Amazon Data Services Ireland Limited

Large Combustion Plants BAT Reference Document

Attachment-4-7-1

Prepared by AWN Consulting

Licence Application Ref: LA011866

Conclusions on BAT from the Large Combustion Plants BAT Reference Document (extracts)

The full and complete Commission Implementing Decision (CID) Large Combustion Plants BAT reference document (2021) is available at the EIPPC Bureau website: http://eippcb.jrc.ec.europa.eu/reference/

SCOPE OF BEST AVAILABLE TECHNIQUES (BAT)

This BREF (BAT Reference Document) for Large Combustion Plants concerns the following activities specified in Annex I to Directive 2010/75/EU:

1.1: Combustion of fuels in installations with a total rated thermal input of 50 MW or more, only when this activity takes place in combustion plants with a total rated thermal input of 50 MW or more.

The fuels considered in this document are any solid, liquid and/or gaseous combustible material including: gaseous fuels (e.g. natural gas, hydrogen-containing gas and syngas).

The relevant requirement for an Industrial Emissions (IE) Licence is outlined within the First Schedule of the EPA Act 1992. Activity 'Class 2.1 Combustion of fuels in installations with a total rated thermal input of 50 MW or more' specifically relates to this facility.

The existing Installation comprises 40 no. 5.44 MWth emergency back-up generators; 2 no. 0.337 MWth fire sprinkler pumps and 2 no. 0.423 MWth fire sprinkler pumps. The extended Installation comprises 10 no. 6.49 MW_{th} emergency back-up generators, 1 no. 3.6 MW_{th} emergency back-up generator, 1 no. 2.19 MW_{th} emergency back-up generator, and 2 no. 0.57 MW_{th} fire sprinkler pumps.

The combined thermal input from the emergency generators exceeds the 50MW_{th} threshold of *Class 2.1* First Schedule of the EPA Act 1992. The applicant is applying to the Environmental Protection Agency (EPA) for an Industrial Emissions (IE) Licence principally relating to the operation of emergency back-up generators under Activity Class 2.1.

The BREF for Large Combustion Plants makes clear that "These Best Available Techniques (BAT) conclusions do not address combustion of fuels in units with a rated thermal input of less than 15 MW". The thermal input of each of the individual combustion plant (emergency generators as set out above) on site are less than 15 MWth. Therefore, the facility does not operate any large combustion plant.

Due to the Class of Activity being applied for it is the EPA's expectation that an applicant has regard to the relevant sector Best Available Techniques (BAT). BAT related to the operation of the installation are generally applicable; however, BAT related to the combustion unit will generally not be applicable.

Conclusions on BAT	Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
1 General BAT conclusions *The fuel-specific BAT conclusions included in Sections 10.2 to 10.7 apply in addition to the general BAT conclusions in this section.*		
1.1 Environmental management systems		
BAT 1. In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features: i. commitment of the management, including senior management; ii. definition, by the management, of an environmental policy that includes the continuous improvement of the environmental performance of the installation; iii. planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment; iv. implementation of procedures paying particular attention to: (a) structure and responsibility (b) recruitment, training, awareness and competence (c) communication (d) employee involvement (e) documentation (f) effective process control (g) planned regular maintenance programmes (h) emergency preparedness and response	**Applicable** – ADSIL is an established operator of data storage facilities in Ireland and has a well-developed set of Standard Operating Procedures (SOPs) covering the management of its facilities including incident management, waste management, fuel delivery, and chemical storage and management. The Environmental Management System (EMS) will be reviewed to ensure it includes the requirements of this BREF and the requirements of the reviewed IE Licence, once granted. The EMS outlines the management of the site's environmental programme and is ISO14001 accredited.	EMS in place. SOPs are in place for the Installation.

(i) safeguarding compliance with environmental legislation; v. checking performance and taking corrective action, paying particular attention to: (a) monitoring and measurement (see also the JRC Reference Report on Monitoring of emissions to air and water from IED-installations – ROM) (b) corrective and preventive action (c) maintenance of records (d) independent (where practicable) internal and external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; vi. review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness; vii. following the development of cleaner technologies; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life including; (a) avoiding underground structures (b) incorporating features that facilitate dismantling (c) choosing surface finishes that are easily decontaminated (d) using an equipment configuration that minimises trapped chemicals and facilitates drainage or cleaning (e) designing flexible, self-contained equipment that enables phased closure (f) using biodegradable and recyclable materials where possible; ix. application of sectoral benchmarking on a regular basis. Specifically, for this sector, it is also important to consider the following features of the EMS, described where appropriate in the relevant BAT: x. quality assurance/quality control programmes to ensure that the characteristics of all fuels are fully determined and controlled (see BAT 9);		

