

## 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/CP3939QN  
The Operator is: RWE Generation UK PLC  
The Installation is: Seal Sands Power Station  
This Variation Notice number is: EPR/CP3939QN/V002

### 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 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.

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

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

## How this document is structured

### Glossary of terms

- 1 Our decision
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- 2.2 Review of our own information in respect to the capability of the installation to meet revised standards included in the BAT Conclusions document
- 3 The legal framework
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- 6 Review and assessment of derogation requests made by the Operator in relation to BAT Conclusions which include an associated emission level (AEL) value
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- 9 Review and assessment of changes that are not part of the BAT Conclusions derived permit review.

## Glossary of acronyms used in this document

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

APC	Air Pollution Control
BAT	Best Available Technique(s)
BAT-AEEL	BAT Associated Energy Efficiency Level
BAT-AEL	BAT Associated Emission Level
BATc	BAT conclusion
BREF	Best available techniques reference document
CCGT	Combined Cycle Gas Turbine
CEM	Continuous emissions monitor
CHP	Combined heat and power
CV	Calorific value
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
DLN	Dry Low NOx burners
DLN-E	Dry Low NOx effective
EIONET	European environment information and observation network is a partnership network of the European Environment Agency
ELV	Emission limit value derived under BAT or an emission limit value set out in IED
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No. 1154)
EWC	European waste catalogue
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 <sub>2</sub> expressed as NO <sub>2</sub> )
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 and other relevant legislation. This document does not therefore include an explanation for these standard conditions. Where they are included in the notice, we have considered the techniques identified by the Operator for the operation of their installation, and have accepted that the details are sufficient and satisfactory to make those standard conditions appropriate. This document does, however, provide an explanation of our use of “tailor-made” or installation-specific conditions, or where our permit template provides two or more options.

## 2 How we reached our decision

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

We issued a notice under Regulation 61(1) of the Environmental Permitting (England and Wales) Regulations 2016 (a Regulation 61 Notice) on 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.

The regulation 61 notice response from the Operator was received on 13 November 2018.

We considered it was in the correct form and contained sufficient information for us to begin our determination of the permit review but not that it necessarily contained all the information we would need to complete that review: see below.

<b>Request for information sent</b>	<b>Received</b>
14 February 2020 BAT Conclusion 40, MSUL/DLN-E and use of low pressure fuel gas	03 March 2020
04 March 2020 MSUL/DLN-E	09 March 2020

## **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 2, 9, 40 and 42 improvements are required.

We have therefore included improvement conditions and a pre-operational condition in the consolidated variation notice, which requires the Operator to upgrade their operational techniques so that the requirements of the BAT Conclusions are delivered. This is discussed in more detail in the key issues section and the decision checklist regarding the 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)

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.

- For gas turbines the IED specified that limits applied over 70% load and the BAT Conclusions specified that AELs applied when dry low NO<sub>x</sub> is effective (DLN-E), we have used DLN-E as a default across all monitoring requirements for NO<sub>x</sub> and CO. We have set an improvement condition to secure compliance with the IED, refer to section 8 below.

### a. Plant configuration

LCP270 comprises one 130.28 MWth input combined cycle gas turbine (CCGT), heat recovery steam generator (HRSG), steam turbine and hybrid cooling. It is fuelled on natural gas, and also has the facility to burn low pressure fuel gas.

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

The ELVs and AELs are based on unlimited hours of operation.

The following tables outline the limits that have been incorporated into the permit for LCP270, 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 if flue gases.

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

### b. NO<sub>x</sub> limits

NO <sub>x</sub> limits (mg/Nm <sup>3</sup> ) – corrected to 15% oxygen							
Averaging	IED (Annex V Part 1)	Existing permit limits	BREF (BAT C 44, Table 24)	Permit limits	Basis	Limits apply	Monitoring
Annual	None	None	45	45	BREF	E-DLN	Continuous
Monthly	50	50	None	50	IED	E-DLN	
Daily	55	55	55	55	BREF	E-DLN	
95 <sup>th</sup> %ile of hourly means	100	60	None	60	IED	E-DLN	



### c. CO limits

CO indicative emission levels are a yearly average of 30 mg/Nm<sup>3</sup>. For plants operating at low load, the higher end of this range will be 50 mg/Nm<sup>3</sup>.

The Operator has proposed a yearly average limit of 30 mg/Nm<sup>3</sup>, with the existing IED Annex V ELVs remaining unchanged.

The applicable indicative BAT AELs are set out in the table below. We have also added the limits which will be in the varied permit and confirmed the basis for their inclusion.

CO (indicative) limits (mg/Nm <sup>3</sup> ) – corrected to 15% oxygen							
Averaging	IED (Annex V Part 1)	Existing permit limits	BREF (BAT C 44, Table 24)	Permit limits	Basis	Limits apply	Monitoring
Annual	None	None	30	30	BREF	E-DLN	Continuous
Monthly	100	100	None	100	IED	E-DLN	
Daily	110	100	None	100	IED	E-DLN	
95 <sup>th</sup> %ile of hr means	200	100	None	100	IED	E-DLN	

### 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.

We have however included a process monitoring requirement in table S3.3 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.

The table below sets out the BAT AEELs specified in the LCP BAT Conclusions for the LCP on the site and the energy efficiency levels confirmed through the regulation 61 notice response.

The most recent performance test was undertaken in 2012 whilst operating in CHP mode but there has not been a performance test in the current CCGT configuration. The expectation is that under test conditions the site would align with the bottom end of the BREF AEEL range for CCGT plant.

In their response to our request for information received 03 March 2020 the Operator confirmed that the net electrical efficiency in CHP mode is 46%.

If the site were to return to CHP, efficiency would be dependent on the requirements of a potential future steam customer, but it is anticipated to be within the BREF AEEL range for CHP plant.

Also refer to BAT Conclusion 2 in section 5 of this document.

We cannot be confident that the CCGT operational mode will be compliant with the BAT AEELs and have set an improvement condition to address this.

BAT AEELs (%)			Plant efficiency (%)		
Net electrical efficiency	Net total fuel utilisation	Net mechanical efficiency	Net electrical efficiency	Net total fuel utilisation	Net mechanical efficiency
<b>LCP207: CCGT (CCGT, 50–600 MWth)</b>					
46 - 54	None	None	46 – 54 <sup>Note 1</sup>	NA	NA
<b>LCP207: CHP (CHP CCGT, 50–600 MWth) <sup>Note 2</sup></b>					
46 - 54	65 - 95	None	46	65 - 75	NA
<p><b>Note 1: We have set an improvement condition for a performance test to be carried out in the current CCGT configuration.</b></p> <p><b>Note 2: The power plant does not currently operate in CHP configuration, refer to section 8 of this document (permit condition 1.2.2)</b></p>					

### 4.3 Fuel characterisation – low pressure fuel gas

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

The Joint Environmental Programme (JEP) report – ‘Characterisation of power plant fuels for compliance with LCP BREF Conclusion BAT 9’ issued October 2019 does not include low pressure fuel gas.

We have therefore included a pre-operational condition in the consolidated variation notice requiring the Operator to submit a plan for approval outlining how this will be carried out prior to the use of low pressure fuel gas in the gas turbine. This has resulted in the addition of permit condition 2.5.1 referring to pre-operational measures and the addition of associated table S1.3a which sets out the details of the pre-operational measures required regarding fuel characterisation.

## 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 annex provides a record of decisions made in relation to each relevant BAT Conclusion applicable to the installation. This annex should be read in conjunction with the consolidated variation notice.

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

BAT Conclusion requirement topic	Permit conditions	Permit tables
Environmental Management System	1.1.1	S1.2
BAT AELs	3.1.1 and 3.5.1	S3.1a
Monitoring	2.3, 3.5 and 3.6	S1.4, S1.5, S1.2, S3.1a
Energy efficiency	1.2 and 2.3	S3.3
Noise	2.3 and 3.4	S1.2
Other operating techniques	2.3	S1.2

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

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

BAT C 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
<b>General</b>			
1	<p><b>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:</b></p> <ul style="list-style-type: none"> <li>i. commitment of the management, including senior management;</li> <li>ii. definition of an environmental policy that includes the continuous improvement of the installation by the management;</li> <li>iii. planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment;</li> <li>iv. implementation of procedures <ul style="list-style-type: none"> <li>(a) Structure and responsibility</li> <li>(b) Training</li> <li>(c) Communication</li> <li>(d) Employee involvement</li> <li>(e) Documentation</li> <li>(f) Efficient process control</li> <li>(g) Maintenance programmes</li> <li>(h) Emergency preparedness and response</li> <li>(i) Safeguarding compliance with environmental legislation</li> </ul> </li> <li>v. checking performance and taking corrective action, paying particular attention to: <ul style="list-style-type: none"> <li>(a) monitoring and measurement (see also the Reference Document on the General Principles of Monitoring)</li> <li>(b) corrective and preventive action</li> <li>(c) maintenance of records</li> <li>(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;</li> </ul> </li> <li>vi. review of the EMS and its continuing suitability, adequacy and effectiveness by senior management;</li> <li>vii. following the development of cleaner technologies;</li> <li>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;</li> <li>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;</li> </ul>	CC	<p>The Operator confirmed that:</p> <p>The installation operates a local EMS which is fully integrated with the RWE Generation UK EMS and is certified to ISO14001: 2015 (certificate No:10054192). The requirements of ISO14001:2015 are consistent with the requirements of BAT Conclusion 1.</p> <p>We agree with the Operator's stated compliance.</p>

