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/SP3935LW
The Operator is: EDF Energy (Thermal Generation) Limited
The Installation is: West Burton Power Station
This Variation Notice number is: EPR/SP3935LW/V011

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 (LCP) published on 17 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 for LCP 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.

This is our record of our decision-making process and shows how we have taken into account all relevant factors in reaching our position.

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 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
FSA	Food Standards Agency
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
TNP	Transitional National Plan
TOC	Total Organic Carbon
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 them 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 (EPR) 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 EPR on 01 May 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 LCP 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 17 August 2021, which will then ensure that operations meet the revised standard, or
- Justifies why standards will not be met by 17 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.

We did not receive any such request from the Operator.

The Regulation 61 Notice response from the Operator was received on 31 October 2018.

The response contained sufficient information for us to commence the permit review; however we did request further information from the Operator as follows:

Further information requested 07/10/19 Biomass firing, operating techniques, emissions to water, BAT Conclusions 2 and 37	Response received 18/10/19
Further information received, BAT Conclusion 2 (gas turbine efficiency) and BAT Conclusion 9 (fuel characterisation)	Response received 14/01/20
Updated site plan showing main emission points	Response received 21/01/20

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.

In relation to BAT Conclusions 4 and 9 we agree with the Operator in respect to their current stated capability as recorded in their Regulation 61 Notice response that improvements are required.

We have therefore included improvement conditions in the consolidated variation notice, which requires the Operator to upgrade their operational techniques so that the requirements of the BAT Conclusion are delivered by 17 August 2021. This is discussed in more detail in the key issues section and/or in the decision checklist regarding relevant BAT Conclusions.

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 Conclusion 4, demonstration of sufficiently stable emissions.
- BAT Conclusion 9, characterisation of fuel.
- BAT Conclusion 15, to reduce emissions to water from flue-gas treatment, refer to Section 7 below.

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.

a) LCP configuration

LCP130 and LCP131 – four coal fired boilers - <1,500 hours/year

LCP130 consists of two boilers with a total net thermal input of 2,628 MWth which vent via multiple flues within a single windshield at emission point A1.

LCP131 consists of two boilers with a total net thermal input of 2,628 MWth which vent via multiple flues within a single windshield at emission point A3.

Both LCPs burn coal, the Operator confirmed that the ability to co-fire biomass is no longer required.

These LCPs operate under the TNP compliance route.

For plant operating under the TNP, emission limit values (ELVs) were set which were derived for the period 2016 – 30 June 2020 (the duration of the TNP). From 01 July 2020 the appropriate limits in Annex V of the IED are applicable.

The plant was put into operation before the IED came into force and therefore the limits from Part 1 of Annex V of the IED are applicable i.e. limits for existing plant.

The ELVs and AELs are based on <1,500 hours/year operation, see below.

LCP456 and LCP457 – two gas-oil fired OCGT - <500 hours/year

Each LCP comprises a 76 MWth black-start open cycle gas turbine (OCGT), GT1 and GT4, which vent via separate stacks at emission points A5a and A5b respectively.

The units burn gas-oil.

These LCPs operate under the ELV compliance route.

No ELVs were set in line with Annex V of the IED, for LCPs that requested a derogation for <500 hours/year operation.

The AELs are based on <500 hours non-emergency plant, see below.

b) LCP Emission limits for LCP130 and LCP131

The following tables outline the limits that have been incorporated into the permit for LCP130 and LCP131, where these were derived from and the reference periods at which they apply.

The emission limits refer to concentrations, expressed as mass of emitted substance per volume of flue-gas under the following standard conditions: dry gas at a temperature of 273.15 K, pressure of 101.3 kPa and 6% volume reference oxygen concentration in flue gases for the boilers (solid fuels).

By the end of the TNP on 30 June 2020, as a minimum plant must meet the limits set out in Annex V of the IED subject to BAT assessment and the principle of no backsliding. From the implementation date of the BAT Conclusions in 2021 the relevant AELs will also apply.

The emission limits and monitoring requirements have been incorporated into Schedule 3 of the permit.

i) BAT Conclusion 20 – NOx and indicative CO limits

NOx limits

NOx limits (mg/Nm^3)								
Averaging	**IED (Annex V Part 1) – for existing plant** Note 3	**BREF (Table 3 BAT-C)**	**Existing to 30 June 2020 TNP ELV**	**Permit limits from 01 July 2020 (after TNP) to 16 August 2021**	**Permit limits from 17 August 2021**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	Note 1	**None**	**None**	**None**	BREF	MSUL/MSDL to baseload	Continuous
Monthly	**450**	**None**	**450**	**450**	**450**	IED	MSUL/MSDL to baseload	
Daily	**495**	**340** Note 2	**550 (95% daily means)**	**495**	**340**	BREF	MSUL/MSDL to baseload	
95th %ile of hr means	**900**	**None**	**None**	**900**	**900**	IED	MSUL/MSDL to baseload	

Note 1 to Table 3: BAT AEL does not apply to plant operated < 1,500 hours/year.
Note 2 to Table 3: In the case of coal-fired PC boiler plants put into operation no later than 1 July 1987, which are operated < 1,500 hours/year and for which SCR and/or SNCR is not applicable, the higher end of the range is 340 mg/Nm^3.
Note 3: Annex V limits applicable to >500 MWth coal fired boilers, permitted before 01/07/87 and operating <1,500 hours/year.

Indicative CO limits
CO indicative emission levels do not apply to plant operating <1,500 hours/year.

We have not set limits as there are no existing limits or applicable IED Annex V limits.

ii) BAT Conclusion 21 – SO_2 limits

SOx limits (mg/Nm^3)								
Averaging	**IED (Annex V Part 1) – for existing plant** Note 3	**BREF (Table 4 BAT-C)**	**Existing to 30 June 2020 TNP ELV**	**Permit limits from 01 July 2020 (after TNP) to 16 August 2021**	**Permit limits from 17 August 2021**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	Note 1	**None**	**None**	**None**	BREF	MSUL/MSDL to baseload	Continuous
Monthly	**800**	**None**	**350**	**350**	**350**	IED	MSUL/MSDL to baseload	
Daily	**880**	**220** Note 5	**440 (95% daily means)**	**440**	**220**	BREF	MSUL/MSDL to baseload	
95th %ile of hr means	**1600**	**None**	**None**	**700**	**700**	IED	MSUL/MSDL to baseload	
Note 1 to Table 4: BAT AEL does not apply to plant operated < 1,500 hours/year. Note 5 to Table 4: The higher end of the BAT-AEL range is 220 mg/Nm^3 in the case of plants put into operation no later than 7 January 2014 and operated < 1,500 hours/year. .Note 3: Annex V limits applicable to >500 MWth coal fired boilers, permitted before 01/07/87 and operating <1,500 hours/year.								

iii) BAT Conclusion 21 – HCl limits

HCl limits (mg/Nm^3)							
Averaging	**IED (Annex V Part 1) – for existing plant**	**BREF (Table 5 BAT-C)**	**Existing limits**	**Permit limits from 17 August 2021**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**20** Note 2	**None**	**20**	BREF	MSUL/MSDL to baseload	Al least once every 6 months
Monthly	**None**	**None**	**None**	**None**	IED	MSUL/MSDL to baseload	
Daily	**None**	**None**	**None**	**None**	BREF	MSUL/MSDL to baseload	
95th %ile of hr means	**None**	**None**	**None**	**None**	IED	MSUL/MSDL to baseload	
Note 2 to Table 5: The higher end of the BAT AEL range is 20 mg/Nm^3 for plants operated < 1,500 hours/year.							

iv) BAT Conclusion 21 – HF limits

HF limits (mg/Nm^3)							
Averaging	**IED (Annex V Part 1) – for existing plant**	**BREF (Table 5 BAT-C)**	**Existing limits**	**Permit limits from 17 August 2021**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**7** Note 4	**None**	7	BREF	MSUL/MSDL to baseload	Al least once every 6 months
Monthly	**None**	**None**	**None**	**None**	IED	MSUL/MSDL to baseload	
Daily	**None**	**None**	**None**	**None**	BREF	MSUL/MSDL to baseload	
95th %ile of hr means	**None**	**None**	**None**	**None**	IED	MSUL/MSDL to baseload	
Note 4 to Table 5: The higher end of the BAT AEL range is 7 mg/Nm^3 for plants operated < 1,500 hours/year.							

v) BAT Conclusion 22 – Dust limits

Dust limits (mg/Nm^3)								
Averaging	**IED (Annex V Part 1) – for existing plant** Note 2	**BREF (Table 6 BAT-C)**	**Existing to 30 June 2020 TNP ELV**	**Permit limits from 01 July 2020 (after TNP) to 16 August 2021**	**Permit limits from 17 August 2021**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	Note 1	**None**	**None**	**None**	BREF	MSUL/MSDL to baseload	Continuous
Monthly	**20**	**None**	**20**	**20**	**20**	IED	MSUL/MSDL to baseload	
Daily	**22**	**14** Note 7	**35 (95% daily means)**	**22**	**14**	BREF	MSUL/MSDL to baseload	
95th %ile of hr means	**40**	**None**	**None**	**40**	**40**	IED	MSUL/MSDL to baseload	
Note 1 to Table 6: BAT AEL does not apply to plant operated < 1,500 hours/year. Note 7 to Table 6: The higher end of the BAT-AEL range is 14 mg/Nm^3 in the case of plants put into operation no later than 7 January 2014. Note 2: Annex V limits applicable to >500 MWth coal fired boilers, permitted before 01/07/87 and operating <1,500 hours/year.								

vi) BAT Conclusion 23 – Mercury limits

There is no limit specified in the existing permit.

We have set the applicable yearly average BAT AEL of 4 µg/Nm^3 as set out in Table 7 of this BAT Conclusion.

Parameter	Yearly average (µg/Nm^3)
mercury	4

c) LCP Emission limits for LCP456 and LCP457

The following tables outline the limits that have been incorporated into the permit for LCP456 and LCP457, where these were derived from and the reference periods at which they apply.

The emission limits refer to concentrations, expressed as mass of emitted substance per volume of flue-gas under the following standard conditions: dry gas at a temperature of 273.15 K, pressure of 101.3 kPa and 15% volume reference oxygen concentration in flue gases for the turbines.

For non-emergency gas turbines operating for <500 hours/year:

Classification of emergency plant

Under Chapter III of the IED, gas turbines and gas engines operating for <500 hours/year are considered to be 'emergency plant' and therefore were not covered by the emission limits set out in IED Annex V. However, for the purposes of the LCP BAT review, plants operated for emergency use may only be defined as plants which operate for the sole purpose of providing power at a site during an on-site emergency and/or during a black start and which do not provide balancing services or demand side response services. As this site runs commercially on an intermittent basis to support the Grid, it is not considered emergency plant and therefore indicative BAT applies.

Indicative BAT limits for non-emergency plant operating <500 hours/year

Where there is an indicative AEL for this type of plant in the BAT Conclusions we have decided that we will set the limits in the permit. Validation will be through emission factors based on the principle that we will not require plant to fire up with the sole purpose of performing an emission measurement, as set out the UK Regulators Interpretation Document.

An appropriate BAT justification must be made for any deviation from this value. However, a formal derogation under Article 15(4) is not required where it is proven that alternative values can be regarded as BAT.

The emission limits and monitoring requirements have been incorporated into Schedule 3 of the permit.

i) BAT Conclusions 37 and 38 – NOx limits

There are no limits specified in the existing permit.

We have applied a NOx limit (applicable to all < 500 hour/year plant) based on what the plant can achieve. Refer to Section 5 of this document.

This is 300 mg/Nm^3 (daily average or average over the sampling period), which is below 500 mg/Nm^3 as specified as a guideline in the BAT for Balancing Markets guidance.

Parameter	daily limit or average over the sampling period (mg/Nm^3)
NOx	300

ii) BAT Conclusion 39 – SO_2 and dust limits

There are no limits specified in the existing permit.

Footnotes to Table 22 of this BAT Conclusion confirm that :

Note 1: yearly averages do not apply to existing plants operated <1,500 hours/year.

Note 2: For existing plants operated <500 hours/year, daily average limits are indicative.

We have set the indicative daily limits as follows:

Parameter	Indicative daily limit (mg/Nm^3)
SO_2	66
Dust	10

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.

BAT Conclusion 19 – LCP130 and LCP131

Note 1 to Table 2 of this LCP BAT Conclusion specifies that the BAT AEELs for this type of plant are not applicable to plant operating <1,500 hours/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.

BAT Conclusion 36 - LCP456 and LCP457

Note 1 to Table 21 of this LCP BAT Conclusion specifies that the BAT AEELs for this type of plant are not applicable to plant operating <1,500 hours/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 this <500 hours/year 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 BAT for gas turbines operating < 500 hours/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.

Refer to BAT Conclusion 37 in Section 5 of this document.

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.

4.4 Fuel characterisation

BAT Conclusion 9
This BAT Conclusion requires the Operator to carry out fuel characterisation.

We have therefore incorporated the Joint Environmental Programme (JEP) report – 'Characterisation of power plant fuels for compliance with LCP BREF Conclusion BAT 9' issued October 2019 into table S1.2 of the permit. This document sets out how this will be carried out prior to the implementation date for the BAT Conclusions.

The Operator confirmed in their response received 14 January 2020, that they will adhere to the requirements of this BAT Conclusion through application of the JEP report.

