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/DP3933DN
The Operator is: Drax Generation Enterprise Limited
The Installation is: Damhead Creek Power Station
This Variation Notice number is: EPR/DP3933DN/V004

What this document is about

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

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

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

As well as considering the review of the operating techniques used by the Operator for the operation of the plant and activities of the installation, the consolidated variation notice takes into account and brings together in a

single document all previous variations that relate to the original permit issued. It also modernises the entire permit to reflect the conditions contained in our current generic permit template.

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

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

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

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

How this document is structured

Glossary of acronyms used in this document

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

APC	Air Pollution Control
BAT	Best Available Technique(s)
BAT-AEEL	BAT Associated Energy Efficiency Level
BAT-AEL	BAT Associated Emission Level
BATc	BAT conclusion
BREF	Best available techniques reference document
CCGT	Combined Cycle Gas Turbine
CEM	Continuous emissions monitor
CHP	Combined heat and power
CV	Calorific value
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
DLN	Dry Low NOx burners
DLN-E	Dry Low NOx effective
EIONET	European environment information and observation network is a partnership network of the European Environment Agency
ELV	Emission limit value derived under BAT or an emission limit value set out in IED
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No. 1154)
EWC	European waste catalogue
FSA	Food Standards Agency
IC	Improvement Condition
IED	Industrial Emissions Directive (2010/75/EU)
IPPCD	Integrated Pollution Prevention and Control Directive (2008/1/EC) – now superseded by IED
LCP	Large Combustion Plant subject to Chapter III of IED
MSUL/MSDL	Minimum start up load/minimum shut-down load
NOx	Oxides of nitrogen (NO plus NO_2 expressed as NO_2)
NPV	Net Present Value
OCGT	Open Cycle Gas Turbine
PHE	Public Health England
SAC	Special Area of Conservation
SGN	Sector guidance note
TGN	Technical guidance note
TNP	Transitional National Plan
TOC	Total Organic Carbon
WFD	Water Framework Directive (2000/60/EC)

1 Our decision

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

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

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

2 How we reached our decision

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

We issued a Notice under Regulation 61(1) of the Environmental Permitting (England and Wales) Regulations 2016 (a Regulation 61 Notice) on 1st 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 large combustion plant BAT Conclusions document. The Notice also required that where the revised standards are not currently met, the operator should provide information that:

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

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

The Regulation 61 Notice response from the Operator, for Damhead Creek 1, was received on 16th November 2018.

The Regulation 61 Notice response from the Operator, for Damhead Creek 2, was received on 5th May 2019.

We considered they were 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.

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

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

3 The legal framework

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

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

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

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

4 The key issues

The key issues arising during this permit review are:

- Emissions to air and the emission limits applied to the plant.
- The energy efficiency levels associated with the Best Available Techniques (BAT-AEELs)

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 where the IED specified that limits applied over 70% load and the BAT Conclusions specified that AELs applied when dry low NOx is effective (DLN-E), we have used DLN-E as a default across all monitoring requirements for NOx and CO.

The Power Station has been developed in two phases Damhead Creek 1 (DHC1) and Damhead Creek 2 (DHC2), both are covered by the same environmental permit (EPR/DP3933DN), however DHC2 has not yet been constructed.

The LCPs on site consist of:

DHC1: LCP 81 and LCP 82. Both LCPs consist of a 711MWth CCGT each of which vent via separate windshields at emission points A1 and A2 respectively. The units burn natural gas. Each gas turbine has a dedicated Heat Recovery Steam Generator (HRSG). Steam from the two HRSGs is routed to a single steam turbine generator.

DHC2: LCP 467, LCP 468 and LCP 469. Each LCP will consist of a 1,093 MWth CCGT which vents via a single windshield at emission points A9, A10 and A11. The units will burn natural gas.

DHC1 was put into operation before IED came into force and therefore the existing limits in the permit are from Part 1 of IED Annex V applicable to existing plant.

DHC2 has not yet been constructed. As the plant will be put into operation after IED came into force the existing limits in the permit are from Part 2 of Annex V applicable to new plant. A variation to permit EPR/DP3933DN to incorporate DHC2 (LCPs 467, 468 and 469) was issued in June 2017. Under the BREF, plant is defined as existing if it was permitted before the publication of the BAT Conclusions (31 July 2017). Therefore, for the purpose of the LCP BAT review DHC2 is considered to be existing plant.

The ELVs and AELs for both DHC1 and DHC2 are based on the following operating regime:

- Unlimited hours operation

Damhead Creek 1 (DHC1)

The following tables outline the limits that have been incorporated into the permit for LCP 81 and LCP 82, 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 consolidated permit.

The existing permit sets monthly, daily and hourly average emission limits for carbon monoxide (CO) and oxides of nitrogen (NOx) for LCP 81 and LCP 82. Under the principal of “no backsliding” the current emission limits will be retained unless tighter limits are set by the BREF.

An additional daily limit from start up/shut down to baseload has been added for DHC1 in tables S3.1 and S3.1a of the consolidated permit. Although this is not a regulatory requirement, it was requested by the Emissions Methodology Working Group of the Joint Environmental Protocol to ensure consistency across the sites. We have included a corresponding footnote in the permit.

The Operator proposed that Dry Low NOx effective (DLN-E) for DHC1 will be defined as per the Minimum Start-Up Load (MSUL) specified in Table S1.5 of the permit. We agree with this approach. See Section 8 of this Decision document for further information.

Type	Combined Cycle Gas Turbine
Age	Permitted **before** publication of the LCP BREF
Operating Hours	Unlimited
Fuel	Natural gas

NOx limits (mg/Nm^3)							
Averaging	**Permit limit/non IED**	**IED (Annex V Part 1) - Existing**	**BREF (Table 24 BAT-c)**	**Expected permit limits**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**None**	**40**	**40**	BREF	DLN-E	Continuous
Monthly	**None**	**50**	**None**	**50**	IED	DLN-E	
Daily	**None**	**55**	**50**	**50**	BREF	DLN -E	
95th %ile of hr means	**90**	**100**	**None**	**90**	Permit	DLN-E	

CO limits (mg/Nm^3)							
Averaging	**Permit limit/non IED**	**IED (Annex V Part 1) - Existing**	**BREF**	**Expected permit limits**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**None**	**30**	**30**	BREF	DLN-E	Continuous
Monthly	**80**	**100**	**None**	**80**	Permit	DLN-E	
Daily	**80**	**110**	**None**	**80**	Permit	DLN-E	
95th %ile of hr means	**120**	**200**	**None**	**120**	Permit	DLN-E	

Damhead Creek 2

The following tables outline the limits that have been incorporated into the permit for LCP 467, LCP 468 and LCP 469, 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 consolidated permit.

The existing permit sets monthly, daily, daily - MSUL/MSDL to base load and hourly average emission limits for CO and NOx for LCP 467, LCP 468 and LCP 469. Under the principal of "no backsliding" the current emission limits will be retained unless tighter limits are set by the BREF.

In their Regulation 61 response, the Operator stated that DLN-E would be at 70% of the load of the plant. This mirrors the point above which limits applied under Chapter III of the IED. However, as the plant is not yet built, we have included an improvement condition (IC14) requiring the Operator to establish and confirm at what load the DLN-E is following commissioning.

Type	Combined Cycle Gas Turbine
Age	Permitted **before** publication of the LCP BREF
Operating Hours	Unlimited
Fuel	Natural gas

NOx limits (mg/Nm^3)						
Averaging	**IED (Annex V Part 2) - New**	**BREF (Table 24 BAT-c)**	**Expected permit limits**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**40**	**40**	BREF	DLN-E	Continuous
Monthly	**50**	**None**	**50**	IED	DLN-E	
Daily	**55**	**50**	**50**	BREF	DLN-E	
95th %ile of hr means	**100**	**None**	**100**	IED	DLN-E	

CO limits (mg/Nm^3)						
Averaging	**IED (Annex V Part 2) - New**	**BREF**	**Expected permit limits**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**30**	**30**	BREF	DLN-E	Continuous
Monthly	**100**	**None**	**100**	IED	DLN-E	
Daily	**110**	**None**	**110**	IED	DLN-E	
95th %ile of hr means	**200**	**None**	**200**	IED	DLN-E	

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

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

The table below sets out the BAT-AEELs specified in the LCP BAT Conclusions for the large combustion plant on the site and the energy efficiency levels for DHC1 confirmed through the Regulation 61 notice response. We consider this plant is BAT in relation to the AEELs.

