flue gas cleaning reagent consumption will be optimised and thus the flue gas cleaning residue minimised. 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.
40	the use of primary (combustion related) NOX reduction measures to reduce NOX production, together with either SCR (4.4.4.1) or SNCR (4.4.4.2), according to the efficiency of flue-gas reduction required. In general SCR is considered BAT where higher NOX reduction efficiencies are required (i.e. raw flue-gas NOX levels are high) and where low final flue-gas emission concentrations of NOX are desired. One MS reported that technical difficulties have been experienced in some cases when retrofitting SNCR abatement systems to existing small MSW incineration installations, and that the cost effectiveness (i.e. NOX reduction per unit cost) of NOX abatement (e.g. SNCR) is lower at small MSWIs (i.e. those MSWIs of capacity <6 tonnes of waste/hour).	The use of primary (combustion related) NOx reduction and secondary NOx reduction is achieved by using a SNCR system. Please refer to BATs 15 & 32 above. The excess oxygen in the post combustion chamber will be around 6 vol %. This is a compromise between enough air to control the CO-peaks and too much air to avoid primary NOx forming.
41	for the reduction of overall PCDD/F emissions to all environmental media, the use of: a. techniques for improving knowledge of and control of the waste, including in particular its combustion characteristics, using a suitable selection of techniques described in 4.1, and b. primary (combustion related) techniques (summarised in 4.4.5.1) to destroy PCDD/F in the waste and possible PCDD/F precursors, and c. the use of installation designs and operational controls that avoid those conditions (see 4.4.5.2) that may give rise to PCDD/F reformation or generation, in particular to avoid the abatement of dust in the temperature range of 250 – 400 oC. Some additional reduction of de-novo synthesis is reported where the dust abatement operational temperature has been further lowered from 250 to below 200 oC, and d. the use of a suitable combination of one or more of the following additional PCDD/F abatement measures: i. adsorption by the injection of activated carbon or other reagents at a suitable reagent dose rate, with bag filtration, as described in 4.4.5.6, or ii. adsorption using fixed beds with a suitable adsorbent replenishment rate, as described in 4.4.5.7, or iii. multi layer SCR, adequately sized to provide for PCDD/F control, as described in 4.4.5.3, or iv. the use of catalytic bag filters (but only where other provision is made for effective metallic and elemental Hg control), as described in 4.4.5.4	The reduction of overall PCDD/F emissions to all environmental media will be provided as follows: (a) Well-controlled combustion secured by means of flow modelling (see BAT 15 above) at the design stage, and an advanced combustion control system (see BAT 17 & 18) to aid the reduction of PCDD/F and its precursors. The 3 T's are applied : **T**emperature is higher than 850°C ; residence **T**ime of the flue gas will be at least 2 s and the **T**urbulence is activily realized by the inspeed velocity and orientation of the secondary air in the post combustion chamber. (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. (d) Fixed boiler cleaning is installed to reduce the amount of fly ash remaining in the boiler. This fly ash (and especially its copper) is known as a catlyst for dioxin/furan forming. 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.
42	where wet scrubbers are used, to carry out an assessment of PCDD/F build up (memory effects) in the scrubber and adopt suitable measures to deal with this build up and prevent scrubber breakthrough releases. Particular consideration should be given to the possibility of memory effects during shut-down and start-up periods.	Not Applicable
43	if re-burn of FGT residues is applied, then suitable measures should be taken to avoid the re-circulation and accumulation of Hg in the installation	Not applicable - Re-burning of flue gas cleaning residues is not applied.