xi. a management plan in order to reduce emissions to air and/or to water during other than normal operating conditions, including start-up and shutdown periods (see BAT 10 and BAT 11); xii. a waste management plan to ensure that waste is avoided, prepared for reuse, recycled or otherwise recovered, including the use of techniques given in BAT 16; xiii. a systematic method to identify and deal with potential uncontrolled and/or unplanned emissions to the environment, in particular: (a) emissions to soil and groundwater from the handling and storage of fuels, additives, by-products and wastes (b)emissions associated with self-heating and/or self-ignition of fuel in the storage and handling activities; xiv. a dust management plan to prevent or, where that is not practicable, to reduce diffuse emissions from loading, unloading, storage and/or handling of fuels, residues and additives; xv. a noise management plan where a noise nuisance at sensitive receptors is expected or sustained, including; (a) a protocol for conducting noise monitoring at the plant boundary (b) a noise reduction programme (c) a protocol for response to noise incidents containing appropriate actions and timelines (d) a review of historic noise incidents, corrective actions and dissemination of noise incident knowledge to the affected parties; xvi. for the combustion, gasification or co-incineration of malodourous substances, an odour management plan including: (a) a protocol for conducting odour monitoring (b)where necessary, an odour elimination programme to identify and eliminate or reduce the odour emissions (c) a protocol to record odour incidents and the appropriate actions and timelines (d) a review of historic odour incidents, corrective actions and the dissemination of odour incident knowledge to the affected parties.		

Where an assessment shows that any of the elements listed under items x to xvi are not necessary, a record is made of the decision, including the reasons. **Applicability** The scope (e.g. level of detail) and nature of the EMS (e.g. standardised or non-standardised) is generally related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have.		
1.2 Monitoring		
BAT 2 BAT is to determine the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the gasification, IGCC and/or combustion units by carrying out a performance test at full load (1), according to EN standards, after the commissioning of the unit and after each modification that could significantly affect the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the unit. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality. (1) In the case of CHP units, if for technical reasons the performance test cannot be carried out with the unit operated at full load for the heat supply, the test can be supplemented or substituted by a calculation using full load parameters.	**Applicable** – Energy auditing will be a key feature of the EMS and Energy Efficiency Management System (ENEMS). Performance testing of the combustion plants (at 90% to prevent the risk of overloading the generators) has been carried out during the commissioning phase; and will be undertaken after each modification that could significantly affect the net electrical efficiency, net total fuel utilisation, and/or net mechanical efficiency of the unit. On-site electricity usage will be minimised as far as possible within the constraints of the process optimisation. Key process monitoring will be carried out to monitor the plant performance including water usage, energy consumption (fuel and electricity), hours of operation and power generated. The plant performance and equipment will be continually monitored by on-board control systems and will alarm in the event of a fault.	In place and ongoing The ENEMS will be updated to include the extended Installation.

BAT 3

BAT is to monitor key process parameters relevant for emissions to air and water including those given below.

Stream	Parameter(s)	Monitoring
Flue-gas	Flow	Periodic or continuous determination
	Oxygen content, temperature, and pressure	Periodic or continuous measurement
	Water vapour content (1)	
Waste water from flue-gas treatment	Flow, pH, and temperature	Continuous measurement
(1) The continuous measurement of the water vapour content of the flue-gas is not necessary if the sampled flue-gas is dried before analysis.		

Not Applicable – The combustion plant (i.e. emergency generators) is below the LCP threshold of 50MWth therefore, this plant specific BAT does not apply.

Monitoring of the flue-gas emissions from emergency generator exhausts will be undertaken in accordance with Licence Conditions.

When air emissions monitoring for the emergency generators is undertaken, the relevant reference parameters will be monitored as per the BAT.

There is no wastewater, and no flue-gas treatment.

N/A

BAT 4

BAT is to monitor emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.

Substance/Parameter	Fuel/Process/Type of combustion plant	Standard(s)	Minimum monitoring frequency
NO_X	gas-oil-fired engines	Generic EN standards	Continuous (6) (8)
CO	gas-oil-fired engines	Generic EN standards	Continuous (6) (8)
SO_2	gas-oil-fired engines	Generic EN standards and EN 14791	Continuous (6) (11) (12)

Not Applicable –The combustion plant (i.e. emergency generators) is below the LCP threshold of 50MWth therefore, this plant specific BAT does not apply.

N/A

Dust	gas-oil-fired engines	Generic EN standards and EN 13284-1 and EN 13284-2	Continuous (6) (17)
Metals and metalloids except mercury (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Se, Tl, V, Zn)	gas-oil-fired engines	EN 14385	Once every year (18)
TVOC	gas-oil-fired engines	EN 12619	Once every six months (13)

(6) In the case of plants with a rated thermal input of < 100 MW operated < 1 500 h/yr, the minimum monitoring frequency may be at least once every six months. For gas turbines, periodic monitoring is carried out with a combustion plant load of > 70 %. For co-incineration of waste with coal, lignite, solid biomass and/or peat, the monitoring frequency needs to also take into account Part 6 of Annex VI to the IED.