The net electrical efficiency for DHC2 will be confirmed, following commissioning, by the submission under Improvement Condition 12 (IC12) and process monitoring requirements specified in Table S3.3 of the permit.

BAT AEELs (%)			Plant efficiency (%)		
Net electrical efficiency	**Net total fuel utilisation**	**Net mechanical efficiency**	**Net electrical efficiency**	**Net total fuel utilisation**	**Net mechanical efficiency**
LCP 81 and LCP 82: Existing CCGT, ≥ 600MWth					
50-60	**None**	**None**	**54**	**NA**	**NA**
LCP 467, LCP 468 and LCP 469: Existing CCGT, ≥ 600MWth					
50-60	**None**	**None**	**Note 1**	**NA**	**NA**
Note 1: to be confirmed by the submission under Improvement Condition 12 (IC12) and process monitoring requirements specified in Table S3.3 of the permit.					

5 Decision checklist regarding relevant BAT Conclusions

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

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

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

BAT Conclusion requirement topic	Permit condition(s)	Permit table(s)
Environmental Management System	1.1.1	S1.2
BAT AELs	3.1.1 and 3.5.1	S3.1a
Monitoring	2.3, 3.5 and 3.6	S1.5, S1.6, S3.1a
Energy efficiency	1.2 and 2.3	S3.3
Noise	3.4 and 2.3	S1.2
Other operating techniques	2.3	S1.2

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

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

The table below contains information for both DHC1 and DHC2. Although DHC2 has not been built yet, where the information provided by the Operator in the Regulation 61 response indicates that the plant will meet the requirements of the BAT Conclusions, we have deemed its status as Currently Compliant.

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
General			
1	**In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features:** i. commitment of the management, including senior management; ii. definition of an environmental policy that includes the continuous improvement of the installation by the management; iii. planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment; iv. implementation of procedures (a) Structure and responsibility (b) Training (c) Communication (d) Employee involvement (e) Documentation (f) Efficient process control (g) Maintenance programmes (h) Emergency preparedness and response (i) Safeguarding compliance with environmental legislation v. checking performance and taking corrective action, paying particular attention to: (a) monitoring and measurement (see also the Reference Document on the General Principles of Monitoring) (b) corrective and preventive action (c) maintenance of records (d) independent (where practicable) internal and external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; vi. review of the EMS and its continuing suitability, adequacy and effectiveness by senior management; vii. following the development of cleaner technologies; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life; ix. application of sectoral benchmarking on a regular basis. Etc - see BAT Conclusions	CC	An EMS is in place which the Operator has confirmed is compliant with the requirements listed in BAT 1. The EMS is certified to ISO 14001:2015. the Operator has also confirmed that the EMS for DHC1 will be expanded to include DHC2.

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	Applicability. The scope (e.g. level of detail) and nature of the EMS (e.g. standardised or non-standardised) will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have.		
2	BAT is to determine the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the gasification, IGCC and/or combustion units by carrying out a performance test at full load (1), according to EN standards, after the commissioning of the unit and after each modification that could significantly affect the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the unit. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	CC	A process monitoring requirement has been set in table S3.3 which requires energy efficiency monitoring within 4 months after commissioning and each modification that could significantly affect these parameters. DHC1: An assessment of efficiency was calculated based on efficiency data and determined to be 54% for DHC1. The efficiency level of the plant is within the range specified in the BAT Conclusions for this type of plant. DHC2: The electrical efficiency of the plant is estimated to be around 60%, which is within the range specified in the BAT Conclusions for this type of plant. The Operator has confirmed they will determine the net electrical efficiency via performance testing the station at full load. Electrical efficiency for DHC2 is to be confirmed by the submission under Improvement Condition 12 (IC12) and process monitoring

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>requirements specified in Table S3.3 of the permit.</td></tr>
<tr><td>3</td><td>BAT is to monitor key process parameters relevant for emissions to air and water including those given below.
<table>
<tr><th>Stream</th><th>Parameter(s)</th><th>Monitoring</th></tr>
<tr><td rowspan="3">Flue-gas</td><td>Flow</td><td>Periodic or continuous determination</td></tr>
<tr><td>Oxygen content, temperature, and pressure</td><td rowspan="2">Periodic or continuous measurement</td></tr>
<tr><td>Water vapour content (3)</td></tr>
<tr><td>Waste water from flue-gas treatment</td><td>Flow, pH, and temperature</td><td>Continuous measurement</td></tr>
</table></td><td>CC</td><td>These parameters have been added to the permit for formal monitoring and reporting in table S3.1a which will apply from August 2021.

BAT 3 specifies monitoring of process water only applicable to waste water from flue gas treatment. This is not applicable to the installation as no flue gas treatment is undertaken on site.

DHC1: Flue gas process parameters listed in BAT 3 are monitored using MCERTs certified Continuous Emissions Monitoring System (CEMs) in accordance with BS EN 14181.

DHC2: The Operator has confirmed that flue gas parameters identified in BAT 3 will be continuously measured to the relevant standards.</td></tr>
<tr><td>4</td><td>BAT is to monitor emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.
<table>
<tr><th>Substance/Parameter</th><th>Fuel/Process/Type of combustion plant</th><th>Combustion plant total rated</th><th>Standard(s) (4)</th><th>Minimum monitoring frequency (5)</th><th>Monitoring associated with</th></tr>
</table></td><td>CC</td><td>DHC1: Flue gases from the site are monitored using MCERTs certified Continuous Emissions Monitoring System (CEMs) in accordance with BS EN 14181. This system continuously monitors</td></tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			thermal input					NOx and CO. Methane is monitored on an annual basis. DHC2: Emissions will be continuously monitored using MCERTS approved CEMS Units. CEMS will be maintained as required in compliance with EN 14181. There is no SCR/SNCR on site and therefore no requirement to monitor ammonia or SO_3.
	NH_3	— When SCR and/or SNCR is used	All sizes	Generic EN standards	Continuous [6] [7]	BAT 7		
	NO_X	— Coal and/or lignite including waste co-incineration — Solid biomass and/or peat including waste co-incineration — HFO- and/or gas-oil-fired boilers and engines — Gas-oil-fired gas turbines — Natural-gas-fired boilers, engines, and turbines — Iron and steel process gases — Process fuels from the chemical industry — IGCC plants	All sizes	Generic EN standards	Continuous [6] [8]	BAT 20 BAT 24 BAT 28 BAT 32 BAT 37 BAT 41 BAT 42 BAT 43 BAT 47 BAT 48 BAT 56 BAT 64 BAT 65 BAT 73		
		— Combustion plants on offshore platforms	All sizes	EN 14792	Once every year [9]	BAT 53		
	N_2O	— Coal and/or lignite in circulating fluidised bed boilers — Solid biomass and/or peat in circulating fluidised bed boilers	All sizes	EN 21258	Once every year [10]	BAT 20 BAT 24		
	CO	— Coal and/or lignite including waste co-incineration — Solid biomass and/or peat including waste co-incineration	All sizes	Generic EN standards	Continuous [6] [8]	BAT 20 BAT 24 BAT 28 BAT 33 BAT 38 BAT 44 BAT 49 BAT 56 BAT 64		

BAT Concn. Number	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		— HFO- and/or gas-oil-fired boilers and engines — Gas-oil-fired gas turbines — Natural-gas-fired boilers, engines, and turbines — Iron and steel process gases — Process fuels from the chemical industry — IGCC plants				BAT 65 BAT 73		
		— Combustion plants on offshore platforms	All sizes	EN 15058	Once every year (9)	BAT 54		
	SO_2	— Coal and/or lignite incl waste co-incineration — Solid biomass and/or peat incl waste co-incineration — HFO- and/or gas-oil-fired boilers — HFO- and/or gas-oil-fired engines — Gas-oil-fired gas turbines — Iron and steel process gases — Process fuels from the chemical industry in boilers — IGCC plants	All sizes	Generic EN standards and EN 14791	Continuous (6) (11) (12)	BAT 21 BAT 25 BAT 29 BAT 34 BAT 39 BAT 50 BAT 57 BAT 66 BAT 67 BAT 74		
	SO_3	— When SCR is used	All sizes	No EN standard available	Once every year	—		
	Gaseous chlorides, expressed as HCl	— Coal and/or lignite — Process fuels from the chemical industry in boilers	All sizes	EN 1911	Once every three months (6) (13) (14)	BAT 21 BAT 57		