5 Decision checklist regarding relevant BAT Conclusions

BAT Conclusions for LCP, were published by the European Commission on 17 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 section provides a record of decisions made in relation to each relevant BAT Conclusion applicable to the installation. This section should be read in conjunction with the consolidated variation notice.

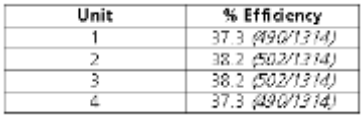
The conditions in the permit through which the relevant BAT Conclusions are implemented include but are not limited to the following:

BAT Conclusion requirement topic	**Permit conditions**	**Permit tables**
Environmental Management System	1.1.1	S1.2
BAT AELs	3.1.1 and 3.5.1	S3.1b and S3.2a
Monitoring	2.3, 3.5 and 3.6	S1.2, S1.4, S3.1b
Energy efficiency	1.2 and 2.3	S3.4
Noise	3.4 and 2.3	S2.1
Other operating techniques	1.2	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 No.	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	**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 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 (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: (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;	CC	The Operator confirmed that: There is an EMS certified to ISO14001:2015 in place and it meets requirements (i) through to (xvi) set out in the BAT Conclusion. We agree with the Operator's stated compliance.

BAT No.	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
	ix. application of sectoral benchmarking on a regular basis. Etc - see BAT Conclusions **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	The Operator confirmed that the efficiencies by unit are as follows:  These are for LCP130 and LCP131. They also confirmed that: Net electrical efficiency has been calculated based on: <u>Maximum Export Limit (MEL)</u> Net Rated Thermal Input (NRTI) The NRTI values use the same methodology previously accepted as part of the IED Regulation 60 response, i.e. design data that is specified in the Operating and Maintenance Manual for the installation which was produced by International Combustion Limited in the 1960s. A copy of the relevant submission dated November 2015 was provided. The NRTI values remain valid because there have been no significant boiler modifications. The NRTI values continue to be the same as currently recorded in the TNP Register.

Unit	% Efficiency
1	37.3 (490/1314)
2	38.2 (502/1314)
3	38.2 (502/1314)
4	37.3 (490/1314)

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>The MEL is the maximum amount of electricity that each generating unit can export to the Grid. By being the export value, it takes into account internal works power requirement, enabling net electrical efficiency to be calculated. The MEL values incorporate turbine modifications made since the 1960s and are a value which enables each generating unit to be operated safely and within design data.

For LCP 456 and LCP457 a further information response was received 14 January 2020. The Operator confirmed that an efficiency test carried out on LCP457 returned a net efficiency of 25.55%. As LCP456 is an identical set they anticipate the efficiency to be very closely linked.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td>3</td><td>BAT is to monitor key process parameters relevant for emissions to air and water including those given below.
<table><tr><th>Stream</th><th>Parameter(s)</th><th>Monitoring</th></tr><tr><td rowspan="3">Flue-gas</td><td>Flow</td><td>Periodic or continuous determination</td></tr><tr><td>Oxygen content, temperature, and pressure</td><td rowspan="2">Periodic or continuous measurement</td></tr><tr><td>Water vapour content (3)</td></tr><tr><td>Waste water from flue-gas treatment</td><td>Flow, pH, and temperature</td><td>Continuous measurement</td></tr></table></td><td>CC</td><td>The Operator confirmed that:

Monitoring of key parameters is undertaken in accordance with BAT Conclusion 3. All equipment is maintained in line with manufacturer and legislative requirements:

Flue-gas
Flow – The flue-gas flow rate is calculated based on load. The calculation is performed using the methodology set by ISO 16911 Part 1 Annex E and is subject to annual verification as per the requirements of the Transitional National Plan (TNP).

Water Vapour – As per footnote 1 of this BAT Conclusion, water vapour is calculated as the sampled flue-gas is dried before analysis. The calculation used is listed in the JEP Monitoring Protocol (section 6.3.2) and is used to correct flue-gas dust concentrations only.

Oxygen content, temperature and pressure are all continuously measured.

FGD Waste water
Temperature, pH and flow are all continuously measured.</td></tr>
</table>

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>We agree with the Operator’s stated compliance.</td></tr>
<tr><td>4</td><td>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.
<table>
<tr><th>Substance/Parameter</th><th>Fuel/Process/Type of combustion plant</th><th>Combustion plant total rated thermal input</th><th>Standard (s) ([4])</th><th>Minimum monitoring frequency ([5])</th><th>Monitoring associated with</th></tr>
<tr><td>NH_3</td><td>— When SCR and/or SNCR is used</td><td>All sizes</td><td>Generic EN standards</td><td>Continuous ([6]) ([7])</td><td>BAT 7</td></tr>
<tr><td>NO_X</td><td>— Coal and/or lignite including waste co-incineration
— Solid biomass and/or peat including waste co-incineration
— HFO- and/or gas-oil-fired boilers and engines
— Gas-oil-fired gas turbines
— Natural-gas-fired boilers, engines, and turbines
— Iron and steel process gases
— Process fuels from the chemical industry
— IGCC plants</td><td>All sizes</td><td>Generic EN standards</td><td>Continuous ([6]) ([8])</td><td>BAT 20
BAT 24
BAT 28
BAT 32
BAT 37
BAT 41
BAT 42
BAT 43
BAT 47
BAT 48
BAT 56
BAT 64
BAT 65
BAT 73</td></tr>
</table></td><td>CC</td><td>The Operator confirmed that:

The following parameters have been identified as being applicable to operations at the installation:

LCP130 and LCP131
NOx/SO_2/dust/CO – shall be monitored continuously and will remain subject to the QA/QC requirements of EN14181.

HCl & HF – shall be periodically measured on an annual basis as per footnote 10 of this BAT Conclusion. The Operator shall demonstrate sufficient stability by adopting the procedure agreed between JEP and the Environment Agency (Trace Species Protocol).

Hg – shall be periodically measured on a six monthly basis as per footnote 13 of this BAT Conclusion. The Operator shall demonstrate sufficient stability by adopting the procedure agreed between JEP and the Environment Agency (Trace Species Protocol).

The footnotes state that if the emission levels are proven to be sufficiently stable, periodic measurements may be undertaken at least once every six months, or each time that there is a change that may have an impact on the emissions.

In such cases “sufficiently stable” emission levels will be demonstrated through quarterly reporting of monthly HCl/HF/Hg fuel content. This will be carried out in advance of the implementation of the emission monitoring requirements and utilise accepted retention factors along with a calculated demonstration that the BAT Conclusions are being met for the plant.

Subject to this demonstration, periodic monitoring will be required at least once a year for HCl & HF and at least once in every six month period for Hg. We have set an improvement condition to address this.

Metals & metalloids (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Se, Ti, V and Zn) -</td></tr>
</table>

BAT No.	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
		— Combustion plants on offshore platforms	All sizes	EN 14792	Once every year [9]	BAT 53		emissions are well understood due to ongoing fuel characterisation and as such periodic monitoring is not required as per footnote 15 of this BAT Conclusion, unless a fuel source is changed and is assessed as having an impact on emissions, subject to agreement with JEP and the Environment Agency. **LCP456 and LCP457** Footnotes 3, 5, 12, 16, 17 and 20 to BAT Conclusion 4 relate to plant operated less than 1,500 and/or 500 hours/year – these footnotes set out when alternative monitoring requirements are acceptable or may apply. We agree with the Operator's stated compliance.
	N_2O	— Coal and/or lignite in circulating fluidised bed boilers — Solid biomass and/or peat in circulating fluidised bed boilers	All sizes	EN 21258	Once every year [10]	BAT 20 BAT 24		
	CO	— Coal and/or lignite including waste co-incineration — Solid biomass and/or peat including waste co-incineration — HFO- and/or gas-oil-fired boilers and engines — Gas-oil-fired gas turbines — Natural-gas-fired boilers, engines, and turbines — Iron and steel process gases — Process fuels from the chemical industry — IGCC plants	All sizes	Generic EN standards	Continuous [6] [8]	BAT 20 BAT 24 BAT 28 BAT 33 BAT 38 BAT 44 BAT 49 BAT 56 BAT 64 BAT 65 BAT 73		
		— Combustion plants on	All sizes	EN 15058	Once every year [9]	BAT 54		

BAT No.	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
			offshore platforms					
	SO_2	— Coal and/or lignite incl waste co-incineration — Solid biomass and/or peat incl waste co-incineration — HFO- and/or gas-oil-fired boilers — HFO- and/or gas-oil-fired engines — Gas-oil-fired gas turbines — Iron and steel process gases — Process fuels from the chemical industry in boilers — IGCC plants	All sizes	Generic EN standards and EN 14791	Continuous ([6]) ([11]) ([12])	BAT 21 BAT 25 BAT 29 BAT 34 BAT 39 BAT 50 BAT 57 BAT 66 BAT 67 BAT 74		
	SO_3	— When SCR is used	All sizes	No EN standard available	Once every year	—		
	Gaseous chlorides, expressed as HCl	— Coal and/or lignite — Process fuels from the chemical industry in boilers	All sizes	EN 1911	Once every three months ([6]) ([13]) ([14])	BAT 21 BAT 57		
		— Solid biomass and/or peat	All sizes	Generic EN standards	Continuous ([15]) ([16])	BAT 25		

BAT No.	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
		— Waste co-incineration	All sizes	Generic EN standards	Continuous (6) (16)	BAT 66 BAT 67		
	HF	— Coal and/or lignite — Process fuels from the chemical industry in boilers	All sizes	No EN standard available	Once every three months (6) (13) (14)	BAT 21 BAT 57		
		— Solid biomass and/or peat	All sizes	No EN standard available	Once every year	BAT 25		
		— Waste co-incineration	All sizes	Generic EN standards	Continuous (6) (16)	BAT 66 BAT 67		
	Dust	— Coal and/or lignite — Solid biomass and/or peat — HFO- and/or gas-oil-fired boilers — Iron and steel process gases — Process fuels from the chemical industry in boilers — IGCC plants — HFO- and/or gas-oil-fired engines — Gas-oil-fired gas turbines	All sizes	Generic EN standards and EN 13284-1 and EN 13284-2	Continuous (6) (17)	BAT 22 BAT 26 BAT 30 BAT 35 BAT 39 BAT 51 BAT 58 BAT 75		
		— Waste co-incineration	All sizes	Generic EN standards and EN 13284-2	Continuous	BAT 68 BAT 69		

BAT No.	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
	Metals and metalloids except mercury (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Se, Tl, V, Zn)	— Coal and/or lignite — Solid biomass and/or peat — HFO- and/or gas-oil-fired boilers and engines	All sizes	EN 14385	Once every year [18]	BAT 22 BAT 26 BAT 30		
		— Waste co-incineration	< 300 MW_{th}	EN 14385	Once every six months [13]	BAT 68 BAT 69		
			≥ 300 MW_{th}	EN 14385	Once every three months [19] [13]			
		— IGCC plants	≥ 100 MW_{th}	EN 14385	Once every year [18]	BAT 75		
	Hg	— Coal and/or lignite including waste co-incineration	< 300 MW_{th}	EN 13211	Once every three months [13] [20]	BAT 23		
			≥ 300 MW_{th}	Generic EN standards and EN 14884	Continuous [16] [21]			
		— Solid biomass and/or peat	All sizes	EN 13211	Once every year [22]	BAT 27		
		— Waste co-incineration with solid biomass and/or peat	All sizes	EN 13211	Once every three months [13]	BAT 70		
		— IGCC plants	≥ 100 MW_{th}	EN 13211	Once every year [23]	BAT 75		
	TVOC	— HFO- and/or gas-oil-fired engines — Process fuels from chemical industry in boilers	All sizes	EN 12619	Once every six months [13]	BAT 33 BAT 59		
		— Waste co-incineration with	All sizes	Generic EN standards	Continuous	BAT 71		

BAT No.	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

	coal, lignite, solid biomass and/or peat				
Formaldehyde	— Natural-gas in spark-ignited lean-burn gas and dual fuel engines	All sizes	No EN standard available	Once every year	BAT 45
CH_4	— Natural-gas-fired engines	All sizes	EN ISO 25139	Once every year (24)	BAT 45
PCDD/F	— Process fuels from chemical industry in boilers — Waste co-incineration	All sizes	EN 1948-1, EN 1948-2, EN 1948-3	Once every six months (13) (25)	BAT 59 BAT 71

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.

Substance/Parameter	Standard(s)	Minimum monitoring frequency	Monitoring associated with
Total organic carbon (TOC) (26)	EN 1484	Once every month	BAT 15
Chemical oxygen demand (COD) (26)	No EN standard available		
Total suspended solids (TSS)	EN 872		
Fluoride (F^-)	EN ISO 10304-1		
Sulphate (SO_4^{2-})	EN ISO 10304-1		
Sulphide, easily released (S^{2-})	No EN standard available		
Sulphite (SO_3^{2-})	EN ISO 10304-3		

FC

The Operator confirmed that:

The BREF introduces new determinands which have not been required to be analysed and complied with previously. In preparation for this, they have worked with an ISO17025 accredited laboratory to have the new determinands analysed – so they can understand (1) whether there is a potential compliance issue and (2) whether the determinands can be analysed to the required standards.

To date, they have encountered issues which regard to being able to analyse certain parameters. Broadly, they have found it possible to consistently analyse for all required determinands, except sulphite and sulphide.

For the determinands which they can analyse consistently, they have also found it is not possible to analyse for all of them to the EN standards listed in this BAT Conclusion.

