

Environment Agency

Review of an Environmental Permit for an Installation subject to Chapter II of the Industrial Emissions Directive under the Environmental Permitting (England & Wales) Regulations 2016

Decision document recording our decision-making process following review of a permit

The Permit number is: EPR/BM4252IJ
The Operator is: EDF Energy Nuclear Generation Limit
The Installation is: Heysham 1 Power Station
This Variation Notice number is: EPR/BM4252IJ/V003

What this document is about

Article 21(3) of the Industrial Emissions Directive (IED) requires the Environment Agency to review conditions in permits that it has issued and to ensure that the permit delivers compliance with relevant standards, within four years of the publication of updated decisions on best available techniques (BAT) conclusions.

We have reviewed the permit for this installation against the revised BAT Conclusions for large combustion plant published on 17th August 2017. This is our decision document, which explains the reasoning for the consolidated variation notice that we are issuing.

It explains how we have reviewed and considered the techniques used by the Operator in the operation and control of the plant and activities of the installation. This review has been undertaken with reference to the decision made by the European Commission establishing best available techniques (BAT) conclusions ('BAT Conclusions') for large combustion plant as detailed in document reference IEDC-7-1. It is our record of our decision-making process and shows how we have taken into account all relevant factors in reaching our position. It also provides a justification for the inclusion of any specific conditions in the permit that are in addition to those included in our generic permit template.

As well as considering the review of the operating techniques used by the Operator for the operation of the plant and activities of the installation, the consolidated variation notice takes into account and brings together in a single document all previous variations that relate to the original permit issued. It also modernises the entire permit to reflect the conditions contained in our current generic permit template.

The introduction of new template conditions makes the Permit consistent with our current general approach and philosophy and with other permits issued to installations in this sector. Although the wording of some conditions has changed, while others have been removed because of the new regulatory approach, it does not reduce the level of environmental protection achieved by the Permit in any way. In this document we therefore address only our determination of substantive issues relating to the new BAT Conclusions.

Throughout this document we will use a number of expressions. These are as referred to in the glossary and have the same meaning as described in “Schedule 6 Interpretation” of the Permit.

We try to explain our decision as accurately, comprehensively and plainly as possible. We would welcome any feedback as to how we might improve our decision documents in future. A lot of technical terms and acronyms are inevitable in a document of this nature: we provide a glossary of acronyms near the front of the document, for ease of reference.

How this document is structured

Glossary of terms

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- 2 How we reached our decision
- 2.1 Requesting information to demonstrate compliance with BAT
Conclusions for Large Combustion Plant
- 2.2 Review of our own information in respect to the capability of the
installation to meet revised standards included in the BAT Conclusions
document
- 3 The legal framework
- 4 Key Issues
- 5 Decision checklist regarding relevant BAT Conclusions
- 6 Review and assessment of derogation requests made by the operator in
relation to BAT Conclusions which include an associated emission level
(AEL) value
- 7 Emissions to Water
- 8 Additional IED Chapter II requirements
- 9 Review and assessment of changes that are not part of the BAT
Conclusions derived permit review.

Glossary of acronyms used in this document

(Please note that this glossary is standard for our decision documents and therefore not all these acronyms are necessarily used in this document.)

APC	Air Pollution Control
BAT	Best Available Technique(s)
BAT-AEEL	BAT Associated Energy Efficiency Level
BAT-AEL	BAT Associated Emission Level
BATc	BAT conclusion
BREF	Best available techniques reference document
CCGT	Combined Cycle Gas Turbine
CEM	Continuous emissions monitor
CHP	Combined heat and power
CV	Calorific value
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
DLN	Dry Low NOx burners
DLN-E	Dry Low NOx effective
EIONET	European environment information and observation network is a partnership network of the European Environment Agency
ELV	Emission limit value derived under BAT or an emission limit value set out in IED
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No. 1154)
EWC	European waste catalogue
IC	Improvement Condition
IED	Industrial Emissions Directive (2010/75/EU)
IPPCD	Integrated Pollution Prevention and Control Directive (2008/1/EC) – now superseded by IED
LCP	Large Combustion Plant subject to Chapter III of IED
MSUL/MSDL	Minimum start up load/minimum shut-down load
NOx	Oxides of nitrogen (NO plus NO ₂ expressed as NO ₂)
NPV	Net Present Value
OCGT	Open Cycle Gas Turbine
PHE	Public Health England
SAC	Special Area of Conservation
SGN	Sector guidance note
TGN	Technical guidance note
WFD	Water Framework Directive (2000/60/EC)

1 Our decision

We have decided to issue the consolidated variation notice to the Operator. This will allow it to continue to operate the Installation, subject to the conditions in the consolidated variation notice.

We consider that, in reaching that decision, we have taken into account all relevant considerations and legal requirements and that the varied permit will ensure that a high level of protection is provided for the environment and human health.

The consolidated variation notice contains many conditions taken from our standard Environmental Permit template including the relevant Annexes. We developed these conditions in consultation with industry, having regard to the legal requirements of the Environmental Permitting Regulations and other relevant legislation. This document does not therefore include an explanation for these standard conditions. Where they are included in the Notice, we have considered the techniques identified by the operator for the operation of their installation, and have accepted that the details are sufficient and satisfactory to make those standard conditions appropriate. This document does, however, provide an explanation of our use of “tailor-made” or installation-specific conditions, or where our Permit template provides two or more options.

2 How we reached our decision

2.1 Requesting information to demonstrate compliance with BAT Conclusions for Large Combustion Plant

We issued a Notice under Regulation 61(1) of the Environmental Permitting (England and Wales) Regulations 2016 (a Regulation 61 Notice) on 14th June 2018 requiring the Operator to provide information to demonstrate how the operation of their installation currently meets, or will subsequently meet, the revised standards described in the large combustion plant BAT Conclusions document. The Notice also required that where the revised standards are not currently met, the operator should provide information that:

- Describes the techniques that will be implemented before 17th August 2021, which will then ensure that operations meet the revised standard, or
- Justifies why standards will not be met by 17th August 2021, and confirmation of the date when the operation of those processes will cease within the installation or an explanation of why the revised BAT standard is not applicable to those processes, or
- Justifies why an alternative technique will achieve the same level of environmental protection equivalent to the revised standard described in the BAT Conclusions.

Where the Operator proposed that they were not intending to meet a BAT standard that also included a BAT Associated Emission Level (BAT AEL) described in the BAT Conclusions Document, the Regulation 61 Notice requested that the Operator make a formal request for derogation from compliance with that AEL (as provisioned by Article 15(4) of IED). In this circumstance, the Notice identified that any such request for derogation must be supported and justified by sufficient technical and commercial information that would enable us to determine acceptability of the derogation request.

The Regulation 61 Notice response from the Operator was received on 1st November 2018.

2.2 Review of our own information in respect to the capability of the installation to meet revised standards included in the BAT Conclusions document

Based on our records and previous regulatory activities with the facility we have no reason to consider that the operator will not be able to comply with the conditions that we include in the permit.