44	for the control of Hg emissions where wet scrubbers are applied as the only or main effective means of total Hg emission control: a. the use of a low pH first stage with the addition of specific reagents for ionic Hg removal (as described in 4.4.6.1, 4.4.6.6 and 4.4.6.5), in combination with the following additional measures for the abatement of metallic (elemental) Hg, as required in order to reduce final air emissions to within the BAT emission ranges given for total Hg b. activated carbon injection, as described in 4.4.6.2, or c. activated carbon or coke filters, as described in 4.4.6.7	Not applicable
45	for the control of Hg emissions where semi-wet and dry FGT systems are applied, the use of activated carbon or other effective adsorptive reagents for the adsorption of PCDD/F and Hg, as described in 4.4.6.2, with the reagent dose rate controlled so that final air emissions are within the BAT emission ranges given for Hg	The activated carbon or activated clay injected before the baghouse filter will reduce the emission of Hg and dioxins/furans. The reagent will be dosed at a fixed flow. The flow will be monitored by both the rotation speed of the dosing screw and the weight of the feeding hopper of the screw. The flow will be adjusted based on the discontinueous analysis of heavy metals and dioxins/furans. The condition of the sleeves of the bagfilter will be monitored due to the adsorption taking place mostly in the sorbent cake on the sleeves of the bag filter. The frequency of the air purges of the bag cleaning system is a good indicator of the condition of the bag sleeves.
46	the general optimisation of the re-circulation and re-use of waste water arising on the site within the installation, as described in 4.5.8, including for example, if of sufficient quality, the use of boiler drain water as a water supply for the wet scrubber in order to reduce scrubber water consumption by replacing scrubber feed-water (see 4.5.6)	Water is re-circulated where feasible for use in the cooling section or wet deslaggers via a collection tank located underneath the main process building.
47	the use of separate systems for the drainage, treatment and discharge of rainwater that falls on the site, including roof water, so that it does not mix with potential or actual contaminated waste water streams, as described in 4.5.9. Some such waste water streams may require only little or no treatment prior to their discharge, depending on contamination risk and local discharge factors	There will be two drainage systems installed on site: one for surface water/fire water (S) and one for rain water collected from roofs of buildings on the site (S1). These are indicated in drawing CD5013-Drainage Plan. The storm water from all of the roads and hard standings will be conveyed via a class 1 hydrocarbon interceptor to the fire water retention tank, which is indicated as tank no. 1 on the drainage plan drawing. The fire water retention tank will have a capacity of 1,690m^3. Drainage in the unloading area for the Ammonia, Fuel Oil and Aqueous Waste deliveries will be separated from the rest of the stormwater drains in this area via a 2m^3 holding tank followed by a forecourt separator. The storm water from the roofs of all of the buildings will be conveyed to the surface water attenuation tank, which is indicated as tank no. 2 on the drainage plan drawing. The surface water attenuation tank will have a capacity of 1,250m^3. The inlet to the fire water retention tank will be constantly monitored. In case of an alarm, the outlet valve to the surface water attentuation tank will close automatically. The outlet of the surface water attentuation tank is also constantly monitored. In case of an alarm, the outlet valve for discharging the water off site will close and therefore, no potentially contaminated water will leave the site. Please refer to Section 15.5.4.6 of the EIAR for further details of the drainage system proposed for the site.
48	where wet flue-gas treatment is used: a. the use of on-site physico/chemical treatment of the scrubber effluents prior to their discharge from the site, as described in 4.5.11, and thereby to achieve, at the point of discharge from the effluent treatment plant (ETP), emission levels generally within the operational emission level ranges associated with BAT that are identified in Table 5.4 b. the separate treatment of the acid and alkaline waste water streams arising from the scrubber stages, as described in 4.5.13, when there are particular drivers for the additional reduction of releases to water that result, and/or where HCl and/or gypsum recovery is to be carried out c. the re-circulation of wet scrubber effluent within the scrubber system, and the use of the electrical conductivity (mS/cm) of the re-circulated water as a control measure, so as to reduce scrubber water consumption by replacing scrubber feed-water, as described in 4.5.4 d. the provision of storage/buffering capacity for scrubber effluents, to provide for a more stable waste water treatment process, as described in 4.5.10 e. the use of sulphides (e.g. M-trimercaptotriazine) or other Hg binders to reduce Hg (and other heavy metals) in the final effluent, as described in 4.5.11 f. when SNCR is used with wet scrubbing the ammonia levels in the effluent discharge may be reduced using ammonia stripping, as described in 4.5.12, and the recovered ammonia re-circulated for use as a NOX reduction reagent	Not Applicable - Wet FGT not used.
