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/FP3031HJ
The Operator is: px Limited
The Installation is: Stallingborough Titanium Dioxide Site, c/o Tronox Pigment UK Limited
This Variation Notice number is: EPR/FP3031HJ/V003

What this document is about

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

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

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

As well as considering the review of the operating techniques used by the Operator for the operation of the plant and activities of the installation, the

consolidated variation notice takes into account and brings together in a single document all previous variations that relate to the original permit issued. It also modernises the entire permit to reflect the conditions contained in our current generic permit template.

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

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

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

How this document is structured

Glossary of 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 was received on 9/10/2018.

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

- BAT 10, 12, 41 and 42 – We asked the operator to confirm whether the upgrade of burners to the second unit and the replacement of the both GT's with Dry low-NOx burners(DLN) due for installation during 2019 had been completed.
- BAT 40 – we asked the operator to confirm the actual figure for net fuel utilisation.
- BAT 42 & 44 – We asked the operator to define Dry Low NOx (DLN) effectiveness point in relation to the indicative BAT-AEL that they will meet for NOx and CO within the ranges set out in the BAT Conclusions.

Suitable further information was provided by the Operator on 24/03/2020 and 05/05/2020. The responses are included in the decision checklist regarding the BAT Conclusions in section 5 of this document.

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

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

In relation to BAT Conclusion 10, 12, 41, 42 and 44 . we agree with the operator in respect to their current stated capability as recorded in their Regulation 61 Notice response that improvements are required. The operator has confirmed that these will be completed by 17 August 2021. This is

discussed in more detail in the key issues section and/or in the decision checklist regarding relevant BAT Conclusions.

3 The legal framework

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

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

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

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

4 The key issues

The key issues arising during this permit review are:

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

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 LCP(s) on site consist of:

LCP 221 - 1 x 21.2MWth gas turbine (GT) with a 48.8MWth heat recovery steam generator (HRSG) – total of 70MWth
LCP414 - 1 x 21.2MWth gas turbine (GT) with a 48.8MWth heat recovery steam generator (HRSG) total of 70MWth

The plant 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.

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

- Unlimited hours of operation
- Existing CCGT with a net total fuel utilisation of ≥ 75 %
- Combustion plant total rated thermal input between 50–600 MWth

The plants operate in three modes: OCGT during start-up, CCGT (GT and HRSG) and auxiliary fired force draft (FD) HRSG only. The site does not operate OCGT for any length of time other than during start-up or in the event of an HRSG trip leaving the GT in open cycle mode. Under the latter mode, the GT is shut down if the HRSG cannot be returned to service within 2 hours. Once the exhaust gas from the GT has been introduced to the HRSG the GT load is increased from 46% required for NOx abatement up to 100% base load within 15 minutes. Therefore, loads between 70% and 100% should only be considered as transient. The start-up of the HRSG is completed independently of the GT as per the design of the CHP.

The following tables outline the limits that have been incorporated into the permit for LCP221 and LCP414, 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.

In the case of HRSG auxiliary firing, this shall be regarded as part of the supplementary firing combustion system, noting that the auxiliary firing performance is technically constrained by the supplementary firing design parameters. For auxiliary firing, the oxygen reference condition for reporting and the boiler ELV reference shall therefore also be increased to 15% O_2 (for short periods when the gas turbine is unavailable). The boiler ELV is taken to be the same numerical value as that applied at 3% O_2. However, in these situations, the Operator shall provide a credible recovery plan for the gas turbine to the Competent Authority and agree a course of action. When a credible recovery plan cannot be agreed, or is not appropriate, then the auxiliary firing then needs to comply with the original boiler ELV at 3% O_2 (for convenience this ELV can be divided by 3 if reporting continues at 15% O_2)

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

The plant is in the Transitional National Plan, TNP. By the end of the TNP on 30 June 2020, as a minimum plant must meet the limits set out in Annex V of the Industrial Emission Directive subject to BAT assessment and the principle of no backsliding. From the implementation date of the BAT Conclusion in 2021 the relevant AELs will also apply.

LCP 221 and LCP414 : Operating in CHP mode post 2021

In their Regulation 61 response, the Operator requested that DLN-E point be set once all works to improve the operation of the CHP units has been completed. We have included an improvement condition (IC04) requiring the Operator to define effective dry low NO_X point.