3 The legal framework

The consolidated variation notice will be issued, under Regulation 20 of the EPR. The Environmental Permitting regime is a legal vehicle which delivers most of the relevant legal requirements for activities falling within its scope. In particular, the regulated facility is:

- an *installation* as described by the IED;
- subject to aspects of other relevant legislation which also have to be addressed.

We consider that the consolidated variation notice will ensure that the operation of the Installation complies with all relevant legal requirements and that a high level of protection will be delivered for the environment and human health.

We explain how we have addressed specific statutory requirements more fully in the rest of this document.

4 The key issues

The key issues arising during this permit review are:

- Emissions to air and the emission limits applied to the plant.
- The energy efficiency levels associated with the Best Available Techniques (BAT-AEELs)
- BAT 9 characterisation of fuel
- The review and assessment of the availability of BAT for gas turbines operating <500 hours per year

We therefore describe how we determined these issues in most detail in the relevant sections of this document.

4.1 Emissions to air and the emission limits applied to the plant

A number of general principles were applied during the permit review. These included:

- The upper value of the BAT AELs ranges specified were used unless use of the tighter limit was justified.
- The principle of no backsliding where if existing limits in the permit were already tighter than those specified in the BREF, the existing permit limits were retained.
- Where a limit was specified in both IED Annex V and the BAT Conclusions for a particular reference period, the tighter limit was applied and in the majority of cases this was from the BAT Conclusions.
- Where AELs are indicative in the BAT Conclusions, these were applied unless adequate justification was provided by the operator to demonstrate that an alternative limit was more appropriate.

The LCPs comprises of four gas turbines running on fuel oil and discharging through individual flues. The net thermal input for each gas turbine is approximately 70MWth, however the fuel input is controlled in a manner so that a maximum of 67MWth is utilised. This was specified in response to improvement condition IP18.

The LCPs are assigned the following DEFRA reference numbers: LCP433, LCP434, LCP435 and LCP436.

The ELVs and AELs are based on the following operating regime:

- <500 hours emergency only plant

Therefore, neither the ELVs from Chapter III of the IED or the BAT AELs are applicable to the plant. There was an existing monitoring programme which has been amended through this variation to ensure consistency across the sector: see section 8 of this document for further information.

The original permit contained condition 2.3.3 required the operator to minimise periods of de-loaded operation of the gas turbines. This has been removed from the permit as we consider that the permit conditions and monitoring and reporting requirements along with the procedures within the environmental management system provide adequate control and protection of the environment.

4.2 The energy efficiency levels associated with the Best Available Techniques Conclusions

An energy efficiency level associated with the best available techniques (BAT-AEEL) refers to the ratio between the combustion unit's net energy output(s) and the combustion unit's fuel/feedstock energy input at actual unit design. The net energy output(s) is determined at the combustion unit boundaries, including auxiliary systems (e.g. flue-gas treatment systems), and for the unit operated at full load.

The LCP BAT Conclusion specify that the BAT-AEELs for this type of plant are not applicable to plant operating less than 1500 hours per year. We have therefore not assessed this operational aspect of the plant. We have however included a process monitoring requirement in table S3.4 of the consolidated variation notice. This is required to demonstrate that efficiency levels are maintained following any significant overhauls of equipment in order to fulfil the requirement of BAT Conclusion 2. For <500 hour plant we have specified that the assessment of efficiency can be based on calculation. This is because we will not require plant to fire up with the sole purpose of carrying out an assessment of efficiency.

4.3 Any additional key issues e.g. fuel characterisation

BAT 9 requires the operator to carry out fuel characterisation.

The operator confirmed that they will characterise fuel in line with the JEP Yellow Jacket 'Characterisation of Power Plant Fuels for Compliance with LCP BREF Conclusion BAT 9'. This confirmation is referenced in table S1.2 'Operating Techniques' in the permit.

4.4 Any additional key issues e.g. the review and assessment of BAT for gas turbines operating < 500 hours per year

Joint Environmental Programme (JEP) produced a document '*BAT Assessment for Existing Gas and Liquid Fuel Fired OCGTs, CCGTs and Dual-fuel GTs with a Thermal Input Rating of 50MWth or Greater Operating <500 Hours Per Year*' dated October 2018. The content of this document has been agreed in principle by the Environment Agency and we have therefore taken the document into account during our determination of this variation.

The gas turbines do not have abatement fitted as specified in BAT 42. We accept that installing abatement is unlikely to be BAT for the installation based

on the JEP document described above. The primary justification is based on infrequent operation of the plant and the issues around retrofitting older plant.

In all cases, the minimum BAT requirements are considered to be: i) the continued compliance with any permit requirements already in place to protect air quality and ii) the demonstration of an appropriate maintenance regime to maintain plant emissions performance.

5 Decision checklist regarding relevant BAT Conclusions

BAT Conclusions for large combustion plant, were published by the European Commission on 17th August 2017. There are 75 BAT Conclusions. Only the BAT Conclusions relevant to the particular fuel type used on site have been replicated below.

This annex provides a record of decisions made in relation to each relevant BAT Conclusion applicable to the installation. This annex should be read in conjunction with the Consolidated Variation Notice.

The conditions in the permit through which the relevant BAT Conclusions are implemented include but are not limited to the following:

BAT Conclusion requirement topic	Permit condition(s)	Permit table(s)
Environmental Management System	1.1.1	S1.2
BAT AELs	3.1.1 and 3.5.1	NA
Monitoring	2.3, 3.5 and 3.6	NA
Energy efficiency	1.2 and 2.3	S3.4
Noise	3.4 and 2.3	S1.2
Other operating techniques	2.3	S1.2

The overall status of compliance with the BAT conclusion is indicated in the table as:

- NA Not Applicable
- CC Currently Compliant
- FC Compliant in the future (within 4 years of publication of BAT conclusions)
- NC Not Compliant
- PC Partially Compliant

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
General			
1	<p>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:</p> <ul style="list-style-type: none"> i. commitment of the management, including senior management; ii. definition of an environmental policy that includes the continuous improvement of the installation by the management; iii. planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment; iv. implementation of procedures <ul style="list-style-type: none"> (a) Structure and responsibility (b) Training (c) Communication (d) Employee involvement (e) Documentation (f) Efficient process control (g) Maintenance programmes (h) Emergency preparedness and response (i) Safeguarding compliance with environmental legislation v. checking performance and taking corrective action, paying particular attention to: <ul style="list-style-type: none"> (a) monitoring and measurement (see also the Reference Document on the General Principles of Monitoring) (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 of the EMS and its continuing suitability, adequacy and effectiveness by senior management; 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; 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; ix. application of sectoral benchmarking on a regular basis. <p>Etc - see BAT Conclusions</p>	CC	EMS in place certified to ISO14001.