BAT C 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  <b>Applicability.</b> 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.	FC	The Operator confirmed that:  The installation operates a Frame 6 B DLN 1.0. in Combined Cycle mode (Combined Cycle Gas Turbine - CCGT). The site formerly operated as a Combined Heat & Power (CHP), supplying steam to the adjacent ConocoPhillips site, but no longer has a steam supply contract. The site has maintained CHP readiness should an option for a future steam contract become available.  The most recent performance test was undertaken in 2012 whilst operating in CHP mode but there has not been a performance test in the current CCGT configuration. The expectation is that under test conditions the site would align with bottom end of the BREF range for CCGT plant.  If the site were to return to CHP, efficiency would be dependent on the requirements of a potential future steam customer, but would be unlikely to exceed 75% efficiency.  We do not agree with the Operator's stated compliance (CC) and have set an improvement condition to address this. This approach is established to ensure that the efficiency of the plant is at least quantified and provides a benchmark to ensure degradation in energy efficiency over time is not unduly significant. We have set this BAT Conclusion to FC.						
3	<b>BAT is to monitor key process parameters relevant for emissions to air and water including those given below.</b> <table border="1" data-bbox="280 1305 1137 1369"> <thead> <tr> <th data-bbox="280 1305 548 1342">Stream</th> <th data-bbox="548 1305 864 1342">Parameter(s)</th> <th data-bbox="864 1305 1137 1342">Monitoring</th> </tr> </thead> <tbody> <tr> <td data-bbox="280 1342 548 1369">Flue-gas</td> <td data-bbox="548 1342 864 1369">Flow</td> <td data-bbox="864 1342 1137 1369">Periodic or continuous</td> </tr> </tbody> </table>	Stream	Parameter(s)	Monitoring	Flue-gas	Flow	Periodic or continuous	CC	The Operator confirmed that:  Flue gas emissions are monitored continuously for oxygen content, temperature and dew point and periodically for flow and pressure. Moisture content is not directly monitored as the extracted gas sample
Stream	Parameter(s)	Monitoring							
Flue-gas	Flow	Periodic or continuous							

BAT C 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	
		Oxygen content, temperature, and pressure	determination Periodic or continuous measurement		<p>is dried prior to analysis.</p> <p>Pressure: The existing monitoring requirement is continuous. This is retained on the basis of no backsliding</p> <p>Flow: The relevant standard for flow rate determination is EN ISO 16911. If a plant runs in a stable pattern continuous flow monitoring is not required. We have set monitoring on a periodic basis.</p> <p>Water vapour: The measurement of the water vapour content of the flue-gas is not necessary if the sampled flue-gas is dried before analysis. The permit includes provision for this with a note to tables S3.1 and S3.1a.</p> <p>We agree with the Operator's stated compliance.</p>	
4	<p>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.</p>			CC	<p>The Operator confirmed that:</p> <p>Emissions of CO and NOx are monitored continuously as required by this BAT Conclusion for natural gas fired turbines.</p> <p>Monitoring equipment is continuously in service and maintained. Due to the plants recent infrequent operation during the last 24 months, we have agreed a relaxation on the requirements to perform annual surveillance tests (ASTs). This is consistent with the philosophy that plant operation should not be for the sole purpose of performing emissions measurement. We have updated table S1.2 of the permit to reflect this requirement.</p> <p>We agree with the Operator's stated compliance.</p>	
	Substance/Parameter	Fuel/Process/Type of combustion plant	Combustion plant total rated thermal input	Standard(s) <sup>(4)</sup>	Minimum monitoring frequency <sup>(5)</sup>	Monitoring associated with
NH <sub>3</sub>	— When SCR and/or SNCR is used	All sizes	All sizes	Generic EN standards	Continuous <sup>(6)</sup> / <sup>(7)</sup>	BAT 7
NO <sub>x</sub>	<ul style="list-style-type: none"> <li>— Coal and/or lignite including waste co-incineration</li> <li>— Solid biomass and/or peat including waste co-incineration</li> <li>— HFO- and/or gas-oil-fired boilers and engines</li> </ul>	All sizes	All sizes	Generic EN standards	Continuous <sup>(6)</sup> / <sup>(8)</sup>	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 C 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
		<ul style="list-style-type: none"> <li>— Gas-oil-fired gas turbines</li> <li>— Natural-gas-fired boilers, engines, and turbines</li> <li>— Iron and steel process gases</li> <li>— Process fuels from the chemical industry</li> <li>— IGCC plants</li> </ul>				BAT 65 BAT 73		
		<ul style="list-style-type: none"> <li>— Combustion plants on offshore platforms</li> </ul>	All sizes	EN 14792	Once every year <sup>(9)</sup>	BAT 53		
N <sub>2</sub> O		<ul style="list-style-type: none"> <li>— Coal and/or lignite in circulating fluidised bed boilers</li> <li>— Solid biomass and/or peat in circulating fluidised bed boilers</li> </ul>	All sizes	EN 21258	Once every year <sup>(10)</sup>	BAT 20 BAT 24		
CO		<ul style="list-style-type: none"> <li>— Coal and/or lignite including waste co-incineration</li> <li>— Solid biomass and/or peat including waste co-incineration</li> <li>— HFO- and/or gas-oil-fired boilers and engines</li> <li>— Gas-oil-fired gas turbines</li> <li>— Natural-gas-fired boilers, engines, and turbines</li> <li>— Iron and steel</li> </ul>	All sizes	Generic EN standards	Continuous <sup>(6)</sup> / <sup>(8)</sup>	BAT 20 BAT 24 BAT 28 BAT 33 BAT 38 BAT 44 BAT 49 BAT 56 BAT 64 BAT 65 BAT 73		

BAT C 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
		<ul style="list-style-type: none"> <li>— process gases</li> <li>— Process fuels from the chemical industry</li> <li>— IGCC plants</li> </ul>						
		<ul style="list-style-type: none"> <li>— Combustion plants on offshore platforms</li> </ul>	All sizes	EN 15058	Once every year <sup>(9)</sup>	BAT 54		
	SO <sub>2</sub>	<ul style="list-style-type: none"> <li>— Coal and/or lignite incl waste co-incineration</li> <li>— Solid biomass and/or peat incl waste co-incineration</li> <li>— HFO- and/or gas-oil-fired boilers</li> <li>— HFO- and/or gas-oil-fired engines</li> <li>— Gas-oil-fired gas turbines</li> <li>— Iron and steel process gases</li> <li>— Process fuels from the chemical industry in boilers</li> <li>— IGCC plants</li> </ul>	All sizes	Generic EN standards and EN 14791	Continuous <sup>(6)</sup> <sub>1</sub> <sup>(11)</sup> <sub>1</sub> <sup>(12)</sup>	BAT 21 BAT 25 BAT 29 BAT 34 BAT 39 BAT 50 BAT 57 BAT 66 BAT 67 BAT 74		
	SO <sub>3</sub>	<ul style="list-style-type: none"> <li>— When SCR is used</li> </ul>	All sizes	No EN standard available	Once every year	—		
	Gaseous chlorides, expressed as HCl	<ul style="list-style-type: none"> <li>— Coal and/or lignite</li> <li>— Process fuels from the chemical industry in boilers</li> </ul>	All sizes	EN 1911	Once every three months <sup>(6)</sup> <sub>1</sub> <sup>(13)</sup> <sub>1</sub> <sup>(14)</sup>	BAT 21 BAT 57		
		<ul style="list-style-type: none"> <li>— Solid biomass and/or peat</li> </ul>	All sizes	Generic EN standards	Continuous <sup>(6)</sup> <sub>1</sub> <sup>(15)</sup>	BAT 25		
		<ul style="list-style-type: none"> <li>— Waste co-</li> </ul>	All sizes	Generic EN	Continuous <sup>(6)</sup> <sub>1</sub> <sup>(16)</sup>	BAT 66		



BAT C 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
	incineration		standards	↓	BAT 67		
HF	— Coal and/or lignite	All sizes	No EN standard available	Once every three months <sup>(6)</sup> ↓ <sup>(13)</sup> ↓ <sup>(14)</sup>	BAT 21 BAT 57		
	— Process fuels from the chemical industry in boilers						
	— 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 <sup>(6)</sup> ↓ <sup>(16)</sup>	BAT 66 BAT 67		
Dust	— Coal and/or lignite	All sizes	Generic EN standards and EN 13284-1 and EN 13284-2	Continuous <sup>(6)</sup> ↓ <sup>(17)</sup>	BAT 22 BAT 26 BAT 30 BAT 35 BAT 39 BAT 51 BAT 58 BAT 75		
	— 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						
	— Waste co-incineration	All sizes	Generic EN standards and EN 13284-2	Continuous	BAT 68 BAT 69		
Metals and metalloids except mercury (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Se, Tl, V, Zn)	— Coal and/or lignite	All sizes	EN 14385	Once every year <sup>(18)</sup>	BAT 22 BAT 26 BAT 30		
	— Solid biomass and/or peat						
	— HFO- and/or gas-oil-fired boilers and engines						
	— Waste co-	< 300 MW <sub>th</sub>	EN 14385	Once every six months <sup>(13)</sup>	BAT 68 BAT 69		