NOx limits (mg/Nm^3)							
Averaging	**Existing (TNP)**	**IED (Annex V Part 1) – Existing**	**BREF (Table 24 BAT-c)**	**Expected permit limits**	**Basis**	**Limits apply**	**Monitoring [1]**
Annual	None	None	55 (>75% net fuel utilisation)	55	BREF	E-DLN	CEMS
Monthly	None	75 [2]	None	75	IED	E-DLN	
Daily	125	82.5	80	80	BREF	E-DLN	
95th %ile of hr means	None	150	None	150	IED	E-DLN	

Note 1 monitoring is currently every 6 months. CEMS are to be reinstated and will be in use from 17/08/2021
Note 2 Limit of 75 mgm^3 for CCGT > 55% η ,

Indicative CO limits (mg/Nm^3)							
Averaging	**Existing Until 30/6/20**	**IED (Annex V Part 1) – Existing**	**BREF (Table 24 BAT-C)**	**Expected permit limits**	**Basis**	**Limits apply**	**Monitoring [1]**
Annual	None	None	30 (50 low load plant)	100	Requested by operator	E-DLN	CEMS
Monthly	None	100	None	100	IED	E-DLN	
Daily	100	110	None	110	IED	E-DLN	
95th %ile of hr means	None	200	None	200	IED	E-DLN	

Note 1 monitoring is currently every 6 months. CEMS are to be reinstated and will be in use from 17/08/2021

The operator has requested to retain the current permit limit of 100mgm^3 on the basis that the reference plant in BAT 44 are much larger CCGTs and are not considered to be representative of the achievable performance of a small (56 MWth input) CHP plant with a significant heat bias. They assert that the BAT category <100 MWth input is a more reasonable comparator of achievable performance CO limit of 100 mg/m^3 as set in Annex V of IED. They also state that in order to achieve lower NOx emissions the temperature of combustion needs to be reduced and a lower air to fuel ratio used to prevent the formation of thermal NOx. The reduced oxygen and temperature lead to incomplete combustion and therefore the formation of CO.

The Turbine Exhaust Gases (TEG) in CHP mode are fed forward to the HRSG where the burners use the 12-15% Oxygen content to combust the burner fuel. Using the TEG gives lower thermal NOx (as less fresh air is used) but due to less availability of oxygen can lead to higher CO formation. This is a finely tuned balance and as we push towards lower NOx limits it adversely affects CO emissions, meeting the annual indicative BREF CO limit of 30 mg/Nm3 at all loads would be adversely affect NOx and the mandatory limits could no longer be met. We consider the technical justification provided by the operator is adequate and we have set the annual emission limits for CO at 100 mg/m^3 in the revised and consolidated permit

LCP 221 and LCP414: HRSG operating as a standalone unit with its burners providing 'auxiliary' firing

NOx limits (mg/Nm^3)							
Averaging	**Existing Until 30/6/20**	**IED (Annex V Part 1) - Existing**	**BREF (Table 25 BAT-c) (1,2,3)**	**Expected permit limits**	**Basis**	**Limits apply**	**Monitoring**
Annual	None	None	100	None	NA	MSUL/MSDL to baseload	<100MWth every 6months/ PEMS
Monthly	150	100	None	NA	NA	MSUL/MSDL to baseload	
Daily	None	110	110	110	BREF	MSUL/MSDL to baseload	
95th %ile of hr means	None	200	None	NA	NA	MSUL/MSDL to baseload	

Footnote
(1) Optimising the functioning of an existing technique to reduce NO_X emissions further may lead to levels of CO emissions at the higher end of the indicative range for CO emissions given after this table.
(2) These BAT-AELs do not apply to plants operated < 1 500 h/yr.
(3) For plants operated < 500 h/yr, these levels are indicative.

BAT Footnote (3) In the case of plants with a rated thermal input of < 100 MW operated < 1 500 h/yr, the minimum monitoring frequency may be at least once every six months.