BAT Concn. Numbe r	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement						
	Applicability. 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.								
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.	CC	<p>The application for the original permit in 2006 stated that the thermal input for each gas turbine was nominally 70 MWth and this is recorded in the introductory note to the permit.</p> <p>The Operator has stated that it has not been possible to find original performance test results or manufacturer's data for the gas turbines to support this. Also, no relevant operational efficiency data for heat accountancy is available. However, the governor fuel control valve for each gas turbine is set to deliver a maximum fuel demand of 67 MWth.</p> <p>To support this figure of 67MWth for net rated thermal input, values has been estimated from fuel burn.</p> <p>As this plant is emergency <500 hour plant only we are happy with this method of calculation.</p>						
3	<p>BAT is to monitor key process parameters relevant for emissions to air and water including those given below.</p> <table border="1" data-bbox="320 1334 1494 1369"> <thead> <tr> <th data-bbox="320 1334 687 1369">Stream</th> <th data-bbox="687 1334 1122 1369">Parameter(s)</th> <th data-bbox="1122 1334 1494 1369">Monitoring</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Stream	Parameter(s)	Monitoring				NA	No AELs applicable so no monitoring required.
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	Flue-gas	Flow Oxygen content, temperature, and pressure Water vapour content (%)	Periodic or continuous determination Periodic or continuous measurement		There are no emissions to water.																				
	Waste water from flue-gas treatment	Flow, pH, and temperature	Continuous measurement	4	BAT is to monitor emissions to air with at least the frequency given in BAT 4 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.																				
5	BAT is to monitor emissions to water from flue-gas treatment with at least the frequency given in BAT 5 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.			NA	No AELs applicable so no monitoring required.																				
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.			CC	All fuel is procured against specification BEG/SPEC/ENG/PSPEC/032. Maintenance of the combustion system is managed in accordance with arrangements deemed to be compliant with current permit requirements and therefore considered to be BAT. The 'Annual Report on Performance of Activities' documents all improvements made to the Gas Turbines.																				
	<table border="1"> <thead> <tr> <th data-bbox="331 839 367 874">Technique</th> <th data-bbox="367 839 555 874">Description</th> <th data-bbox="555 839 994 874">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="331 874 367 963">a.</td> <td data-bbox="367 874 555 963">Fuel blending and mixing</td> <td data-bbox="555 874 994 963">Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type</td> </tr> <tr> <td data-bbox="331 963 367 1043">b.</td> <td data-bbox="367 963 555 1043">Maintenance of the combustion system</td> <td data-bbox="555 963 994 1043">Regular planned maintenance according to suppliers' recommendations</td> </tr> <tr> <td data-bbox="331 1043 367 1123">c.</td> <td data-bbox="367 1043 555 1123">Advanced control system</td> <td data-bbox="555 1043 994 1123">See description in Section 8.1</td> </tr> <tr> <td data-bbox="331 1123 367 1203">d.</td> <td data-bbox="367 1123 555 1203">Good design of the combustion equipment</td> <td data-bbox="555 1123 994 1203">Good design of furnace, combustion chambers, burners and associated devices</td> </tr> <tr> <td data-bbox="331 1203 367 1383">e.</td> <td data-bbox="367 1203 555 1383">Fuel choice</td> <td data-bbox="555 1203 994 1383">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</td> </tr> </tbody> </table>	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	b.	Maintenance of the combustion system	Regular planned maintenance according to suppliers' recommendations	c.	Advanced control system	See description in Section 8.1	d.	Good design of the combustion equipment	Good design of furnace, combustion chambers, burners and associated devices	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	<table border="1"> <thead> <tr> <th data-bbox="994 839 1491 874">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="994 874 1491 1043">Generally applicable</td> </tr> <tr> <td data-bbox="994 1043 1491 1123">The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system</td> </tr> <tr> <td data-bbox="994 1123 1491 1203">Generally applicable to new combustion plants</td> </tr> <tr> <td data-bbox="994 1203 1491 1383">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.</td> </tr> </tbody> </table>	Applicability	Generally applicable	The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system	Generally applicable to new combustion plants	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.
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			For existing combustion plants, the type of fuel chosen may be limited by the configuration and the design of the plant				
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 NO _x emissions, BAT is to optimise the design and/or operation of SCR and/or SNCR (e.g. optimised reagent to NO _x ratio, homogeneous reagent distribution and optimum size of the reagent drops).	NA	No abatement on the plant.				
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.	CC	<p>The Gas Turbines are maintained and operated by suitably qualified and experienced staff in accordance with set inspection arrangements informed by the original equipment manufacturer and specialist suppliers who also support procurement of replacement parts designed to appropriate standards.</p> <p>The permit requires an energy efficiency review to be undertaken on a 4-yearly schedule. This is considered to deliver BAT.</p>				
9	<p>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):</p> <ul style="list-style-type: none"> (i) Initial full characterisation of the fuel used including at least the parameters listed below 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); 	FC	<p>All fuel is procured against specification BEG/SPEC/ENG/PSPEC/032 based on the requirements of BS 2869:2010+A1:2011 Fuel Oils for Agricultural, Domestic and Industrial Engines and Boilers – Specification, October 2011.</p> <p>Fuel quality assurance is provided by the supplier with periodic testing of fuel in storage by site.</p>				

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	<p>(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 8.1)).</p> <p>Description 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.</p> <table border="1" data-bbox="322 555 1491 759"> <thead> <tr> <th data-bbox="322 555 712 592">Fuel(s)</th> <th data-bbox="712 555 1491 592">Substances/Parameters subject to characterisation</th> </tr> </thead> <tbody> <tr> <td data-bbox="322 592 712 675">HFO</td> <td data-bbox="712 592 1491 675">— Ash — C, S, N, Ni, V</td> </tr> <tr> <td data-bbox="322 675 712 759">Gas oil</td> <td data-bbox="712 675 1491 759">— Ash — N, C, S</td> </tr> </tbody> </table>	Fuel(s)	Substances/Parameters subject to characterisation	HFO	— Ash — C, S, N, Ni, V	Gas oil	— Ash — N, C, S		<p>Energy efficiency reviews are undertaken on a 4-yearly schedule. This is considered to deliver BAT.</p> <p>See key issues section for further information on fuel characterisation.</p>
Fuel(s)	Substances/Parameters subject to characterisation								
HFO	— Ash — C, S, N, Ni, V								
Gas oil	— Ash — N, C, S								
10	<p>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:</p> <ul style="list-style-type: none"> — 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. 	CC	<p>The combustion plant system is of an appropriate design for its purpose of maintaining a power supply at site during an on-site emergency. The very low operating hours experienced are as a result of essential preventative maintenance, testing and periodic efficiency review. Therefore operation in an OTNOC state is primarily limited to periods of testing whilst the unit is outside its operating load.</p>						
11	<p>BAT is to appropriately monitor emissions to air and/or to water during OTNOC.</p> <p>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.</p>	CC	<p>The current permit requires measurement of oxides of nitrogen periodically. Sulphur dioxide and particulates are calculated as agreed in writing with the Regulator. The determination methods for total emissions as documented in The</p>						