BAT C 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
		incineration	≥ 300 MW <sub>th</sub>	EN 14385	Once every three months <sup>(19)</sup> <sub>(13)</sub>			
		— IGCC plants	≥ 100 MW <sub>th</sub>	EN 14385	Once every year <sup>(18)</sup>	BAT 75		
	Hg	— Coal and/or lignite including waste co-incineration	< 300 MW <sub>th</sub>	EN 13211	Once every three months <sup>(13)</sup> <sub>(20)</sub>	BAT 23		
			≥ 300 MW <sub>th</sub>	Generic EN standards and EN 14884	Continuous <sup>(16)</sup> <sub>(2)</sub>			
		— Solid biomass and/or peat	All sizes	EN 13211	Once every year <sup>(22)</sup>	BAT 27		
		— Waste co-incineration with solid biomass and/or peat	All sizes	EN 13211	Once every three months <sup>(13)</sup>	BAT 70		
		— IGCC plants	≥ 100 MW <sub>th</sub>	EN 13211	Once every year <sup>(23)</sup>	BAT 75		
	TVOC	— HFO- and/or gas-oil-fired engines	All sizes	EN 12619	Once every six months <sup>(13)</sup>	BAT 33 BAT 59		
		— Process fuels from chemical industry in boilers						
		— Waste co-incineration with coal, lignite, solid biomass and/or peat	All sizes	Generic EN standards	Continuous	BAT 71		
	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 <sub>4</sub>	— Natural-gas-fired engines	All sizes	EN ISO 25139	Once every year <sup>(24)</sup>	BAT 45		
	PCDD/F	— Process fuels from chemical industry in boilers	All sizes	EN 1948-1, EN 1948-2, EN 1948-3	Once every six months <sup>(13)</sup> <sub>(25)</sub>	BAT 59 BAT 71		
— Waste co-								

BAT C 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																														
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5	<p>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.</p>					NA	<p>The Operator confirmed that:</p> <p>Not applicable, no flue-gas treatment fitted.</p> <p>We agree that this BAT Conclusion is not applicable to the activities carried out at the installation.</p>																														
<table border="1"> <thead> <tr> <th data-bbox="271 507 481 592">Substance/Parameter</th> <th data-bbox="481 507 792 592">Standard(s)</th> <th data-bbox="792 507 967 592">Minimum monitoring frequency</th> <th data-bbox="967 507 1151 592">Monitoring associated with</th> </tr> </thead> <tbody> <tr> <td data-bbox="271 592 481 651">Total organic carbon (TOC)<sub>(26)</sub></td> <td data-bbox="481 592 792 651">EN 1484</td> <td data-bbox="792 592 967 651" rowspan="7">Once every month</td> <td data-bbox="967 592 1151 651" rowspan="7">BAT 15</td> </tr> <tr> <td data-bbox="271 651 481 710">Chemical oxygen demand (COD)<sub>(26)</sub></td> <td data-bbox="481 651 792 710">No EN standard available</td> </tr> <tr> <td data-bbox="271 710 481 769">Total suspended solids (TSS)</td> <td data-bbox="481 710 792 769">EN 872</td> </tr> <tr> <td data-bbox="271 769 481 807">Fluoride (F<sup>-</sup>)</td> <td data-bbox="481 769 792 807">EN ISO 10304-1</td> </tr> <tr> <td data-bbox="271 807 481 844">Sulphate (SO<sub>4</sub><sup>2-</sup>)</td> <td data-bbox="481 807 792 844">EN ISO 10304-1</td> </tr> <tr> <td data-bbox="271 844 481 903">Sulphide, easily released (S<sup>2-</sup>)</td> <td data-bbox="481 844 792 903">No EN standard available</td> </tr> <tr> <td data-bbox="271 903 481 940">Sulphite (SO<sub>3</sub><sup>2-</sup>)</td> <td data-bbox="481 903 792 940">EN ISO 10304-3</td> </tr> <tr> <td data-bbox="271 940 481 1286" rowspan="7">Metals and metalloids</td> <td data-bbox="481 940 533 962">As</td> <td data-bbox="533 940 792 962" rowspan="7">Various EN standards available (e.g. EN ISO 11885 or EN ISO 17294-2)</td> <td data-bbox="967 940 1151 1286" rowspan="7"></td> </tr> <tr> <td data-bbox="481 962 533 984">Cd</td> </tr> <tr> <td data-bbox="481 984 533 1007">Cr</td> </tr> <tr> <td data-bbox="481 1007 533 1029">Cu</td> </tr> <tr> <td data-bbox="481 1029 533 1051">Ni</td> </tr> <tr> <td data-bbox="481 1051 533 1074">Pb</td> </tr> <tr> <td data-bbox="481 1074 533 1096">Zn</td> </tr> <tr> <td data-bbox="481 1096 533 1118">Hg</td> <td data-bbox="533 1096 792 1118">Various EN standards available (e.g. EN ISO 12846 or EN ISO 17852)</td> </tr> <tr> <td data-bbox="271 1286 481 1369">Chloride (Cl<sup>-</sup>)</td> <td data-bbox="481 1286 792 1369">Various EN standards available (e.g. EN ISO 10304-1 or</td> <td data-bbox="792 1286 967 1369"></td> <td data-bbox="967 1286 1151 1369">—</td> </tr> </tbody> </table>		Substance/Parameter	Standard(s)	Minimum monitoring frequency	Monitoring associated with	Total organic carbon (TOC) <sub>(26)</sub>	EN 1484	Once every month	BAT 15	Chemical oxygen demand (COD) <sub>(26)</sub>	No EN standard available	Total suspended solids (TSS)	EN 872	Fluoride (F <sup>-</sup> )	EN ISO 10304-1	Sulphate (SO <sub>4</sub> <sup>2-</sup> )	EN ISO 10304-1	Sulphide, easily released (S <sup>2-</sup> )	No EN standard available	Sulphite (SO <sub>3</sub> <sup>2-</sup> )	EN ISO 10304-3	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 <sup>-</sup> )	Various EN standards available (e.g. EN ISO 10304-1 or		—
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		EN ISO 15682)																			
	Total nitrogen	EN 12260		—																	
6	<p>In order to improve the general environmental performance of combustion plants and to reduce emissions to air of CO and unburnt substances, BAT is to ensure optimised combustion and to use an appropriate combination of the techniques given below.</p>			CC	<p>The Operator confirmed that:</p> <p>The installation optimises the environmental performance of its combustion plant through techniques b, c, and d, given in this BAT Conclusion.</p> <p>We agree with the Operator's stated compliance.</p>																
	<table border="1"> <thead> <tr> <th data-bbox="338 544 405 576">Technique</th> <th data-bbox="405 544 461 576">Description</th> <th data-bbox="461 544 1133 576">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="338 576 405 715">a.</td> <td data-bbox="405 576 461 715">Fuel blending and mixing</td> <td data-bbox="461 576 1133 715">Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type</td> </tr> <tr> <td data-bbox="338 715 405 823">b.</td> <td data-bbox="405 715 461 823">Maintenance of the combustion system</td> <td data-bbox="461 715 1133 823">Regular planned maintenance according to suppliers' recommendations</td> </tr> <tr> <td data-bbox="338 823 405 959">c.</td> <td data-bbox="405 823 461 959">Advanced control system</td> <td data-bbox="461 823 1133 959">See description in Section 8.1</td> </tr> <tr> <td data-bbox="338 959 405 1114">d.</td> <td data-bbox="405 959 461 1114">Good design of the combustion equipment</td> <td data-bbox="461 959 1133 1114">Good design of furnace, combustion chambers, burners and associated devices</td> </tr> <tr> <td data-bbox="338 1114 405 1377">e.</td> <td data-bbox="405 1114 461 1377">Fuel choice</td> <td data-bbox="461 1114 1133 1377">Select or switch totally or partially to another fuel(s) with a better environmental profile (e.g. with low sulphur and/or mercury content) amongst the available fuels, including in start-up situations or when back-up fuels are used</td> </tr> </tbody> </table>	Technique	Description	Applicability	a.	Fuel blending and mixing	Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type	b.	Maintenance of the combustion system	Regular planned maintenance according to suppliers' recommendations	c.	Advanced control system	See description in Section 8.1	d.	Good design of the combustion equipment	Good design of furnace, combustion chambers, burners and associated devices	e.	Fuel choice	Select or switch totally or partially to another fuel(s) with a better environmental profile (e.g. with low sulphur and/or mercury content) amongst the available fuels, including in start-up situations or when back-up fuels are used		
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7	<p>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<sub>x</sub> emissions, BAT is to optimise the design and/or operation of SCR and/or SNCR (e.g. optimised reagent to NO<sub>x</sub> ratio, homogeneous reagent distribution and optimum size of the reagent drops).</p> <p><b>BAT-associated emission levels</b></p> <p>The BAT-associated emission level (BAT-AEL) for emissions of NH<sub>3</sub> to air from the use of SCR and/or SNCR is &lt; 3–10 mg/Nm<sup>3</sup> 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<sup>3</sup>.</p>	NA	<p>The Operator confirmed that:</p> <p>Not applicable, SCR/SNCR not present.</p> <p>We agree that this BAT Conclusion is not applicable to the activities carried out at the installation.</p>				
8	<p>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.</p>	NA	<p>The Operator confirmed that:</p> <p>Not applicable, CCGT without emissions abatement.</p> <p>We agree that this BAT Conclusion is not applicable to the activities carried out at the installation.</p>				
9	<p>In order to improve the general environmental performance of combustion and/or gasification plants and to reduce emissions to air, BAT is to include the following elements in the quality assurance/quality control programmes for all the fuels used, as part of the environmental management system (see BAT 1):</p> <ul style="list-style-type: none"> <li>(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;</li> <li>(ii) Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications. The frequency of testing and the parameters chosen from the table below are based on the variability of the fuel and an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed);</li> </ul>	FC	<p>The Operator confirmed that:</p> <p>Fuel gas is supplied to installation via the National Grid and has been assessed in accordance with technique (i) and is continually monitored via gas chromatograph in accordance with technique (ii) given in this BAT Conclusion.</p> <p>We consider that for plants which burn natural gas from the National Grid as a fuel that it is not necessary for the Operator to replicate the testing carried out by the National Grid.</p> <p>We agree with the Operator's stated compliance of CC for the natural gas fuel supplied via the National grid.</p>				