A comparison of the standards they currently use against those listed in this BAT Conclusion are listed below:

BAT No.	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

Metals and metalloids	As	Various EN standards available (e.g. EN ISO 11885 or EN ISO 17294-2)		
	Cd			
	Cr			
	Cu			
	Ni			
	Pb			
	Zn			
	Hg	Various EN standards available (e.g. EN ISO 12846 or EN ISO 17852)		
Chloride (Cl^-)		Various EN standards available (e.g. EN ISO 10304-1 or EN ISO 15682)		—
Total nitrogen		EN 12260		—

Substance / Parameter	BAT 5 standard listed	Standard advised by laboratory
Total organic carbon (TOC)	EN1484	ISO 8245:1999 (this is equivalent to European Standard EN1484)
Chemical oxygen demand (COD)	No EN standard available	BS ISO 15705:2002
Total suspended solids	EN 872	EN 872
Fluoride	EN ISO 10304-1	ISO 10359-1 (to avoid interference from chloride levels found in FGD WWTP waters)
Sulphate	EN ISO 10304-1	EN ISO 10304-1
Sulphide	No EN standard available	When no interference: redox-titration with sodium thiosulpate following addition of iodine/iodide – "standard methods for the examination of water & waste water" & VGB methods
Arsenic	Various EN standards available (e.g. EN ISO 11885 or EN ISO 17294-2)	BS ISO 17378-2:2014
Cadmium	Various EN standards available (e.g. EN ISO 11885 or EN ISO 17294-2)	BS EN ISO 15586:2003
Chromium	Various EN standards available (e.g. EN ISO 11885 or EN ISO 17294-2)	ISO 11885
Copper	Various EN standards available (e.g. EN ISO 11885 or EN ISO 17294-2)	ISO 11885
Nickel	Various EN standards available (e.g. EN ISO 11885 or EN ISO 17294-2)	ISO 11885
Lead	Various EN standards available (e.g. EN ISO 11885 or EN ISO 17294-2)	BS EN ISO 15586:2003
Zinc	Various EN standards available (e.g. EN ISO 11885 or EN ISO 17294-2)	ISO 11885
Mercury	Various EN standards available (e.g. EN ISO 12846 or EN ISO 15682)	BS EN ISO 12846 :2012
Chloride	Various EN standards available (EN ISO 10304-1 or EN ISO 15682)	EN ISO 10304-1
Total nitrogen	EN 12260	BS EN ISO 14911:1999

Based on feedback from the laboratory, where different methods are used this is to give the best sensitivity and detection limits and/or correct for interferences associated with the very rich matrix of FGD treated waste waters. All of the above standards may be acceptable to normal, low-chemical waters, but they believe some are not suitable for the relatively chemical-rich FGD treated waste waters. Consequently, subject to further developments in standards, they propose to continue with the standards they currently use.

As noted above, it is not possible to consistently analyse for sulphite and sulphide. It has only been possible to obtain sulphite and sulphide results on a very limited basis. This is due to chemical interference. However, based on

BAT No.	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
			the stable range of sulphate readings they record, it is believed to demonstrate that oxidation has occurred. This is supported by the limited sulphite and sulphide results they have, which routinely record below the limit of detection. In addition, they would expect this because the FGD absorbers include an oxidation step (in order to produce saleable gypsum). Finally, although limited sulphides are added in the FGD treated waste waters to promote precipitation of metals, this process has been optimised so that these low amounts of sulphide will be utilised and oxidised. This BAT Conclusion notes that TOC and COD monitoring are alternatives. TOC monitoring is identified as the preferred option because it does not rely on the use of very toxic compounds. They therefore choose to monitor TOC and not COD. This BAT Conclusion identifies a minimum monitoring frequency of once per month. Provided the FGD waste water treatment is operational, they confirm it will be possible to meet this requirement. We agree with the proposed monitoring methods and have included them in the permit, with the exception of total nitrogen. We think that method 14911 was suggested in error. The acceptable alternatives to EN 12260 are BS EN ISO 11905-1 or possibly the measurement of total nitrogen as the sum of total Kjeldahl nitrogen [BS EN 25663], nitrate nitrogen (NO_3- N) and nitrite nitrogen (NO_2-N) [BS EN ISO 13395]. We have included method BS EN 12260 in the permit, with permit condition 3.5.3 providing some flexibility with choice of methods. Regarding sulphite and sulphide, we have included a requirement in the permit for the method to be agreed in writing with the Environment Agency. As part of this we suggest consideration of method ISO 13358 and information on the problems with interference for the different methods. Whist the Operator stated that they would be none compliant, the permit will ensure that they will be future compliant.
6	In order to improve the general environmental performance of combustion plants and to reduce emissions to air of CO and unburnt substances, BAT	FC	The Operator confirmed that:

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>is to ensure optimised combustion and to use an appropriate 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>Fuel blending and mixing</td><td>Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type</td><td rowspan="2">Generally applicable</td></tr>
<tr><td>b.</td><td>Maintenance of the combustion system</td><td>Regular planned maintenance according to suppliers' recommendations</td></tr>
<tr><td>c.</td><td>Advanced control system</td><td>See description in Section 8.1</td><td>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>d.</td><td>Good design of the combustion equipment</td><td>Good design of furnace, combustion chambers, burners and associated devices</td><td>Generally applicable to new combustion plants</td></tr>
<tr><td>e.</td><td>Fuel choice</td><td>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><td>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</td></tr>
</table></td><td></td><td>Technique (a) fuel blending and mixing
This is applicable.
This technique is already in use in terms of the installations Acceptable Fuels list. This list ensures fuels are purchased that can be fired within the design parameters for the furnace/boilers to safeguard stable combustion and minimisation of the production of CO. Fuel blending will be implemented on site as per normal practices of coal stock management of the active working stock.

Technique (b) maintenance of the combustion system
This is applicable.
There is regular planned maintenance, based on original equipment manufacturer (OEM) recommendations, statutory compliance and condition-based monitoring.

Technique (c) advanced control system
This is applicable.
Units1 to 4 are fitted with a mix of control systems.

Technique (d) good design of the combustion equipment
This aspect relates to new plant and is therefore not applicable.

Technique (e) fuel choice
This is applicable.
As noted above, the installation has an Acceptable Fuels List, with new fuels subject to a rigorous testing process before entry onto it. In addition, all fuels comply with the fuel specification outlined in the original PPC Permit Application Document 23 Raw Materials.

Although there is the option to switch to other fuels stocked on-site in the event of a plant issue, the use of a different fuel specific to start-up and shut-down is not required and would not have a material benefit on combustion.

The use of HFO during start-up and shut-down helps to stabilise combustion and limit CO production. Additionally, as the installation will be a 1,500 hour/year plant with an uncertain and intermittent generation pattern, including frequency response services in real time, it is not feasible to predict when start-up and shut-down is needed and provide relevant fuels to the</td></tr>
</table>

BAT No.	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
			bunkers accordingly (the bunkers generally have enough fuel to supply a unit at full load for a 6-hour period). It will not be possible to guarantee compliance with this BAT Conclusion prior to August 2021, because fuel choice is a significant factor and assessment and trialling will be required to re-optimise the combustion system in light of the new compliance drivers. For fuel choice, the installation has existing coal stocks to burn as well as current fuel purchase commitments to honour. In preparation for BREF compliance, suitable fuels will be purchased and delivered to site. It should be noted, however, these fuels will also need to be suitable for other BREF BAT Conclusions (e.g. BAT 21, BAT 22 and others) – therefore, this will be a complex undertaking and time will be required to be confident the fuels identified are indeed suitable, including potential testing and optimisation of them in the combustion process in the lead up to August 2021. We agree with the Operator's stated compliance.
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). **BAT-associated emission levels** The BAT-associated emission level (BAT-AEL) for emissions of NH_3 to air from the use of SCR and/or SNCR is < 3–10 mg/Nm^3 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/Nm^3.	NA	The Operator confirmed that: This BAT Conclusion not applicable - SCR or SNCR are not installed at the installation. We agree this BAT Conclusion is not applicable to the activities at the installation.
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	The Operator confirmed that: The abatement systems for air at the installation are the FGD system and electrostatic precipitators (supported by sulphur trioxide injection when required). The responses to BAT Conclusions 21 and 22 contain further

BAT No.	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
			information on this. Combustion is optimised in accordance with plant efficiency, environmental compliance drivers and acceptable CO control. The design parameters of the abatement systems are appropriate to achieve reduction of air emissions during normal operating conditions. Although the FGD system at the installation is by-passed during start-up, such periods are typically brief. The FGD is operational once safe operational parameters have been achieved. Furthermore, there is regular planned maintenance, based on OEM recommendations, statutory compliance and condition-based monitoring. The units, and their abatement systems, are operated in accordance with documented procedures (e.g. the Pulverised Fuel Code of Practice). Alarms are programmed to ensure units and systems are operated within design parameters. In preparation for start-up and entry into normal operating conditions, a purge of residual gases is conducted as well, to ensure this occurs in known and safe conditions. Should it be necessary, in the event of short-term problems with abatement systems unit operators are also empowered to reduce load in order to prevent or reduce air emissions. We agree with the Operator's stated compliance.
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 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	FC	The Operator confirmed that: As part of the EMS, there is a procedure 'Control of Fuel Quality' in place at the installation. The purpose of this document is to provide quality assurance that new solid fuels are adequately assessed prior to their trialling and acceptance or rejection onto the Acceptable Fuels List for the installation. This includes (for those parameters which can be reasonably expected to be present in the fuel) full characterisation of the solid fuel as described in this BAT Conclusion (i). This procedure includes coal and biomass. There is regular testing of approved fuels as described in this BAT Conclusion (ii) performed at a number of locations.

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>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 8.1)).
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.
<table>
<tr><th>Fuel(s)</th><th>Substances/Parameters subject to characterisation</th></tr>
<tr><td rowspan="2">Biomass/peat</td><td>— LHV
— moisture</td></tr>
<tr><td>— Ash
— C, Cl, F, N, S, K, Na
— Metals and metalloids (As, Cd, Cr, Cu, Hg, Pb, Zn)</td></tr>
<tr><td rowspan="3">Coal/lignite</td><td>— LHV
— Moisture
— Volatiles, ash, fixed carbon, C, H, N, O, S</td></tr>
<tr><td>— Br, Cl, F</td></tr>
<tr><td>— Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)</td></tr>
<tr><td>HFO</td><td>— Ash
— C, S, N, Ni, V</td></tr>
<tr><td>Gas oil</td><td>— Ash
— N, C, S</td></tr>
<tr><td>Natural gas</td><td>— LHV
— CH_4, C_2H_6, C_3, C_4+, CO_2, N_2, Wobbe index</td></tr>
</table></td><td></td><td>In preparation for BREF it is possible they will need to be tested more regularly. Selective environmental assessments are performed in real-time through emissions compliance with daily and monthly air limits and adjustments to plant settings can be made accordingly to achieve day-to-day optimisation.

(iii), regular testing does not perform a significant role in real-time operation. Nor is it practicable: fuels can be mixed on-site, as well as burnt before the regular analysis is received back.

We have incorporated the JEP document into table S1.2 of the permit. Refer to key issues section of this document.

We agree with the Operator’s stated compliance.</td></tr>
</table>

BAT No.	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
	Process fuels from the chemical industry (27): — Br, C, Cl, F, H, N, O, S — Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn) Iron and steel process gases: — LHV, CH_4 (for COG), C_XH_Y (for COG), CO_2, H_2, N_2, total sulphur, dust, Wobbe index Waste (28): — LHV — Moisture — Volatiles, ash, Br, C, Cl, F, H, N, O, S — Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)		
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.	FC	The Operator confirmed that: **Emissions to air specific** Start-up and shut-down periods are minimised within operational and scientific restrictions, with procedures in the EMS to deliver this. This is the most common OTNOC. Other instances of OTNOC are unlikely to occur or will be very infrequent. Should environmental performance deviate during normal operation, as indicated by CEMs instrumentation, such that it could be considered to be OTNOC or potentially approaching OTNOC, there are automatic alarms on the unit control desks, as well as “abnormal events” procedures to follow in order to restore environmental performance to an acceptable level. In the event of a major unit problem which would affect emissions to air, procedures would require operation of the unit to cease as soon as possible. Personnel are empowered to take such action in the event of a potential environmental performance issue. **Emissions to water specific** Emissions to water during OTNOC, especially for start-up and shutdown, are not materially different compared to normal operation. The FGD waste water treatment system is designed and operated based on

BAT No.	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
			continuous in-process testing, which includes monitoring of pH, conductivity, flow from absorbers and flow proportionate chemical dosing. This system ensures continued stability of emissions in OTNOC. The FGD waste water treatment effluent releases into a holding pond. Should it be necessary, effluent can be retained in the holding pond pending further analysis. It is also possible to re-circulate effluent back to the FGD absorbers and on to the FGD waste water treatment plant for further treatment. In the event of a major problem at the FGD waste water treatment plant, procedures would require operation to cease and the station would not operate. Personnel are empowered to take such action in the event of a potential environmental performance issue. It will not be possible to guarantee compliance with this BAT Conclusion prior to August 2021, because fuel choice is a significant factor and assessment and trialling will be required to re-optimise the combustion system in light of the new compliance drivers. For fuel choice, West Burton has existing coal stocks to burn as well as current fuel purchase commitments to honour. In preparation for BREF compliance, fuels suitable will be purchased and delivered to site. It should be noted, however, these fuels will also need to be suitable for other BREF BAT conclusions (e.g. BAT 21, BAT 22 and others) – therefore, this will be a complex undertaking and time will be required to be confident the fuels identified are indeed suitable, including potential testing and optimisation of them in the combustion process in the lead up to August 2021. The improvement condition set for BAT Conclusion 9 will secure compliance with this BAT Conclusion. We agree with the Operator's stated compliance.
11	BAT is to appropriately monitor emissions to air and/or to water during OTNOC. ***Description***	CC	The Operator confirmed that: **Emissions to air**