NA – for periodic monitoring only the daily limits applies

Indicative CO limits (mg/Nm^3)							
Averaging	**Existing Until 30/6/20**	**IED (Annex V Part 1) – Existing**	**BREF (Table 25 BAT-C)**[j]	**Expected permit limits**	**Basis**	**Limits apply**	**Monitoring**
Annual	None	None	40 [1]	None	NA	MSUL/MSDL to baseload	<100MWth every 6 months/PEMS
Monthly	100	100	None	None	IED	MSUL/MSDL to baseload	
Daily	None	110	40	100	BREF	MSUL/MSDL to baseload	
95th %ile of hr means	None	200	None	None	NA	MSUL/MSDL to baseload	

Note [1] As an indication, the yearly average CO emission levels will generally be: <5–40 mg/Nm3 for existing boilers operated ≥ 1 500 h/yr
NA – for periodic monitoring only the daily limit applies

As already discussed above we accept that for this type of plant higher emissions of CO are expected, particularly when the HRSGs is operating on supplementary firing. Operation in this mode is not likely to be ≥ 1 500 h/yr. We have set the ELV in line BREF and the JEP "Electricity Supply Industry IED Compliance Protocol for Utility Boilers and Gas Turbines" dated December 2015.

LCP 221 and LCP414: OCGT mode of operation

The operator is currently limited to operating the GT in open mode during start-up only (applicable to release points A1 and A3 GT bypass stacks). However, there are occasions when the GT needs to operate open cycle outside of start-up. These operations are limited in Tables S3.1, S3.1a and 3.1b to less than 500 hours per annum. There are no ELVs associated with emission points A1 and A3. However, 6 monthly reporting of NOx, SO_2 and CO concentration values are required.

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

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

4.2 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 The Operator stated in the Regulation 61 response that for the CHP (Heat Generation Orientated) the net total fuel utilisation was between 65-95% and . between 78-95% when operating HRSG Only. We asked the operator to provide exact figure and the calculations of derivation. The operator responded on 24/03/2020 with SCHP Model Data from IPSE Pro and stated that the plant is orientated to heat generation. We consider this plant is BAT in relation to the AEELs.

Table 23 BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of natural gas

BAT AEELs (%)			**Plant efficiency (%)** [1]		
Net electrical efficiency	**Net total fuel utilisation**	**Net mechanical efficiency**	**Net electrical efficiency**	**Net total fuel utilisation**	**Net mechanical efficiency**
LCP221:existing CCGT < 600 MWth – heat generation					
46 - 54	**65-95**	**None**	**NA**	**89.9**	**NA**
LCP414: existing CCGT < 600 MWth					
46 - 54	**None**	**None**	**NA**	**90.78**	**NA**

Note 1 In the case of CHP units, only one of the two BAT-AEELs 'Net electrical efficiency' or 'Net total fuel utilisation' applies, depending on the CHP unit design (i.e. either more oriented towards electricity generation or heat generation).

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	S3.1b
Monitoring	2.3, 3.5 and 3.6	S1.2, S1.5,S3.1b
Energy efficiency	1.2 and 2.3	S3.4
Noise	3.4 and 2.3	S2.1
Other operating techniques	2.3	S1.2

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

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

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
General			
1	**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;	CC	An EMS certified to the ISO 14001:2015 standard is in place that meets requirements (i) through to (xvi) set out in the BAT Conclusion.

<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>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

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.</td><td></td><td></td></tr>
<tr><td>2</td><td>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.</td><td>CC</td><td>The operator confirmed that no performance test has been conducted as this is not relevant to CHP Unit.

Recent calculations conducted utilising IPSE Pro software submitted on the on 23/03/20 confirmed that the net total fuel utilisation for the CHP are

FD Mode CHP - 89.5%
Teg Mode (Tornado no DLE fitted) - 89.9%
Teg Mode (SGT 200 DLE) -90.78%

Refer to section 4.2</td></tr>
<tr><td>3</td><td>BAT is to monitor key process parameters relevant for emissions to air and water including those given below.
<table>
<tr><th>Stream</th><th>Parameter(s)</th><th>Monitoring</th></tr>
<tr><td rowspan="3">Flue-gas</td><td>Flow</td><td>Periodic or continuous determination</td></tr>
<tr><td>Oxygen content, temperature, and pressure</td><td rowspan="2">Periodic or continuous measurement</td></tr>
<tr><td>Water vapour content (3)</td></tr>
<tr><td>Waste water from flue-gas treatment</td><td>Flow, pH, and temperature</td><td>Continuous measurement</td></tr>
</table></td><td>CC</td><td>The operator has confirmed that A2 - Oxygen monitored periodically to BS EN 14789
A4 - Oxygen monitored periodically to BS EN 14789
A2 - Water vapour monitored periodically to BS EN 14790
A4 - Water vapour monitored periodically to BS EN 14790
A2 - Stack gas volume flow monitored periodically to BS EN 16941 & TGN M2
A4 - Stack gas volume flow monitored periodically to BS EN 16941 & TGN M2 in line with BREF</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</td><td>CC</td><td>The operator has confirmed that periodic measurement are undertaken as follows:</td></tr>
</table>