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement												
			Annual Report on Performance include OTNOC such as start-up and shutdown periods.												
12	In order to increase the energy efficiency of combustion, gasification and/or IGCC units operated $\geq 1\,500$ h/yr, BAT is to use an appropriate combination of the techniques given in BAT 12.	NA	Not applicable for units <1500 hours per year.												
13	<p>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.</p> <table border="1" data-bbox="320 612 1494 914"> <thead> <tr> <th data-bbox="320 612 360 644"></th> <th data-bbox="360 612 521 644">Technique</th> <th data-bbox="521 612 1066 644">Description</th> <th data-bbox="1066 612 1494 644">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="320 644 360 778">a.</td> <td data-bbox="360 644 521 778">Water recycling</td> <td data-bbox="521 644 1066 778">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 data-bbox="1066 644 1494 778">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 data-bbox="320 778 360 914">b.</td> <td data-bbox="360 778 521 914">Dry bottom ash handling</td> <td data-bbox="521 778 1066 914">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 data-bbox="1066 778 1494 914">Only applicable to plants combusting solid fuels. There may be technical restrictions that prevent retrofitting to existing combustion plants</td> </tr> </tbody> </table>		Technique	Description	Applicability	a.	Water recycling	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	Not applicable to waste water from cooling systems when water treatment chemicals and/or high concentrations of salts from seawater are present	b.	Dry bottom ash handling	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.	Only applicable to plants combusting solid fuels. There may be technical restrictions that prevent retrofitting to existing combustion plants	NA	LCP combustion system has no applicable water usage or emission.
	Technique	Description	Applicability												
a.	Water recycling	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	Not applicable to waste water from cooling systems when water treatment chemicals and/or high concentrations of salts from seawater are present												
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14	<p>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.</p> <p>Description Waste water streams that are typically segregated and treated include surface run-off water, cooling water, and waste water from flue-gas treatment.</p> <p>Applicability The applicability may be restricted in the case of existing plants due to the configuration of the drainage systems.</p>	NA	Combustion system has no applicable emissions to water.												
15	<p>In order to reduce emissions to water from flue-gas treatment, BAT is to use an appropriate combination of the techniques given in BAT 15, and to use secondary techniques as close as possible to the source in order to avoid dilution.</p> <p>The BAT-AELs refer to direct discharges to a receiving water body at the point where the emission leaves the installation.</p>	NA	No Flue gas treatment on site.												
16	<p>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:</p>	CC	The specified techniques are not considered applicable as the combustion system does not:												

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement															
	<p>(a) waste prevention, e.g. maximise the proportion of residues which arise as by-products;</p> <p>(b) waste preparation for reuse, e.g. according to the specific requested quality criteria;</p> <p>(c) waste recycling;</p> <p>(d) other waste recovery (e.g. energy recovery),</p> <p>by implementing an appropriate combination of techniques such as:</p> <table border="1" data-bbox="322 571 1491 1161"> <thead> <tr> <th data-bbox="322 571 573 608">Technique</th> <th data-bbox="573 571 1079 608">Description</th> <th data-bbox="1079 571 1491 608">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="322 608 573 762">a. Generation of gypsum as a by-product</td> <td data-bbox="573 608 1079 762">Quality optimisation of the calcium-based reaction residues generated by the wet FGD so that they can be used as a substitute for mined gypsum (e.g. as raw material in the plasterboard industry). The quality of limestone used in the wet FGD influences the purity of the gypsum produced</td> <td data-bbox="1079 608 1491 762">Generally applicable within the constraints associated with the required gypsum quality, the health requirements associated to each specific use, and by the market conditions</td> </tr> <tr> <td data-bbox="322 762 573 898">b. Recycling or recovery of residues in the construction sector</td> <td data-bbox="573 762 1079 898">Recycling or recovery of residues (e.g. from semi-dry desulphurisation processes, fly ash, bottom ash) as a construction material (e.g. in road building, to replace sand in concrete production, or in the cement industry)</td> <td data-bbox="1079 762 1491 898">Generally applicable within the constraints associated with the required material quality (e.g. physical properties, content of harmful substances) associated to each specific use, and by the market conditions</td> </tr> <tr> <td data-bbox="322 898 573 1007">c. Energy recovery by using waste in the fuel mix</td> <td data-bbox="573 898 1079 1007">The residual energy content of carbon-rich ash and sludges generated by the combustion of coal, lignite, heavy fuel oil, peat or biomass can be recovered for example by mixing with the fuel</td> <td data-bbox="1079 898 1491 1007">Generally applicable where plants can accept waste in the fuel mix and are technically able to feed the fuels into the combustion chamber</td> </tr> <tr> <td data-bbox="322 1007 573 1161">d. Preparation of spent catalyst for reuse</td> <td data-bbox="573 1007 1079 1161">Preparation of catalyst for reuse (e.g. up to four times for SCR catalysts) restores some or all of the original performance, extending the service life of the catalyst to several decades. Preparation of spent catalyst for reuse is integrated in a catalyst management scheme</td> <td data-bbox="1079 1007 1491 1161">The applicability may be limited by the mechanical condition of the catalyst and the required performance with respect to controlling NO_x and NH₃ emissions</td> </tr> </tbody> </table>	Technique	Description	Applicability	a. Generation of gypsum as a by-product	Quality optimisation of the calcium-based reaction residues generated by the wet FGD so that they can be used as a substitute for mined gypsum (e.g. as raw material in the plasterboard industry). The quality of limestone used in the wet FGD influences the purity of the gypsum produced	Generally applicable within the constraints associated with the required gypsum quality, the health requirements associated to each specific use, and by the market conditions	b. 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Preparation of spent catalyst for reuse	Preparation of catalyst for reuse (e.g. up to four times for SCR catalysts) restores some or all of the original performance, extending the service life of the catalyst to several decades. Preparation of spent catalyst for reuse is integrated in a catalyst management scheme	The applicability may be limited by the mechanical condition of the catalyst and the required performance with respect to controlling NO _x and NH ₃ emissions		<p>include flue-gas desulphurisation, generate a waste ash, use solid fuel or include SCR.</p> <p>Under the current permit the station undertakes an waste and resource review of Gas Turbines every 4 years. The main waste products are synthetic lube oil; blade wash effluent and starter batteries. These wastes are managed in accordance with the EMS including application of the waste hierarchy. This is considered to deliver BAT.</p>
Technique	Description	Applicability																
a. Generation of gypsum as a by-product	Quality optimisation of the calcium-based reaction residues generated by the wet FGD so that they can be used as a substitute for mined gypsum (e.g. as raw material in the plasterboard industry). The quality of limestone used in the wet FGD influences the purity of the gypsum produced	Generally applicable within the constraints associated with the required gypsum quality, the health requirements associated to each specific use, and by the market conditions																
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17	<p>In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below.</p> <table border="1" data-bbox="322 1209 1491 1342"> <thead> <tr> <th data-bbox="322 1209 573 1246">Technique</th> <th data-bbox="573 1209 1079 1246">Description</th> <th data-bbox="1079 1209 1491 1246">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="322 1246 573 1342">a. Operational measures</td> <td data-bbox="573 1246 1079 1342">These include: <ul style="list-style-type: none"> — improved inspection and maintenance of equipment </td> <td data-bbox="1079 1246 1491 1342">Generally applicable</td> </tr> </tbody> </table>	Technique	Description	Applicability	a. Operational measures	These include: <ul style="list-style-type: none"> — improved inspection and maintenance of equipment 	Generally applicable	CC	<p>The specified techniques are all considered generally applicable.</p> <p>A combination of techniques are deployed. This combination includes attenuation through the use of insulation, enclosure and</p>									
Technique	Description	Applicability																
a. Operational measures	These include: <ul style="list-style-type: none"> — improved inspection and maintenance of equipment 	Generally applicable																