49	the use of a suitable combination of the techniques and principles described in 4.6.1 for improving waste burnout to the extent that is required so as to achieve a TOC value in the ash residues of below 3 wt % and typically between 1 and 2 wt %, including in particular: a. the use of a combination of furnace design (see combustion technology selection in 4.2.1), furnace operation (see 4.2.17) and waste throughput rate (see 4.2.18) that provides sufficient agitation and residence time of the waste in the furnace at sufficiently high temperatures, including any ash burn-out areas b. the use of furnace designs that, as far as possible, physically retain the waste within the combustion chamber (e.g. narrow grate bar spacings for grates, rotary or static kilns for appreciably liquid wastes) to allow its combustion. The return of early grate riddlings to the combustion chamber for re-burn may provide a means to improve overall burn out where they contribute significantly to the deterioration of burnout (see 4.2.21) c. the use of techniques for mixing and pretreatment of the waste, as described in BAT 11, according to the type(s) of waste received at the installation d. the optimisation and control of combustion conditions, including air (oxygen) supply and distribution, as described in BAT 18	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 as follows. (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. The grate surface is state of the art for waste to energy. The last zones of the grate are dedicated to burnout the ash. Cameras provide a visual confirmation to the operator on the quality of the burnout on the grate. (b) applying furnace designs that, as far as possible, physically retain the waste within the combustion chamber. The waste burns out onto the grate. The flue gas flow is sufficiently low to avoid entrainment of solids up to the post combustion chamber. (c) using techniques for mixing and pre-treatment of the waste, as described under BAT 11 above. The waste in the bunker is homogenized by mixing operations in the waste bunker. The crane operator is assisted by a screen indicating the trend of the calorific value of the waste. This helps him to keep the calorific as constant a possible and within a band of a minimum and maximum calorific value. (d) optimising and controlling combustion conditions, including air (oxygen) supply and distribution, as described in BATs 17 and 18 above. The combustion control is advanced. Besides the standard combustion control a temperature measurement in a al plane in the post combustion chamber will help to find inhomogenities in the flue gas coming from the grate furnace. Inhomogenities will be adjusted with the control loops of the grate.
50	the separate management of bottom ash from fly ash and other FGT residues, so as to avoid contamination of the bottom ash and thereby improve the potential for bottom ash recovery, as described in 4.6.2. Boiler ash may exhibit similar or very different levels of contamination to that seen in bottom ash (according to local operational, design and waste specific factors) – it is therefore also BAT to assess the levels of contaminants in the boiler ash, and to assess whether separation or mixing with bottom ash is appropriate. It is BAT to assess each separate solid waste stream that arises for its potential for recovery either alone or in combination.	Bottom ash, boiler ash and flue gas cleaning residues will be managed separately to avoid contamination of bottom ash and improve the potential for bottom ash recovery. Boiler ash and flue gas cleaning residues will be collected in separate silos. If a suitable facility is available on the Island (licensed or permitted saltmine or above ground landfill), boiler ash and flue gas cleaning residues will be combined with water in a mixer on site and bagged and ultimately used for recovery in backfilling of saltmines. Ferrous and non-ferrrous metals will be removed from the bottom ash and options for recovery of the resultant bottom ash residue will be sought.

51	where a pre-dedusting stage (see 4.6.3 and 4.4.2.1) is in use, an assessment of the composition of the fly ash so collected should be carried out to assess whether it may be recovered, either directly or after treatment, rather than disposed of	There is no dedicated pre-dedusting stage. The fly ash will be partly separated in the boiler as boiler ash and partly in the bag filter of the flue gas cleaning. The fly ash quality is not sufficient to allow recovery to another destination other than salmines or landfilling. The quality is variable due to the waste. It contains heavy metals and alkaline substances. Acid leaching shoud be done to eliminate the heavy metals and alkaline components. Neutralization would be the final step. This is not economically viable and the sustainability is questioned due to the need for an acid and water purge.
52	the separation of remaining ferrous and non-ferrous metals from bottom ash (see 4.6.4), as far as practicably and economically viable, for their recovery	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. Refer to BAT 12 above and BAT 53 below also.