(8) In the case of natural-gas-fired turbines with a rated thermal input of < 100 MW operated < 1 500 h/yr, or in the case of existing OCGTs, PEMS may be used instead.

(11) As an alternative to the continuous measurement in the case of plants combusting oil with a known sulphur content and where there is no flue-gas desulphurisation system, periodic measurements at least once every three months and/or other procedures ensuring the provision of data of an equivalent scientific quality may be used to determine the SO_2 emissions.

(12) In the case of process fuels from the chemical industry, the monitoring frequency may be adjusted for plants of < 100 MW_{th} after an initial characterisation of the fuel (see BAT 5) based on an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed) in the emissions to air, but in any case at least each time that a change of the fuel characteristics may have an impact on the emissions.

(13) If the emission levels are proven to be sufficiently stable, periodic measurements may be carried out each time that a change of the fuel and/or waste characteristics may have an impact on the emissions, but in any case at least once every year. For

co-incineration of waste with coal, lignite, solid biomass and/or peat, the monitoring frequency needs to also take into account Part 6 of Annex VI to the IED. (17) In the case of plants combusting iron and steel process gases, the minimum monitoring frequency may be at least once every six months if the emission levels are proven to be sufficiently stable. (18) The list of pollutants monitored and the monitoring frequency may be adjusted after an initial characterisation of the fuel (see BAT 5) based on an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed) in the emissions to air, but in any case at least each time that a change of the fuel characteristics may have an impact on the emissions.		
BAT 5 BAT is to monitor emissions to water from flue-gas treatment with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	**Not Applicable** – The combustion plant does not have flue gas treatment systems.	N/A
1.3 General environmental and combustion performance		
BAT 6 In order to improve the general environmental performance of combustion plants and to reduce emissions to air of CO and unburnt substances, BAT is to ensure optimised combustion and to use an appropriate combination of the techniques given below.	**Applicable** – The general techniques to improve combustion performance have been incorporated into the design of the new facility. The techniques from the table in the BAT have been assessed as follows: Fuel blending and mixing: Low sulphur fuel of a consistent quality is sourced for the site. It is mixed in the top up or bulk tanks, there are polishing filters on the main tanks. Maintenance of the combustion system: Regular maintenance is undertaken as part of the facility's preventative maintenance programme (Enterprise Asset Management (EAM)). This programme will be incorporated in the EMS.	In place.

	Technique	Description	Applicability
a	Fuel blending and mixing	Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type	Generally applicable
b	Maintenance of the combustion system	Regular planned maintenance according to suppliers' recommendations	
c	Advanced control system	See description in Section 10.8.1	The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system
d	Good design of the combustion equipment	Good design of furnace, combustion chambers, burners and associated devices	Generally applicable to new combustion plants
e	Fuel choice	Select or switch totally or partially to another fuel(s) with a better environmental profile (e.g. with low sulphur and/or mercury content) amongst the available fuels, including in start-up situations or when back-up fuels are used	Applicable within the constraints associated with the availability of suitable types of fuel with a better environmental profile as a whole, which may be impacted by the energy policy of the Member State, or by the integrated site's fuel balance in the case of combustion of industrial process fuels. For existing combustion plants, the type of fuel chosen may be limited by the configuration and the design of the plant

Advance control system: The plant performance and equipment will be continually monitored by on-board control systems and will alarm in the event of a fault. Each installed engine is connected into Electrical Power Monitoring System (EPMS) associated with the building which will control the operation of the units to ensure optimal efficiency at all times.

Good design of the combustion equipment: All units are new and have been procured on the basis that they are highly efficient and fit for purpose.

Fuel choice: The sulphur content of the fuel used in the generators will not exceed 0.1% by mass.

BAT 7

In order to reduce emissions of ammonia to air from the use of selective catalytic reduction (SCR) and/or selective non-catalytic reduction (SNCR) for the abatement of NOX emissions, BAT is to optimise the design and/or operation of SCR and/or SNCR (e.g. optimised reagent to NOX ratio, homogeneous reagent distribution and optimum size of the reagent drops).

BAT-associated emission levels

Applicable – The emergency backup generators for Buildings U (excluding the house generator) and V are each fitted with a Selective Catalytic Reduction (SCR) unit to reduce exhaust emission gases to air. The SCR system injects a reductant, an aqueous solution of urea, into the exhaust stream of the engine. The mixed exhaust gases and urea solution pass through a specialised catalytic converter, known as the SCR catalyst.