BAT Concn. Number	Summary of BAT Conclusion requirement			Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		<ul style="list-style-type: none"> — 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 			<p>the housing of combustion units within a secure building of a solid construction located on an industrial site reasonably distanced from relevant receptors. Noise-control equipment is also employed including silencers which are fitted on the system air intakes and exhausts. The combustion units themselves are maintained by suitably qualified experienced staff in accordance with set inspection arrangements informed by the original equipment manufacturer and specialist suppliers who also support procurement of replacement parts deigned to appropriate standards.</p>
	b. Low-noise equipment	This potentially includes compressors, pumps and disks	Generally applicable when the equipment is new or replaced		
	c. Noise attenuation	Noise propagation can be reduced by inserting obstacles between the emitter and the receiver. Appropriate obstacles include protection walls, embankments and buildings	Generally applicable to new plants. In the case of existing plants, the insertion of obstacles may be restricted by lack of space		
	d. Noise-control equipment	This includes: <ul style="list-style-type: none"> — noise-reducers — equipment insulation — enclosure of noisy equipment — soundproofing of buildings 	The applicability may be restricted by lack of space		
	e. Appropriate location of equipment and buildings	Noise levels can be reduced by increasing the distance between the emitter and the receiver and by using buildings as noise screens	Generally applicable to new plant		
Combustion of liquid fuels					
Table 13	BAT-associated energy efficiency levels (BAT-AEELs) for HFO and/or gas oil combustion in boilers.			NA	Not relevant to gas turbines.
28	In order to prevent or reduce NO _x 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 in BAT 28.			NA	Not applicable to gas turbines.
29	In order to prevent or reduce SO _x , 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 in BAT 29.			NA	Not applicable to gas turbines.
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 in BAT 30.			NA	Not applicable to gas turbines.

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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 BAT 31.	NA	Not applicable to gas turbines.																			
32	In order to prevent or reduce NO _x 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 in BAT 32.	NA	Not applicable to gas turbines.																			
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 in BAT 33.	NA	Not applicable to gas turbines.																			
34	In order to prevent or reduce SO _x , 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 in BAT 34.	NA	Not applicable to gas turbines.																			
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 in BAT 35.	NA	Not applicable to gas turbines.																			
36	<p>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.</p> <table border="1"> <thead> <tr> <th>Technique</th> <th>Description</th> <th>Applicability</th> </tr> </thead> <tbody> <tr> <td>a. Combined cycle</td> <td>See description in Section 8.2</td> <td>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</td> </tr> </tbody> </table> <p>BAT-associated energy efficiency levels (BAT-AEELs) for gas-oil-fired gas turbines</p> <table border="1"> <thead> <tr> <th rowspan="3">Type of combustion unit</th> <th colspan="2">BAT-AEELs ⁽¹³²⁾</th> </tr> <tr> <th colspan="2">Net electrical efficiency (%), ⁽¹³³⁾</th> </tr> <tr> <th>New unit</th> <th>Existing unit</th> </tr> </thead> <tbody> <tr> <td>Gas-oil-fired open-cycle gas turbine</td> <td>> 33</td> <td>25–35,7</td> </tr> <tr> <td>Gas-oil-fired combined cycle gas turbine</td> <td>> 40</td> <td>33–44</td> </tr> </tbody> </table>	Technique	Description	Applicability	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	Type of combustion unit	BAT-AEELs ⁽¹³²⁾		Net electrical efficiency (%), ⁽¹³³⁾		New unit	Existing unit	Gas-oil-fired open-cycle gas turbine	> 33	25–35,7	Gas-oil-fired combined cycle gas turbine	> 40	33–44	NA	Not applicable to plant <500 hours per year.
Technique	Description	Applicability																				
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a. Water/steam addition	See description in Section 8.3	The applicability may be limited due to water availability																				
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	c. 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		COMBUSTION PLANT BEST AVAILABLE TECHNIQUES INTERPRETATION DOCUMENT" issued by the Environment Agency states that BAT-AELs do not apply to liquid-fuel-fired turbines operated for the sole purpose of maintaining a power supply at a site during an onsite emergency and during a black start. BAT for these turbines will be delivered through an inspection and maintenance programme to ensure that environmental performance does not degrade significantly over time.																									
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.																													
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<table border="1"> <thead> <tr> <th data-bbox="315 954 472 978">Technique</th> <th data-bbox="483 954 701 978">Description</th> <th colspan="2" data-bbox="712 954 1491 978">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="315 978 472 1034">a. Fuel choice</td> <td data-bbox="483 978 701 1034">See description in Section 8.4</td> <td colspan="2" data-bbox="712 978 1491 1034">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</td> </tr> </tbody> </table> <p data-bbox="315 1042 1491 1090">BAT-associated emission levels for SO₂ and dust emissions to air from the combustion of gas oil in gas turbines, including dual fuel gas turbines</p> <table border="1"> <thead> <tr> <th data-bbox="315 1098 528 1249" rowspan="3">Type of combustion plant</th> <th colspan="4" data-bbox="539 1098 1491 1121">BAT-AELs (mg/Nm³)</th> </tr> <tr> <th colspan="2" data-bbox="539 1129 1010 1153">SO₂</th> <th colspan="2" data-bbox="1021 1129 1491 1153">Dust</th> </tr> <tr> <th data-bbox="539 1161 712 1249">Yearly average ⁽¹³⁴⁾</th> <th data-bbox="723 1161 1010 1249">Daily average or average over the sampling period ⁽¹³⁵⁾</th> <th data-bbox="1021 1161 1193 1249">Yearly average ⁽¹³⁴⁾</th> <th data-bbox="1205 1161 1491 1249">Daily average or average over the sampling period ⁽¹³⁵⁾</th> </tr> </thead> <tbody> <tr> <td data-bbox="315 1257 528 1302">New and existing plants</td> <td data-bbox="539 1257 712 1302">35–60</td> <td data-bbox="723 1257 1010 1302">50–66</td> <td data-bbox="1021 1257 1193 1302">2–5</td> <td data-bbox="1205 1257 1491 1302">2–10</td> </tr> </tbody> </table>				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		Type of combustion plant	BAT-AELs (mg/Nm ³)				SO ₂		Dust		Yearly average ⁽¹³⁴⁾	Daily average or average over the sampling period ⁽¹³⁵⁾	Yearly average ⁽¹³⁴⁾	Daily average or average over the sampling period ⁽¹³⁵⁾	New and existing plants	35–60	50–66	2–5	2–10	
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New and existing plants	35–60	50–66	2–5	2–10																										