53	the treatment of bottom ash (either on or off-site), by a suitable combination of: a. dry bottom ash treatment with or without ageing, as described in 4.6.6 and 4.6.7, or b. wet bottom ash treatment, with or without ageing, as described in 4.6.6and 4.6.8, or c. thermal treatment, as described in 4.6.9 (for separate treatment) and 4.6.10 (for in-process thermal treatment) or d. screening and crushing (see 4.6.5) to the extent that is required to meet the specifications set for its use or at the receiving treatment or disposal site e.g. to achieve a leaching level for metals and salts that is in compliance with the local environmental conditions at the place of use.	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 if a suitably licensed or permitted facility is available. The bottom ash will be screened on a finger sieve to remove oversized material that is not suitable for the downstream process. On overband magnet will be installed to pick out the more massive iron scrap. The bottom ash will then be sieved into a small, medium and course fraction. The medium and course fraction will further be separately processed with magnet and induction current separator to extract iron and non-ferro scrap respectively.
54	the treatment of FGT residues (on or off-site) to the extent required to meet the acceptance requirements for the waste management option selected for them, including consideration of the use of the FGT residue treatment techniques described in 4.6.11	The facility will have a solidification plant on site which will allow for the solidification of a mixture of FGR and BA in big bags. See BAT 50 above also. These big bags will then be transported off site to a suitable and licensed outlet (e.g. saltmine for backfilling for recovery or to a landfill for disposal). If no suitable facility is available, the boiler ash and flue gas cleaning residues will be exported in bulk tankers and treated off-site to the extent required in order to meet the acceptance criteria of the waste disposal option selected.
55	the implementation of noise reduction measures to meet local noise requirements (techniques are described in 4.7 and 3.6)	As a basic standard, Indaver define 82dB at 1m from all process equipment. The following noise reduction measures will be implemented to meet local noise requirements: (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. (c) Noise damper between tail end fan and stack. (d) Separate noise attentuating housing or insulation of equipment with higher noise production (higher than 82 dB at 1 m) such as the tail end fan, hydraulic units, air compressor, turbine. (e) The Plant is housed inside a building. (f) Low noise fan blades for the air cooled condensor. (g) Frequency driven motors to avoid unnecessary high rotation speed of higher noise generating equipment. (h) Slope of the ramp to the tipping hall is minimised to avoid high gear of trucks. (i) Noise dampers of steam valves to atmosphere except for valves with a safety function
56	apply environmental management. A number of environmental management techniques are determined as BAT. The scope (e.g. level of detail) and nature of the EMS (e.g. standardised or non-standardised) will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have. BAT is to implement and adhere to an Environmental Management System (EMS) that incorporates, as appropriate to individual circumstances, the following features: (see Chapter 4.8) • definition of an environmental policy for the installation by top management (commitment of the top management is regarded as a precondition for a successful application of other features of the EMS) • planning and establishing the necessary procedures • implementation of the procedures, paying particular attention to - structure and responsibility - training, awareness and competence - communication - employee involvement - documentation - efficient process control - maintenance programme - emergency preparedness and response - safeguarding compliance with environmental legislation. • checking performance and taking corrective action, paying particular attention to - monitoring and measurement (see also the Reference document on Monitoring of Emissions) - corrective and preventive action - maintenance of records - independent (where practicable) internal auditing in order to determine whether or not the environmental management system conforms to planned arrangements and has been properly implemented and maintained. • review by top management.	An Environmental Management System will be implemented in the facility. Indaver's facilities in Ireland and elsewhere operate environmental management systems certified to ISO 14001. Details on the environmental management systems are further described in attachment 9-1 to this licence application.
56	Three further features, which can complement the above stepwise, are considered as supporting measures. However, their absence is generally not inconsistent with BAT. These three additional steps are: • having the management system and audit procedure examined and validated by an accredited certification body or an external EMS verifier • preparation and publication (and possibly external validation) of a regular environmental statement describing all the significant environmental aspects of the installation, allowing for year-by-year comparison against environmental objectives and targets as well as with sector benchmarks as appropriate • implementation and adherence to an internationally accepted voluntary system such as EMAS and EN ISO 14001:1996. This voluntary step could give higher credibility to the EMS. In particular EMAS, which embodies all the above-mentioned features, gives higher credibility. However, non-standardised systems can in principle be equally effective provided that they are properly designed and implemented.	An environmental audit will be conducted on an annual basis, carried out by an external body as part of the accreditation process. An annual sustainability report is produced at a company Group level to which the Irish region contributes. Indaver is fully committed to maintaining its ISO 14001 standard and undergoes an ongoing assessment programme to ensure that this is maintained annually, once commissioning is fully conducted.