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	<p>(iii) Subsequent adjustment of the plant settings as and when needed and practicable (e.g. integration of the fuel characterisation and control in the advanced control system (see description in Section 8.1)).</p> <p><b>Description</b> Initial characterisation and regular testing of the fuel can be performed by the Operator and/or the fuel supplier. If performed by the supplier, the full results are provided to the Operator in the form of a product (fuel) supplier specification and/or guarantee.</p> <table border="1" data-bbox="277 560 1137 1364"> <thead> <tr> <th data-bbox="277 560 568 592">Fuel(s)</th> <th data-bbox="568 560 1137 592">Substances/Parameters subject to characterisation</th> </tr> </thead> <tbody> <tr> <td data-bbox="277 592 568 799" rowspan="5">Biomass/peat</td> <td data-bbox="568 592 1137 632">— LHV</td> </tr> <tr> <td data-bbox="568 632 1137 671">— moisture</td> </tr> <tr> <td data-bbox="568 671 1137 711">— Ash</td> </tr> <tr> <td data-bbox="568 711 1137 751">— C, Cl, F, N, S, K, Na</td> </tr> <tr> <td data-bbox="568 751 1137 799">— Metals and metalloids (As, Cd, Cr, Cu, Hg, Pb, Zn)</td> </tr> <tr> <td data-bbox="277 799 568 1038" rowspan="5">Coal/lignite</td> <td data-bbox="568 799 1137 839">— LHV</td> </tr> <tr> <td data-bbox="568 839 1137 879">— Moisture</td> </tr> <tr> <td data-bbox="568 879 1137 919">— Volatiles, ash, fixed carbon, C, H, N, O, S</td> </tr> <tr> <td data-bbox="568 919 1137 959">— Br, Cl, F</td> </tr> <tr> <td data-bbox="568 959 1137 1038">— Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Ti, V, Zn)</td> </tr> <tr> <td data-bbox="277 1038 568 1118" rowspan="2">HFO</td> <td data-bbox="568 1038 1137 1078">— Ash</td> </tr> <tr> <td data-bbox="568 1078 1137 1118">— C, S, N, Ni, V</td> </tr> <tr> <td data-bbox="277 1118 568 1198" rowspan="2">Gas oil</td> <td data-bbox="568 1118 1137 1158">— Ash</td> </tr> <tr> <td data-bbox="568 1158 1137 1198">— N, C, S</td> </tr> <tr> <td data-bbox="277 1198 568 1286" rowspan="2">Natural gas</td> <td data-bbox="568 1198 1137 1238">— LHV</td> </tr> <tr> <td data-bbox="568 1238 1137 1286">— CH<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, C<sub>3</sub>, C<sub>4+</sub>, CO<sub>2</sub>, N<sub>2</sub>, Wobbe index</td> </tr> <tr> <td data-bbox="277 1286 568 1364" rowspan="2">Process fuels from the chemical industry<sup>(27)</sup></td> <td data-bbox="568 1286 1137 1326">— Br, C, Cl, F, H, N, O, S</td> </tr> <tr> <td data-bbox="568 1326 1137 1364">— Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn,</td> </tr> </tbody> </table>	Fuel(s)	Substances/Parameters subject to characterisation	Biomass/peat	— LHV	— moisture	— Ash	— C, Cl, F, N, S, K, Na	— Metals and metalloids (As, Cd, Cr, Cu, Hg, Pb, Zn)	Coal/lignite	— LHV	— Moisture	— Volatiles, ash, fixed carbon, C, H, N, O, S	— Br, Cl, F	— Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Ti, V, Zn)	HFO	— Ash	— C, S, N, Ni, V	Gas oil	— Ash	— N, C, S	Natural gas	— LHV	— CH <sub>4</sub> , C <sub>2</sub> H <sub>6</sub> , C <sub>3</sub> , C <sub>4+</sub> , CO <sub>2</sub> , N <sub>2</sub> , Wobbe index	Process fuels from the chemical industry <sup>(27)</sup>	— Br, C, Cl, F, H, N, O, S	— Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn,		<p>The Operator confirmed in their response to our further information request received 03 March 2020 that the plant does not currently burn low pressure fuel gas; however they want to maintain the ability to do so.</p> <p>Refer to key issues section of this document.</p> <p>If the Operator were to burn low pressure fuel gas they would be required to carry out full characterisation in accordance with this BAT Conclusion prior to its use as a fuel. We have set a pre-operational condition to address this.</p> <p>We have set the compliance status to FC based on characterisation of the low pressure fuel gas.</p>
Fuel(s)	Substances/Parameters subject to characterisation																												
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10	<p>In order to reduce emissions to air and/or to water during other than normal operating conditions (OTNOC), BAT is to set up and implement a management plan as part of the environmental management system (see BAT 1), commensurate with the relevance of potential pollutant releases, that includes the following elements:</p> <ul style="list-style-type: none"> <li>— 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),</li> <li>— set-up and implementation of a specific preventive maintenance plan for these relevant systems,</li> <li>— review and recording of emissions caused by OTNOC and associated circumstances and implementation of corrective actions if necessary,</li> <li>— periodic assessment of the overall emissions during OTNOC (e.g. frequency of events, duration, emissions quantification/estimation) and implementation of corrective actions if necessary.</li> </ul>	CC	<p>The Operator confirmed that:</p> <p>The installation does not have a specific OTNOC management plan. However the requirements of this BAT Conclusion are met by existing site documentation and procedures. In all cases, emissions to air and water are assessed as part of the annual environmental performance report. In the event of an accident or environmental incident, emissions, cause etc. are reviewed during the incident investigation process ensuring any relevant corrective and / or preventive actions are implemented. Starts are optimised based on plant condition (i.e. warmth category) to minimise emissions. GT components are included within preventative maintenance programmes.</p> <p>We agree with the Operator's stated compliance.</p>						
11	<p>BAT is to appropriately monitor emissions to air and/or to water during OTNOC.</p> <p><b>Description</b></p> <p>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</p>	CC	<p>The Operator confirmed that:</p> <p>Monitoring equipment for emissions to air and water are fully operable during all operating conditions (including start-up and shut-down) and is not affected by OTNOC events. Emissions monitoring equipment is included within preventative maintenance programmes.</p> <p>We agree with the Operator's stated compliance.</p>						

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		improved	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: <ul style="list-style-type: none"> <li>— flue-gas</li> <li>— grate cooling</li> <li>— circulating fluidised bed</li> </ul>	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 via a dedicated stack	Only applicable to units fitted with wet FGD where reheating of the flue-gas is necessary before release, and where the		

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				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-supercritical steam conditions	Use of a steam circuit, including steam reheating systems, in which steam can reach pressures above 220,6 bar and temperatures above 374 °C in the case of supercritical conditions, and above 250 –	Only applicable to new units of $\geq 600 \text{ MW}_{\text{th}}$ operated $> 4,000 \text{ h/yr}$ . Not applicable when the purpose of the unit is to produce low steam	

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		300 bar and temperatures above 580 – 600 °C in the case of ultra-supercritical conditions	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		
13	In order to reduce water usage and the volume of contaminated waste water discharged, BAT is to use one or both of the techniques given below.			CC	<p>The Operator confirmed that:</p> <p>Raw, demineralised and cooling water is provided under contract by the host site and is optimised where ever plant operations allow. Surface water and plant drainage are collected, monitored and returned to the host for treatment, before discharge to the environment as per contractual arrangements.</p> <p>The quality of surface water for re-use may potentially have an adverse impact on the process or operation of the ConocoPhillips water treatment plant, potentially leading to increased chemical and energy usage.</p> <p>We agree with the Operator's stated compliance.</p>
	<b>Technique</b>	<b>Description</b>	<b>Applicability</b>		
a.	Water recycling	Residual aqueous streams, including run-off water, from the plant are reused for other purposes. The degree of recycling is limited by the quality requirements of the recipient water stream and the water balance of the plant	Not applicable to waste water from cooling systems when water treatment chemicals and/or high concentrations of salts from seawater are present		
b.	Dry bottom ash handling	Dry, hot bottom ash falls from the furnace onto a mechanical conveyor system and is cooled down by ambient air. No water is used in the process.	Only applicable to plants combusting solid fuels. There may be technical restrictions that prevent retrofitting to existing combustion plants		
14	<p>In order to prevent the contamination of uncontaminated waste water and to reduce emissions to water, BAT is to segregate waste water streams and to treat them separately, depending on the pollutant content.</p> <p><b>Description</b> Waste water streams that are typically segregated and treated include surface run-off water, cooling water, and waste water from flue-gas treatment.</p> <p><b>Applicability</b> The applicability may be restricted in the case of existing plants due to the configuration of the drainage systems.</p>			CC	<p>The Operator confirmed that:</p> <p>Surface and process water (i.e. plant drains) are collected in the site's effluent tank, monitored for pH and conductivity and returned to ConocoPhillips for treatment before discharge to the environment as per contractual arrangement. In the unlikely event that collected effluent is out of specification, it will be retained and treated as necessary before being returned to ConocoPhillips.</p> <p>We agree with the Operator's stated compliance.</p>