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40	<p>In order to increase the energy efficiency of natural gas combustion, BAT is to use an appropriate combination of the techniques given in BAT 12 and below.</p> <table border="1" data-bbox="320 440 1494 687"> <thead> <tr> <th>Technique</th> <th>Description</th> <th>Applicability</th> </tr> </thead> <tbody> <tr> <td>a. Combined cycle</td> <td>See description in Section 8.2</td> <td>Generally applicable to new gas turbines and engines except when operated < 1 500 h/yr. Applicable to existing gas turbines and engines within the constraints associated with the steam cycle design and the space availability. Not applicable to existing gas turbines and engines operated < 1 500 h/yr. Not applicable to mechanical drive gas turbines operated in discontinuous mode with extended load variations and frequent start-ups and shutdowns. Not applicable to boilers</td> </tr> </tbody> </table> <p>BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of natural gas</p> <table border="1" data-bbox="320 715 1494 1023"> <thead> <tr> <th rowspan="3">Type of combustion unit</th> <th colspan="5">BAT-AEELs ⁽¹³⁶⁾ ⁽¹³⁷⁾</th> </tr> <tr> <th colspan="2">Net electrical efficiency (%)</th> <th rowspan="2">Net total fuel utilisation (%) ⁽¹³⁸⁾ ⁽¹³⁹⁾</th> <th colspan="2">Net mechanical energy efficiency (%) ⁽¹³⁹⁾ ⁽¹⁴⁰⁾</th> </tr> <tr> <th>New unit</th> <th>Existing unit</th> <th>New unit</th> <th>Existing unit</th> </tr> </thead> <tbody> <tr> <td>Gas engine</td> <td>39,5–44 ⁽¹⁴¹⁾</td> <td>35–44 ⁽¹⁴¹⁾</td> <td>56–85 ⁽¹⁴¹⁾</td> <td colspan="2">No BAT-AEEL.</td> </tr> <tr> <td>Gas-fired boiler</td> <td>39–42,5</td> <td>38–40</td> <td>78–95</td> <td colspan="2">No BAT-AEEL.</td> </tr> <tr> <td>Open cycle gas turbine, ≥ 50 MW_{th}</td> <td>36–41,5</td> <td>33–41,5</td> <td>No BAT-AEEL</td> <td>36,5–41</td> <td>33,5–41</td> </tr> </tbody> </table> <p>Combined cycle gas turbine (CCGT)</p> <table border="1" data-bbox="320 1066 1494 1209"> <tbody> <tr> <td>CCGT, 50–600 MW_{th}</td> <td>53–58,5</td> <td>46–54</td> <td>No BAT-AEEL</td> <td>No BAT-AEEL</td> </tr> <tr> <td>CCGT, ≥ 600 MW_{th}</td> <td>57–60,5</td> <td>50–60</td> <td>No BAT-AEEL</td> <td>No BAT-AEEL</td> </tr> <tr> <td>CHP CCGT, 50–600 MW_{th}</td> <td>53–58,5</td> <td>46–54</td> <td>65–95</td> <td>No BAT-AEEL</td> </tr> <tr> <td>CHP CCGT, ≥ 600 MW_{th}</td> <td>57–60,5</td> <td>50–60</td> <td>65–95</td> <td>No BAT-AEEL</td> </tr> </tbody> </table>	Technique	Description	Applicability	a. Combined cycle	See description in Section 8.2	Generally applicable to new gas turbines and engines except when operated < 1 500 h/yr. Applicable to existing gas turbines and engines within the constraints associated with the steam cycle design and the space availability. Not applicable to existing gas turbines and engines operated < 1 500 h/yr. Not applicable to mechanical drive gas turbines operated in discontinuous mode with extended load variations and frequent start-ups and shutdowns. Not applicable to boilers	Type of combustion unit	BAT-AEELs ⁽¹³⁶⁾ ⁽¹³⁷⁾					Net electrical efficiency (%)		Net total fuel utilisation (%) ⁽¹³⁸⁾ ⁽¹³⁹⁾	Net mechanical energy efficiency (%) ⁽¹³⁹⁾ ⁽¹⁴⁰⁾		New unit	Existing unit	New unit	Existing unit	Gas engine	39,5–44 ⁽¹⁴¹⁾	35–44 ⁽¹⁴¹⁾	56–85 ⁽¹⁴¹⁾	No BAT-AEEL.		Gas-fired boiler	39–42,5	38–40	78–95	No BAT-AEEL.		Open cycle gas turbine, ≥ 50 MW _{th}	36–41,5	33–41,5	No BAT-AEEL	36,5–41	33,5–41	CCGT, 50–600 MW _{th}	53–58,5	46–54	No BAT-AEEL	No BAT-AEEL	CCGT, ≥ 600 MW _{th}	57–60,5	50–60	No BAT-AEEL	No BAT-AEEL	CHP CCGT, 50–600 MW _{th}	53–58,5	46–54	65–95	No BAT-AEEL	CHP CCGT, ≥ 600 MW _{th}	57–60,5	50–60	65–95	No BAT-AEEL	NA	Combined Cycle not applicable to <1500 hours per year. AEELs not applicable to <500 plant.
Technique	Description	Applicability																																																												
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41	In order to prevent or reduce NO _x emissions to air from the combustion of natural gas in boilers, BAT is to use one or a combination of the techniques given in BAT 41.	NA	Only applicable to Large Combustion Plant boilers.																																																											
42	<p>In order to prevent or reduce NO_x emissions to air from the combustion of natural gas in gas turbines, BAT is to use one or a combination of the techniques given below.</p> <table border="1" data-bbox="320 1353 1494 1390"> <thead> <tr> <th>Technique</th> <th>Description</th> <th>Applicability</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Technique	Description	Applicability				CC	See section 4.4 of the decision document.																																																					
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BAT Concn. Number	Summary of BAT Conclusion requirement			Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	a. Advanced control system	See description in Section 8.3. This technique is often used in combination with other techniques or may be used alone for combustion plants operated < 500 h/yr	The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system		
	b. Water/steam addition	See description in Section 8.3	The applicability may be limited due to water availability		
	c. Dry low-NO _x burners (DLN)		The applicability may be limited in the case of turbines where a retrofit package is not available or when water/steam addition systems are installed		
	d. Low-load design concept	Adaptation of the process control and related equipment to maintain good combustion efficiency when the demand in energy varies, e.g. by improving the inlet airflow control capability or by splitting the combustion process into decoupled combustion stages	The applicability may be limited by the gas turbine design		
	e. Low-NO _x burners (LNB)	See description in Section 8.3	Generally applicable to supplementary firing for heat recovery steam generators (HRSGs) in the case of combined-cycle gas turbine (CCGT) combustion plants		
	f. Selective catalytic reduction (SCR)		Not applicable in the case of combustion plants operated < 500 h/yr. Not generally applicable to existing combustion plants of < 100 MW _{th} . Retrofitting existing combustion plants may be constrained by the availability of sufficient space. There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr		
43	In order to prevent or reduce NO _x emissions to air from the combustion of natural gas in engines, BAT is to use one or a combination of the techniques given in BAT 43.			NA	Only applicable to gas engines.
44	In order to prevent or reduce CO emissions to air from the combustion of natural gas, BAT is to ensure optimised combustion and/or to use oxidation catalysts. Description - See descriptions in Section 8.3.			NA	BAT AELs not applicable to <500 hour plant.