56	Specifically for this industry sector*, it is also important to consider the following potential features of the EMS: • giving consideration to the environmental impact from the eventual decommissioning of the unit at the stage of designing a new plant • giving consideration to the development of cleaner technologies • where practicable, sectoral benchmarking on a regular basis, including energy efficiency and energy conservation activities, choice of input materials, emissions to air, discharges to water, consumption of water and generation of waste • the development and use of procedures for the commissioning stages of new installations, generally including: • the prior preparation of a detailed programme of works describing the commissioning programme • an initial gap analysis of training requirements to identify pre-commissioning training needs • health & safety needs which meet European and local requirements • the availability of sufficient and up to date documentation regarding the installation • emergency and accident prevention planning, generally include procedures for: o serious fire o major explosion o sabotage/bomb o site intruders o major injury/death of employee/visitor/contractor o traffic accident o theft o environmental incident o power interruption • where the plant commissioning and tuning period may give rise to emissions outside the normal regulatory controls. All incineration installations, and in particular for those receiving hazardous wastes, personnel training programs are considered an important part of all safety management systems, especially training for: - explosion and fire prevention - fire extinguishing - knowledge of chemical risks (labelling, carcinogenic substances, toxicity, corrosion, fire) and transportation	The EMS will cover all items listed in the BAT documents and will be written in accordance with the conditions of the IE licence upon receival.
5.2	For *municipal waste incineration* Bat is considered to be:	
57	the storage of all waste, (with the exception of wastes specifically prepared for storage or bulk items with low pollution potential e.g. furniture), on sealed surfaces with controlled drainage inside covered and walled buildings	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. See also, BATs 2, 6 & 7 above. 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.
58	when waste is stockpiled (typically for later incineration) it should generally be baled (see Section 4.1.4.3) or otherwise prepared for such storage so that it may be stored in such a manner that risks of odour, vermin, litter, fire and leaching are effectively controlled.	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. See also, BATs 2, 6, 7 & 57 above.
59	to pretreat the waste, in order to improve its homogeneity and therefore combustion characteristics and burn-out, by: a. mixing in the bunker (see 4.1.5.1), and b. the use of shredding or crushing for bulky wastes e.g. furniture (see 4.1.5.2) that are to be incinerated, to the extent that is beneficial according to the combustion system used. In general grates and rotary kilns (where used) require lower levels of pretreatment (e.g. waste mixing with bulky waste crushing) whereas fluidized bed systems require greater waste selection and pretreatment, usually including full shredding of the MSW.	Constant mixing of waste in the bunker will be conducted. This will either be carried out by one of the trained operators or by the automated control system. Levels in the bunker will be monitored at all times. This will allow for a better distribution of waste and, therefore, a more consistent cv value which will aid in the incineration process. See also BAT 11 above. The use of a shredder is not envisaged for handling bulky waste.
60	the use of a grate design that incorporates sufficient cooling of the grate such that it permits the variation of the primary air supply for the main purpose of combustion control, rather than for the cooling of the grate itself. Air-cooled grates with well distributed air cooling flow are generally suitable for wastes of average NCV of up to approx 18 MJ/kg. Higher NCV wastes may require water (or other liquid) cooling in order to prevent the need for excessive primary air levels (i.e. levels that result in a greater air supply than the optimum for combustion control) to control grate temperature and length/position of fire on the grate (see section 4.2.14)	The calorific value of the waste is clearly lower than what would require water cooled tiles (Range of 8 to 14MJ/kg). There is enough flexibility to use the primary air in function of the combustion control rather than in function of tile cooling. The grate will be retrofittable to water cooling in the future if needed due to a drastic change in waste properties.