BAT C 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																																										
15	<p>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.</p> <table border="1" data-bbox="280 411 1137 1361"> <thead> <tr> <th data-bbox="280 411 568 475">Technique</th> <th data-bbox="568 411 792 475">Typical pollutants prevented/abated</th> <th data-bbox="792 411 1137 475">Applicability</th> </tr> </thead> <tbody> <tr> <td colspan="3" data-bbox="280 475 1137 507" style="text-align: center;"><b>Primary techniques</b></td> </tr> <tr> <td data-bbox="280 507 568 643">a. 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Oxidation</td> <td data-bbox="568 1337 792 1361">Sulphide (S<sup>2-</sup>),</td> <td data-bbox="792 1337 1137 1361">Generally applicable</td> </tr> </tbody> </table>	Technique	Typical pollutants prevented/abated	Applicability	<b>Primary techniques</b>			a. Optimised combustion (see BAT 6) and flue-gas treatment systems (e.g. SCR/SNCR, see BAT 7)	Organic compounds, ammonia (NH <sub>3</sub> )	Generally applicable	<b>Secondary techniques <sup>(29)</sup></b>			b. Adsorption on activated carbon	Organic compounds, mercury (Hg)	Generally applicable	c. Aerobic biological treatment	Biodegradable organic compounds, ammonium (NH <sub>4</sub> <sup>+</sup> )	Generally applicable for the treatment of organic compounds. Aerobic biological treatment of ammonium (NH <sub>4</sub> <sup>+</sup> ) may not be applicable in the case of high chloride concentrations (i.e. around 10 g/l)	d. 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	<p>The BAT-AELs refer to direct discharges to a receiving water body at the point where the emission leaves the installation.</p> <p><b>BAT-AELs for direct discharges to a receiving water body from flue-gas treatment</b></p> <table border="1" data-bbox="271 628 1151 1225"> <thead> <tr> <th colspan="2" data-bbox="271 628 680 663">Substance/Parameter</th> <th data-bbox="680 628 1151 663">BAT-AELs</th> </tr> <tr> <th colspan="2" data-bbox="271 663 680 699"></th> <th data-bbox="680 663 1151 699">Daily average</th> </tr> </thead> <tbody> <tr> <td colspan="2" data-bbox="271 699 680 734">Total organic carbon (TOC)</td> <td data-bbox="680 699 1151 734">20–50 mg/l <sup>(30)</sup> <sub>(31)</sub> <sub>(32)</sub></td> </tr> <tr> <td colspan="2" data-bbox="271 734 680 769">Chemical oxygen demand (COD)</td> <td data-bbox="680 734 1151 769">60–150 mg/l <sup>(30)</sup> <sub>(31)</sub> <sub>(32)</sub></td> </tr> <tr> <td colspan="2" data-bbox="271 769 680 804">Total suspended solids (TSS)</td> <td data-bbox="680 769 1151 804">10–30 mg/l</td> </tr> <tr> <td colspan="2" data-bbox="271 804 680 839">Fluoride (F<sup>-</sup>)</td> <td data-bbox="680 804 1151 839">10–25 mg/l <sub>(32)</sub></td> </tr> <tr> <td colspan="2" data-bbox="271 839 680 874">Sulphate (SO<sub>4</sub><sup>2-</sup>)</td> <td data-bbox="680 839 1151 874">1,3–2,0 g/l <sub>(32)</sub> <sub>(33)</sub> <sub>(34)</sub> <sub>(35)</sub></td> </tr> <tr> <td colspan="2" data-bbox="271 874 680 909">Sulphide (S<sup>2-</sup>), easily released</td> <td data-bbox="680 874 1151 909">0,1–0,2 mg/l <sub>(32)</sub></td> </tr> <tr> <td colspan="2" data-bbox="271 909 680 944">Sulphite (SO<sub>3</sub><sup>2-</sup>)</td> <td data-bbox="680 909 1151 944">1–20 mg/l <sub>(32)</sub></td> </tr> <tr> <td data-bbox="271 944 680 1225" rowspan="8">Metals and metalloids</td> <td data-bbox="680 944 757 979">As</td> <td data-bbox="757 944 1151 979">10–50 µg/l</td> </tr> <tr> <td data-bbox="680 979 757 1015">Cd</td> <td data-bbox="757 979 1151 1015">2–5 µg/l</td> </tr> <tr> <td data-bbox="680 1015 757 1050">Cr</td> <td data-bbox="757 1015 1151 1050">10–50 µg/l</td> </tr> <tr> <td data-bbox="680 1050 757 1085">Cu</td> <td data-bbox="757 1050 1151 1085">10–50 µg/l</td> </tr> <tr> <td data-bbox="680 1085 757 1120">Hg</td> <td data-bbox="757 1085 1151 1120">0,2–3 µg/l</td> </tr> <tr> <td data-bbox="680 1120 757 1155">Ni</td> <td data-bbox="757 1120 1151 1155">10–50 µg/l</td> </tr> <tr> <td data-bbox="680 1155 757 1190">Pb</td> <td data-bbox="757 1155 1151 1190">10–20 µg/l</td> </tr> <tr> <td data-bbox="680 1190 757 1225">Zn</td> <td data-bbox="757 1190 1151 1225">50–200 µg/l</td> </tr> </tbody> </table>			Substance/Parameter		BAT-AELs			Daily average	Total organic carbon (TOC)		20–50 mg/l <sup>(30)</sup> <sub>(31)</sub> <sub>(32)</sub>	Chemical oxygen demand (COD)		60–150 mg/l <sup>(30)</sup> <sub>(31)</sub> <sub>(32)</sub>	Total suspended solids (TSS)		10–30 mg/l	Fluoride (F <sup>-</sup> )		10–25 mg/l <sub>(32)</sub>	Sulphate (SO <sub>4</sub> <sup>2-</sup> )		1,3–2,0 g/l <sub>(32)</sub> <sub>(33)</sub> <sub>(34)</sub> <sub>(35)</sub>	Sulphide (S <sup>2-</sup> ), easily released		0,1–0,2 mg/l <sub>(32)</sub>	Sulphite (SO <sub>3</sub> <sup>2-</sup> )		1–20 mg/l <sub>(32)</sub>	Metals and metalloids	As	10–50 µg/l	Cd	2–5 µg/l	Cr	10–50 µg/l	Cu	10–50 µg/l	Hg	0,2–3 µg/l	Ni	10–50 µg/l	Pb	10–20 µg/l	Zn	50–200 µg/l		
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16	<p>In order to reduce the quantity of waste sent for disposal from the combustion and/or gasification process and abatement techniques, BAT is to organise operations so as to maximise, in order of priority and taking into account life-cycle thinking:</p> <p>(a) waste prevention, e.g. maximise the proportion of residues which arise</p>			CC	<p>The Operator confirmed that:</p> <p>There are no by-products identified by this BAT Conclusion associated with the combustion process at the installation. Other wastes arising from site activities are dealt with according to the waste hierarchy.</p>																																												