In place

The BAT-associated emission level (BAT-AEL) for emissions of NH3 to air from the use of SCR and/or SNCR is < 3–10 mg/Nm3 as a yearly average or average over the sampling period. The lower end of the range can be achieved when using SCR and the upper end of the range can be achieved when using SNCR without wet abatement techniques. In the case of plants combusting biomass and operating at variable loads as well as in the case of engines combusting HFO and/or gas oil, the higher end of the BAT-AEL range is 15 mg/Nm3.	Inside the SCR catalyst the high-temperature exhaust gases react with the urea significantly reducing NOx and producing nitrogen gas (N2) and water vapor (H2O).	
BAT 8 In order to prevent or reduce emissions to air during normal operating conditions, BAT is to ensure, by appropriate design, operation and maintenance, that the emission abatement systems are used at optimal capacity and availability.	**Applicable** – The emergency backup generators for Buildings U (excluding the house generator) and V are each fitted with a Selective Catalytic Reduction (SCR) unit to reduce exhaust emission gases to air. The SCR abatement system includes, electronic sensors checks for proper urea injection, ensuring that the catalyst is functioning effectively to reduce NOx emissions.	In place
BAT 9 In order to improve the general environmental performance of combustion and/or gasification plants and to reduce emissions to air, BAT is to include the following elements in the quality assurance/quality control programmes for all the fuels used, as part of the environmental management system (see BAT 1): i. Initial full characterisation of the fuel used including at least the parameters listed (in the table provided) and in accordance with EN standards. ISO, national or other international standards may be used provided they ensure the provision of data of an equivalent scientific quality; ii. Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications. The frequency of testing and the parameters chosen from the table below are based on the variability of the fuel and an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed); iii. Subsequent adjustment of the plant settings as and when needed and practicable (e.g. integration of the fuel characterisation and control in the advanced control system (see description in Section 10.8.1)). **Description**	**Applicable** - The EMS will be reviewed to ensure it includes the requirements of this BREF and the requirements of the reviewed IE Licence, once granted. Full characterisation of the fuel used is undertaken by the vendor typically every 12 months to EN standards and supplied to ADSIL. Regular SDS sheets provided by fuel vendor typically every 12 months as part of GHG reporting. It is unlikely that there will be significant variation in the fuel supplied.	EMS in place

Initial characterisation and regular testing of the fuel can be performed by the operator and/or the fuel supplier. If performed by the supplier, the full results are provided to the operator in the form of a product (fuel) supplier specification and/or guarantee.		
BAT 10 In order to reduce emissions to air and/or to water during other than normal operating conditions (OTNOC), BAT is to set up and implement a management plan as part of the environmental management system (see BAT 1), commensurate with the relevance of potential pollutant releases, that includes the following elements: – appropriate design of the systems considered relevant in causing OTNOC that may have an impact on emissions to air, water and/or soil (e.g. low-load design concepts for reducing the minimum start-up and shutdown loads for stable generation in gas turbines); – set-up and implementation of a specific preventive maintenance plan for these relevant systems; – review and recording of emissions caused by OTNOC and associated circumstances and implementation of corrective actions if necessary; – periodic assessment of the overall emissions during OTNOC (e.g. frequency of events, duration, emissions quantification/estimation) and implementation of corrective actions if necessary.	**Applicable** – Under normal operating conditions the emergency back-up generators will be used for routine testing only. The installation requires a continuous supply of electricity to operate. During normal operations, the facility is supplied electricity from the national grid. Outside of normal operations, emergency electricity to the facility is first supplied electricity by some or all of the onsite battery installations and then by some or all of the onsite backup generators. An uninterruptible power source or UPS system is also provided for the short-term transition from mains power to the emergency back-up generators. The changeover will be a highly controlled process which will be automated and will be controlled at the central control room. This automated system is required to ensure consistency of power supply and will ensure maximum efficiency. The generators are monitored continuously and are connected to the EPMS and alarm system to alert the Operator to any inefficiencies or irregularities. There is no requirement to monitor the emissions to air during the OTNOC as the emissions profile is known and has been assessed as part of the air dispersion modelling included in Section 7 of this application. Changeovers and emergency events will be logged, and corrective actions recorded and reported to the site lead where applicable.	In place

	The EMS will be reviewed to ensure it includes the requirements of this BREF and the requirements of the reviewed IE Licence, once granted. A preventative maintenance SOP for the generators is already in place for ADSIL sites. A schedule of preventive maintenance is in place which will be included as part of the EMS. Enterprise Asset Management (EAM) is the software platform ADSIL Infrastructure uses to maintain and manage its mechanical, electrical, and plumbing (MEP) equipment. This platform enables Infrastructure teams to do a variety of tasks: • Track and coordinate planned and unplanned maintenance • Track the full life cycle of critical data centre assets • Identify defective equipment through mechanisms like field service bulletins (FSBs) • Provide tracking for DCEO spare part inventory • Provide key insights for equipment failure, root cause analysis (RCA), and total cost of ownership (TCO) The EAM team maintains the EAM system – the EAM team objective is to create and maintain a reliable maintenance platform that improves operational excellence, reduces both equipment failures and maintenance costs, and promotes standardized processes that support operations in ADSIL data centres.	
BAT 11	**Not Applicable.** There is no requirement to monitor the emissions to air during the OTNOC as	N/A