61	the location of new installations so that the use of CHP and/or the heat and/or steam utilisation can be maximised, so as to generally exceed an overall total energy export level of 1.9 MWh/tonne of MSW (ref. Table 3.42), based on an average NCV of 2.9 MWh/tonne (ref. Table 2.11)	The facility will as an annual average generate in excess of 0.65 MWh electricity/tonne waste received. 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 plant will be designed to allow for a supply of 10 MW heat to a district heating network. The steam turbine will allow 10 MW additional steam extraction at the 6 bar steam tap compared to its full power production mode. Space will be provided for a heat exchanger and pump set in the future.
62	in situations where less than 1.9 MWh/tonne of MSW (based on an average NCV of 2.9 MWh /tonne) can be exported, the greater of: a. the generation of an annual average of 0.4 – 0.65 MWh electricity/tonne of MSW (based on an average NCV of 2.9 MWh/tonne (ref. Table 2.11) processed (ref. Table 3.40), with additional heat/steam supply as far as practicable in the local circumstances), or b. the generation of at least the same amount of electricity from the waste as the annual average electricity demand of the entire installation, including (where used) on-site waste pretreatment and on-site residue treatment operations (ref. Table 3.48)	The plant will be designed for minimum 0,65 MWh net electrical export per ton of waste with an average NCV of 2,9 MWh/tonne.
63	to reduce average installation electrical demand (excluding pretreatment or residue treatment) to be generally below 0.15 MWh/tonne of MSW processed (ref. Table 3.47 and section 4.3.6) based on an average NCV of 2.9 MWh/tonne of MSW (ref. Table 2.11)	See BAT 75 below also. The installation electrical load will generally be below 0.15 MWh/tonne of waste processed as an annual average. The electric consumption of the plant will be less than 2.5 MW. With 30 t/h waste 2,5 MWh is consumed. This is 0,084 MWh/t waste and largely below the BAT range.
5.3	**For *pretreated or selected municipal waste incineration* BAT is considered to be:**	

65	the storage of wastes: a. in enclosed hoppers or, b. on sealed surfaces with controlled drainage inside covered and walled buildings	This section is not applicable.
66	when waste is stockpiled (typically for later incineration) it should generally be baled (see Section 4.1.4.3) or otherwise prepared for such storage so that it may be stored in such a manner that risks of odour, vermin, litter, fire and leaching are effectively controlled	
67	at new and existing installations, the generation of the greater of: a. an annual average of generally at least 0.6 – 1.0 MWh electricity/tonne of waste (based on an average NCV of 4.2 MWh/tonne), or b. the annual average electricity demand of the entire installation, including (where used) on-site waste pretreatment and on-site residue treatment operations	
68	the location of new installations so that: a. as well as the 0.6 – 1.0 MWhe/ tonne of electricity generated, the heat and/or steam can also be utilised for CHP, so that in general an additional thermal export level of 0.5 – 1.25 MWh/tonne of waste (ref. section 3.5.4.3) can be achieved (based on an average NCV of 4.2 MWh/tonne), or b. where electricity is not generated, a thermal export level of 3 MWh/tonne of waste can be achieved (based on an average NCV of 4.2 MWh/tonne)	
69	to reduce installation energy demand and to achieve an average installation electrical demand (excluding pretreatment or residue treatment) to generally below 0.2 MWh/tonne of waste processed (ref. Table 3.47 and section 4.3.6) based on an average NCV of 4.2 MWh/tonne of waste	
5.4	**For *hazardous waste incineration* BAT is considered to be:**	
70	in addition to the quality controls outlined in BAT4, at HWI to use specific systems and procedures, using a risk based approach according to the source of the waste, for the labelling, checking, sampling and testing of waste to be stored/treated (see 4.1.3.4). Analytical procedures should be managed by suitable qualified personnel and using appropriate procedures. In general equipment is required to test: • the calorific value • the flashpoint • PCBs • Halogens (e.g. Cl, Br, F) and sulphur • heavy metals • waste compatibility and reactivity • radioactivity (if not already covered by BAT3 through fixed detectors at the plant entrance. Knowledge of the process or origin of the waste is important as certain hazardous characteristics, (for example toxicity or infectiousness) are difficult to determine analytically.	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. Analytical procedures will be managed by suitably qualified staff using appropriate techniques. The sources and origins of the waste will be known. Refer to the Waste Acceptance Procedure in attachment 4-3-5 and the description of waste acceptance in section 2.1 of the Operational Report in attachment 4-8-1.