BAT Concn. Number	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		— Solid biomass and/or peat	All sizes	Generic EN standards	Continuous (15) (16)	BAT 25		
		— Waste co-incineration	All sizes	Generic EN standards	Continuous (6) (16)	BAT 66 BAT 67		
	HF	— Coal and/or lignite — Process fuels from the chemical industry in boilers	All sizes	No EN standard available	Once every three months (6) (13) (14)	BAT 21 BAT 57		
		— Solid biomass and/or peat	All sizes	No EN standard available	Once every year	BAT 25		
		— Waste co-incineration	All sizes	Generic EN standards	Continuous (6) (16)	BAT 66 BAT 67		
	Dust	— Coal and/or lignite — Solid biomass and/or peat — HFO- and/or gas-oil-fired boilers — Iron and steel process gases — Process fuels from the chemical industry in boilers — IGCC plants — HFO- and/or gas-oil-fired engines — Gas-oil-fired gas turbines	All sizes	Generic EN standards and EN 13284-1 and EN 13284-2	Continuous (6) (17)	BAT 22 BAT 26 BAT 30 BAT 35 BAT 39 BAT 51 BAT 58 BAT 75		
		— Waste co-incineration	All sizes	Generic EN standards and EN 13284-2	Continuous	BAT 68 BAT 69		
	Metals and metalloids except mercury (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Se, Tl, V, Zn)	— Coal and/or lignite — Solid biomass and/or peat — HFO- and/or gas-oil-fired boilers and engines	All sizes	EN 14385	Once every year (18)	BAT 22 BAT 26 BAT 30		
		— Waste co-incineration	< 300 MW_{th}	EN 14385	Once every six months (13)	BAT 68 BAT 69		

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement

		≥ 300 MW_{th}	EN 14385	Once every three months [19] [13]	
	— IGCC plants	≥ 100 MW_{th}	EN 14385	Once every year [18]	BAT 75
Hg	— Coal and/or lignite including waste co-incineration	< 300 MW_{th}	EN 13211	Once every three months [13] [20]	BAT 23
		≥ 300 MW_{th}	Generic EN standards and EN 14884	Continuous [16] [21]	
	— Solid biomass and/or peat	All sizes	EN 13211	Once every year [22]	BAT 27
	— Waste co-incineration with solid biomass and/or peat	All sizes	EN 13211	Once every three months [13]	BAT 70
	— IGCC plants	≥ 100 MW_{th}	EN 13211	Once every year [23]	BAT 75
TVOC	— HFO- and/or gas-oil-fired engines — Process fuels from chemical industry in boilers	All sizes	EN 12619	Once every six months [13]	BAT 33 BAT 59
	— Waste co-incineration with 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_4	— Natural-gas-fired engines	All sizes	EN ISO 25139	Once every year [24]	BAT 45
PCDD/F	— Process fuels from chemical industry in boilers — Waste co-incineration	All sizes	EN 1948-1, EN 1948-2, EN 1948-3	Once every six months [13] [25]	BAT 59 BAT 71

5	BAT is to monitor emissions to water from flue-gas treatment with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	NA	Not applicable to either DHC1 or DHC2 as there is no flue-gas treatment.

<table>
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<tr><td></td><td>
<table>
<tr><th colspan="2">Substance/Parameter</th><th>Standard(s)</th><th>Minimum monitoring frequency</th><th>Monitoring associated with</th></tr>
<tr><td colspan="2">Total organic carbon (TOC) (26)</td><td>EN 1484</td><td rowspan="12">Once every month</td><td>BAT 15</td></tr>
<tr><td colspan="2">Chemical oxygen demand (COD) (26)</td><td>No EN standard available</td><td rowspan="11"></td></tr>
<tr><td colspan="2">Total suspended solids (TSS)</td><td>EN 872</td></tr>
<tr><td colspan="2">Fluoride (F^-)</td><td>EN ISO 10304-1</td></tr>
<tr><td colspan="2">Sulphate (SO_4^{2-})</td><td>EN ISO 10304-1</td></tr>
<tr><td colspan="2">Sulphide, easily released (S^{2-})</td><td>No EN standard available</td></tr>
<tr><td colspan="2">Sulphite (SO_3^{2-})</td><td>EN ISO 10304-3</td></tr>
<tr><td rowspan="8">Metals and metalloids</td><td>As</td><td rowspan="7">Various EN standards available (e.g. EN ISO 11885 or EN ISO 17294-2)</td></tr>
<tr><td>Cd</td></tr>
<tr><td>Cr</td></tr>
<tr><td>Cu</td></tr>
<tr><td>Ni</td></tr>
<tr><td>Pb</td></tr>
<tr><td>Zn</td></tr>
<tr><td>Hg</td><td>Various EN standards available (e.g. EN ISO 12846 or EN ISO 17852)</td></tr>
<tr><td colspan="2">Chloride (Cl^-)</td><td>Various EN standards available (e.g. EN ISO 10304-1 or EN ISO 15682)</td><td>—</td></tr>
<tr><td colspan="2">Total nitrogen</td><td>EN 12260</td><td>—</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>6</td><td>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.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Fuel blending and mixing</td><td>Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type</td><td>Generally applicable</td></tr>
</table>
</td><td>CC</td><td>(a) fuel blending and mixing: There is no requirement to blend or mix fuels. The plant has a contractual agreement to receive natural gas from the National Transmission System (NTS), which requires the gas to comply with specified quality criteria.</td></tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	b. Maintenance of the combustion system: Regular planned maintenance according to suppliers' recommendations c. Advanced control system: See description in Section 8.1 — The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system d. Good design of the combustion equipment: Good design of furnace, combustion chambers, burners and associated devices — Generally applicable to new combustion plants e. Fuel choice: Select or switch totally or partially to another fuel(s) with a better environmental profile (e.g. with low sulphur and/or mercury content) amongst the available fuels, including in start-up situations or when back-up fuels are used — Applicable within the constraints associated with the availability of suitable types of fuel with a better environmental profile as a whole, which may be impacted by the energy policy of the Member State, or by the integrated site's fuel balance in the case of combustion of industrial process fuels. For existing combustion plants, the type of fuel chosen may be limited by the configuration and the design of the plant		(b) Maintenance of the combustion system: DHC1 has a long term service agreement (LTSA) with the gas turbine original equipment manufacturer (OEM) under which planned preventative maintenance of the gas turbine combustion system is carried out at pre-determined intervals. The gas turbines are also monitored remotely by the OEM. DHC2 will also be subject to a planned preventative maintenance system, as per DHC1. The plant is covered by a Distributed Control System (DCS) to continuously monitor the operation of the plant and equipment at the site. Any non-conformance or deviation in normal operating parameters is identified by the DCS to allow operators to take action to avoid a breach of permitted emission levels. DHC2 will be operated from the existing DHC1 control room, or a new central control room for both DHC1 and 2, via the DCS (c) Advanced control system: the combustion system is equipped with Combustion Pulsation

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			Frequency Monitoring (CPFM) which monitors for combustion pulsation and regulates load accordingly to protect hardware and reduce emissions. Plant operational controls for DHC2 will be integrated into the existing Distributed Control System currently used for DHC1. (d) Good design of the combustion equipment: The combustion units for DHC1 are equipped with dry Low NOx burners standard to this technology to ensure minimum emissions of NOx. Dry Low-NOx burners will also be fitted for DHC2. (e) Fuel choice: The plant is operated using odourised natural gas. Natural gas is considered to represent the fuel with the best environmental profile for this installation.