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	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.		Aside from start-up and shut-down, other instances of OTNOC are unlikely to occur or will be very infrequent. Except for start-up and shut-down periods, which are limited in duration, the CEMS instrumentation will continue to function and record emissions above 260 MW sent out and be reported in accordance with IED and BREF requirements – as documented in the JEP document IED Compliance Protocol (and as updated from time to time), which has been agreed with the Environment Agency. Should emissions during other instances of OTNOC put compliance with daily and monthly limits at risk, appropriate action would be taken. As contingency, spare CEMs are available on-site in the event of a significant problem with a CEM. CEMs are considered unreliable during start-up and shut-down conditions. However, emissions during such times are recorded. This is determined using a detailed estimation methodology, derived from known fuel requirement for start-up type and shut-down, i.e. fuel requirement is specific for all 4 different starts: hot, warm 1, warm 2 and cold. In the event of plant modifications, the ongoing validity of the estimation methodology is reviewed. This is in accordance with the JEP document IED Compliance Protocol (and as updated from time to time), which has been agreed with the Environment Agency. **Emissions to water** Emissions to water continue to be monitored for OTNOC as for normal operation, including start-up and shut-down. The FGD waste water treatment system is operated based on continuous in-process testing, which includes monitoring of pH, conductivity and flow from absorbers and flow proportionate chemical dosing. This system ensures continued stability of emissions in OTNOC. The treated effluent from the FGD releases into a holding pond. Should it be necessary, effluent can be retained in the holding pond pending further analysis. We agree with the Operator's stated compliance.
12	In order to increase the energy efficiency of combustion, gasification and/or	NA	The Operator confirmed that:

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>IGCC units operated ≥ 1 500 h/yr, BAT is to use an appropriate 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>Combustion optimisation</td><td>See description in Section 8.2. Optimising the combustion minimises the content of unburnt substances in the flue-gases and in solid combustion residues</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Optimisation of the working medium conditions</td><td>Operate at the highest possible pressure and temperature of the working medium gas or steam, within the constraints associated with, for example, the control of NO_X emissions or the characteristics of energy demanded</td><td></td></tr>
<tr><td>c.</td><td>Optimisation of the steam cycle</td><td>Operate with lower turbine exhaust pressure by utilisation of the lowest possible temperature of the condenser cooling water, within the design conditions</td><td></td></tr>
<tr><td>d.</td><td>Minimisation of energy consumption</td><td>Minimising the internal energy consumption (e.g. greater efficiency of the feed-water pump)</td><td></td></tr>
<tr><td>e.</td><td>Preheating of combustion air</td><td>Reuse of part of the heat recovered from the combustion flue-gas to preheat the air used in combustion</td><td>Generally applicable within the constraints related to the need to control NO_X emissions</td></tr>
<tr><td>f.</td><td>Fuel preheating</td><td>Preheating of fuel using recovered heat</td><td>Generally applicable within the constraints associated with the boiler design and the need to control NO_Xemissions</td></tr>
<tr><td>g.</td><td>Advanced control system</td><td>See description in Section 8.2. Computerised control of the main combustion parameters enables the combustion</td><td>Generally applicable to new units. The applicability to old units may be constrained by the need to retrofit the</td></tr>
</table></td><td></td><td>This BAT Conclusion is not applicable to the installation as the Operator has chosen the <1,500 hours/year IED compliance route for LCP130 and LCP131, with effect from 01 July 2020.

LCP456 and LCP457 operate for <500 hours/year.

We agree that this BAT Conclusion is not applicable to the activities carried out at the installation.</td></tr>
</table>

BAT No.	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

		efficiency to be improved	combustion system and/or control command system
h.	Feed-water preheating using recovered heat	Preheat water coming out of the steam condenser with recovered heat, before reusing it in the boiler	Only applicable to steam circuits and not to hot boilers. Applicability to existing units may be limited due to constraints associated with the plant configuration and the amount of recoverable heat
i.	Heat recovery by cogeneration (CHP)	Recovery of heat (mainly from the steam system) for producing hot water/steam to be used in industrial processes/activities or in a public network for district heating. Additional heat recovery is possible from: — flue-gas — grate cooling — circulating fluidised bed	Applicable within the constraints associated with the local heat and power demand. The applicability may be limited in the case of gas compressors with an unpredictable operational heat profile
j.	CHP readiness	See description in Section 8.2.	Only applicable to new units where there is a realistic potential for the future use of heat in the vicinity of the unit
k.	Flue-gas condenser	See description in Section 8.2.	Generally applicable to CHP units provided there is enough demand for low-temperature heat
l.	Heat accumulation	Heat accumulation storage in CHP mode	Only applicable to CHP plants. The applicability may be limited in the case of low heat load demand
m.	Wet stack	See description in Section 8.2.	Generally applicable to new and existing units fitted with wet FGD
n.	Cooling tower discharge	The release of emissions to air through a cooling tower and not	Only applicable to units fitted with wet FGD where

BAT No.	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
			via a dedicated stack	reheating of the flue-gas is necessary before release, and where the unit cooling system is a cooling tower		
	o.	Fuel pre-drying	The reduction of fuel moisture content before combustion to improve combustion conditions	Applicable to the combustion of biomass and/or peat within the constraints associated with spontaneous combustion risks (e.g. the moisture content of peat is kept above 40 % throughout the delivery chain). The retrofit of existing plants may be restricted by the extra calorific value that can be obtained from the drying operation and by the limited retrofit possibilities offered by some boiler designs or plant configurations		
	p.	Minimisation of heat losses	Minimising residual heat losses, e.g. those that occur via the slag or those that can be reduced by insulating radiating sources	Only applicable to solid-fuel-fired combustion units and to gasification/IGCC units		
	q.	Advanced materials	Use of advanced materials proven to be capable of withstanding high operating temperatures and pressures and thus to achieve increased steam/combustion process efficiencies	Only applicable to new plants		
	r.	Steam turbine upgrades	This includes techniques such as increasing the temperature and pressure of medium-pressure steam, addition of a low-pressure turbine, and modifications to the geometry of the turbine rotor blades	The applicability may be restricted by demand, steam conditions and/or limited plant lifetime		
	s.	Supercritical and ultra-	Use of a steam circuit, including steam reheating systems, in	Only applicable to new units of ≥ 600 MW_{th} operated		

<table>
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<tr><td></td><td>
<table>
<tr><td></td><td>supercritical steam conditions</td><td>which steam can reach pressures above 220,6 bar and temperatures above 374 °C in the case of supercritical conditions, and above 250 – 300 bar and temperatures above 580 – 600 °C in the case of ultra-supercritical conditions</td><td>> 4 000 h/yr.
Not applicable when the purpose of the unit is to produce low steam temperatures and/or pressures in process industries.
Not applicable to gas turbines and engines generating steam in CHP mode.
For units combusting biomass, the applicability may be constrained by high-temperature corrosion in the case of certain biomasses</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>13</td><td>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>CC</td><td>The Operator confirmed that:

The installation uses one of the two methods identified in this BAT Conclusion.

(a) water recycling is already used – for example, recycle of water treatment plant effluent back into the production process. Where possible, water recycling is utilised. However, similar to BAT 14, the existing drainage configuration can limit applicability.

They have identified an opportunity to reuse treated waste water from the FGD waste water treatment plant. This would enable the treated effluent to be returned to the production process, available for re-use, via the cooling tower ponds, serving to reduce water abstraction by 1-2%/year. The proposed methodology to be used to report treated effluent releases from FGD is included in the response to BAT Conclusion 15.

(b) dry bottom ash handling is not used at the installation. The existing system is a wet method. There are technical restrictions preventing retrofitting. It would require a significant outage across all 4 units, with several months of planning and preparation. It is likely the furnace bottom ash hopper on each unit would need to be modified, which in turn would require significant structural reinforcement of the boiler structure. Finally, the</td></tr>
</table>

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>configuration of existing infrastructure in and around the boiler ground area creates access and space restrictions for a common mechanical conveyor system which could not be realistically overcome.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td>14</td><td>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.</td><td>CC</td><td>The Operator confirmed that:

The existing drainage may restrict applicability. Some waste water streams become combined prior to release from the installation – for example, some surface waters and process waters. Although the effluent from the FGD treatment plant is currently released separately, an opportunity has been identified to reuse this water under BAT Conclusion 13. This water will only be reused once treated. Additionally, this reuse of water will reduce the amount to be abstracted. Apart from this opportunity, they do not propose to make any other changes to the existing arrangement.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td>15</td><td>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.
<table>
<tr><th colspan="2">Technique</th><th>Typical pollutants prevented/abated</th><th>Applicability</th></tr>
<tr><td colspan="4">Primary techniques</td></tr>
<tr><td>a.</td><td>Optimised combustion (see BAT 6) and flue-gas treatment systems (e.g. SCR/SNCR, see BAT 7)</td><td>Organic compounds, ammonia (NH_3)</td><td>Generally applicable</td></tr>
<tr><td colspan="4">Secondary techniques [29]</td></tr>
<tr><td>b.</td><td>Adsorption on activated carbon</td><td>Organic compounds, mercury (Hg)</td><td>Generally applicable</td></tr>
<tr><td>c.</td><td>Aerobic biological</td><td>Biodegradable</td><td>Generally applicable for the</td></tr>
</table></td><td>FC</td><td>The Operator confirmed that: Refer to Section 7 below.

We agree with the Operator’s stated compliance.</td></tr>
</table>

BAT No.	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

	treatment	organic compounds, ammonium (NH_4^+)	treatment of organic compounds. Aerobic biological treatment of ammonium (NH_4^+) may not be applicable in the case of high chloride concentrations (i.e. around 10 g/l)
d.	Anoxic/anaerobic biological treatment	Mercury (Hg), nitrate (NO_3^-), nitrite (NO_2^-)	Generally applicable
e.	Coagulation and flocculation	Suspended solids	Generally applicable
f.	Crystallisation	Metals and metalloids, sulphate (SO_4^{2-}), fluoride (F^-)	Generally applicable
g.	Filtration (e.g. sand filtration, microfiltration, ultrafiltration)	Suspended solids, metals	Generally applicable
h.	Flotation	Suspended solids, free oil	Generally applicable
i.	Ion exchange	Metals	Generally applicable
j.	Neutralisation	Acids, alkalis	Generally applicable
k.	Oxidation	Sulphide (S^{2-}), sulphite (SO_3^{2-})	Generally applicable
l.	Precipitation	Metals and metalloids, sulphate (SO_4^{2-}), fluoride (F^-)	Generally applicable
m.	Sedimentation	Suspended solids	Generally applicable
n.	Stripping	Ammonia (NH_3)	Generally applicable

The BAT-AELs refer to direct discharges to a receiving water body at the point where the emission leaves the installation.

BAT-AELs for direct discharges to a receiving water body from flue-gas treatment

Substance/Parameter	BAT-AELs
	Daily average

<table>
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<tr><td></td><td>
<table>
<tr><td colspan="2">Total organic carbon (TOC)</td><td>20–50 mg/l [30] [31] [32]</td></tr>
<tr><td colspan="2">Chemical oxygen demand (COD)</td><td>60–150 mg/l [30] [31] [32]</td></tr>
<tr><td colspan="2">Total suspended solids (TSS)</td><td>10–30 mg/l</td></tr>
<tr><td colspan="2">Fluoride (F^-)</td><td>10–25 mg/l [32]</td></tr>
<tr><td colspan="2">Sulphate (SO_4^{2-})</td><td>1,3–2,0 g/l [32] [33] [34] [35]</td></tr>
<tr><td colspan="2">Sulphide (S^{2-}), easily released</td><td>0,1–0,2 mg/l [32]</td></tr>
<tr><td colspan="2">Sulphite (SO_3^{2-})</td><td>1–20 mg/l [32]</td></tr>
<tr><td rowspan="8">Metals and metalloids</td><td>As</td><td>10–50 µg/l</td></tr>
<tr><td>Cd</td><td>2–5 µg/l</td></tr>
<tr><td>Cr</td><td>10–50 µg/l</td></tr>
<tr><td>Cu</td><td>10–50 µg/l</td></tr>
<tr><td>Hg</td><td>0,2–3 µg/l</td></tr>
<tr><td>Ni</td><td>10–50 µg/l</td></tr>
<tr><td>Pb</td><td>10–20 µg/l</td></tr>
<tr><td>Zn</td><td>50–200 µg/l</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>16</td><td>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),
by implementing an appropriate combination of techniques such as:
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Generation of gypsum as a by-product</td><td>Quality optimisation of the calcium-based reaction residues generated by the wet FGD so that they can be used as a substitute</td><td>Generally applicable within the constraints associated with the required gypsum quality, the health</td></tr>
</table>
</td><td>CC</td><td>The Operator confirmed that:

Technique (a) – Generation of gypsum as a by-product
This is applicable.