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	<p>as by-products;</p> <p>(b) waste preparation for reuse, e.g. according to the specific requested quality criteria;</p> <p>(c) waste recycling;</p> <p>(d) other waste recovery (e.g. energy recovery),</p> <p>by implementing an appropriate combination of techniques such as:</p> <table border="1" data-bbox="280 544 1137 1380"> <thead> <tr> <th data-bbox="280 544 324 576">Technique</th> <th data-bbox="324 544 840 576">Description</th> <th data-bbox="840 544 1137 576">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="280 576 324 810">a.</td> <td data-bbox="324 576 840 810">Generation of gypsum as a by-product Quality optimisation of the calcium-based reaction residues generated by the wet FGD so that they can be used as a substitute for mined gypsum (e.g. as raw material in the plasterboard industry). The quality of limestone used in the wet FGD influences the purity of the gypsum produced</td> <td data-bbox="840 576 1137 810">Generally applicable within the constraints associated with the required gypsum quality, the health requirements associated to each specific use, and by the market conditions</td> </tr> <tr> <td data-bbox="280 810 324 1018">b.</td> <td data-bbox="324 810 840 1018">Recycling or recovery of residues in the construction sector Recycling or recovery of residues (e.g. from semi-dry desulphurisation processes, fly ash, bottom ash) as a construction material (e.g. in road building, to replace sand in concrete production, or in the cement industry)</td> <td data-bbox="840 810 1137 1018">Generally applicable within the constraints associated with the required material quality (e.g. physical properties, content of harmful substances) associated to each specific use, and by the market conditions</td> </tr> <tr> <td data-bbox="280 1018 324 1177">c.</td> <td data-bbox="324 1018 840 1177">Energy recovery by using waste in the fuel mix The residual energy content of carbon-rich ash and sludges generated by the combustion of coal, lignite, heavy fuel oil, peat or biomass can be recovered for example by mixing with the fuel</td> <td data-bbox="840 1018 1137 1177">Generally applicable where plants can accept waste in the fuel mix and are technically able to feed the fuels into the combustion chamber</td> </tr> <tr> <td data-bbox="280 1177 324 1380">d.</td> <td data-bbox="324 1177 840 1380">Preparation of spent catalyst for reuse Preparation of catalyst for reuse (e.g. up to four times for SCR catalysts) restores some or all of the original performance, extending the service life of the catalyst to several decades. Preparation of spent catalyst for reuse is integrated in a catalyst management scheme</td> <td data-bbox="840 1177 1137 1380">The applicability may be limited by the mechanical condition of the catalyst and the required performance with respect to controlling NO<sub>x</sub> and NH<sub>3</sub> emissions</td> </tr> </tbody> </table>	Technique	Description	Applicability	a.	Generation of gypsum as a by-product Quality optimisation of the calcium-based reaction residues generated by the wet FGD so that they can be used as a substitute for mined gypsum (e.g. as raw material in the plasterboard industry). The quality of limestone used in the wet FGD influences the purity of the gypsum produced	Generally applicable within the constraints associated with the required gypsum quality, the health requirements associated to each specific use, and by the market conditions	b.	Recycling or recovery of residues in the construction sector 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)	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	c.	Energy recovery by using waste in the fuel mix 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	Generally applicable where plants can accept waste in the fuel mix and are technically able to feed the fuels into the combustion chamber	d.	Preparation of spent catalyst for reuse Preparation of catalyst for reuse (e.g. up to four times for SCR catalysts) restores some or all of the original performance, extending the service life of the catalyst to several decades. Preparation of spent catalyst for reuse is integrated in a catalyst management scheme	The applicability may be limited by the mechanical condition of the catalyst and the required performance with respect to controlling NO <sub>x</sub> and NH <sub>3</sub> emissions		We agree with the Operator's stated compliance.
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BAT C 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																								
17	In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below.			CC	<p>The Operator confirmed that:</p> <p>Noise emissions from the installation are reduced by the application of techniques a, b, c and d as identified in this BAT Conclusion.</p> <p>We agree with the Operator's stated compliance.</p>																								
<table border="1"> <thead> <tr> <th data-bbox="271 384 338 416"></th> <th data-bbox="338 384 479 416">Technique</th> <th data-bbox="479 384 846 416">Description</th> <th data-bbox="846 384 1151 416">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="271 416 338 762">a.</td> <td data-bbox="338 416 479 762">Operational measures</td> <td data-bbox="479 416 846 762">           These include:           <ul style="list-style-type: none"> <li>— improved inspection and maintenance of equipment</li> <li>— closing of doors and windows of enclosed areas, if possible</li> <li>— equipment operated by experienced staff</li> <li>— avoidance of noisy activities at night, if possible</li> <li>— provisions for noise control during maintenance activities</li> </ul> </td> <td data-bbox="846 416 1151 762">Generally applicable</td> </tr> <tr> <td data-bbox="271 762 338 842">b.</td> <td data-bbox="338 762 479 842">Low-noise equipment</td> <td data-bbox="479 762 846 842">This potentially includes compressors, pumps and disks</td> <td data-bbox="846 762 1151 842">Generally applicable when the equipment is new or replaced</td> </tr> <tr> <td data-bbox="271 842 338 978">c.</td> <td data-bbox="338 842 479 978">Noise attenuation</td> <td data-bbox="479 842 846 978">Noise propagation can be reduced by inserting obstacles between the emitter and the receiver. Appropriate obstacles include protection walls, embankments and buildings</td> <td data-bbox="846 842 1151 978">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 data-bbox="271 978 338 1161">d.</td> <td data-bbox="338 978 479 1161">Noise-control equipment</td> <td data-bbox="479 978 846 1161">           This includes:           <ul style="list-style-type: none"> <li>— noise-reducers</li> <li>— equipment insulation</li> <li>— enclosure of noisy equipment</li> <li>— soundproofing of buildings</li> </ul> </td> <td data-bbox="846 978 1151 1161">The applicability may be restricted by lack of space</td> </tr> <tr> <td data-bbox="271 1161 338 1294">e.</td> <td data-bbox="338 1161 479 1294">Appropriate location of equipment and buildings</td> <td data-bbox="479 1161 846 1294">Noise levels can be reduced by increasing the distance between the emitter and the receiver and by using buildings as noise screens</td> <td data-bbox="846 1161 1151 1294">Generally applicable to new plant</td> </tr> </tbody> </table>							Technique	Description	Applicability	a.	Operational measures	These include: <ul style="list-style-type: none"> <li>— improved inspection and maintenance of equipment</li> <li>— closing of doors and windows of enclosed areas, if possible</li> <li>— equipment operated by experienced staff</li> <li>— avoidance of noisy activities at night, if possible</li> <li>— provisions for noise control during maintenance activities</li> </ul>	Generally applicable	b.	Low-noise equipment	This potentially includes compressors, pumps and disks	Generally applicable when the equipment is new or replaced	c.	Noise attenuation	Noise propagation can be reduced by inserting obstacles between the emitter and the receiver. Appropriate obstacles include protection walls, embankments and buildings	Generally applicable to new plants. In the case of existing plants, the insertion of obstacles may be restricted by lack of space	d.	Noise-control equipment	This includes: <ul style="list-style-type: none"> <li>— noise-reducers</li> <li>— equipment insulation</li> <li>— enclosure of noisy equipment</li> <li>— soundproofing of buildings</li> </ul>	The applicability may be restricted by lack of space	e.	Appropriate location of equipment and buildings	Noise levels can be reduced by increasing the distance between the emitter and the receiver and by using buildings as noise screens	Generally applicable to new plant
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<p><b>The following BAT Conclusions are deleted as they are not applicable to the activities carried out at the installation: Combustion of solid fuels only (coal and/or lignite) – BAT Conclusions 18 to 23</b></p>																													