<table>
<tr><td>BAT is to appropriately monitor emissions to air and/or to water during OTNOC.
Description
The monitoring can be carried out by direct measurement of emissions or by monitoring of surrogate parameters if this proves to be of equal or better scientific quality than the direct measurement of emissions. Emissions during start-up and shutdown (SU/SD) may be assessed based on a detailed emission measurement carried out for a typical SU/SD procedure at least once every year and using the results of this measurement to estimate the emissions for each and every SU/SD throughout the year.</td><td>the emissions profile is known and has been assessed as part of the air dispersion modelling included in Section 7 of this application.
There is no discharge to water from the emergency generators.</td><td></td></tr>
<tr><td>1.4 Energy efficiency</td><td></td><td></td></tr>
<tr><td>BAT 12
In order to increase the energy efficiency of combustion, gasification and/or IGCC units operated ≥ 1 500 h/yr, BAT is to use an appropriate combination of the techniques given (in the table provided).</td><td>Not applicable. The plant are not gasification and/or IGCC units. The emergency generators are not expected to be operated > 1500 h/yr.</td><td>N/A</td></tr>
<tr><td>1.5 Water usage and emissions to water</td><td></td><td></td></tr>
<tr><td>BAT 13
In order to reduce water usage and the volume of contaminated waste water discharged, BAT is to use one or both of the techniques given below.
<table><tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr><tr><td>a</td><td>Water recycling</td><td>Residual aqueous streams, including run-off water, from the plant are reused for other purposes. The degree of recycling is limited by the quality requirements of the recipient water stream and the water balance of the plant</td><td>Not applicable to waste water from cooling systems when water treatment chemicals and/or high concentrations of salts from seawater are present</td></tr><tr><td>b</td><td>Dry bottom ash handling</td><td>Dry, hot bottom ash falls from the furnace onto a mechanical conveyor system and is cooled down by ambient air. No water is used in the process.</td><td>Only applicable to plants combusting solid fuels.
There may be technical restrictions that prevent retrofitting to existing combustion plants</td></tr></table></td><td>Not Applicable. No wastewater produced from combustion processes</td><td>N/A</td></tr>
</table>

BAT 14 In order to prevent the contamination of uncontaminated waste water and to reduce emissions to water, BAT is to segregate waste water streams and to treat them separately, depending on the pollutant content. **Description** Waste water streams that are typically segregated and treated include surface run-off water, cooling water, and waste water from flue-gas treatment. **Applicability** The applicability may be restricted in the case of existing plants due to the configuration of the drainage systems.	**Applicable** - No wastewater produced from combustion processes. There is no wastewater produced from cooling of the emergency generators. There is no flue-gas treatment. Stormwater runoff is collected across the site and is discharged off site via hydrocarbon interceptors. Potentially contaminated wastewater streams are separated from the stormwater run-off.	In place
BAT 15. In order to reduce emissions to water from flue-gas treatment, BAT is to use an appropriate combination of the techniques given below, and to use secondary techniques as close as possible to the source in order to avoid dilution. The BAT-AELs refer to direct discharges to a receiving water body at the point where the emission leaves the installation. Table 10.1 BAT-AELs for direct discharges to a receiving water body from flue-gas treatment.	**Not applicable.** There is no flue-gas treatment.	N/A
1.6 Waste management		
BAT 16 In order to reduce the quantity of waste sent for disposal from the combustion and/or gasification process and abatement techniques, BAT is to organise operations so as to maximise, in order of priority and taking into account life-cycle thinking: a. waste prevention, e.g. maximise the proportion of residues which arise as by-products; b. waste preparation for reuse, e.g. according to the specific requested quality criteria; c. waste recycling; d. other waste recovery (e.g. energy recovery),	**Not applicable.** There are no combustion and/or gasification process and abatement techniques wastes generated from the emergency generators	N/A

<table>
<tr><td>by implementing an appropriate combination of techniques.</td><td></td><td></td></tr>
<tr><td>1.7 Noise emissions</td><td></td><td></td></tr>
<tr><td>BAT 17
In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below.
<table><tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr><tr><td>a</td><td>Operational measures</td><td>These include:
improved inspection and maintenance of equipment
closing of doors and windows of enclosed areas, if possible
equipment operated by experienced staff
avoidance of noisy activities at night, if possible
provisions for noise control during maintenance activities</td><td>Generally applicable</td></tr><tr><td>b</td><td>Low-noise equipment</td><td>This potentially includes compressors, pumps and disks</td><td>Generally applicable when the equipment is new or replaced</td></tr><tr><td>c</td><td>Noise attenuation</td><td>Noise propagation can be reduced by inserting obstacles between the emitter and the receiver. Appropriate obstacles include protection walls, embankments and buildings</td><td>Generally applicable to new plants. In the case of existing plants, the insertion of obstacles may be restricted by lack of space</td></tr><tr><td>d</td><td>Noise-control equipment</td><td>This includes:
noise-reducers
equipment insulation
enclosure of noisy equipment
soundproofing of buildings</td><td>The applicability may be restricted by lack of space</td></tr><tr><td>e</td><td>Appropriate location of equipment and buildings</td><td>Noise levels can be reduced by increasing the distance between the emitter and the receiver and by using buildings as noise screens</td><td>Generally applicable to new plants. In the case of existing plants, the relocation of equipment and production units may be restricted by lack of space or by excessive costs</td></tr></table></td><td>Applicable .The facility as a whole has been designed to minimise noise emissions and to ensure that the facility is compliant with the relevant noise limits for the facility as set out in the planning permissions for the facility and presented in Attachment-7-1-3-2-Noise Emissions Impact Assessment. An assessment on the noise emissions during testing and emergency operation is presented in in Section 7-5 of this application.