The installation is equipped with a wet FGD system designed to produce wallboard grade gypsum. This system continues to be successful and a contract with quality specifications exists with a major wallboard manufacturer, resulting in all gypsum being sold as a by-product.

Technique (b) – Recycling or recovery of residues in the construction sector
This is applicable.

The installation seeks to maximise the use of ash as by-products.
All Furnace Bottom Ash (FBA) continues to be sold for the manufacture of building blocks or similar uses in the construction industry under the EN13055 standard.</td></tr>
</table>

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
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<table>
<tr><td></td><td></td><td>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>requirements associated to each specific use, and by the market conditions</td></tr>
<tr><td>b.</td><td>Recycling or recovery of residues in the construction sector</td><td>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>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>c.</td><td>Energy recovery by using waste in the fuel mix</td><td>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>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>d.</td><td>Preparation of spent catalyst for reuse</td><td>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>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</td></tr>
</table>
</td><td></td><td>When coal-fired generation occurred regularly throughout the year, it was possible to sell quantities of Pulverised Fuel Ash (PFA) into the EN450 market as a cement replacement material. Now that coal-fired generation has significantly reduced, this market is no longer viable. However, it has become possible to sell PFA into others markets instead, such as EN13055, as these markets rely much less on newly generated ash and, typically, can be supplied from historical PFA stocks as well.

Consequently, it has become possible to not only reduce PFA to landfill, but reclaim from it as well. Future sales of PFA and FBA will continue to rely on availability and strength of markets.

Technique (c) – Energy recovery by using waste in the fuel mix
This is not applicable.

The installation does not meet the IED requirements for waste incineration. Additionally, its combustion process produces PFA which is relatively low in unburnt carbon, such that energy recovery is not required. Furthermore, as described above, now that the EN450 market is no longer available to the installation, its STI plant is no longer operational.

Technique (d) – Preparation of spent catalyst for reuse
This is not applicable.

The installation does not have an SCR system or equivalent.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td>17</td><td>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</td><td>Generally applicable</td></tr>
</table>
</td><td>CC</td><td>The Operator confirmed that:

The installation uses the techniques listed in this BAT Conclusion in order to reduce noise emissions where applicable, noting that some techniques have limited applicability as they mainly relate to new plant and equipment. The specific techniques are captured within a noise management plan.

Noise impacts are taken into consideration when commissioning new equipment and the positioning of any potentially noisy equipment is carefully</td></tr>
</table>

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td></td><td>— equipment operated by experienced staff
— avoidance of noisy activities at night, if possible
— provisions for noise control during maintenance activities</td><td></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 plant</td></tr>
</table>
</td><td></td><td>considered to ensure the minimum disturbance to local residents. New technologies are reviewed and, if cost effective, items of plant and equipment are replaced by more modern equivalents when appropriate.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td colspan="4">Combustion of solid fuels only (LCP130, LCP131) coal fired boilers (1,500 hours/year)</td></tr>
<tr><td>18</td><td>In order to improve the general environmental performance of the combustion of coal and/or lignite, and in addition to BAT 6, BAT is to use the technique given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Integrated combustion process ensuring high boiler efficiency and including primary techniques for</td><td>Combustion processes such as pulverised combustion, fluidised bed</td><td>Generally applicable</td></tr>
</table>
</td><td>CC</td><td>The Operator confirmed that:

The integrated combustion process, from fuel choice, milling and combustion, and the drivers of efficiency, environmental compliance and limiting of CO is described in the original PPC Permit Application Document 5 Combustion Activities Summary and Document 15 Emissions to Air.</td></tr>
</table>

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td>NO_X reduction (e.g. air staging, fuel staging, low-NO_Xburners (LNB) and/or flue-gas recirculation)</td><td>combustion or moving grate firing allow this integration</td><td></td></tr>
</table>
</td><td></td><td>Upgrades have been undertaken since then to improve the combustion process significantly, particularly on the primary technique side (i.e. secondary air dampers, Zolo Boss laser grid, Siemens P3000 combustion optimiser, improved fuel staging) – the result of this is a more integrated combustion system, able to react faster and proactively in real-time to maintain high efficiency, environmental compliance and low carbon-in-ash levels.

Also refer to responses provided for BAT Conclusions 6 and 20.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td>19</td><td>In order to increase the energy efficiency of the combustion of coal and/or lignite, BAT is to use an appropriate combination of the techniques given in BAT 12 and below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Dry bottom ash handling</td><td>Dry hot bottom ash falls from the furnace onto a mechanical conveyor system and, after redirection to the furnace for reburning, is cooled down by ambient air. Useful energy is recovered from both the ash reburning and ash cooling</td><td>There may be technical restrictions that prevent retrofitting to existing combustion units</td></tr>
</table>
BAT-associated energy efficiency levels (BAT-AEELs) for coal and/or lignite combustion
<table>
<tr><th rowspan="3">Type of combustion unit</th><th colspan="3">BAT-AEELs [36] [37]</th></tr>
<tr><th colspan="2">Net electrical efficiency (%) [38]</th><th>Net total fuel utilisation (%) [38] [39] [40]</th></tr>
<tr><th>New unit [41] [42]</th><th>Existing unit [41] [43]</th><th>New or existing unit</th></tr>
<tr><td>Coal-fired, ≥ 1 000 MW_{th}</td><td>45 – 46</td><td>33,5 – 44</td><td>75 – 97</td></tr>
<tr><td>Lignite-fired, ≥ 1 000 MW_{th}</td><td>42 – 44 [44]</td><td>33,5 – 42,5</td><td>75 – 97</td></tr>
<tr><td>Coal-fired,</td><td>36,5 –</td><td>32,5 – 41,5</td><td>75 – 97</td></tr>
</table>
</td><td>CC</td><td>The Operator confirmed that:

(a) dry bottom ash handling is not used at the installation. The existing system is a wet method. There are technical restrictions preventing retrofitting. It would require a significant outage in time across all 4 units, with several months of planning and preparation. It is likely the furnace bottom ash hopper on each unit would need to be modified, which in turn would require significant structural reinforcement of the boiler structure. Finally, the configuration of existing infrastructure in and around the boiler ground area creates access and space restrictions for a common mechanical conveyor system which could not be realistically overcome.

The limits set by this BAT Conclusion in Table 2 are not applicable to the installation as both LCPs operate for <1,500 hours/year.

Refer to Section 4.2 of this document.

We agree with the Operator’s stated compliance.</td></tr>
</table>

BAT No.	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
	< 1 000 MW_{th} | 41,5 ([45]) | | Lignite-fired, < 1 000 MW_{th} | 36,5 – 40 ([46]) | 31,5 – 39,5 | 75 – 97		
20	In order to prevent or reduce NO_X emissions to air while limiting CO and N_2O emissions to air from the combustion of coal and/or lignite, BAT is to use one or a combination of the techniques given below. a. Combustion optimisation — See description in Section 8.3. Generally used in combination with other techniques — Generally applicable b. Combination of other primary techniques for NO_X reduction (e.g. air staging, fuel staging, flue-gas recirculation, low-NO_X burners (LNB)) — See description in Section 8.3 for each single technique. The choice and performance of (an) appropriate (combination of) primary techniques may be influenced by the boiler design — Generally applicable c. Selective non-catalytic reduction (SNCR) — See description in Section 8.3. Can be applied with 'slip' SCR — The applicability may be limited in the case of boilers with a high cross-sectional area preventing homogeneous mixing of NH_3 and NO_X. The applicability may be limited in the case of combustion plants operated < 1 500 h/yr with highly variable boiler loads d. Selective catalytic — See description in — Not applicable to	FC	The Operator confirmed that: **Technique (a) combustion optimisation** As described in BAT Conclusion 6, combustion is optimised in accordance with plant efficiency, environmental compliance drivers and acceptable CO control. It must be recognised good combustion is complex and involves some trade-off – hence the need to reduce NOx will increase the difficulty to control CO. Since the original PPC permit was granted, a key set of modifications have been implemented on the four units to optimise combustion. **Technique (b) Combination of other primary techniques for NOx reduction** This is applicable. Air and fuel staging is integral to tangential furnaces at the installation, the modifications referred to above effectively optimise these effects as the staged arrangement of burner nozzles and secondary air dampers control combustion. The staging effect means that the lower section of the furnace is under a heavily reduced atmosphere limiting the production of NOx. This is aided with all the units being fitted with Low NOx burner nozzles. **Technique (c) selective non-catalytic reduction (SNCR)** This is not applicable. As noted in this BAT Conclusion, the applicability of SNCR may be limited in the case of combustion plants which operate <1,500 hours/year with highly variable boiler loads. SNCR is only effective at narrow temperature ranges, 370-400˚C if installed at the cold side of the gas path and 760-1093˚C on the hot side of the furnace. Generation has been sporadic during recent operation of the station (post-IED), which has resulted in a high degree of boiler load variation, which makes these tight temperature ranges very difficult to achieve stably. The Operator has chosen to take the <1,500 hours/year route under IED,

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<tr><td>.</td><td>reduction (SCR)</td><td>Section 8.3</td><td>combustion plants of
< 300 MW_{th} operated
< 500 h/yr.
Not generally applicable to combustion plants of
< 100 MW_{th}.
There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr and for existing combustion plants of
≥ 300 MW_{th} operated
< 500 h/yr</td></tr>
<tr><td>e.</td><td>Combined techniques for NO_X and SO_X reduction</td><td>See description in Section 8.3</td><td>Applicable on a case-by-case basis, depending on the fuel characteristics and combustion process</td></tr>
</table>
BAT-associated emission levels (BAT-AELs) for NO_X emissions to air from the combustion of coal and/or lignite
<table>
<tr><th rowspan="3">Combustion plant total rated thermal input (MW_{th})</th><th colspan="4">BAT-AELs (mg/Nm^3)</th></tr>
<tr><th colspan="2">Yearly average</th><th colspan="2">Daily average or average over the sampling period</th></tr>
<tr><th>New plant</th><th>Existing plant (47)</th><th>New plant</th><th>Existing plant (48) (49)</th></tr>
<tr><td>< 100</td><td>100–150</td><td>100–270</td><td>155–200</td><td>165–330</td></tr>
<tr><td>100–300</td><td>50–100</td><td>100–180</td><td>80–130</td><td>155–210</td></tr>
<tr><td>≥ 300, FBC boiler</td><td>50 –</td><td>< 85 –</td><td>80 –</td><td>140 – 165 (52)</td></tr>
</table>
</td><td></td><td>which will restrict the station to a continuing sporadic load pattern.

Technique (d) selective catalytic reduction (SCR)
This is not applicable.

As noted in this BAT Conclusion, the applicability of retrofitting SCR may be limited in the case of combustion plants which operate <1,500 hours/year due to technical and economic restrictions. The Operator has chosen to take the <1,500/year route under IED.

Furthermore, the limited remaining life-time of coal-fired power stations in the UK, place an economic restriction on this as well. The UK government has stated that all UK coal stations will be required to close by the end of 2025 at the latest.

Technique (e) combined techniques for NOx and SOx reduction
This is not applicable due to the combustion process.

In addition to the techniques considered above, it should also be noted that fuel choice is an important parameter. The installation has an Acceptable Fuels List, with any new coals going through a rigorous on-site testing regime in accordance with the new fuel testing procedures to ensure it can be fired within the design parameters for the boilers to reduce NOx emissions whilst limiting CO production. Should it be necessary, fuels are blended and mixed.

The combination of techniques identified will enable NOx compliance with the higher end of the BAT-AEL range for <1,500 hours/year plant:

Daily average NOx - 340 mg/Nm^3) to be achieved from the start of BREF in August 2021 – whilst limiting CO.

The yearly average NOx limit and indicative CO BAT AEL do not apply as the plant is operated <1,500 hours/year.

We have set limits as set out in Section 4.1 of this document.

We agree with the Operator’s stated compliance.</td></tr>
</table>

BAT No.	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

combusting coal and/or lignite and lignite-fired PC boiler	85	150 ([50]) ([51])	125	
≥ 300, coal-fired PC boiler	65 – 85	65 – 150	80 – 125	< 85 – 165 ([53])

As an indication, the yearly average CO emission levels for existing combustion plants operated ≥ 1 500 h/yr or for new combustion plants will generally be as follows:

Combustion plant total rated thermal input (MW_{th})	CO indicative emission level (mg/Nm^3)
< 300	< 30–140
≥ 300, FBC boiler combusting coal and/or lignite and lignite-fired PC boiler	< 30–100 ([54])
≥ 300, coal-fired PC boiler	< 5–100 ([54])

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In order to prevent or reduce SO_X, HCl and HF emissions to air from the combustion of coal and/or lignite, BAT is to use one or a combination of the techniques given below.

	Technique	Description	Applicability
a.	Boiler sorbent injection (in-furnace or in-bed)	See description in Section 8.4	Generally applicable
b.	Duct sorbent injection (DSI)	See description in Section 8.4. The technique can be used for HCl/HF removal when no specific FGD end-of-pipe technique is implemented	
c.	Spray dry absorber (SDA)	See description in Section 8.4	

FC

The Operator confirmed that:

The combinations of techniques used and applicable at the installation are (f) wet flue-gas desulphurisation (wet FGD) and (j) fuel choice. Generally, the other techniques are not applicable where a wet FGD is in place.

Although the installation has a gas gas heater (technique i), it is not applicable as it does not need to be changed at this point of the installed FGDs operational life.