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	<p align="center">BAT-associated emission levels (BAT-AELs) for NO_x emissions to air from the combustion of natural gas in gas turbines</p> <table border="1"> <thead> <tr> <th data-bbox="327 440 786 560" rowspan="2">Type of combustion plant</th> <th data-bbox="797 440 1025 560" rowspan="2">Combustion plant total rated thermal input (MW_{th})</th> <th colspan="2" data-bbox="1037 440 1491 472">BAT-AELs (mg/Nm³) ⁽¹⁴²⁾ ⁽¹⁴³⁾</th> </tr> <tr> <th data-bbox="1037 475 1249 560">Yearly average ⁽¹⁴⁴⁾ ⁽¹⁴⁵⁾</th> <th data-bbox="1261 475 1491 560">Daily average or average over the sampling period</th> </tr> </thead> <tbody> <tr> <td colspan="4" data-bbox="327 563 1491 595" style="text-align: center;">Open-cycle gas turbines (OCGTs) ⁽¹⁴⁶⁾ ⁽¹⁴⁷⁾</td> </tr> <tr> <td data-bbox="327 603 786 635">New OCGT</td> <td data-bbox="797 603 1025 635">≥ 50</td> <td data-bbox="1037 603 1249 635">15–35</td> <td data-bbox="1261 603 1491 635">25–50</td> </tr> <tr> <td data-bbox="327 643 786 722">Existing OCGT (excluding turbines for mechanical drive applications) — All but plants operated < 500 h/yr</td> <td data-bbox="797 643 1025 722">≥ 50</td> <td data-bbox="1037 643 1249 722">15–50</td> <td data-bbox="1261 643 1491 722">25–55 ⁽¹⁴⁸⁾</td> </tr> <tr> <td colspan="4" data-bbox="327 726 1491 758" style="text-align: center;">Combined-cycle gas turbines (CCGTs) ⁽¹⁴⁶⁾ ⁽¹⁴⁹⁾</td> </tr> <tr> <td data-bbox="327 766 786 798">New CCGT</td> <td data-bbox="797 766 1025 798">≥ 50</td> <td data-bbox="1037 766 1249 798">10–30</td> <td data-bbox="1261 766 1491 798">15–40</td> </tr> <tr> <td data-bbox="327 805 786 853">Existing CCGT with a net total fuel utilisation of < 75 %</td> <td data-bbox="797 805 1025 853">≥ 600</td> <td data-bbox="1037 805 1249 853">10–40</td> <td data-bbox="1261 805 1491 853">18–50</td> </tr> <tr> <td data-bbox="327 861 786 909">Existing CCGT with a net total fuel utilisation of ≥ 75 %</td> <td data-bbox="797 861 1025 909">≥ 600</td> <td data-bbox="1037 861 1249 909">10–50</td> <td data-bbox="1261 861 1491 909">18–55 ⁽¹⁵⁰⁾</td> </tr> <tr> <td data-bbox="327 917 786 965">Existing CCGT with a net total fuel utilisation of < 75 %</td> <td data-bbox="797 917 1025 965">50–600</td> <td data-bbox="1037 917 1249 965">10–45</td> <td data-bbox="1261 917 1491 965">35–55</td> </tr> <tr> <td data-bbox="327 973 786 1021">Existing CCGT with a net total fuel utilisation of ≥ 75 %</td> <td data-bbox="797 973 1025 1021">50–600</td> <td data-bbox="1037 973 1249 1021">25–50 ⁽¹⁵¹⁾</td> <td data-bbox="1261 973 1491 1021">35–55 ⁽¹⁵²⁾</td> </tr> <tr> <td colspan="4" data-bbox="327 1024 1491 1056" style="text-align: center;">Open- and combined-cycle gas turbines</td> </tr> <tr> <td data-bbox="327 1064 786 1160">Gas turbine put into operation no later than 27 November 2003, or existing gas turbine for emergency use and operated < 500 h/yr</td> <td data-bbox="797 1064 1025 1160">≥ 50</td> <td data-bbox="1037 1064 1249 1160">No BAT-AEL</td> <td data-bbox="1261 1064 1491 1160">60–140 ⁽¹⁵³⁾ ⁽¹⁵⁴⁾</td> </tr> <tr> <td data-bbox="327 1168 786 1248">Existing gas turbine for mechanical drive applications — All but plants operated < 500 h/yr</td> <td data-bbox="797 1168 1025 1248">≥ 50</td> <td data-bbox="1037 1168 1249 1248">15–50 ⁽¹⁵⁵⁾</td> <td data-bbox="1261 1168 1491 1248">25–55 ⁽¹⁵⁶⁾</td> </tr> </tbody> </table> <p data-bbox="327 1256 1491 1313">As an indication, the yearly average CO emission levels for each type of existing combustion plant operated ≥ 1 500 h/yr and for each type of new combustion plant will generally be as follows:</p>	Type of combustion plant	Combustion plant total rated thermal input (MW _{th})	BAT-AELs (mg/Nm ³) ⁽¹⁴²⁾ ⁽¹⁴³⁾		Yearly average ⁽¹⁴⁴⁾ ⁽¹⁴⁵⁾	Daily average or average over the sampling period	Open-cycle gas turbines (OCGTs) ⁽¹⁴⁶⁾ ⁽¹⁴⁷⁾				New OCGT	≥ 50	15–35	25–50	Existing OCGT (excluding turbines for mechanical drive applications) — All but plants operated < 500 h/yr	≥ 50	15–50	25–55 ⁽¹⁴⁸⁾	Combined-cycle gas turbines (CCGTs) ⁽¹⁴⁶⁾ ⁽¹⁴⁹⁾				New CCGT	≥ 50	10–30	15–40	Existing CCGT with a net total fuel utilisation of < 75 %	≥ 600	10–40	18–50	Existing CCGT with a net total fuel utilisation of ≥ 75 %	≥ 600	10–50	18–55 ⁽¹⁵⁰⁾	Existing CCGT with a net total fuel utilisation of < 75 %	50–600	10–45	35–55	Existing CCGT with a net total fuel utilisation of ≥ 75 %	50–600	25–50 ⁽¹⁵¹⁾	35–55 ⁽¹⁵²⁾	Open- and combined-cycle gas turbines				Gas turbine put into operation no later than 27 November 2003, or existing gas turbine for emergency use and operated < 500 h/yr	≥ 50	No BAT-AEL	60–140 ⁽¹⁵³⁾ ⁽¹⁵⁴⁾	Existing gas turbine for mechanical drive applications — All but plants operated < 500 h/yr	≥ 50	15–50 ⁽¹⁵⁵⁾	25–55 ⁽¹⁵⁶⁾		
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BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	<ul style="list-style-type: none"> — New OCGT of $\geq 50 \text{ MW}_{\text{th}}$: $< 5\text{--}40 \text{ mg/Nm}^3$. For plants with a net electrical efficiency (EE) greater than 39 %, a correction factor may be applied to the higher end of this range, corresponding to [higher end] \times EE/39, where EE is the net electrical energy efficiency or net mechanical energy efficiency of the plant determined at ISO baseload conditions. — Existing OCGT of $\geq 50 \text{ MW}_{\text{th}}$ (excluding turbines for mechanical drive applications): $< 5\text{--}40 \text{ mg/Nm}^3$. The higher end of this range will generally be 80 mg/Nm^3 in the case of existing plants that cannot be fitted with dry techniques for NO_x reduction, or 50 mg/Nm^3 for plants that operate at low load. — New CCGT of $\geq 50 \text{ MW}_{\text{th}}$: $< 5\text{--}30 \text{ mg/Nm}^3$. For plants with a net electrical efficiency (EE) greater than 55 %, a correction factor may be applied to the higher end of the range, corresponding to [higher end] \times EE/55, where EE is the net electrical energy efficiency of the plant determined at ISO baseload conditions. — Existing CCGT of $\geq 50 \text{ MW}_{\text{th}}$: $< 5\text{--}30 \text{ mg/Nm}^3$. The higher end of this range will generally be 50 mg/Nm^3 for plants that operate at low load. — Existing gas turbines of $\geq 50 \text{ MW}_{\text{th}}$ for mechanical drive applications: $< 5\text{--}40 \text{ mg/Nm}^3$. The higher end of the range will generally be 50 mg/Nm^3 when plants operate at low load. 		
45	<p>In order to reduce non-methane volatile organic compounds (NMVOC) and methane (CH_4) emissions to air from the combustion of natural gas in spark-ignited lean-burn gas engines, BAT is to ensure optimised combustion and/or to use oxidation catalysts.</p> <p>Description See descriptions in Section 8.3. Oxidation catalysts are not effective at reducing the emissions of saturated hydrocarbons containing less than four carbon atoms.</p>	NA	Only applicable to gas engines.