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
7	In order to reduce emissions of ammonia to air from the use of selective catalytic reduction (SCR) and/or selective non-catalytic reduction (SNCR) for the abatement of NO_X emissions, BAT is to optimise the design and/or operation of SCR and/or SNCR (e.g. optimised reagent to NO_X ratio, homogeneous reagent distribution and optimum size of the reagent drops). **BAT-associated emission levels** The BAT-associated emission level (BAT-AEL) for emissions of NH_3 to air from the use of SCR and/or SNCR is < 3–10 mg/Nm^3 as a yearly average or average over the sampling period. The lower end of the range can be achieved when using SCR and the upper end of the range can be achieved when using SNCR without wet abatement techniques. In the case of plants combusting biomass and operating at variable loads as well as in the case of engines combusting HFO and/or gas oil, the higher end of the BAT-AEL range is 15 mg/Nm^3.	NA	Not applicable - no SCR or SNCR on site.
8	In order to prevent or reduce emissions to air during normal operating conditions, BAT is to ensure, by appropriate design, operation and maintenance, that the emission abatement systems are used at optimal capacity and availability.	CC	DHC1: All plant and equipment at the site is regularly maintained. Periodic maintenance and major overhauls of the plant equipment are undertaken to ensure appropriate and optimised operation of the plant. Maintenance works at the site are scheduled using the maintenance software system. DHC2: The CCGTs and associated monitoring equipment will be designed to ensure that the fuel combustion systems and abatement technologies are operating within their specified design parameters in order to maintain compliance with the limits specified in the permit. A maintenance regime will be established which ensures that plant and equipment is regularly

<table>
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<tr><td></td><td></td><td></td><td>checked and tested to ensure safe and reliable operation.</td></tr>
<tr><td>9</td><td>In order to improve the general environmental performance of combustion and/or gasification plants and to reduce emissions to air, BAT is to include the following elements in the quality assurance/quality control programmes for all the fuels used, as part of the environmental management system (see BAT 1):
(i) Initial full characterisation of the fuel used including at least the parameters listed below and in accordance with EN standards. ISO, national or other international standards may be used provided they ensure the provision of data of an equivalent scientific quality;
(ii) Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications. The frequency of testing and the parameters chosen from the table below are based on the variability of the fuel and an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed);
(iii) Subsequent adjustment of the plant settings as and when needed and practicable (e.g. integration of the fuel characterisation and control in the advanced control system (see description in Section 8.1)).
Description
Initial characterisation and regular testing of the fuel can be performed by the operator and/or the fuel supplier. If performed by the supplier, the full results are provided to the operator in the form of a product (fuel) supplier specification and/or guarantee.
<table>
<tr><th>Fuel(s)</th><th>Substances/Parameters subject to characterisation</th></tr>
<tr><td rowspan="2">Biomass/peat</td><td>— LHV
— moisture</td></tr>
<tr><td>— Ash
— C, Cl, F, N, S, K, Na
— Metals and metalloids (As, Cd, Cr, Cu, Hg, Pb, Zn)</td></tr>
<tr><td rowspan="3">Coal/lignite</td><td>— LHV
— Moisture
— Volatiles, ash, fixed carbon, C, H, N, O, S</td></tr>
<tr><td>— Br, Cl, F</td></tr>
<tr><td>— Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)</td></tr>
</table></td><td>CC</td><td>The plant has a contractual agreement to receive natural gas from the National Transmission System (NTS). National Grid is responsible for ensuring that the gas in the NTS meets a specified standard.

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.</td></tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement		Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	HFO	— Ash — C, S, N, Ni, V		
	Gas oil	— Ash — N, C, S		
	Natural gas	— LHV — CH_4, C_2H_6, C_3, C_4+, CO_2, N_2, Wobbe index		
	Process fuels from the chemical industry ([27])	— Br, C, Cl, F, H, N, O, S — Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)		
	Iron and steel process gases	— LHV, CH_4 (for COG), C_XH_Y (for COG), CO_2, H_2, N_2, total sulphur, dust, Wobbe index		
	Waste ([28])	— LHV — Moisture — Volatiles, ash, Br, C, Cl, F, H, N, O, S — Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)		
10	In order to reduce emissions to air and/or to water during other than normal operating conditions (OTNOC), BAT is to set up and implement a management plan as part of the environmental management system (see BAT 1), commensurate with the relevance of potential pollutant releases, that includes the following elements: — appropriate design of the systems considered relevant in causing OTNOC that may have an impact on emissions to air, water and/or soil (e.g. low-load design concepts for reducing the minimum start-up and shutdown loads for stable generation in gas turbines), — set-up and implementation of a specific preventive maintenance plan for these relevant systems, — review and recording of emissions caused by OTNOC and associated circumstances and implementation of corrective actions if necessary, — periodic assessment of the overall emissions during OTNOC (e.g. frequency of events, duration, emissions quantification/estimation) and implementation of corrective actions if necessary.		CC	DHC1: The plant and associated control systems have been designed to minimise the potential for OTNOC events to occur. All plant and equipment at the site is regularly maintained including those systems provided to minimise the potential for OTNOC conditions to occur. Maintenance works at the site are scheduled using the maintenance software system. The site has a long term service contract with qualified maintenance contractors who

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			carry out the maintenance works regularly. The response to BAT 1 confirms that the Operator's document *'Monitoring and Reporting for Compliance with Environmental Permitting Regulations' (reference: GEN-TG-ENV-7002, Nov 2016)* covers the procedures for monitoring emissions to air during periods of abnormal operation (such as start-up and shut-down). Response to BAT 6 specifies that a preventative maintenance programme is in place. DHC2: The plant will be managed and operated to avoid unnecessary OTNOC events and deviations from normal operational parameters. Monitoring and management systems will be designed to identify OTNOC events with procedures and systems in place to return the plant operations to normal operations as rapidly and safely as possible. Events which are OTNOC will also be covered by the EMS which includes risk assessments and procedures designed to deal with events and

<table>
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<tr><td></td><td></td><td></td><td>circumstances which are outside the normal operational circumstances of the plant.</td></tr>
<tr><td>11</td><td>BAT is to appropriately monitor emissions to air and/or to water during OTNOC..
Description
The monitoring can be carried out by direct measurement of emissions or by monitoring of surrogate parameters if this proves to be of equal or better scientific quality than the direct measurement of emissions. Emissions during start-up and shutdown (SU/SD) may be assessed based on a detailed emission measurement carried out for a typical SU/SD procedure at least once every year, and using the results of this measurement to estimate the emissions for each and every SU/SD throughout the year.</td><td>CC</td><td>The flue gases from the site are all monitored using MCERTS certified CEMs in accordance with BS EN 14181. These systems would be operational during both normal and OTNOC operations and events and can be used to inform subsequent incident investigation.

The MCERTS continuous flow monitoring system for water discharges monitors flow, temperature and PH. monitoring equipment is calibrated and checked periodically every month. The water discharge system at DHC contains water in a holding basin prior to discharge into Damhead Creek via release point W1. The same system is used for all operating conditions and is monitored and recorded 24/7. There is no difference in the recording and monitoring during normal or OTNOC operations.</td></tr>
<tr><td>12</td><td>In order to increase the energy efficiency of combustion, gasification and/or IGCC units operated ≥ 1 500 h/yr, BAT is to use an appropriate combination of the techniques given below.
<table>
<tr><th>Technique</th><th>Description</th><th>Applicability</th></tr>
</table></td><td>CC</td><td>(a) Combustion optimisation:
DHC1: Combustion performance is monitored at the site using CPFM and by operations staff via the wider</td></tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement				Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	a.	Combustion optimisation	See description in Section 8.2. Optimising the combustion minimises the content of unburnt substances in the flue-gases and in solid combustion residues	Generally applicable		control system and is also monitored remotely by the OEM. Performance monitoring measuring the load, fuel used, and power output to calculate overall efficiencies are undertaken in accordance with applicable BE EN standards. Formal tests are undertaken at least annually. DHC2: Combustion optimisation associated with the management of NOx and CO will be a key element of the design and operation of the combustion conditions.
	b.	Optimisation of the working medium conditions	Operate at the highest possible pressure and temperature of the working medium gas or steam, within the constraints associated with, for example, the control of NO_X emissions or the characteristics of energy demanded			(b) Optimisation of the working medium conditions: DHC1: The CCGTs and the Heat Recovery Steam Generators (HRSGs) have been designed to operate to maximise efficiency and exploit optimum steam pressure and temperature settings to maximise overall efficiency. DHC2: The design of the plant is such that it will utilise high steam pressures and temperatures to maximise overall efficiency.
	c.	Optimisation of the steam cycle	Operate with lower turbine exhaust pressure by utilisation of the lowest possible temperature of the condenser cooling water, within the design conditions			
	d.	Minimisation of energy consumption	Minimising the internal energy consumption (e.g. greater efficiency of the feed-water pump)			
	e.	Preheating of combustion air	Reuse of part of the heat recovered from the combustion flue-gas to preheat the air used in combustion	Generally applicable within the constraints related to the need to control NO_X emissions		
	f.	Fuel preheating	Preheating of fuel using recovered heat	Generally applicable within the constraints associated with the boiler design and the need to control NO_Xemissions		
	g.	Advanced control system	See description in Section 8.2. Computerised control of the main combustion parameters enables the combustion efficiency to be improved	Generally applicable to new units. The applicability to old units may be constrained by the need to retrofit the combustion system and/or control command system		
	h.	Feed-water preheating using recovered heat	Preheat water coming out of the steam condenser with recovered heat, before reusing it in the boiler	Only applicable to steam circuits and not to hot boilers. Applicability to existing units may be limited due to constraints associated with the plant configuration and the amount of recoverable heat		
	i.	Heat recovery by cogeneration (CHP)	Recovery of heat (mainly from the steam system) for producing hot water/steam to be used in industrial processes/activities or in a public network for district heating. Additional heat recovery is possible from:	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		