The combination of techniques identified will enable:
SO_2 - 220 mg/Nm^3 (daily average);
HCl - 20 mg/Nm^3 (yearly average); and
HF - 7mg/Nm^3 (yearly average)

We have set limits as set out in Section 4.1 of this document.

We agree with the Operator's stated compliance.

BAT No.	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
	d.	Circulating fluidised bed (CFB) dry scrubber				
	e.	Wet scrubbing	See description in Section 8.4. The techniques can be used for HCl/HF removal when no specific FGD end-of-pipe technique is implemented			
	f.	Wet flue-gas desulphurisation (wet FGD)	See description in Section 8.4	Not applicable to combustion plants operated < 500 h/yr. There may be technical and economic restrictions for applying the technique to combustion plants of < 300 MW_{th}, and for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr		
	g.	Seawater FGD				
	h.	Combined techniques for NO_X and SO_X reduction		Applicable on a case-by-case basis, depending on the fuel characteristics and combustion process		
	i.	Replacement or removal of the gas-gas heater located downstream of the wet FGD	Replacement of the gas-gas heater downstream of the wet FGD by a multi-pipe heat extractor, or removal and discharge of the flue-gas via a cooling tower or a wet stack	Only applicable when the heat exchanger needs to be changed or replaced in combustion plants fitted with wet FGD and a downstream gas-gas heater		

BAT No.	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

j.	Fuel choice	See description in Section 8.4. Use of fuel with low sulphur (e.g. down to 0,1 wt-%, dry basis), chlorine or fluorine content	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. The applicability may be limited due to design constraints in the case of combustion plants combusting highly specific indigenous fuels

BAT-associated emission levels (BAT-AELs) for SO_2 emissions to air from the combustion of coal and/or lignite

Combustion plant total rated thermal input (MW_{th})	BAT-AELs (mg/Nm^3)			
	Yearly average		Daily average	Daily average or average over the sampling period
	New plant	Existing plant ([55])	New plant	Existing plant ([56])
< 100	150–200	150–360	170–220	170–400
100–300	80–150	95–200	135–200	135–220 ([57])
≥ 300, PC boiler	10–75	10–130 ([58])	25–110	25–165 ([59])
≥ 300, Fluidised bed boiler ([60])	20–75	20–180	25–110	50–220

For a combustion plant with a total rated thermal input of more than 300 MW, which is specifically designed to fire indigenous lignite fuels and which can demonstrate that it cannot achieve the BAT-AELs mentioned in Table 4 for techno-economic reasons, the daily average BAT-AELs set out in Table 4 do not apply, and the upper end of the yearly average BAT-AEL

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>range is as follows:
(i) for a new FGD system: RCG × 0,01 with a maximum of 200 mg/Nm^3;
(ii) for an existing FGD system: RCG × 0,03 with a maximum of 320 mg/Nm^3;
in which RCG represents the concentration of SO_2 in the raw flue-gas as a yearly average (under the standard conditions given under General considerations) at the inlet of the SO_X abatement system, expressed at a reference oxygen content of 6 vol- % O_2.
(iii) If boiler sorbent injection is applied as part of the FGD system, the RCG may be adjusted by taking into account the SO_2 reduction efficiency of this technique (η_{BSI}), as follows: RCG (adjusted) = RCG (measured)/(1-η_{BSI}).
BAT-associated emission levels (BAT-AELs) for HCl and HF emissions to air from the combustion of coal and/or lignite
<table>
<tr><th rowspan="2">Pollutant</th><th rowspan="2">Combustion plant total rated thermal input (MW_{th})</th><th colspan="2">BAT-AELs (mg/Nm^3)</th></tr>
<tr><th colspan="2">Yearly average or average of samples obtained during one year</th></tr>
<tr><th></th><th></th><th>New plant</th><th>Existing plant (61)</th></tr>
<tr><td rowspan="2">HCl</td><td>< 100</td><td>1–6</td><td>2–10 (62)</td></tr>
<tr><td>≥ 100</td><td>1–3</td><td>1–5 (62) (63)</td></tr>
<tr><td rowspan="2">HF</td><td>< 100</td><td>< 1–3</td><td>< 1–6 (64)</td></tr>
<tr><td>≥ 100</td><td>< 1–2</td><td>< 1–3 (64</td></tr>
</table></td><td></td><td></td></tr>
<tr><td>22</td><td>In order to reduce dust and particulate-bound metal emissions to air from the combustion of coal and/or lignite, 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>Electrostatic precipitator (ESP)</td><td rowspan="2">See description in Section 8.5</td><td rowspan="2">Generally applicable</td></tr>
<tr><td>b.</td><td>Bag filter</td></tr>
</table></td><td>FC</td><td>The Operator confirmed that:

The combinations of techniques used and applicable at the installation are (a) electrostatic precipitator and (e) wet FGD. Generally, the other techniques are not applicable where (a) and (e) are present.

The installation also operates the technique of sulphur trioxide injection. Furthermore, fuel choice is a factor for dust compliance and is considered as part of the new fuel testing procedures.</td></tr>
</table>

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<tr><td>c.</td><td>Boiler sorbent injection (in-furnace or in-bed)</td><td rowspan="3">See descriptions in Section 8.5. The techniques are mainly used for SO_X, HCl and/or HF control</td><td></td></tr>
<tr><td>d.</td><td>Dry or semi-dry FGD system</td><td></td></tr>
<tr><td>e.</td><td>Wet flue-gas desulphurisation (wet FGD)</td><td>See applicability in BAT 21</td></tr>
</table>
BAT-associated emission levels (BAT-AELs) for dust emissions to air from the combustion of coal and/or lignite
<table>
<tr><th rowspan="2">Combustion plant total rated thermal input (MW_{th})</th><th colspan="4">BAT-AELs (mg/Nm^3)</th></tr>
<tr><th colspan="2">Yearly average</th><th colspan="2">Daily average or average over the sampling period</th></tr>
<tr><th>New plant</th><th>Existing plant (65)</th><th>New plant</th><th>Existing plant (66)</th></tr>
<tr><td>< 100</td><td>2–5</td><td>2–18</td><td>4–16</td><td>4–22 (67)</td></tr>
<tr><td>100–300</td><td>2–5</td><td>2–14</td><td>3–15</td><td>4–22 (68)</td></tr>
<tr><td>300–1 000</td><td>2–5</td><td>2–10 (69)</td><td>3–10</td><td>3–11 (70)</td></tr>
<tr><td>≥ 1 000</td><td>2–5</td><td>2–8</td><td>3–10</td><td>3–11 (71)</td></tr>
</table>
</td><td></td><td>The combination of techniques identified will enable:

Dust - 14 mg/Nm^3 (daily average)

We have set limits as set out in Section 4.1 of this document.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td>23</td><td>In order to prevent or reduce mercury emissions to air from the combustion of coal and/or lignite, 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 colspan="4">Co-benefit from techniques primarily used to reduce emissions of other pollutants</td></tr>
<tr><td>a.</td><td>Electrostatic precipitator (ESP)</td><td>See description in Section 8.5.
Higher mercury removal</td><td>Generally applicable</td></tr>
</table>
</td><td>FC</td><td>The Operator confirmed that:

The combination of techniques used and applicable at the installation, which provide a co-benefit in respect of mercury emissions, are:

(a) Electrostatic precipitators – YES
(b) Bag filters – NO
(c) Dry or semi-dry FGD system – NO
(d) Wet flue-gas desulphurisation (wet FGD) – YES
(e) Selective catalytic reduction (SCR) – NO</td></tr>
</table>

BAT No.	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
			efficiency is achieved at flue-gas temperatures below 130 °C. The technique is mainly used for dust control			Specific techniques used and applicable to reduce mercury emissions are: (f) Carbon sorbent injection in the flue-gas – NO (g) Use of halogenated additives in the fuel or injected in the furnace – NO (h) Fuel pre-treatment – NO (i) Fuel choice – YES The combination of existing co-benefit techniques identified, as well as the specific technique of fuel choice, will enable: Mercury - 4 µg/Nm^3 (yearly average) We have set limits as set out in Section 4.1 of this document. We agree with the Operator's stated compliance.
	b.	Bag filter	See description in Section 8.5. The technique is mainly used for dust control			
	c.	Dry or semi-dry FGD system	See descriptions in Section 8.5. The techniques are mainly used for SO_X, HCl and/or HF control			
	d.	Wet flue-gas desulphurisation (wet FGD)		See applicability in BAT 21		
	e.	Selective catalytic reduction (SCR)	See description in Section 8.3. Only used in combination with other techniques to enhance or reduce the mercury oxidation before capture in a subsequent FGD or dedusting system. The technique is mainly used for NO_X control	See applicability in BAT 20		
	Specific techniques to reduce mercury emissions					
	f.	Carbon sorbent (e.g. activated carbon or halogenated activated carbon) injection in the flue-gas	See description in Section 8.5. Generally used in combination with an ESP/bag filter. The use of this technique may require additional treatment steps to further segregate the mercury-containing carbon fraction prior to further	Generally applicable		

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td></td><td>reuse of the fly ash</td><td></td></tr>
<tr><td>g.</td><td>Use of halogenated additives in the fuel or injected in the furnace</td><td>See description in Section 8.5</td><td>Generally applicable in the case of a low halogen content in the fuel</td></tr>
<tr><td>h.</td><td>Fuel pretreatment</td><td>Fuel washing, blending and mixing in order to limit/reduce the mercury content or improve mercury capture by pollution control equipment</td><td>Applicability is subject to a previous survey for characterising the fuel and for estimating the potential effectiveness of the technique</td></tr>
<tr><td>i.</td><td>Fuel choice</td><td>See description in Section 8.5</td><td>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>
</table>
BAT-associated emission levels (BAT-AELs) for mercury emissions to air from the combustion of coal and lignite
<table>
<tr><th rowspan="3">Combustion plant total rated thermal input (MW_{th})</th><th colspan="4">BAT-AELs ($\mu g/Nm^3$)</th></tr>
<tr><th colspan="4">Yearly average or average of samples obtained during one year</th></tr>
<tr><th colspan="2">New plant</th><th colspan="2">Existing plant ([72])</th></tr>
<tr><th>coal</th><th>lignite</th><th>coal</th><th>lignite</th></tr>
<tr><td>< 300</td><td>< 1–3</td><td>< 1–5</td><td>< 1–9</td><td>< 1–10</td></tr>
<tr><td>≥ 300</td><td>< 1–2</td><td>< 1–4</td><td>< 1–4</td><td>< 1–7</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>2.2.1 Table</td><td>BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of solid biomass and/or peat</td><td>NA</td><td>The Operator confirmed that this is not applicable to the activities carried out at the installation.</td></tr>
</table>

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td>8</td><td>
<table>
<tr><th rowspan="2">Type of combustion unit</th><th colspan="4">BAT-AEELs [73] [74]</th></tr>
<tr><th colspan="2">Net electrical efficiency (%) [75]</th><th colspan="2">Net total fuel utilisation (%) [76] [77]</th></tr>
<tr><th>New unit [78]</th><th>Existing unit</th><th>New unit</th><th>Existing unit</th></tr>
<tr><td>Solid biomass and/or peat boiler</td><td>33,5–to > 38</td><td>28–38</td><td>73–99</td><td>73–99</td></tr>
</table>
</td><td></td><td>The existing permit authorises the LCP130 and LCP131 boilers to combust biomass. We have amended the permit to limit the boilers to the combustion of coal only.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td>24</td><td>In order to prevent or reduce NO_X emissions to air while limiting CO and N_2O emissions to air from the combustion of solid biomass and/or peat, 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>Combustion optimisation</td><td rowspan="5">See descriptions in Section 8.3</td><td rowspan="5">Generally applicable</td></tr>
<tr><td>b.</td><td>Low-NO_X burners (LNB)</td></tr>
<tr><td>c.</td><td>Air staging</td></tr>
<tr><td>d.</td><td>Fuel staging</td></tr>
<tr><td>e.</td><td>Flue-gas recirculation</td></tr>
<tr><td>f.</td><td>Selective non-catalytic reduction (SNCR)</td><td>See description in Section 8.3.
Can be applied with ‘slip’ SCR</td><td>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.
For existing combustion plants, applicable within the</td></tr>
</table>
</td><td>NA</td><td>As above.</td></tr>
</table>

BAT No.	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

			constraints associated with the required temperature window and residence time for the injected reactants
g.	Selective catalytic reduction (SCR)	See description in Section 8.3. The use of high-alkali fuels (e.g. straw) may require the SCR to be installed downstream of the dust abatement system	Not applicable to combustion plants operated < 500 h/yr. There may be economic restrictions for retrofitting existing combustion plants of < 300 MW_{th}. Not generally applicable to existing combustion plants of < 100 MW_{th}

BAT-associated emission levels (BAT-AELs) for NO_X emissions to air from the combustion of solid biomass and/or peat

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 ([79])	New plant	Existing plant ([80])
50–100	70–150 ([81])	70–225 ([82])	120–200 ([83])	120–275 ([84])
100–300	50–140	50–180	100–200	100–220
≥ 300	40–140	40–150 ([85])	65–150	95–165 ([86])

As an indication, the yearly average CO emission levels will generally be:

— < 30–250 mg/Nm^3 for existing combustion plants of 50–100 MW_{th}

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>operated ≥ 1 500 h/yr, or new combustion plants of 50–100 MW_{th},
— < 30–160 mg/Nm^3 for existing combustion plants of 100–300 MW_{th} operated ≥ 1 500 h/yr, or new combustion plants of 100–300 MW_{th},
— < 30–80 mg/Nm^3 for existing combustion plants of ≥ 300 MW_{th} operated ≥ 1 500 h/yr, or new combustion plants of ≥ 300 MW_{th}.</td><td></td><td></td></tr>
<tr><td>25</td><td>In order to prevent or reduce SO_X, HCl and HF emissions to air from the combustion of solid biomass and/or peat, 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>Boiler sorbent injection (in-furnace or in-bed)</td><td rowspan="7">See descriptions in Section 8.4</td><td rowspan="6">Generally applicable</td></tr>
<tr><td>b.</td><td>Duct sorbent injection (DSI)</td></tr>
<tr><td>c.</td><td>Spray dry absorber (SDA)</td></tr>
<tr><td>d.</td><td>Circulating fluidised bed (CFB) dry scrubber</td></tr>
<tr><td>e.</td><td>Wet scrubbing</td></tr>
<tr><td>f.</td><td>Flue-gas condenser</td></tr>
<tr><td>g.</td><td>Wet flue-gas desulphurisation (wet FGD)</td><td>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</td></tr>
</table></td><td>NA</td><td>As above.</td></tr>
</table>

BAT No.	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

h.	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

BAT-associated emission levels (BAT-AELs) for SO_2 emissions to air from the combustion of solid biomass and/or peat

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 (87)	New plant	Existing plant (88)
< 100	15–70	15–100	30–175	30–215
100–300	< 10–50	< 10–70 (89)	< 20–85	< 20–175 (90)
≥ 300	< 10–35	< 10–50 (89)	< 20–70	< 20–85 (91)

BAT-associated emission levels (BAT-AELs) for HCl and HF emissions to air from the combustion of solid biomass and/or peat

Combustion plant total rated thermal input (MW_{th})	BAT-AELs for HCl (mg/Nm^3) (92) (93)				BAT-AELs for HF (mg/Nm^3)	
	Yearly average or average of samples obtained during one year		Daily average or average over the sampling period		Average over the sampling period	
	New plant	Existing plant (94)	New	Existing	New	Existing

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<tr><th></th><th>t</th><th>(95)</th><th>plant</th><th>plant (96)</th><th>plant</th><th>plant (96)</th></tr>
<tr><td>< 100</td><td>1–7</td><td>1–15</td><td>1–12</td><td>1–35</td><td>< 1</td><td>< 1,5</td></tr>
<tr><td>100–300</td><td>1–5</td><td>1–9</td><td>1–12</td><td>1–12</td><td>< 1</td><td>< 1</td></tr>
<tr><td>≥ 300</td><td>1–5</td><td>1–5</td><td>1–12</td><td>1–12</td><td>< 1</td><td>< 1</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>26</td><td>
In order to reduce dust and particulate-bound metal emissions to air from the combustion of solid biomass and/or peat, 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>Electrostatic precipitator (ESP)</td><td rowspan="2">See description in Section 8.5</td><td rowspan="2">Generally applicable</td></tr>
<tr><td>b.</td><td>Bag filter</td></tr>
<tr><td>c.</td><td>Dry or semi-dry FGD system</td><td rowspan="2">See descriptions in Section 8.5 The techniques are mainly used for SO_X, HCl and/or HF control</td><td></td></tr>
<tr><td>d.</td><td>Wet flue-gas desulphurisation (wet FGD)</td><td>See applicability in BAT 25</td></tr>
<tr><td>e.</td><td>Fuel choice</td><td>See description in Section 8.5</td><td>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>
</table>
BAT-associated emission levels (BAT-AELs) for dust emissions to air from the combustion of solid biomass and/or peat
<table>
<tr><th rowspan="2">Combustion plant total rated thermal input (MW_{th})</th><th colspan="2">BAT-AELs for dust (mg/Nm^3)</th></tr>
<tr><th>Yearly average</th><th>Daily average or average over the sampling period</th></tr>
</table>
</td><td>NA</td><td>As above.</td></tr>
</table>

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<tr><th></th><th>New plant</th><th>Existing plant (97)</th><th>New plant</th><th>Existing plant (98)</th></tr>
<tr><td>< 100</td><td>2–5</td><td>2–15</td><td>2–10</td><td>2–22</td></tr>
<tr><td>100–300</td><td>2–5</td><td>2–12</td><td>2–10</td><td>2–18</td></tr>
<tr><td>≥ 300</td><td>2–5</td><td>2–10</td><td>2–10</td><td>2–16</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>27</td><td>
In order to prevent or reduce mercury emissions to air from the combustion of solid biomass and/or peat, 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 colspan="4">Specific techniques to reduce mercury emissions</td></tr>
<tr><td>a.</td><td>Carbon sorbent (e.g. activated carbon or halogenated activated carbon) injection in the flue-gas</td><td rowspan="3">See descriptions in Section 8.5</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Use of halogenated additives in the fuel or injected in the furnace</td><td>Generally applicable in the case of a low halogen content in the fuel</td></tr>
<tr><td>c.</td><td>Fuel choice</td><td>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>
<tr><td colspan="4">Co-benefit from techniques primarily used to reduce emissions of other pollutants</td></tr>
<tr><td>d.</td><td>Electrostatic precipitator (ESP)</td><td rowspan="2">See descriptions in Section 8.5. The techniques</td><td rowspan="2">Generally applicable</td></tr>
<tr><td>e.</td><td>Bag filter</td></tr>
</table>
</td><td>NA</td><td>As above.</td></tr>
</table>

BAT No.	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
	<table><tr><td></td><td></td><td>are mainly used for dust control</td><td></td></tr><tr><td>f.</td><td>Dry or semi-dry FGD system</td><td rowspan="2">See descriptions in Section 8.5. The techniques are mainly used for SO_X, HCl and/or HF control</td><td></td></tr><tr><td>g.</td><td>Wet flue-gas desulphurisation (wet FGD)</td><td>See applicability in BAT 25</td></tr></table> The BAT-associated emission level (BAT-AEL) for mercury emissions to air from the combustion of solid biomass and/or peat is < 1–5 µg/Nm^3 as average over the sampling period.		
Combustion of liquid fuels in boilers - Table 13 and BAT Conclusions 28 to 30 not applicable – deleted Combustion of liquid fuels in reciprocating engines – BAT Conclusions 31 to 35 not applicable - deleted			
Combustion of liquid fuels (LCP456, LCP457) gas oil fired gas turbines – (< 500 hours/year)			
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. <table><tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr><tr><td>a.</td><td>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></table> **BAT-associated energy efficiency levels (BAT-AEELs) for gas-oil-fired gas turbines** <table><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></table>	NA	Note 1 to Table 21 confirms that these BAT AEELS do not apply to plants operated < 1,500 hours/year. LCP456 and LCP457 are authorised to operate for < 500 hours/year. Refer to Section 4.2 of this document. We agree that this BAT Conclusion is not applicable to the activities carried out at the installation.

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<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>
</table>
</td><td></td><td></td></tr>
<tr><td>37</td><td>
In order to prevent or reduce NO_X 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.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Water/steam addition</td><td rowspan="3">See description in Section 8.3</td><td>The applicability may be limited due to water availability</td></tr>
<tr><td>b.</td><td>Low-NO_X burners (LNB)</td><td>Only applicable to turbine models for which low-NO_X burners are available on the market</td></tr>
<tr><td>c.</td><td>Selective catalytic reduction (SCR)</td><td>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</td></tr>
</table>
</td><td>CC</td><td>
The Operator confirmed that:

OCGTs that operate for <500 hours/year are subject to indicative daily BAT AELs only. Whilst there is not an indicative NOx BAT AEL applicable to the Avon dedicated oil-fired system, the Avon NOx emission (300 mg/m^3) is only 20% higher than the Dual-fuel indicative BAT AEL: 145 - 250 mg/m^3 at 15% O_2, dry, 273K, 101.3 kPa. In any case, there are no commercially available NOx reduction options.

A BAT assessment for existing gas, liquid and dual fuel fired OCGT and combined cycle gas turbines (CCGT) with a thermal input rating of 50 MWth or greater which operate for < 500 hours/year has been put together by the JEP Group. This assessment contained a flow chart which determined BAT for specific conclusions and conditions, the flow chart and compliance path for the installation are provided in Appendix C & D of the BAT Conclusion response.

Appendix C - OCGT <500hr BAT Assessment Flow Chart (NOx) concludes that BAT is currently permitted performance and appropriate maintenance.

Appendix D - OCGT <500hr BAT Assessment Flow Chart (SO_2 & dust) concludes that the plant meets the requirements of this BAT Conclusion.

The BAT AELs are not applicable for emergency plant, but indicative BAT applies to other <500 hour/year plant.

The Operator confirmed that the plant does not meet the BAT Conclusions definition for emergency plant.

The NOx BAT AEL under BAT Conclusion 38 does not apply to gas oil only gas turbines as it specifically references dual fuel. This AEL is therefore not relevant. However we have applied a NOx limit (applicable to all < 500 hour/year plant) based on what the plant can achieve. This is below 500 mg/m^3 as specified as a guideline in the BAT for Balancing Markets guidance.
</td></tr>
</table>

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>They also confirmed that:

The two gas turbines do not use any of the techniques identified in BAT37.

For techniques (a) to (b) (water/steam addition and low NOx burners) there are no commercially available NOx reduction options. Further information on this is set out in the JEP Document JEP17EMG02: Maintaining the Emissions Performance of Open Cycle Gas Turbines that Operate for Less Than 500 Hours Per Year. Section 3.3 of this document confirms that no NOx reduction options are available and that this has been checked with the Original Equipment Manufacturer (OEM) and third party organisations.

For technique (c) (selective catalytic reduction) this is not used. As noted in the applicability section of this BAT Conclusion, this is not applicable to combustion plants operated < 500 hours/year as is the case for LCP456 and LCP457.

An additional JEP document was referenced, JEP19AIB08: BAT Assessment for Existing Natural Gas, Gas Oil and Dual-Fuel Fired OCGTs and CCGTs with a Thermal Input Rating of 50MWth or Greater Operating < 500 Hours Per Year. This document concludes that for gas turbines like LCP456 and LCP457 an appropriate maintenance regime is considered to represent BAT as this will maintain existing performance levels.

We have set limits as set out in Section 4.1 of this document.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td>38</td><td>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.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Combustion optimisation</td><td rowspan="2">See description in Section 8.3</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Oxidation catalysts</td><td>Not applicable to combustion plants operated < 500 h/yr.</td></tr>
</table></td><td>CC</td><td>The Operator confirmed that:

OCGTs that operate for < 500 hours/year are subject to indicative daily BAT-AELs only.

Emissions reporting will continue to be based on Emission Factors and fixed emission concentrations which may be revised following a recent data review. A maintenance based approach will be adopted to maintain general emissions performance.</td></tr>
</table>

<table>
<tr><th>BAT No.</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td></td><td></td><td>Retrofitting existing combustion plants may be constrained by the availability of sufficient space</td></tr>
</table>
As an indication, the emission level for NO_X emissions to air from the combustion of gas oil in dual fuel gas turbines for emergency use operated < 500 h/yr will generally be 145–250 mg/Nm^3 as a daily average or average over the sampling period.</td><td></td><td>Refer to BAT Conclusion 37 above.

We have set limits as set out in Section 4.1 of this document.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td>39</td><td>In order to prevent or reduce SO_X and dust emissions to air from the combustion of gas oil in gas turbines, BAT is to use the technique given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Fuel choice</td><td>See description in Section 8.4</td><td>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>
</table>
BAT-associated emission levels for SO_2 and dust emissions to air from the combustion of gas oil in gas turbines, including dual fuel gas turbines
<table>
<tr><th rowspan="2">Type of combustion plant</th><th colspan="4">BAT-AELs (mg/Nm^3)</th></tr>
<tr><th colspan="2">SO_2</th><th colspan="2">Dust</th></tr>
<tr><th>Yearly average (134)</th><th>Daily average or average over the sampling period (135)</th><th>Yearly average (134)</th><th>Daily average or average over the sampling period (135)</th></tr>
<tr><td>New and existing plants</td><td>35–60</td><td>50–66</td><td>2–5</td><td>2–10</td></tr>
</table></td><td>CC</td><td>The Operator confirmed that:

The sulphur content of the fired gas oil is regulated to ≤ 0.1% by mass, equivalent to 55 mg/m^3 SO_2 in the flue gas (BAT AEL: 50 - 66 mg/m^3).

The CO emission is of the order of 100 mg/m^3 and there is no BAT AEL. The smoke emission, during normal operation, has a peak value of ≤ 2 on the Bacharach scale which equates to a reportable smoke emission of 1.0 mg/m^3. When this is combined with the particulate emission, that is related to the maximum possible fuel ash content, the total dust emission is then 3.4 mg/m^3 (BAT AEL: 2 - 10 mg/m^3). All of the Avon emissions are therefore fully compliant with the applicable indicative daily BAT AELs during normal operation.

Emissions reporting will continue to be based on emission factors and fixed emission concentrations which may be revised following a recent data review. A maintenance based approach will therefore be adopted to maintain general emissions performance.

Refer to BAT Conclusion 37 above for the BAT assessment put together by the JEP Group.