<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>use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.
<table>
<tr><th>Substance/Parameter</th><th>Fuel/Process/Type of combustion plant</th><th>Combustion plant total rated thermal input</th><th>Standard(s) [4]</th><th>Minimum monitoring frequency [5]</th><th>Monitoring associated with</th></tr>
<tr><td>NH_3</td><td>— When SCR and/or SNCR is used</td><td>All sizes</td><td>Generic EN standards</td><td>Continuous [6] [7]</td><td>BAT 7</td></tr>
<tr><td>NO_X</td><td>— Coal and/or lignite including waste co-incineration
— Solid biomass and/or peat including waste co-incineration
— HFO- and/or gas-oil-fired boilers and engines
— Gas-oil-fired gas turbines
— Natural-gas-fired boilers, engines, and turbines
— Iron and steel process gases
— Process fuels from the chemical industry
— IGCC plants</td><td>All sizes</td><td>Generic EN standards</td><td>Continuous [6] [8]</td><td>BAT 20
BAT 24
BAT 28
BAT 32
BAT 37
BAT 41
BAT 42
BAT 43
BAT 47
BAT 48
BAT 56
BAT 64
BAT 65
BAT 73</td></tr>
<tr><td></td><td>— Combustion plants on offshore platforms</td><td>All sizes</td><td>EN 14792</td><td>Once every year [9]</td><td>BAT 53</td></tr>
</table></td><td></td><td>A2 - NOx monitored periodically to BS EN 14792
A4 - NOx monitored periodically to BS EN 14792
A2 - CO monitored periodically to BS EN 15058
A4 - CO monitored periodically to BS EN 15058
A2 - SO2 monitored periodically by calculation
A4 - SO2 monitored periodically to calculation

From the 17th August 2021 continuous emission monitoring of NOx and CO will be required. See section 4.1 for the setting of limits and monitoring.</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
	N_2O	— Coal and/or lignite in circulating fluidised bed boilers — Solid biomass and/or peat in circulating fluidised bed boilers	All sizes	EN 21258	Once every year [10]	BAT 20 BAT 24		
	CO	— Coal and/or lignite including waste co-incineration — Solid biomass and/or peat including waste co-incineration — HFO- and/or gas-oil-fired boilers and engines — Gas-oil-fired gas turbines — Natural-gas-fired boilers, engines, and turbines — Iron and steel process gases — Process fuels from the chemical industry — IGCC plants	All sizes	Generic EN standards	Continuous [6] [8]	BAT 20 BAT 24 BAT 28 BAT 33 BAT 38 BAT 44 BAT 49 BAT 56 BAT 64 BAT 65 BAT 73		
		— Combustion plants on offshore platforms	All sizes	EN 15058	Once every year [9]	BAT 54		
	SO_2	— Coal and/or lignite incl waste co-incineration	All sizes	Generic EN standards and EN 14791	Continuous [6] [11] [12]	BAT 21 BAT 25 BAT 29 BAT 34		

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 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				BAT 39 BAT 50 BAT 57 BAT 66 BAT 67 BAT 74		
	SO_3	— When SCR is used	All sizes	No EN standard available	Once every year	—		
	Gaseous chlorides, expressed as HCl	— Coal and/or lignite — Process fuels from the chemical industry in boilers	All sizes	EN 1911	Once every three months [6] [13] [14]	BAT 21 BAT 57		
		— Solid biomass and/or peat	All sizes	Generic EN standards	Continuous [15] [16]	BAT 25		
		— 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		

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
		— 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		
			≥ 300 MW_{th}	EN 14385	Once every three months [19] [13]			
		— IGCC plants	≥ 100 MW_{th}	EN 14385	Once every year [18]	BAT 75		

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
	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		