BAT Concn. Number	Summary of BAT Conclusion requirement				Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			— flue-gas — grate cooling — circulating fluidised bed			(c) Optimisation of the steam cycle: DHC1: The plant operates a High Pressure (HP)/Low Pressure (LP) steam cycle. The HRSG produces high pressure steam for use in the steam turbine, with a multi stage steam turbine to maximise the energy recovery and steam turbine efficiency. The LP steam is recovered, condensed and reused as boiler feed-water. Heat recovered from the steam is transferred to the condensate receiver tank pre-heaters, which are part of the steam system. DHC2: The steam cycle associated with the HRSG element of the plant will be designed and managed to extract as much usable heat as is possible for a CCGT of this current design. (d) Minimisation of energy consumption: DHC1: Regular performance reports are run that monitor internal consumption. All plant and equipment on site is maintained regularly to ensure optimal operation.
		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 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	

BAT Concn. Number	Summary of BAT Conclusion requirement				Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	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		DHC2: Condensate is recovered and re-used to minimise both water loss as well as recover usable heat. (e) Preheating of combustion air: DHC1: The plant is designed to operate using ambient air, therefore no preheating of combustion air is required. DHC2: The Operator has previously confirmed that fuel gas is preheated using waste heat from the boiler systems (variation application EPR/DP3933DN/V002 document ref 60471441/LORP001) (f) Fuel preheating: DHC1: The natural gas is preheated using waste heat from the GT air compressors. DHC2: The Operator has previously confirmed that fuel gas will be preheated using waste heat from the boiler systems (variation application EPR/DP3933DN/V002 document ref 60471441/LORP001). (g) Advanced control system: DHC1: Operation of the CCGT units is controlled by trained
	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 – 300 bar and temperatures above 580 – 600 °C in the case of ultra-supercritical conditions	Only applicable to new units of ≥ 600 MW_{th} operated > 4 000 h/yr. Not applicable when the purpose of the unit is to produce low steam temperatures and/or pressures in process industries. Not applicable to gas turbines and engines generating steam in CHP mode. For units combusting biomass, the applicability may be constrained by high-temperature corrosion in the case of certain biomasses		

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			site operators using a DCS system, which is used to control the operation of the plant and also records data on the plant performance, which can be used by the site operations team to identify potential issues. DHC2 will be operated from the existing DHC1 control room, or a new central control room for both DHC1 and 2, via the DCS (h) Feed-water preheating using recovered heat: Feed-water is fed into the condensate receiver tank and is then pumped into the economisers for preheating using waste heat from the boilers prior to entering the boiler. (r) Steam turbine upgrades: DHC1: The steam turbine technology introduced during construction of the power station produced the best combined cycle efficiency available at that time. Low pressure steam cycle was implemented as part of the overall plant design.

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<tr><td>13</td><td>In order to reduce water usage and the volume of contaminated waste water discharged, BAT is to use one or both of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Water recycling</td><td>Residual aqueous streams, including run-off water, from the plant are reused for other purposes. The degree of recycling is limited by the quality requirements of the recipient water stream and the water balance of the plant</td><td>Not applicable to waste water from cooling systems when water treatment chemicals and/or high concentrations of salts from seawater are present</td></tr>
<tr><td>b.</td><td>Dry bottom ash handling</td><td>Dry, hot bottom ash falls from the furnace onto a mechanical conveyor system and is cooled down by ambient air. No water is used in the process.</td><td>Only applicable to plants combusting solid fuels.
There may be technical restrictions that prevent retrofitting to existing combustion plants</td></tr>
</table></td><td>CC</td><td>DHC1: The power station uses closed loop air cooled condensers instead of water cooled condensers. Wastewater generated from boiler blowdown is treated and recycled into the process.

DHC2: DHC2 is designed to employ an air cooled condenser which minimises water use. Process water and stream generated consist principally of boiler blow down which is collected, treated and discharged. Domestic wastewater is discharged to sewer.

As the Power Station utilises gaseous fuel, no ash is generated. Therefore, no associated wastewater is generated at the site.</td></tr>
<tr><td>14</td><td>In order to prevent the contamination of uncontaminated waste water and to reduce emissions to water, BAT is to segregate waste water streams and to treat them separately, depending on the pollutant content.
Description
Waste water streams that are typically segregated and treated include surface run-off water, cooling water, and waste water from flue-gas treatment.
Applicability
The applicability may be restricted in the case of existing plants due to the configuration of the drainage systems.</td><td>CC</td><td>Wastewater from boiler blowdown, water treatment plant, drain down of plant, Power block area, Lubrication Oil Storage area, and water from oily water separator is treated in a waste conditioning basin, before being discharged to the storm water basin. Rainwater from roof and road runoff, is directed to the storm water basin. Water from the storm water basin</td></tr>
</table>

<table>
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<tr><td></td><td></td><td></td><td>is discharged to Damhead Creek via emission point W1. The discharge is monitored in line with the requirements of the Environmental Permit.

Any contaminated wastewater generated on site (for instance from Gas Turbine water wash etc.) is stored separately before being taken off-site via specialist contractor for disposal.

The operator has confirmed that all process wastewater streams from DHC2 will be segregated and treated onsite prior to discharge via W2.</td></tr>
<tr><td>15</td><td>In order to reduce emissions to water from flue-gas treatment, BAT is to use an appropriate combination of the techniques given in BAT Conclusion 15, and to use secondary techniques as close as possible to the source in order to avoid dilution.</td><td>NA</td><td>No flue gas treatment undertaken on site</td></tr>
<tr><td>16</td><td>In order to reduce the quantity of waste sent for disposal from the combustion and/or gasification process and abatement techniques, BAT is to organise operations so as to maximise, in order of priority and taking into account life-cycle thinking:
(a) waste prevention, e.g. maximise the proportion of residues which arise as by-products;
(b) waste preparation for reuse, e.g. according to the specific requested quality criteria;
(c) waste recycling;
(d) other waste recovery (e.g. energy recovery),
by implementing an appropriate combination of techniques such as:
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Generation of gypsum as a by-product</td><td>Quality optimisation of the calcium-based reaction residues generated by the wet FGD so that they can be used as a substitute for mined gypsum (e.g. as</td><td>Generally applicable within the constraints associated with the required gypsum quality, the health requirements</td></tr>
</table></td><td>CC</td><td>Due to the nature of the site operations and fuel used (natural gas), the site only produces minor quantities of waste, primarily from maintenance activities. the specific techniques of BAT16 are not applicable to the installation because no waste is produced as a by-product of combustion and there is no flue gas treatment used on site.