Low noise equipment has been selected where practical during site design. Plant have also been located during the design of the site to minimise the potential for impact at the noise sensitive receptors.

Preventative maintenance will be undertaken at the facility as part of the EMS and EAM and the generators and other equipment will be operated by experienced staff.</td><td>In place</td></tr>
<tr><td colspan="3">3. BAT CONCLUSIONS FOR THE COMBUSTION OF LIQUID FUELS</td></tr>
</table>

3.1. HFO- and/or gas-oil-fired boilers

3.1.2. NOX and CO emissions to air

BAT 28

In order to prevent or reduce NOX emissions to air while limiting CO emissions to air from the combustion of HFO and/or gas oil in boilers, BAT is to use one or a combination of the techniques given below.

Technique		Description	Applicability
a.	Air staging	See descriptions in Section 8.3	Generally applicable
b.	Fuel staging		
c.	Flue-gas recirculation		
d.	Low-NOX burners (LNB)		
e.	Water/steam addition		Applicable within the constraints of water availability
f.	Selective non-catalytic reduction (SNCR)		Not applicable to combustion plants operated < 500 h/yr with highly variable boiler loads. The applicability may be limited in the case of combustion plants operated between 500 h/yr and 1 500 h/yr with highly variable boiler loads
g.	Selective catalytic reduction (SCR)	See descriptions in Section 8.3	Not applicable to combustion plants operated < 500 h/yr. There may be technical and economic restrictions for retrofitting existing

Not Applicable. No LCP boilers at the site.

N/A

			combustion plants operated between 500 h/yr and 1 500 h/yr. Not generally applicable to combustion plants of < 100 MWth		
h.	Advanced control system		Generally applicable to new combustion plants. The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system		
i.	Fuel choice		Applicable within the constraints associated with the availability of different types of fuel, which may be impacted by the energy policy of the Member State		

3.1.3. SOX, HCl and HF emissions to air

BAT 29

In order to prevent or reduce SOX, HCl and HF emissions to air from the combustion of HFO and/or gas oil in boilers, BAT is to use one or a combination of the techniques given below.

Technique		Description	Applicability		
a.	Duct sorbent injection (DSI)	See description in Section 8.4	Generally applicable	**Not Applicable.** No LCP boilers at the site.	**N/A**
b.	Spray dry absorber (SDA)				
c.	Flue-gas condenser				
d.	Wet flue-gas desulphurisation (wet FGD)		There may be technical and economic restrictions for applying the technique to combustion plants of < 300 MWth.		

			Not applicable to combustion plants operated < 500 h/yr. There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr		
e.	Seawater FGD		There may be technical and economic restrictions for applying the technique to combustion plants of < 300 MWth. Not applicable to combustion plants operated < 500 h/yr. There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr		
f.	Fuel choice		Applicable within the constraints associated with the availability of different types of fuel, which may be impacted by the energy policy of the Member State		
3.1.4. Dust and particulate-bound metal emissions to air					
BAT 30. In order to reduce dust and particulate-bound metal emissions to air from the combustion of HFO and/or gas oil in boilers, BAT is to use one or a combination of the techniques given below.				**Not Applicable.** No LCP boilers at the site.	**N/A**
Technique		Description	Applicability		
a.	Electrostatic precipitator (ESP)	See description in Section 8.5	Generally applicable		
b.	Bag filter				

c.	Multicyclones	See description in Section 8.5. Multicyclones can be used in combination with other dedusting techniques			
d.	Dry or semi-dry FGD system	See descriptions in Section 8.5. The technique is mainly used for SOX, HCl and/or HF control			
e.	Wet flue-gas desulphurisation (wet FGD)	See description in Section 8.5. The technique is mainly used for SOX, HCl and/or HF control	See applicability in BAT 29		
f.	Fuel choice	See description in Section 8.5	Applicable within the constraints associated with the availability of different types of fuel, which may be impacted by the energy policy of the Member State		
3.2. HFO- and/or gas-oil-fired engines					
3.2.1. Energy efficiency					
BAT 31 In order to increase the energy efficiency of HFO and/or gas oil combustion in reciprocating engines, BAT is to use an appropriate combination of the techniques given in BAT 12 and below:				**Not applicable** – These BAT-AELs are not applicable as the combustion units are standalone emergency back-up generators expected to operate less than 1500 hours per year.	N/A

	Technique	Description	Applicability
a	Combined cycle	See description in Section 10.8.2	Generally applicable to new units operated ≥ 1 500 h/yr. Applicable to existing units within the constraints associated with the steam cycle design and the space availability. Not applicable to existing units operated < 1 500 h/yr

Table 10.17: BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of HFO and/or gas oil in reciprocating engines.