71	the mixing, blending and pretreating of the waste in order to improve its homogeneity, combustion characteristics and burn-out to a suitable degree with due regard to safety considerations. Examples are the shredding of drummed and packaged hazardous wastes, described in 4.1.5.3 and 4.1.5.6. If shredding is carried out then blanketing with an inert atmosphere should be carried out.	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. 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. Liquid waste will be directly injected in the roof of the furnace just above the waste grate. The waste in the bunker will be moved 3 times : once to move it from the tipping gate to the storage area, once from the storage area to working area for mixing and once from the working area to the feeding chute. The waste coming from the storage area is spread in the working area by slowly opening the grab while it is travelling horizontally. This makes thin layers of waste like a stack of pancakes. For the feeding the grab punches vertically through the layers of waste to bring it to the feeding chute. There is no mixing, blending or pre-treating proposed, other than the mixing of the waste in the bunker to achieve, as far as possible, a homogenous feed.
72	the use of a feed equalisation system for solid hazardous wastes (e.g. as described in 4.1.5.4 or other similar feeding technology) in order to improve the combustion characteristics of the fed waste and to improve the stability of flue-gas composition including the improved control of short-term CO peak emissions.	Further to BAT 70, there is control of waste feeding to the furnace by the charging pusher located at the base of the feeding chute. The pusher contains two parallel sections consisting of a number of pistons operated by a hydraulic cylinder. These are individually controlled to achieve even feeding across the width of the grate. The charging pusher slowly pushes the waste onto the first step of the grate.
73	the direct injection of liquid and gaseous hazardous wastes, where those wastes require specific reduction of exposure, releases or odour risk, as described in 4.1.6.3	Liquid wastes are introduced to the furnace by way of direct injection. Liquid waste will be separately stored and dosed in the furnace. The storage is in a closed tank with controlled venting of the tank.
74	the use of a combustion chamber design that provides for containment, agitation and transport of the waste, for example: rotary kilns - either with or without water cooling. Water cooling for rotary kilns (see 4.2.15), may be favourable in situations where: a. the LHV of the fed waste is higher (e.g. >15 – 17 GJ/tonne), or b. higher temperatures e.g. >1100 °C are used (e.g. for ash slagging or destruction of specific wastes)	The proposed new waste types will be treated using the existing grate technology which is contained in the furnace. The grate consists of independently controlled sections and is steeply angled (20°). The shafts of each section alternately turn so the grate surface forms a stair-shape where the steps change pace. This achieves a rolling movement which has the effect of breaking up and agitating the waste whilst moving it forward through the furnace. Extreme waste properties at the entrance of the furnace are avoided by mixing of the waste in the waste bunker.The grate will be divided in at least 6 individual zones. In each zone the movement of the grate and amount of primary air is separately adjustable. Inhomogeneous distribution of the combustion will be observed by the acoustic temperature measurement in the post combustion chamber. This will allow to adjust the grate zones to get the combustion equalized.
75	to reduce installation energy demand and in general, and to achieve an average installation electrical demand (excluding pretreatment or residue treatment) of generally below 0.3 – 0.5 MWh/tonne of waste processed (see 3.5.5 and 4.3.6). Smaller installations generally result in consumption levels at the upper end of this range. Weather conditions may have a significant impact on consumption owing to heating requirements etc.	BAT 63 would apply as facility is primarily for the treatment of MSW waste. The plants own electric consumption will be less than 2.5 MW. With 30 t/h waste 2,5 MWh is consumed. This is 0,084 MWh/t waste and largely below the BAT range.
76	for merchant HWI and other hazardous waste incinerators feeding wastes of highly varying composition and sources, the use of: a. wet FGT, as described in 4.4.3.1, is generally BAT to provide for improved control of short-term air emissions (see concluding remarks 7.4.3 ref. other systems and BAT37 regarding FGT system selection) b. specific techniques for the reduction of elemental iodine and bromine emissions, as described in 4.4.7.1, where such substances exist in the waste at appreciable concentrations	Not Applicable - Facility is primarily a MSW treatment facility