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<b>Combustion of solid fuels (solid biomass and/or peat) - BAT Conclusions 24 to 27</b> <b>Combustion of liquid fuels (HFO and/or gas-oil-fired boilers) – BAT Conclusions 28 to 30</b> <b>Combustion of liquid fuels (HFO and/or gas-oil-fired engines) – BAT Conclusions 31 to 35</b> <b>Combustion of liquid fuels (gas oil fired gas turbines) – BAT Conclusions 36 to 39</b>																																										
<b>Combustion of gaseous fuels</b>																																										
40	<p>In order to increase the energy efficiency of natural gas combustion, BAT is to use an appropriate combination of the techniques given in BAT 12 and below.</p> <table border="1" data-bbox="280 555 1137 901"> <thead> <tr> <th data-bbox="280 555 414 619">Technique</th> <th data-bbox="414 555 582 619">Description</th> <th data-bbox="582 555 1137 619">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="280 619 414 901">a</td> <td data-bbox="414 619 582 901">Combined cycle</td> <td data-bbox="582 619 1137 901">See description in Section 8.2 Generally applicable to new gas turbines and engines except when operated &lt; 1,500 h/yr. Applicable to existing gas turbines and engines within the constraints associated with the steam cycle design and the space availability. Not applicable to existing gas turbines and engines operated &lt; 1,500 h/yr. Not applicable to mechanical drive gas turbines operated in discontinuous mode with extended load variations and frequent start-ups and shutdowns. Not applicable to boilers</td> </tr> </tbody> </table> <p><b>BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of natural gas</b></p> <table border="1" data-bbox="280 957 1137 1340"> <thead> <tr> <th data-bbox="280 957 470 1157" rowspan="3">Type of combustion unit</th> <th colspan="5" data-bbox="470 957 1137 997">BAT-AEELs <sup>(136)</sup> <sup>(137)</sup></th> </tr> <tr> <th colspan="2" data-bbox="470 997 672 1077">Net electrical efficiency (%)</th> <th data-bbox="672 997 873 1077" rowspan="2">Net total fuel utilisation (%) <sup>(138)</sup> <sup>(139)</sup></th> <th colspan="2" data-bbox="873 997 1137 1077">Net mechanical energy efficiency (%) <sup>(139)</sup> <sup>(140)</sup></th> </tr> <tr> <th data-bbox="470 1077 560 1157">New unit</th> <th data-bbox="560 1077 672 1157">Existing unit</th> <th data-bbox="873 1077 985 1157">New unit</th> <th data-bbox="985 1077 1137 1157">Existing unit</th> </tr> </thead> <tbody> <tr> <td data-bbox="280 1157 470 1220">Gas engine</td> <td data-bbox="470 1157 560 1220">39,5–44 <sup>(141)</sup></td> <td data-bbox="560 1157 672 1220">35–44 <sup>(141)</sup></td> <td data-bbox="672 1157 873 1220">56–85 <sup>(141)</sup></td> <td colspan="2" data-bbox="873 1157 1137 1220">No BAT-AEEL.</td> </tr> <tr> <td data-bbox="280 1220 470 1284">Gas-fired boiler</td> <td data-bbox="470 1220 560 1284">39–42,5</td> <td data-bbox="560 1220 672 1284">38–40</td> <td data-bbox="672 1220 873 1284">78–95</td> <td colspan="2" data-bbox="873 1220 1137 1284">No BAT-AEEL.</td> </tr> <tr> <td data-bbox="280 1284 470 1340">Open cycle gas turbine, ≥ 50 MWth</td> <td data-bbox="470 1284 560 1340">36–41,5</td> <td data-bbox="560 1284 672 1340">33–41,5</td> <td data-bbox="672 1284 873 1340">No BAT-AEEL</td> <td data-bbox="873 1284 985 1340">36,5–41</td> <td data-bbox="985 1284 1137 1340">33,5–41</td> </tr> </tbody> </table> <p><b>Combined cycle gas turbine (CCGT)</b></p>	Technique	Description	Applicability	a	Combined cycle	See description in Section 8.2 Generally applicable to new gas turbines and engines except when operated < 1,500 h/yr. Applicable to existing gas turbines and engines within the constraints associated with the steam cycle design and the space availability. Not applicable to existing gas turbines and engines operated < 1,500 h/yr. Not applicable to mechanical drive gas turbines operated in discontinuous mode with extended load variations and frequent start-ups and shutdowns. Not applicable to boilers	Type of combustion unit	BAT-AEELs <sup>(136)</sup> <sup>(137)</sup>					Net electrical efficiency (%)		Net total fuel utilisation (%) <sup>(138)</sup> <sup>(139)</sup>	Net mechanical energy efficiency (%) <sup>(139)</sup> <sup>(140)</sup>		New unit	Existing unit	New unit	Existing unit	Gas engine	39,5–44 <sup>(141)</sup>	35–44 <sup>(141)</sup>	56–85 <sup>(141)</sup>	No BAT-AEEL.		Gas-fired boiler	39–42,5	38–40	78–95	No BAT-AEEL.		Open cycle gas turbine, ≥ 50 MWth	36–41,5	33–41,5	No BAT-AEEL	36,5–41	33,5–41	FC	<p>The Operator confirmed that:</p> <p>CCGT 46-54% (Net electrical efficiency)</p> <p>CHP 65-75% (Net total fuel utilisation)</p> <p>Refer to Section 4.2 of this document and BAT Conclusion 2.</p> <p>Energy efficiency is optimised through techniques; a, b, c, d, g and h given in BAT Conclusion 12.</p> <p>We do not agree with the Operator's stated compliance (CC) and have set an improvement condition to address this. We have set this BAT Conclusion to FC.</p>
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BAT C 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
	CCGT, 50–600 MW <sub>th</sub>	53–58,5	46–54	No BAT-AEEL	No BAT-AEEL		
	CCGT, ≥ 600 MW <sub>th</sub>	57–60,5	50–60	No BAT-AEEL	No BAT-AEEL		
	CHP CCGT, 50–600 MW <sub>th</sub>	53–58,5	46–54	65–95	No BAT-AEEL		
	CHP CCGT, ≥ 600 MW <sub>th</sub>	57–60,5	50–60	65–95	No BAT-AEEL		
41	In order to prevent or reduce NO <sub>x</sub> emissions to air from the combustion of natural gas in boilers, BAT is to use one or a combination of the techniques given below.					NA	<p>The Operator confirmed that:</p> <p>Not applicable, no boilers at the installation.</p> <p>We agree that this BAT Conclusion is not applicable to the activities carried out at the installation.</p>
	<b>Technique</b>	<b>Description</b>		<b>Applicability</b>			
a	Air and/or fuel staging	See descriptions in Section 8.3. Air staging is often associated with low-NO <sub>x</sub> burners		Generally applicable			
b	Flue-gas recirculation	See description in Section 8.3					
c	Low-NO <sub>x</sub> burners (LNB)						
d	Advanced control system	See description in Section 8.3. This technique is often used in combination with other techniques or may be used alone for combustion plants operated < 500 h/yr		The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system			
e	Reduction of the combustion air temperature	See description in Section 8.3		Generally applicable within the constraints associated with the process needs			
f	Selective non-catalytic reduction (SNCR)			Not applicable to combustion plants operated < 500 h/yr with highly variable boiler loads. The applicability may be limited in the case of combustion plants operated between 500 h/yr and 1 500 h/yr with highly variable boiler loads			
a	Selective			Not applicable to combustion			

BAT C 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																		
	<ul style="list-style-type: none"> <li>catalytic reduction (SCR)</li> </ul>		plants operated < 500 h/yr. Not generally applicable to combustion plants of < 100 MW <sub>th</sub> . There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1,500 h/yr																				
42	In order to prevent or reduce NO <sub>x</sub> emissions to air from the combustion of natural gas in gas turbines, BAT is to use one or a combination of the techniques given below.			FC	<p>The Operator confirmed that:</p> <p>NO<sub>x</sub> emissions are reduced by the application of techniques a and c as identified in this BAT Conclusion. The GT is a GE Frame 6B DLN 1.0 and is already fitted with DLN combustors and emissions will be within the applicable BAT-AEL ranges for NO<sub>x</sub>.</p> <p>The effective DLN point is currently defined as 75% GT load, equal to 30 MW.</p> <p>If the site were to be returned to CHP operation, efficiency would be dependent on the requirements of a potential future steam customer, but would be unlikely to exceed 75%. Therefore, the applicable BAT-AEL ranges for NO<sub>x</sub> would remain consistent with CCGT operation.</p> <p>Annual AEL 10-45 mg/Nm<sup>3</sup></p> <p>Daily AEL 35-55 mg/Nm<sup>3</sup></p> <p>Refer to Section 4.1 of this document for setting of limits.</p> <p>We do not agree with the Operator's stated compliance (CC) and have set an improvement condition to address this. We require additional information to demonstrate that the proposed effective DLN point is appropriate. We have set this BAT Conclusion to FC.</p>																		
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	f.	Selective catalytic reduction (SCR)	<p>(CCGT) combustion plants</p> <p>Not applicable in the case of combustion plants operated &lt; 500 h/yr.</p> <p>Not generally applicable to existing combustion plants of &lt; 100 MW<sub>th</sub>.</p> <p>Retrofitting existing combustion plants may be constrained by the availability of sufficient space.</p> <p>There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1,500 h/yr</p>																	
43	In order to prevent or reduce NO <sub>x</sub> emissions to air from the combustion of natural gas in engines, BAT is to use one or a combination of the techniques given below.			NA	<p>The Operator confirmed that:</p> <p>Not applicable, no engines at the installation.</p> <p>We agree that this BAT Conclusion is not applicable to the activities carried out at the installation.</p>															
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Type of combustion plant	Combustion plant total rated thermal input (MW <sub>th</sub> )	BAT-AELs (mg/Nm <sup>3</sup> ) <sup>(142)</sup> <sup>(143)</sup>																																																					
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	existing gas turbine for emergency use and operated < 500 h/yr												
Existing gas turbine for mechanical drive applications — All but plants operated < 500 h/yr	≥ 50	15–50 <sup>(155)</sup>	25–55 <sup>(156)</sup>										
<p>As an indication, the yearly average CO emission levels for each type of existing combustion plant operated ≥ 1,500 h/yr and for each type of new combustion plant will generally be as follows:</p>													
<p>— New OCGT of ≥ 50 MW<sub>th</sub>: &lt; 5–40 mg/Nm<sup>3</sup>. For plants with a net electrical efficiency (EE) greater than 39 %, a correction factor may be applied to the higher end of this range, corresponding to [higher end] × EE/39, where EE is the net electrical energy efficiency or net mechanical energy efficiency of the plant determined at ISO baseload conditions.</p>													
<p>— Existing OCGT of ≥ 50 MW<sub>th</sub> (excluding turbines for mechanical drive applications): &lt; 5–40 mg/Nm<sup>3</sup>. The higher end of this range will generally be 80 mg/Nm<sup>3</sup> in the case of existing plants that cannot be fitted with dry techniques for NO<sub>x</sub> reduction, or 50 mg/Nm<sup>3</sup> for plants that operate at low load.</p>													
<p>— New CCGT of ≥ 50 MW<sub>th</sub>: &lt; 5–30 mg/Nm<sup>3</sup>. For plants with a net electrical efficiency (EE) greater than 55 %, a correction factor may be applied to the higher end of the range, corresponding to [higher end] × EE/55, where EE is the net electrical energy efficiency of the plant determined at ISO baseload conditions.</p>													
<p>— Existing CCGT of ≥ 50 MW<sub>th</sub>: &lt; 5–30 mg/Nm<sup>3</sup>. The higher end of this range will generally be 50 mg/Nm<sup>3</sup> for plants that operate at low load.</p>													
<p>— Existing gas turbines of ≥ 50 MW<sub>th</sub> for mechanical drive applications: &lt; 5–40 mg/Nm<sup>3</sup>. The higher end of the range will generally be 50 mg/Nm<sup>3</sup> when plants operate at low load.</p>													
<p>In the case of a gas turbine equipped with DLN burners, these indicative levels correspond to when the DLN operation is effective.</p>													
<p><b>BAT-associated emission levels (BAT-AELs) for NO<sub>x</sub> emissions to air from the combustion of natural gas in boilers and engines</b></p>													
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45	<p>In order to reduce non-methane volatile organic compounds (NMVOC) and methane (CH<sub>4</sub>) emissions to air from the combustion of natural gas in spark-ignited lean-burn gas engines, BAT is to ensure optimised combustion and/or to use oxidation catalysts.</p> <p><b>Description</b></p> <p>See descriptions in Section 8.3. Oxidation catalysts are not effective at reducing the emissions of saturated hydrocarbons containing less than four carbon atoms.</p> <p><b>BAT-associated emission levels (BAT-AELs) for formaldehyde and CH<sub>4</sub> emissions to air from the combustion of natural gas in a spark-ignited lean-burn gas engine</b></p> <table border="1" data-bbox="280 963 1137 1187"> <thead> <tr> <th rowspan="3">Combustion plant total rated thermal input (MW<sub>th</sub>)</th> <th colspan="3">BAT-AELs (mg/Nm<sup>3</sup>)</th> </tr> <tr> <th>Formaldehyde</th> <th colspan="2">CH<sub>4</sub></th> </tr> <tr> <th colspan="3">Average over the sampling period</th> </tr> <tr> <th></th> <th>New or existing plant</th> <th>New plant</th> <th>Existing plant</th> </tr> </thead> <tbody> <tr> <td>≥ 50</td> <td>5–15 <sup>(162)</sup></td> <td>215–500 <sup>(163)</sup></td> <td>215–560 <sup>(162)</sup> <sub><sup>(163)</sup></sub></td> </tr> </tbody> </table>	Combustion plant total rated thermal input (MW <sub>th</sub> )	BAT-AELs (mg/Nm <sup>3</sup> )			Formaldehyde	CH <sub>4</sub>		Average over the sampling period				New or existing plant	New plant	Existing plant	≥ 50	5–15 <sup>(162)</sup>	215–500 <sup>(163)</sup>	215–560 <sup>(162)</sup> <sub><sup>(163)</sup></sub>	NA	<p>The Operator confirmed that:</p> <p>Not applicable, no engines at the installation.</p> <p>We agree that this BAT Conclusion is not applicable to the activities carried out at the installation.</p>	
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≥ 50	5–15 <sup>(162)</sup>	215–500 <sup>(163)</sup>	215–560 <sup>(162)</sup> <sub><sup>(163)</sup></sub>																			
<p><b>The following BAT Conclusions are deleted as they are not applicable to the activities carried out at the installation:</b></p> <p><b>BAT Conclusions for iron and steel process gases – BAT Conclusions 46 to 51</b></p> <p><b>BAT Conclusions for offshore platforms – BAT Conclusions BAT 52 to 54</b></p> <p><b>BAT Conclusions for chemical process gases – BAT Conclusions 55 to 59</b></p> <p><b>BAT Conclusions for co-incineration – BAT Conclusions 60 to 71</b></p> <p><b>BAT Conclusions for gasification – BAT Conclusions 72 to 75</b></p>																						