Type of combustion unit	BAT-AEELs (1) Net electrical efficiency (%) (2)	
	New unit	Existing unit
HFO- and/or gas-oil-fired reciprocating engine – single cycle	41.5–44.5 (3)	38.3–44.5 (3)
HFO- and/or gas-oil-fired reciprocating engine – combined cycle	> 48 (4)	No BAT-AEEL

(1) These BAT-AEELs do not apply to units operated < 1 500 h/yr.
(2) Net electrical efficiency BAT-AEELs apply to CHP units whose design is oriented towards power generation, and to units generating only power.
(3) These levels may be difficult to achieve in the case of engines fitted with energy-intensive secondary abatement techniques.
(4) This level may be difficult to achieve in the case of engines using a radiator as a cooling system in dry, hot geographical locations.

3.2.2. NOX, CO and volatile organic compound emissions to air

BAT 32.

In order to prevent or reduce NOX emissions to air from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to use one or a combination of the techniques given below.

Technique		Description	Applicability
a.	Low-NOX combustion concept in diesel engines	See descriptions in Section 8.3	Generally applicable

Applicable.

Low-NOX combustion concept techniques are applicable to the emergency generators.

The combustion strategy for the emergency generators (in-cylinder technologies) are optimized for emissions requirements (Tier 2, 2g TA Luft & local regulation requirements). The emergency generators also include altitude capability and fuel staging to optimize the engine's performance. Water/steam addition and exhaust-

N/A

b.	Exhaust-gas recirculation (EGR)		Not applicable to four-stroke engines	gas recirculation (EGR) are not applicable to emergency generators. In respect of the SCR applicability assessment in BAT 32 SCR is not applicable to combustion plants operated < 500 h/yr. The emergency generators on site are not intended to be operated more than 500 h/yr.	
c.	Water/steam addition		Applicable within the constraints of water availability. The applicability may be limited where no retrofit package is available		
d.	Selective catalytic reduction (SCR)		Not applicable to combustion plants operated < 500 h/yr. There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr. Retrofitting existing combustion plants may be constrained by the availability of sufficient space		

BAT 33

In order to prevent or reduce emissions of CO and volatile organic compounds to air from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to use one or both of the techniques given below.

	Technique	Description	Applicability
a	Combustion optimisation	See descriptions in Section 10.8.3	Generally applicable
b	Oxidation catalysts		Not applicable to combustion plants operated < 500 h/yr. The applicability may be limited by the sulphur content of the fuel

Table 10.18: BAT-associated emission levels (BAT-AELs) for NOX emissions to air from the combustion of HFO and/or gas oil in reciprocating engines

Not Applicable

An advanced control system is used on all generators to control the combustion efficiency and support the prevention and/or reduction of emissions.

Oxidation catalysts are not applicable to combustion plants operated < 500 h/yr.

The BAT-AELs set out in Table 10.18 are not applicable as the units are standalone emergency back-up generators operated less than 1500 hours per year.

N/A

Combustion plant total rated thermal input (MW_{th})	BAT-AELs (mg/Nm^3)			
	Yearly average		Daily average or average over the sampling period	
	New plant	Existing plant ([1])	New plant	Existing plant ([2])([3])
≥ 50	115–190([4])	125–625	145–300	150–750

([1]) These BAT-AELs do not apply to plants operated < 1 500 h/yr or to plants that cannot be fitted with secondary abatement techniques.
([2]) The BAT-AEL range is 1 150–1 900 mg/Nm^3 for plants operated < 1 500 h/yr and for plants that cannot be fitted with secondary abatement techniques.
([3]) For plants operated < 500 h/yr, these levels are indicative.
([4]) For plants including units of < 20MW_{th} combusting HFO, the higher end of the BAT-AEL range applying to those units is 225 mg/Nm^3.

As an indication, for existing combustion plants burning only HFO and operated ≥ 1 500 h/yr or new combustion plants burning only HFO,

- the yearly average CO emission levels will generally be 50–175 mg/Nm3 ;
- the average over the sampling period for TVOC emission levels will generally be 10–40 mg/Nm3

3.2.3 SOX, HCl and HF emissions to air

BAT 34

In order to prevent or reduce SOX, HCl and HF emissions to air from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to use one or a combination of the techniques given below.