6. Review and assessment of derogation requests made by the operator in relation to BAT Conclusions which include an associated emission level (AEL) value

The IED enables a competent authority to allow derogations from BAT AELs stated in BAT Conclusions under specific circumstances as detailed under Article 15(4):

By way of derogation from paragraph 3, and without prejudice to Article 18, the competent authority may, in specific cases, set less strict emission limit values. Such a derogation may apply only where an assessment shows that the achievement of emission levels associated with the best available techniques as described in BAT conclusions would lead to disproportionately higher costs compared to the environmental benefits due to:

(a) the geographical location or the local environmental conditions of the installation concerned; or

(b) the technical characteristics of the installation concerned.

No AELs are applicable to the plant on this site because it operates in emergency capacity only for <500 hours per year.

7. Emissions to Water

The consolidated permit incorporates the existing discharges to controlled waters identified in table S3.2.

There are no BAT AELs specified in the BAT Conclusions for this type of plant. There are also no additional treatment options identified as BAT for the installation. We have therefore not carried out any additional assessment of the emissions to water as part of this review.

8 Additional IED Chapter II requirements:

Updated permit Conditions

Condition 3.1.2 relating to protection of soil, groundwater and groundwater monitoring, has been added in compliance with IED requirements.

Updated monitoring conditions

The monitoring in the permit for nitrogen dioxides and carbon monoxide has been formally revised from a frequency of annual to four yearly. This is based on the following:

There are no specific emission limit values or monitoring requirements for emergency plant <500 hours in either Chapter III of the Industrial Emissions Directive or in the BAT Conclusions.

The operator has monitored emissions once per year and the results have been relatively stable.

The combustion plant is operated in accordance with written instructions, and the operator has a robust preventative maintenance programme in place. These factors should ensure adequate combustion conditions in the gas turbines.

On the basis of the above, we have agreed to amend the monitoring frequency for NO_x, CO and the assessment frequency of SO₂ and dust all to 4 yearly.

To comply with the requirements of Chapter III of the IED the operator is required to report NO_x, SO₂ and particulate emissions from the gas turbines on an annual basis. The reporting requirements allow for emissions to be calculated from monitoring data or by using an emission factor.

9 Review and assessment of changes that are not part of the BAT Conclusions derived permit review.

This document should be read in conjunction with the application, supporting information and notice.

Aspect considered	Decision
Receipt of application	
Confidential information	A claim for commercial or industrial confidentiality has not been made.
Identifying confidential information	We have not identified information provided as part of the application that we consider to be confidential.
The site	
Biodiversity, heritage, landscape and nature conservation	<p>The application is within the relevant distance criteria of a site of heritage, landscape or nature conservation, and/or protected species or habitat.</p> <p>A full assessment of the application and its potential to affect the site(s)/species/habitat has not been carried out as part of the permit review process. We consider that the review will not affect the features of the site(s)/species/habitat as the conditions will provide at least the same level of protection as those in the previous permit and in some cases will provide a higher level of protection to those in the previous permit.</p> <p>We have not consulted Natural England on the application. The decision was taken in accordance with our guidance.</p>
Operating techniques	
General operating techniques	<p>We have reviewed the techniques used by the operator where they are relevant to the BAT Conclusions and compared these with the relevant guidance notes.</p> <p>The permit conditions ensure compliance with the relevant BREF, BAT Conclusions.</p>
Permit conditions	
Updating permit conditions during consolidation	We have updated permit conditions to those in the current generic permit template as part of permit consolidation. The conditions will provide at least the same level of protection as those in the previous permit and in some cases will provide a higher level of protection to those in the previous permit.
Changes to the permit conditions due to an Environment Agency initiated variation	We have varied the permit as stated in the variation notice.
Emission limits	We have not set any emission limits in the permit.

Aspect considered	Decision
Monitoring	<p>We have decided that monitoring should be carried out for the parameters listed in the permit, using the methods detailed and to the frequencies specified.</p> <p>These are described in the relevant BAT Conclusions in Section 5 of this document.</p> <p>Table S3.4 Process monitoring requirements was amended to include the requirement to monitor energy efficiency after overhauls on site in line with BAT2.</p>
Reporting	Reporting has been amended to a 4 yearly frequency for monitoring of nitrogen dioxide, carbon monoxide, sulphur dioxide and dust.
Operator competence	
Management system	There is no known reason to consider that the operator will not have the management system to enable it to comply with the permit conditions.
Growth Duty	
Section 108 Deregulation Act 2015 – Growth duty	<p>We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit.</p> <p>Paragraph 1.3 of the guidance says:</p> <p>“The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation.”</p> <p>We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.</p> <p>We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.</p>