## **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.*

**The Operator has not made any such request.**

## **7 Emissions to water**

There are no direct emissions to water from the installation. There is a release to sewer at emission point S1.

Non-hazardous liquid emissions (surface water drainage and cooling water blow-down) are collected and pumped to the effluent treatment facilities at the adjacent ConocoPhillips site. Flows from the installation are combined with those generated by the ConocoPhillips site following which the effluent is subjected to primary and secondary and treatment. The treated effluent is then sent to the Bran Sands sewage treatment plant and further treated prior to being discharged to the River Tees

There are no BAT AELs specified in the BAT Conclusions for this type of plant.

## 8 Additional IED Chapter II requirements:

We have made the following changes to the permit which are outside the scope of the review in order that the varied and consolidated permit reflects the current operations at the site.

Condition/table	Justification
Condition 1.2.2 added	To drive the active review of the available local options to reinstate combined heat and power (CHP).
Condition 2.3.7 and improvement condition IC4 added  (definition in Schedule 6 already in permit)	<p>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.</p> <p>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 2.3.7. 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.</p>
Table S1.1	Amended to include, 1 MWth black start emergency gas-oil generator.
Table S1.2	Amended to include reference to an agreement to use a reduced AST/QAL2 during periods of low operational use. This had already been agreed with the Operator 25 January 2019 and this agreement is now incorporated into the table.
Table S1.3	Amended to confirm the completion of IC3. Amended to include an improvement condition to ensure compliance with IED Chapter III/Annex V limits.
Table S2.1	Amended to add natural gas, consistent with other permits in the sector. It also helps with regulation as it is clear that the Operator is permitted to burn natural gas.



Table S3.1	<p>The Operator confirmed that sampled flue gas is dried prior to analysis.</p> <p>The existing permit requires the continuous measurement of water vapour.</p> <p>We have added a note to table S3.1 to confirm that measurement of the water vapour content of the flue-gas is not necessary if the sampled flue-gas is dried before analysis. This provides operational flexibility should sampling arrangements change.</p> <p>We have also included this note to table S3.1a.</p> <p>The ‘hourly average’ reference period for NOx and CO was amended to ‘95% of validated hourly averages within a calendar year’, consistent with IED chapter III/Annex V requirements.</p> <p>We have added a note to table S3.1 to confirm that dust monitoring requirements are only applicable when the gas turbine is fired on LP fuel gas.</p> <p>For gas turbines fired on natural gas the dust emissions will always be reported as zero.</p> <p>We have also included this note to table S3.1a.</p>
Tables S3.1 and S3.1a	<p>The Chapter III Annex V limits in the existing permit apply above 75% load. There can be no deviation from these limits and they apply above 70% load.</p> <p>We have set an improvement condition to address this deviation.</p>
Table S3.2	Amended to require inspection for oil at release point S1, effluent from the collection sump.
Table 4.3	Amended to include the use of low pressure fuel gas.
Schedule 6 Interpretation	<p>Deleted “background concentration” definition which is not applicable to the installation.</p> <p>“background concentration” means such concentration of that substance as is present in:</p> <ul style="list-style-type: none"> <li>- for emissions to surface water, the surface water quality up-gradient of the site; or</li> <li>- for emissions to sewer, the surface water quality up-gradient of the sewage treatment works discharge.</li> </ul> <p>Amended the reference conditions interpretation to remove those that are not applicable to the facility.</p>
General (reference to	Whilst the regulation 61 response did not make any reference to the firing of low pressure fuel gas in the gas

low pressure fuel gas)	<p>turbine, the Operator confirmed in their response to our further information request received 03 March 2020 that they wanted it to be retained in the permit.</p> <p>The low pressure fuel gas is from the adjacent ConocoPhillips facility.</p> <p>We have retained the approach for the existing permit i.e. that the limits for the firing of the process gas are the same as those for natural gas. We have set a pre-operational condition to secure compliance with BAT Conclusion 9.</p>
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## 9 Review and assessment of changes that are not part of the BAT Conclusions derived permit review.

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

Aspect considered	Decision
<b>Receipt of application</b>	
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.
<b>The site</b>	
Biodiversity, heritage, landscape and nature conservation	<p>The application is within the relevant distance criteria of a site of heritage, landscape or nature conservation, and/or protected species or habitat.</p> <p>A full assessment of the application and its potential to affect the sites/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 sites/species/habitat as the conditions will provide at least the same level of protection as those in the previous permit and in some cases will provide a higher level of protection to those in the previous permit.</p> <p>We have not consulted Natural England on the application. The decision was taken in accordance with</p>

Aspect considered	Decision
	our guidance.
<b>Operating techniques</b>	
General operating techniques	<p>We have reviewed the techniques used by the Operator where they are relevant to the BAT Conclusions and compared these with the relevant guidance notes.</p> <p>The permit conditions ensure compliance with the relevant BREF, BAT Conclusions. The ELVs deliver compliance with the BAT AELs.</p>
<b>Permit conditions</b>	
Updating permit conditions during consolidation	<p>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.</p>
Changes to the permit conditions due to an Environment Agency initiated variation	<p>We have varied the permit as stated in the variation notice.</p>
Pre-operational conditions	<p>Based on the information in the application, we consider that we need to impose a pre-operational condition. Refer to key issues section above, BAT Conclusion 9 for fuel characterisation.</p>
Improvement programme	<p>Based on the information in the application, we consider that we need to impose an improvement programme.</p> <p>We have imposed an improvement programme to ensure that the performance of the plant is verified in accordance with BAT Conclusions 2, 40 and 42. Refer to key issues section of this document.</p>
Emission limits	<p>We have decided that emission limits should be set for the parameters listed in the permit.</p>

Aspect considered	Decision
	<p>These are described in the relevant BAT Conclusions in Sections 4.1 and 5 of this document.</p> <p>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.</p>
Monitoring	<p>We have decided that monitoring should be carried out for the parameters listed in the permit, using the methods detailed and to the frequencies specified.</p> <p>These are described in the relevant BAT Conclusions in Sections 4.1 and 5 of this document.</p> <p>Table S3.3 Process monitoring requirements was amended to include the requirement to monitor energy efficiency after overhauls on site in line with BAT Conclusion 2.</p> <p>Based on the information in the application we are satisfied that the Operator's techniques, personnel and equipment have either MCERTS certification or MCERTS accreditation as appropriate.</p>
Reporting	<p>We have specified reporting in the permit for the following parameters:</p> <ul style="list-style-type: none"> <li>• Nitrogen dioxide</li> <li>• Carbon monoxide</li> <li>• Sulphur dioxide (IED Chapter III requirement)</li> <li>• Dust (IED Chapter III requirement)</li> </ul> <p>These are described in the relevant BAT Conclusions in Sections 4.1 and 5 of this document.</p>
<b>Operator competence</b>	
Management system	There is no known reason to consider that the Operator will not have the management system to enable them to comply with the permit conditions.
<b>Growth Duty</b>	
Section 108	We have considered our duty to have regard to the

Aspect considered	Decision
Deregulation Act 2015 – Growth duty	<p>desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit.</p> <p>Paragraph 1.3 of the guidance says:  “The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation.”</p> <p>We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.</p> <p>We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate Operators because the standards applied to the Operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.</p>