	Technique	Description	Applicability
a	Fuel choice	See descriptions in Section 10.8.4	Applicable within the constraints associated with the availability of different types of fuel, which may be impacted by the energy policy of the Member State
b	Duct sorbent injection (DSI)		There may be technical restrictions in the case of existing combustion plants Not applicable to combustion plants operated < 500 h/yr
c	Wet flue-gas desulphurisation (wet FGD)		There may be technical and economic restrictions for applying the technique to combustion plants of < 300 MW_{th}. Not applicable to combustion plants operated < 500 h/yr. There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr

Applicable

Fuel choice – the sulphur content of the fuel used in the generators will not exceed 0.1% by mass.

Duct sorbent injection (DSI) and wet flue-gas desulphurisation (wet GFD) is not applicable due to the limited running hours of the emergency generators.

The BAT-AELs set out in Table 10.19 are not applicable as the units are standalone emergency back-up generators operated less than 1500 hours per year.

In Place.

Table 10.19: BAT-associated emission levels (BAT-AELs) for SO2 emissions to air from the combustion of HFO and/or gas oil in reciprocating engines

Combustion plant total rated thermal input (MW_{th})	BAT-AELs for SO_2 (mg/Nm^3)			
	Yearly average		Daily average or average over the sampling period	
	New plant	Existing plant (1)	New plant	Existing plant (2)
All sizes	45–100	100–200 (3)	60–110	105–235 (3)

(1) These BAT-AELs do not apply to plants operated < 1 500 h/yr.
(2) For plants operated < 500 h/yr, these levels are indicative.
(3) The higher end of the BAT-AEL range is 280 mg/Nm^3 if no secondary abatement technique can be applied. This corresponds to a sulphur content of the fuel of 0.5 wt-% (dry).

3.2.4 Dust and particulate-bound metal emissions to air

BAT 35

In order to prevent or reduce dust and particulate-bound metal emissions from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to use one or a combination of the techniques given below.

	Technique	Description	Applicability
a	Fuel choice	See descriptions in Section 10.8.5	Applicable within the constraints associated with the availability of different types of fuel, which may be impacted by the energy policy of the Member State
b	Electrostatic precipitator (ESP)		Not applicable to combustion plants operated < 500 h/yr
c	Bag filter		

Table 10.20: BAT-associated emission levels (BAT-AELs) for dust emissions to air from the combustion of HFO and/or gas oil in reciprocating engines

Combustion plant total rated thermal input (MW_{th})	BAT-AELs for dust (mg/Nm^3)			
	Yearly average		Daily average or average over the sampling period	
	New plant	Existing plant (1)	New plant	Existing plant (2)
≥ 50	5–10	5–35	10–20	10–45

(1) These BAT-AELs do not apply to plants operated < 1 500 h/yr.
(2) For plants operated < 500 h/yr, these levels are indicative.

Applicable

Fuel Choice: The Installation uses fuel with a low ash (< 0.01 % m/m) or metals (e.g. mercury) content.

Electrostatic precipitation (ESP) and bag filters are not applicable as the emergency generators operate less than 500 h/yr.

The listed ELV's are not applicable to the emergency generators.

In Place

3.3. Gas-oil-fired gas turbines		
3.3.1. Energy efficiency		
BAT 36. In order to increase the energy efficiency of gas oil combustion in gas turbines, BAT is to use an appropriate combination of the techniques given in BAT 12 and below. a. Combined cycle — See description in Section 8.2 — Generally applicable to new units operated ≥ 1 500 h/yr. Applicable to existing units within the constraints associated with the steam cycle design and the space availability. Not applicable to existing units operated < 1 500 h/yr	**Not Applicable.** No gas turbines	N/A
3.3.2. NOX and CO emissions to air		
BAT 37. In order to prevent or reduce NOX emissions to air from the combustion of gas oil in gas turbines, BAT is to use one or a combination of the techniques given below. a. Water/steam addition — See description in Section 8.3 — The applicability may be limited due to water availability b. Low-NOX burners (LNB) — Only applicable to turbine models for which low-NOX burners are available on the market c. Selective catalytic reduction (SCR) — Not applicable to combustion plants operated < 500 h/yr.	**Not Applicable.** No gas turbines	N/A

			There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr. Retrofitting existing combustion plants may be constrained by the availability of sufficient space		
BAT 38. In order to prevent or reduce CO emissions to air from the combustion of gas oil in gas turbines, BAT is to use one or a combination of the techniques given below.				**Not Applicable –** No gas turbines	N/A
Technique		Description	Applicability		
a.	Combustion optimisation	See description in Section 8.3	Generally applicable		
b.	Oxidation catalysts		Not applicable to combustion plants operated < 500 h/yr. Retrofitting existing combustion plants may be constrained by the availability of sufficient space		
3.3.3. SOX and dust emissions to air					
BAT 39. In order to prevent or reduce SOX and dust emissions to air from the combustion of gas oil in gas turbines, BAT is to use the technique given below.				**Not Applicable –** No gas turbines	N/A
Technique		Description	Applicability		
a.	Fuel choice	See description in Section 8.4	Applicable within the constraints associated with the availability of different types of fuel, which may be impacted by the energy policy of the Member State		