The main waste streams generated from the site activities</td></tr>
</table>

<table>
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<tr><td></td><td>
<table>
<tr><td></td><td></td><td>raw material in the plasterboard industry). The quality of limestone used in the wet FGD influences the purity of the gypsum produced</td><td>associated to each specific use, and by the market conditions</td></tr>
<tr><td>b.</td><td>Recycling or recovery of residues in the construction sector</td><td>Recycling or recovery of residues (e.g. from semi-dry desulphurisation processes, fly ash, bottom ash) as a construction material (e.g. in road building, to replace sand in concrete production, or in the cement industry)</td><td>Generally applicable within the constraints associated with the required material quality (e.g. physical properties, content of harmful substances) associated to each specific use, and by the market conditions</td></tr>
<tr><td>c.</td><td>Energy recovery by using waste in the fuel mix</td><td>The residual energy content of carbon-rich ash and sludges generated by the combustion of coal, lignite, heavy fuel oil, peat or biomass can be recovered for example by mixing with the fuel</td><td>Generally applicable where plants can accept waste in the fuel mix and are technically able to feed the fuels into the combustion chamber</td></tr>
<tr><td>d.</td><td>Preparation of spent catalyst for reuse</td><td>Preparation of catalyst for reuse (e.g. up to four times for SCR catalysts) restores some or all of the original performance, extending the service life of the catalyst to several decades. Preparation of spent catalyst for reuse is integrated in a catalyst management scheme</td><td>The applicability may be limited by the mechanical condition of the catalyst and the required performance with respect to controlling NO_X and NH_3 emissions</td></tr>
</table>
</td><td></td><td>are used lubricating oil and used filters; these waste streams are sent off-site for recycling. The site also produces general waste. The site applies the waste hierarchy for the management of any waste produced on site. The Operator's Waste Management Procedure outlines identification of waste streams and how they must be handled. Where possible, the waste generated on site is sent off site for recycling, with any hazardous waste streams sent off site for disposal.</td></tr>
<tr><td>17</td><td>In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Operational measures</td><td>These include:
— improved inspection and maintenance of equipment
— closing of doors and windows of enclosed areas, if possible
— equipment operated by experienced staff
— avoidance of noisy activities at night, if possible
— provisions for noise control during maintenance activities</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Low-noise equipment</td><td>This potentially includes compressors, pumps and disks</td><td>Generally applicable when the equipment is new or replaced</td></tr>
<tr><td>c.</td><td>Noise attenuation</td><td>Noise propagation can be reduced by inserting obstacles between the emitter and the receiver.</td><td>Generally applicable to new plants. In the case of existing plants, the insertion</td></tr>
</table>
</td><td>CC</td><td>DHC1: The plant was commissioned in 2001. The equipment installed at this time was selected to avoid noise impacts either via inherent design qualities, or where a noise risk exists via the installation of noise attenuation measures.

Equipment which has the potential for high noise emissions (e.g. gas turbines) are located within acoustic enclosures and an acoustically clad building. All doors are closed during operations to minimise noise emissions. GT air intakes have acoustic louvres.</td></tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			The site has a maintenance schedule in place to ensure optimum operation of all plant and equipment. The plant is available for operation on a 24 hours basis and any maintenance work required is mainly undertaken during daylight hours with the exception of major outages. Noise emissions are monitored regularly with annual noise surveys undertaken. DHC2: The EMS will include a complaints procedure which identifies and complaints and enquiries which relate to perceived excessive noise issues. A maintenance regime will include the maintenance of equipment which have the possibility of generating noise at a level which may cause complaint. Enclosures will be used for those pieces of plant which have been identified as having high noise emissions.
Combustion of gaseous fuels			
40	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.	CC	For both DHC1 and DHC2, the plant is a combined cycle gas turbine (CCGT) plant. BAT 40 identifies operation of a combined cycle in a combustion plant as a

		Appropriate obstacles include protection walls, embankments and buildings	of obstacles may be restricted by lack of space
d.	Noise-control equipment	This includes: — noise-reducers — equipment insulation — enclosure of noisy equipment — soundproofing of buildings	The applicability may be restricted by lack of space
e.	Appropriate location of equipment and buildings	Noise levels can be reduced by increasing the distance between the emitter and the receiver and by using buildings as noise screens	Generally applicable to new plant

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.

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement

			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

BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of natural gas

Type of combustion unit	BAT-AEELs [136] [137]				
	Net electrical efficiency (%)		Net total fuel utilisation (%) [138] [139]	Net mechanical energy efficiency (%) [139] [140]	
	New unit	Existing unit		New unit	Existing unit
Gas engine	39,5–44 [141]	35–44 [141]	56–85 [141]	No BAT-AEEL.	
Gas-fired boiler	39–42,5	38–40	78–95	No BAT-AEEL.	
Open cycle gas turbine, ≥ 50 MWth	36–41,5	33–41,5	No BAT-AEEL	36,5–41	33,5–41
Combined cycle gas turbine (CCGT)					
CCGT, 50–600 MW_{th}	53–58,5	46–54	No BAT-AEEL	No BAT-AEEL	
CCGT, ≥ 600 MW_{th}	57–60,5	50–60	No BAT-AEEL	No BAT-AEEL	
CHP CCGT, 50–600 MW_{th}	53–58,5	46–54	65–95	No BAT-AEEL	
CHP CCGT, ≥ 600 MW_{th}	57–60,5	50–60	65–95	No BAT-AEEL	

technique to improve the energy efficiency of the plant.

Response to BAT 12 specifies further energy efficiency measures are undertaken. See above.

A process monitoring requirement has been set in Table S3.3 which requires energy efficiency monitoring after an overhaul, this is in line with BAT 2.

The BAT-AEEL for an CCGT plant having thermal output of >600MWth is 50-60% .

For DHC1, periodic operational performance tests have demonstrated that the plant achieves 54% LHV efficiency.

For DHC2, the electrical efficiency is estimated to be around 60%. The Operator will validate this by carrying out performance testing the station at full load once the plant is operational. Electrical efficiency for DHC2 is to be confirmed by the submission under Improvement Condition 12 (IC12) and process monitoring requirements specified in Table S3.3 of the permit.

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td>41</td><td>In order to prevent or reduce NO_X emissions to air from the combustion of natural gas in boilers, BAT is to use one or a combination of the techniques given in BAT Conclusion 41.</td><td>NA</td><td>Not applicable to gas turbines.</td></tr>
<tr><td>42</td><td>In order to prevent or reduce NO_X emissions to air from the combustion of natural gas in gas turbines, BAT is to use one or a combination of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Advanced control system</td><td>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</td><td>The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system</td></tr>
<tr><td>b.</td><td>Water/steam addition</td><td rowspan="2">See description in Section 8.3</td><td>The applicability may be limited due to water availability</td></tr>
<tr><td>c.</td><td>Dry low-NO_X burners (DLN)</td><td>The applicability may be limited in the case of turbines where a retrofit package is not available or when water/steam addition systems are installed</td></tr>
<tr><td>d.</td><td>Low-load design concept</td><td>Adaptation of the process control and related equipment to maintain good combustion efficiency when the demand in energy varies, e.g. by improving the inlet airflow control capability or by splitting the combustion process into decoupled combustion stages</td><td>The applicability may be limited by the gas turbine design</td></tr>
<tr><td>e.</td><td>Low-NO_X burners (LNB)</td><td rowspan="2">See description in Section 8.3</td><td>Generally applicable to supplementary firing for heat recovery steam generators (HRSGs) in the case of combined-cycle gas turbine (CCGT) combustion plants</td></tr>
<tr><td>f.</td><td>Selective catalytic reduction (SCR)</td><td>Not applicable in the case of combustion plants operated < 500 h/yr.
Not generally applicable to existing combustion plants of < 100 MW_{th}.
Retrofitting existing combustion plants may be constrained by the availability of sufficient space.
There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr</td></tr>
</table></td><td>CC</td><td>(a) Advanced control system: The Regulation 61 response for DHC1 confirms that the operation of the CCGT units is controlled by trained site operators using a distributed control system (DCS) which is used to control the operation of the plant and also records data on the plant performance, which also can be used by the operations team to identify potential issues. The specific control settings for the combustion units are pre-set in the control system during these maintenance checks and are set to achieve efficient combustion and optimise plant efficiency.