We have set limits as set out in Section 4.1 of this document.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td colspan="4">Combustion of gaseous fuels – BAT Conclusion 40 to 45 not applicable-deleted
Iron and steel process gases - BAT Conclusions 46 to 51 deleted
Offshore platforms – BAT Conclusions BAT 52 to 54 deleted
Chemical process gases – BAT Conclusions BAT 55 to 59 deleted</td></tr>
</table>

BAT No.	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
Co-incineration – BAT Conclusions 60 to 71 deleted **Gasification – BAT Conclusions 72 to 75 deleted**			

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.

We received no such request from the Operator.

7. Emissions to water

The consolidated permit incorporates the four current discharges to controlled waters identified as W1 to W4. W2 is the discharge from the flue-gas waste water treatment plant.

7.1 BAT Conclusion 15
This BAT Conclusion requires the Operator to reduce emissions to water from flue-gas treatment. Also refer to Section 5 of this document.

It should be noted some techniques essentially duplicate the outcome produced by other techniques and hence become not applicable.

Technique	Justification
(a) optimised combustion and flue-gas treatment systems	This is applicable. Wet FGD system, as well as suitable fuel, is utilised as identified in BAT Conclusion 21. SCR/SNCR is not applicable as explained in BAT Conclusion 20.
(b) adsorption on activated carbon	This is not applicable. The optimised combustion process results in very low levels of organic carbon compounds in the FGD waste water treatment plant (WWTP). Similarly, the FGD WWTP is designed to treat mercury and therefore records results typically below the limit of detection.
(c) aerobic biological treatment	This is not applicable. Organic compounds are low and SCR/SNCR is not utilised in the process. The FGD WWTP deals with this already, producing a sludge which removes relevant species prior to the WWTP effluent release.
(d) Anoxic / anaerobic biological treatment	This is not applicable. As described above, the FGD WWTP is designed to treat mercury and therefore records results typically below the limit of detection.
(e) coagulation and flocculation	This is applicable and a technique which is part of the FGD WWTP design.
(f) crystallisation	This is applicable and a technique which is part of the FGD WWTP design. Through the addition of relevant chemicals, metals are crystallised / precipitated.
(g) filtration	This is applicable and a technique (specifically sand filtration) which is part of the FGD WWTP design. Along with coagulation and flocculation, this produces suspended solid results routinely below the limit of detection.
(h) flotation	This is partially applicable. As described above, there is a filtration system in place as part of the FGD WWTP design, as well as coagulation and flocculation, so it is not needed for suspended solids. Whilst free oil is not an issue, the holding pond pumps from the bottom of the pond, hence any free oil would be retained on the surface of the holding pond and identified during routine visual inspections.
(i) ion exchange	This is not applicable due to the use of technique (f) crystallisation, as described above.
(j) neutralisation	This is applicable. The pH is raised as part of the FGD WWTP design, in order to treat the raw effluent. Later chemical addition, as part of the treatment process, neutralises the effluent by default.

(k) oxidation	This is not applicable. By design, the FGD absorbers include an oxidation step in order to produce gypsum. Although some sulphide is added as part of the FGD WWTP process in order to treat metals, the FGD WWTP has been optimised and so the sulphide is expected to be utilised. This is observed in what limited sulphite / sulphide results are available; and is discussed further in BAT Conclusion 5.
(l) precipitation	This is applicable and a technique which is part of the FGD WWTP design. Through the addition of relevant chemicals, metals are crystallised / precipitated.
(m) sedimentation	This is applicable and is part of the FGD WWTP design, i.e. it includes steps which promote settling out.
(n) stripping	This is not applicable. As described in BAT Conclusion 20, SCR/SNCR is not applicable and so ammonia is not produced and required to be abated.

7.2 Demonstrating BAT-AEL compliance

The UK Regulators' Large Combustion Plant Best Available Techniques Interpretation Document identifies that the FGD WWTP should be monitored for BAT AEL compliance at an appropriate point. The exact location is to be justified on a site specific basis, taking into account current performance compared to the BAT AELs. There should also be no backsliding from current ELVs without appropriate justification.

Furthermore, where monitoring for BAT AEL compliance purposes takes place upstream of the final discharge point the monitoring value corresponding to the BAT AEL compliance may differ from the numeric value in the BREF and will need to be set reflecting the specific installation arrangements.

For the installation, the Operator has confirmed the most appropriate compliance point is the installation boundary. The discharge from the effluent treatment plant will be controlled to secure compliance with the BAT AELs at the installation boundary. We have defined this as W7 in the permit.

The monitoring point at W2 will, however, be upstream of the installation boundary, to reflect where current monitoring equipment is installed, i.e. when the FGD WWTP effluent leaves the FGD WWTP holding pond. This will enable existing instrumentation to be used at a secure place with existing power supply, reflecting the site specific installation arrangements.

7.3 Cadmium and lead

Based on the assessment of current performance, the limits to be specified at W2 are consistent with the BAT AELs except for cadmium and lead.

For cadmium and lead a worst-case scenario has been calculated to demonstrate that BAT AEL compliance at the installation boundary (W7) will be achieved if the limits at W2 remain the same as the current permit limits. It

is therefore proposed that the current permit limits for cadmium and lead are maintained, applying at W2, the existing monitoring point.

Compliance with these existing limits at this location will ensure compliance with the BAT AELs at the installation boundary.

As per BAT Conclusion 13, the Operator has identified an opportunity to re-use treated waste water from its FGD WWTP. This would enable the treated effluent to be returned to the production process, available for re-use, via the cooling tower ponds, serving to reduce water abstraction by 1-2%/year.

The worst-case scenario is based on the maximum permitted discharge rate from the FGD WWTP entering the cooling tower ponds.

This is 6,048 m^3/day, although historically the highest discharge rate between 2016-2018 was recorded at 1,540 m^3/day.

Cooling tower capacity is 123,650 m^3/day.

Although the FGD WWTP treated effluent will be re-used, should the cooling tower ponds be discharged, the concentrations at the installation boundary have been calculated.

For FGD WWTP concentration data, the current permit limit has been assumed (i.e. worst-case performance).

For the cooling tower concentration data, the highest concentration results from 2016-2018 analysis has been used (i.e. worst-case values). This scenario is presented in the tables below.

Cadmium	FGD WWTP monitoring point (W2)	Cooling tower ponds
Concentration (µg/l)	25	0.2
Water volume (m^3)	6,048	123,650
Weighting	0.05	0.95
Combined concentration (µg/l)	1.4	
Installation boundary BAT-AEL (µg/l)	5	

Lead	FGD WWTP monitoring point (W2)	Cooling tower ponds
Concentration (µg/l)	200	1
Water volume (m^3)	6,048	123,650
Weighting	0.05	0.95
Combined concentration (µg/l)	3.3	
Installation boundary BAT-AEL (µg/l)	20	

We have looked at the calculations in the table above and for lead the combined concentration would be 10.95 µg/l, however this is still compliant with the BAT AEL. This shows, even with worst-case performance, that there is a wide margin of compliance at the installation boundary (W7).

In the unlikely event of poorer FGD WWTP performance, it indicates compliance will still be achieved.

In the unlikely event of FGD WWTP performance outside current environmental permit limits, the Operator would conduct an event-specific calculation to determine whether a breach of the BAT AEL at the installation boundary (W7) would have actually occurred.

7.4 Proposed limits

Consequently, the Operator's proposed monitoring limits are shown in the table below, along with a comparison against installation boundary (W7) BAT AELs and current permit limits for ease of reference.

Importantly, for cadmium and lead, there is no backsliding from current limits at the W2 monitoring point. Cooling tower concentration data will continue to be collected to confirm the worst-case scenario remains valid.

For fluoride the existing permit limit is 20 mg/l and not 50 mg/l as stated in the table below. The Operator confirmed that the existing concentration limit for fluoride is indeed 20 mg/l. Based on the principle of no backsliding they confirm that the proposed monitoring limit should also be 20 mg/l.

Parameter	BAT-AEL	Unit	Current Permit Limit	Proposed monitoring limit
TOC	50	mg/l	None	50
TSS	30	mg/l	30	30
F	25	mg/l	50	25
Sulphate	2	g/l	None	2
Sulphide	0.2	mg/l	None	0.2 (+)
Sulphite	20	mg/l	None	20 (+)
Arsenic	50	µg/l	100	50
Cadmium	5	µg/l	25	25
Chromium	50	µg/l	500	50
Copper	50	µg/l	150	50
Mercury	3	µg/l	30	3
Nickel	50	µg/l	200	50
Lead	20	µg/l	200	200
Zinc	200	µg/l	500	200

(+) = see discussion about potential sampling limitations in BAT 5

The Operator confirmed that any exceedance of a limit at W2 would result in a an event-specific assessment to determine whether an actual BAT AEL breach would have occurred at the installation boundary.

As per BAT Conclusion 5 and this BAT Conclusion, either the BAT AEL for TOC or COD applies. TOC is the Operator's preferred option.

Compliance will be on the higher end of the BAT AELs in this BAT Conclusion and will be achievable once the appropriate modifications have been implemented.

We have set limits in Table S3.2a of the permit based on the Operator's proposal. The limits for cadmium and lead at W7 will be calculated from the monitoring undertaken at emission point W2.

This is based solely on the BREF and not the Water Framework Directive (WFD).

7.5 Water Framework Directive

In addition to the review of compliance against the relevant BAT Conclusions for emissions to water, this permit review also provides an opportunity to consider whether the discharge to surface water will maintain River Quality Objectives (RQOs) in the receiving watercourse to ensure the water quality objectives under the WFD will be met.

The emissions have reduced significantly and will do further once the LCPs are limited to <1,500 hours/year from 01 July 2020. There are also plans for the closure of UK coal fired power stations by 2025. On this basis and the introduction of tighter BAT AELS it is not necessary to implement further limits based on the river needs.

8 Additional IED Chapter II requirements:

Condition/table	Justification	
Condition 2.3.6 added (Existing conditions renumbered)	LCP130 and LCP131 From 01 July 2020 (end of the TNP), the Operator has proposed that the LCPs operate for <1,500 hours/year.	
Condition 2.3.9 and improvement condition IC15 added	In the event of a black out National Grid would call on combustion plant to operate and may require them to do so outside their permitted conditions. We have dedicated black start plant and they are permitted to run as such but this scenario is relevant to the rest of the LCP which could be called depending on the circumstances. A risk assessment will be carried out by Energy UK/Joint Environmental Programme on behalf of LCP connected to the National Transmission System. Air emissions modelling will be based on generic black start scenarios to establish whether they have the potential to have a local impact on the environment or not (on a national basis). If the modelling demonstrates that no significant impacts are likely, the plant can operate under condition 2.3.9. This condition allows the hourly ELVs for plants operating under a black start instruction to be discounted for the purpose of reporting. We would also require there to be a procedure in place for minimisation of emissions in the case of a black start event and for reporting in the event of a black start. This modelling and the procedures have not been agreed in advance of the issue of the permit review and therefore a condition linking back to an improvement condition has been included in the permit.	
Tables S1.1, S1.2 and S2.2 amended	The ability to co-fire biomass in LCP130 and LCP131 is no longer required.	
Table S1.1 amended	To add the diesel generators for black start support for OCGTs.	
Table S1.3 amended to confirm completion of improvement conditions	From receipt of lime-stone to dispatch of gypsum off site and discharge of waste water to the wastewater treatment plant	29 March 2016
	IC7 complete	22 December 2016
	IC11 complete	16 January 2018
	IC12 complete	27 January 2016

	IC13 complete	20 April 2016
Table S2.1 amended	To remove ‘tall-oil’. The operator confirmed that it is no longer used and can be removed.	
Table S2.2 amended	To remove relevant exempt biomass which is no longer used.	
Table S2.3 amended	To remove waste code 10 01 02 for PFA produced at Cottam Power Station. The power station has ceased operation.	
Table S3.3 amended	To reduce annual limits to water at emission point W2 from 17 August 2021, in accordance with the reduction in limits.	
Schedule 7 site plan	Updated to amend emissions to water.	

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 regulation 61 response, 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	The application is within the relevant distance criteria of a site of heritage, landscape or nature conservation, and/or protected species or habitat. 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. We have not consulted Natural England on the application. The decision was taken in accordance with our guidance.
Operating techniques	
General operating techniques	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. The permit conditions ensure compliance with the relevant BREF, BAT Conclusions. The ELVs deliver compliance with the BAT AELs.

Aspect considered	Decision
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.
Improvement programme	Based on the information on the application, we consider that we need to impose an improvement programme. We have imposed an improvement programme to ensure compliance with the relevant BAT Conclusions. This is described in the relevant sections of this document.
Emission limits	We have decided that emission limits should be set for the parameters listed in the permit. These are described in the relevant BAT Conclusions in Sections 4.1 and 5 of this document. It is considered that the ELVs described above will ensure that significant pollution of the environment is prevented and a high level of protection for the environment is secured.
Monitoring	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. These are described in the relevant BAT Conclusions in Section 5 of this document. Table S3.4 Process monitoring requirements was

Aspect considered	Decision
	amended to include the requirement to monitor energy efficiency after overhauls on site in line with BAT Conclusion 2. Based on the information in the Regulation 61 response, we are satisfied that the Operator's techniques, personnel and equipment have either MCERTS certification or MCERTS accreditation as appropriate.
Reporting	We have specified reporting in the permit for the monitored parameters. These are described in the relevant BAT Conclusions in Section 5 of this document.
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	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. Paragraph 1.3 of the guidance says: "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." 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

Aspect considered	Decision
	at the expense of necessary protections. 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.