For DHC2, the Operator has previously confirmed that DHC2 will be designed with a view to automatic operation with a minimum of Operator intervention being necessary. Full facilities for interfacing information, control and alarm systems will be installed so that DHC2 can be operated</td></tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			from the existing DHC1 control room or a new central control room for both DHC1 and 2 via the DCS. Plant performance will be continuously recorded to ensure correct and efficient operation of DHC2. Any significant deviations will be alarmed and corrections carried out on occurrence. Records will be maintained of performance and deviation (variation application EPR/DP3933DN/V002 document ref 60471441/LORP001). (b) Water/steam addition is not applied at the site as Dry Low NOx burners are used for NOx control. (c) Dry low NOx burners (DLN): For DHC1, the CCGT has DLN burners in place. Periodic major overhauls of the plant equipment are undertaken to ensure appropriate and optimised operation of the plant. The CCGTs at DHC2 will also be fitted with DLN burners. (d) Low load design concept: The Regulation 61 response for

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			DHC1 confirms that there is a minimum stable load for the plant below which the plant does not operate. For DHC1, the operator requested to amend the set of minimum start-up (MSUL) and shut-down (MSDL) conditions specified in the permit. We consider that this amendment will reduce emissions to air during start-up and shut-down operations and that the proposed implementation of low load operation is best available technique to reduce NOx emissions to air from, in line with BAT 42(d). Further details are given in Section 8 of this Decision Document. (e) Low-NOX burners (LNB): The CCGT units are installed with DLNs, therefore LNBs are not appropriate. (f) Selective catalytic reduction (SCR): SCR is not installed at the site. For DHC2 the Operator confirms that AELs can be met without secondary NOx abatement.

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td>43</td><td>In order to prevent or reduce NO_X emissions to air from the combustion of natural gas in engines, BAT is to use one or a combination of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Advanced control system</td><td>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</td><td>The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system</td></tr>
<tr><td>b.</td><td>Lean-burn concept</td><td>See description in Section 8.3.
Generally used in combination with SCR</td><td>Only applicable to new gas-fired engines</td></tr>
<tr><td>c.</td><td>Advanced lean-burn concept</td><td rowspan="2">See descriptions in Section 8.3</td><td>Only applicable to new spark plug ignited engines</td></tr>
<tr><td>d.</td><td>Selective catalytic reduction (SCR)</td><td>Retrofitting existing combustion plants may be constrained by the availability of sufficient space.
Not applicable to combustion plants operated < 500 h/yr.
There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr</td></tr>
</table></td><td>NA</td><td>Not applicable to gas turbines.</td></tr>
<tr><td>44</td><td>In order to prevent or reduce CO emissions to air from the combustion of natural gas, BAT is to ensure optimised combustion and/or to use oxidation catalysts.
Description - See descriptions in Section 8.3.

BAT-associated emission levels (BAT-AELs) for NO_X emissions to air from the combustion of natural gas in gas turbines
<table>
<tr><th rowspan="2">Type of combustion plant</th><th rowspan="2">Combustion plant total rated thermal input (MW_{th})</th><th colspan="2">BAT-AELs (mg/Nm^3) (142) (143)</th></tr>
<tr><th>Yearly average (144) (145)</th><th>Daily average or average over the sampling period</th></tr>
<tr><td colspan="4">Open-cycle gas turbines (OCGTs) (146) (147)</td></tr>
<tr><td>New OCGT</td><td>≥ 50</td><td>15–35</td><td>25–50</td></tr>
<tr><td>Existing OCGT (excluding turbines for mechanical drive applications) — All but plants operated < 500 h/yr</td><td>≥ 50</td><td>15–50</td><td>25–55 (148)</td></tr>
<tr><td colspan="4">Combined-cycle gas turbines (CCGTs) (146) (149)</td></tr>
</table></td><td>CC</td><td>CO emissions at the installation are managed via combustion control and monitoring measures. Emissions of CO from a gas turbine are limited by optimising the fuel to air ratio to maximise the heat released per unit of fuel.

As an existing CCGT having output ≥50 MWth, the indicative BAT-AEL for CO emissions is <5–30 mg/Nm^3 as an annual average. The Operator has confirmed that CO emissions can meet the indicative BAT-AEL for this type of plant.</td></tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement

New CCGT	≥ 50	10–30	15–40
Existing CCGT with a net total fuel utilisation of < 75 %	≥ 600	10–40	18–50
Existing CCGT with a net total fuel utilisation of ≥ 75 %	≥ 600	10–50	18–55 (150)
Existing CCGT with a net total fuel utilisation of < 75 %	50–600	10–45	35–55
Existing CCGT with a net total fuel utilisation of ≥ 75 %	50–600	25–50 (151)	35–55 (152)
Open- and combined-cycle gas turbines			
Gas turbine put into operation no later than 27 November 2003, or existing gas turbine for emergency use and operated < 500 h/yr	≥ 50	No BAT-AEL	60–140 (153) (154)
Existing gas turbine for mechanical drive applications — All but plants operated < 500 h/yr	≥ 50	15–50 (155)	25–55 (156)

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:

- New OCGT of ≥ 50 MW_{th}: < 5–40 mg/Nm^3. For plants with a net electrical efficiency (EE) greater than 39 %, a correction factor may be applied to the higher end of this range, corresponding to [higher end] × EE/39, where EE is the net electrical energy efficiency or net mechanical energy efficiency of the plant determined at ISO baseload conditions.
- Existing OCGT of ≥ 50 MW_{th} (excluding turbines for mechanical drive applications): < 5–40 mg/Nm^3. The higher end of this range will generally be 80 mg/Nm^3 in the case of existing plants that cannot be fitted with dry techniques for NO_X reduction, or 50 mg/Nm^3 for plants that operate at low load.
- New CCGT of ≥ 50 MW_{th}: < 5–30 mg/Nm^3. For plants with a net electrical efficiency (EE) greater than 55 %, a correction factor may be applied to the higher end of the range, corresponding to [higher end] × EE/55, where EE is the net electrical energy efficiency of the plant determined at ISO baseload conditions.
- Existing CCGT of ≥ 50 MW_{th}: < 5–30 mg/Nm^3. The higher end of this range will generally be 50 mg/Nm^3 for plants that operate at low load.
- Existing gas turbines of ≥ 50 MW_{th} for mechanical drive applications: < 5–40 mg/Nm^3. The higher end of the range will generally be 50 mg/Nm^3 when plants operate at low load.

In the case of a gas turbine equipped with DLN burners, these indicative levels correspond to when the DLN operation is effective.

As an existing CCGT plant with a thermal input >600 MWth and a net fuel utilisation of <75% the applicable NOx BAT-AELs are 40 mg/m^3 (annually) and 50 mg/m^3 (daily).These limits are applicable when the DLN system is fully effective.

The existing permit also sets monthly, daily and hourly average emission limits for carbon monoxide and NOx. Under the principal of “no backsliding”, the current emission limits will be retained unless tighter limits are set by the BREF.

The stacks will be continuously monitored for NOx and CO.

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
BAT-associated emission levels (BAT-AELs) for NO_X emissions to air from the combustion of natural gas in boilers and engines
<table>
<tr><th rowspan="3">Type of combustion plant</th><th colspan="4">BAT-AELs (mg/Nm^3)</th></tr>
<tr><th colspan="2">Yearly average (157)</th><th colspan="2">Daily average or average over the sampling period</th></tr>
<tr><th>New plant</th><th>Existing plant (158)</th><th>New plant</th><th>Existing plant (159)</th></tr>
<tr><td>Boiler</td><td>10–60</td><td>50–100</td><td>30–85</td><td>85–110</td></tr>
<tr><td>Engine (160)</td><td>20–75</td><td>20–100</td><td>55–85</td><td>55–110 (161)</td></tr>
</table>
As an indication, the yearly average CO emission levels will generally be:
— < 5–40 mg/Nm^3 for existing boilers operated ≥ 1 500 h/yr,
— < 5–15 mg/Nm^3 for new boilers,
— 30–100 mg/Nm^3 for existing engines operated ≥ 1 500 h/yr and for new engines.
</td><td></td><td></td></tr>
<tr><td>45</td><td>
In order to reduce non-methane volatile organic compounds (NMVOC) and methane (CH_4) emissions to air from the combustion of natural gas in spark-ignited lean-burn gas engines, BAT is to ensure optimised combustion and/or to use oxidation catalysts.
Description
See descriptions in Section 8.3. Oxidation catalysts are not effective at reducing the emissions of saturated hydrocarbons containing less than four carbon atoms.
BAT-associated emission levels (BAT-AELs) for formaldehyde and CH_4 emissions to air from the combustion of natural gas in a spark-ignited lean-burn gas engine
<table>
<tr><th rowspan="3">Combustion plant total rated thermal input (MW_{th})</th><th colspan="3">BAT-AELs (mg/Nm^3)</th></tr>
<tr><th>Formaldehyde</th><th colspan="2">CH_4</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>
<tr><td>≥ 50</td><td>5–15 (162)</td><td>215–500 (163)</td><td>215–560 (162) (163)</td></tr>
</table>
</td><td>NA</td><td>Not applicable to gas turbines.</td></tr>
<tr><td>46</td><td>
In order to increase the energy efficiency of the combustion of iron and steel process gases, BAT is to use an appropriate combination of the techniques given in BAT 12 and below.
<table>
<tr><th>Technique</th><th>Description</th><th>Applicability</th></tr>
</table>
</td><td>NA</td><td>Not applicable to Damhead Creek Power Station.</td></tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement

a.	Process gas management system	See description in Section 8.2	Only applicable to integrated steelworks

BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of iron and steel process gases in boilers

Type of combustion unit	BAT-AEELs ([164]) ([165])	
	Net electrical efficiency (%)	Net total fuel utilisation (%) ([166])
Existing multi-fuel firing gas boiler	30–40	50–84
New multi-fuel firing gas boiler ([167])	36–42,5	50–84

BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of iron and steel process gases in CCGTs

Type of combustion unit	BAT-AEELs ([168]) ([169])		
	Net electrical efficiency (%)		Net total fuel utilisation (%) ([170])
	New unit	Existing unit	
CHP CCGT	> 47	40–48	60–82
CCGT	> 47	40–48	No BAT-AEEL

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.

As part of their Regulation 61 Notice response, the Operator indicated that a derogation from compliance with the AEL values included in Table 24 under BAT Conclusion 44 may be required. Their response did not contain adequate information to allow us to commence assessment of a derogation request. Further information was therefore requested and subsequently supplied on 1st August 2019. The Operator confirmed that, following a review of emissions performance within the context of the '*UK Regulator's Large Combustion Plant Best Available Techniques Interpretation Document*', the BAT-AELs can be complied with and that a derogation is not required.

We have therefore not carried out any additional assessment in relation to the proposed derogation request as part of this review.

7. Emissions to Water

The consolidated permit incorporates the current discharges to controlled waters (Damhead Creek) identified as W1 and W2.

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

The Operator also requested that the limits for mercury and cadmium are removed from the surface water discharge monitoring requirements (Table S3.2). Currently the permit specifies monthly monitoring for these parameters. The Operator states that the monitoring results have always been below the limit of detection.

Mercury and cadmium were originally included in the permit as they were identified as being potentially minor constituents in two products used in regenerating the water treatment plant (hydrochloric acid and sodium hydroxide). However, the Operator has confirmed that the water treatment plant now uses caustic soda. The supplier of the caustic soda confirmed that they use purified brine to produce the caustic soda solution. They also carry out biannual analysis of the caustic soda produced, both mercury and cadmium are included in the analysis suite. They are routinely shown to be at very low levels or none is detected.

We agree with the Operators justification and have removed mercury and cadmium from Table S3.2 in the consolidated permit.

8 Additional IED Chapter II requirements:

Low load operation:
For Damhead Creek 1, the Operator requested to amend the set of minimum start-up (MSUL) and shut-down (MSDL) conditions specified in the permit.

MSUL and MSDL are the minimum declared load thresholds, below which the plant will not generate commercially and above which environmental reporting is active.

Table S1.5 of the permit, as referred to by condition 2.3.6, specifies the end of the start-up period and the start of the shutdown period, by setting MSUL and MSDL parameters.

The Operator has proposed the following revised load figures for MSUL and MSDL:

Revised Start-up and Shut-down thresholds		
Emission Point and Unit Reference	**"Minimum Start-Up Load"** **Load in MWe and as percent of rated power output (%)**	**"Minimum Shut-Down Load"** **Load in MWe and as percent of rated power output (%)**
A1: LCP 81	200 MWe; 50% - "part module" operation – single GT and ST	185 MWe; 46% - "part module" operation – single GT and ST
A2: LCP 82	200 MWe; 50% - "part module" operation – single GT and ST	185 MWe; 46% - "part module" operation – single GT and ST
A1: LCP 81 + A2: LCP 82	430 MWe; 53.4% - "full module" operation – two GTs and ST	380 MWe; 47.2% - "full module" operation – two GTs and ST

The operator has confirmed that both NOx and CO levels have been analysed at these operating ranges and the plant is able to comply with the limits in the permit. As compliance with the BAT-AELs can be achieved, the Operator also proposed using the lower MSUL and MSDL criteria to define Dry Low NOx effective (DLN-E) for DHC1.

We agree with all of these definitions and have set these thresholds in tables S1.5 and S1.6 of the permit accordingly. We consider that this amendment will not change the emission profile of the installation during its stationary operation and will not result in any increased risk to the environment.

Black start operations:
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 large combustion plant which could be called depending on the circumstances.

A risk assessment will be carried out by Energy UK/Joint Environmental Programme on behalf of Large Combustion Plant 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 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 conditions 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.

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

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

Aspect considered	Decision
Receipt of application	
Confidential information	A claim for commercial or industrial confidentiality has not been made.
Identifying confidential information	We have not identified information provided as part of the application that we consider to be confidential. The decision was taken in accordance with our guidance on confidentiality.
The site	
Extent of the site of the facility	The operator has provided a plan which we consider is satisfactory, showing the extent of the site of the facility. The plan is included in the permit.
Biodiversity, heritage, landscape and nature conservation	The application is within the relevant distance criteria of a site of heritage, landscape or nature conservation, and/or protected species or habitat. A full assessment of the application and its potential to affect the site(s)/species/habitat has not been carried out as part of the permit review process. We consider that the review will not affect the features of the site(s)/species/habitat as the conditions will provide at least the same level of protection as those in the previous permit and in some cases will provide a higher level of protection to those in the previous permit. We have not consulted Natural England on the application. The decision was taken in accordance with our guidance.
Operating techniques	
General operating techniques	We have reviewed the techniques used by the operator where they are relevant to the BAT Conclusions and compared these with the relevant guidance notes. The permit conditions ensure compliance with the relevant BREF, BAT Conclusions. The ELVs deliver compliance with the BAT-AELs.

Aspect considered	Decision
Permit conditions	
Updating permit conditions during consolidation	We have updated permit conditions to those in the current generic permit template as part of permit consolidation. The conditions will provide at least the same level of protection as those in the previous permit and in some cases will provide a higher level of protection to those in the previous permit.
Changes to the permit conditions due to an Environment Agency initiated variation	We have varied the permit as stated in the variation notice.
Pre-operational conditions	The pre-operational conditions already set in the permit have been retained.
Improvement programme	Based on the information on the application, we consider that we need to impose an improvement programme. We have imposed an improvement programme to ensure that: • the operator defines an output load or operational parameters for LCP467, LCP468 and LCP469 and provides a written justification for when the dry low NOx operation is effective in line with BAT 42. IC12 has been reworded to include a requirement for the Operator to undertake a review of how the design of the plant meets the BAT Conclusions as specified in the Regulation 61 response dated 14/05/2019. We have also removed the completed improvement conditions from the permit.
Emission limits	We have decided that emission limits should be set for the parameters listed in the permit. These are described in the relevant BAT Conclusions in Section 5 of this document. It is considered that the ELVs/equivalent parameters or technical measures described above will ensure that significant pollution of the environment is prevented and a high level of protection for the environment is secured.
Monitoring	We have decided that monitoring should be carried out for the parameters listed in the permit, using the methods detailed and to the frequencies specified. These are described in the relevant BAT Conclusions in Section 5 of this document.

Aspect considered	Decision
	Table S3.3 Process monitoring requirements was amended to include the requirement to monitor energy efficiency after overhauls on site in line with BAT2. Based on the information in the application we are [not fully] satisfied that the operator's techniques, personnel and equipment have either MCERTS certification or MCERTS accreditation as appropriate.
Reporting	We have specified reporting in the permit for the following parameters: • Nitrogen dioxide • Carbon monoxide • Sulphur dioxide These are described in the relevant BAT Conclusions in Section 5 of this document.
Operator competence	
Management system	There is no known reason to consider that the operator will not have the management system to enable it to comply with the permit conditions.
Growth Duty	
Section 108 Deregulation Act 2015 – Growth duty	We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit. Paragraph 1.3 of the guidance says: "The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation." We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections. We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.