<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>5</td><td>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.
<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></td></tr>
<tr><td colspan="2">Total suspended solids (TSS)</td><td>EN 872</td><td></td></tr>
<tr><td colspan="2">Fluoride (F^-)</td><td>EN ISO 10304-1</td><td></td></tr>
<tr><td colspan="2">Sulphate (SO_4^{2-})</td><td>EN ISO 10304-1</td><td></td></tr>
<tr><td colspan="2">Sulphide, easily released (S^{2-})</td><td>No EN standard available</td><td></td></tr>
<tr><td colspan="2">Sulphite (SO_3^{2-})</td><td>EN ISO 10304-3</td><td></td></tr>
<tr><td rowspan="7">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><td></td></tr>
<tr><td>Cd</td><td></td></tr>
<tr><td>Cr</td><td></td></tr>
<tr><td>Cu</td><td></td></tr>
<tr><td>Ni</td><td></td></tr>
<tr><td>Pb</td><td></td></tr>
<tr><td>Zn</td><td></td></tr>
<tr><td></td><td>Hg</td><td>Various EN standards available (e.g. EN ISO 12846 or EN ISO 17852)</td><td></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><td>—</td></tr>
</table></td><td>NA</td><td>No flue gas treatment</td></tr>
</table>

<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><table><tr><td>Total nitrogen</td><td>EN 12260</td><td></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>
<tr><td>b.</td><td>Maintenance of the combustion system</td><td>Regular planned maintenance according to suppliers' recommendations</td><td></td></tr>
<tr><td>c.</td><td>Advanced control system</td><td>See description in Section 8.1</td><td>The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system</td></tr>
<tr><td>d.</td><td>Good design of the combustion equipment</td><td>Good design of furnace, combustion chambers, burners and associated devices</td><td>Generally applicable to new combustion plants</td></tr>
<tr><td>e.</td><td>Fuel choice</td><td>Select or switch totally or partially to another fuel(s) with a better environmental profile (e.g. with low sulphur and/or mercury content) amongst the available fuels, including in start-up situations or when back-up fuels are used</td><td>Applicable within the constraints associated with the availability of suitable types of fuel with a better environmental profile as a whole, which may be impacted by the energy policy of the Member State, or by the integrated site's fuel balance in the case of combustion of industrial process fuels.
For existing combustion plants, the type of fuel chosen may be limited</td></tr>
</table></td><td>FC</td><td>The operator has confirmed the following:
A) no blending or mixing undertaken natural gas only.
B) Combustion system maintained to manufacturer's recommendations.
C) Advanced control system in place via Eurotherm Network, PLC & Burner Management System
D) OEM designed & supplied burner equipment. One boiler has undergone burner modifications in order to meet the IED regulations with the second unit to be modified during 2019. In addition both GT's will be replaced with DLE units to further improve emissions.
E) Natural gas used as the fuel."</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
	by the configuration and the design of the plant		
7	In order to reduce emissions of ammonia to air from the use of selective catalytic reduction (SCR) and/or selective non-catalytic reduction (SNCR) for the abatement of NO_X emissions, BAT is to optimise the design and/or operation of SCR and/or SNCR (e.g. optimised reagent to NO_X ratio, homogeneous reagent distribution and optimum size of the reagent drops). **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	No SCR/SNCR is fitted. We agree this is not applicable.
8	In order to prevent or reduce emissions to air during normal operating conditions, BAT is to ensure, by appropriate design, operation and maintenance, that the emission abatement systems are used at optimal capacity and availability.	CC	The operator has confirmed that steam injection NOx control abatement system is installed as a part of the current gas turbine system. System includes an engineer locked steam to fuel ratio which is continuously monitored and trimmed dependent upon gas turbine fuel use. System valves are maintained and calibrated on an annual basis.
9	In order to improve the general environmental performance of combustion and/or gasification plants and to reduce emissions to air, BAT is to include the following elements in the quality assurance/quality control programmes for all the fuels used, as part of the environmental management system (see BAT 1): (i) Initial full characterisation of the fuel used including at least the parameters listed below and in accordance with EN standards. ISO, national or other international standards may be used provided they ensure the provision of data of an equivalent scientific quality; (ii) Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications. The frequency of testing and the parameters chosen from the table below are based on the variability	CC	Natural Gas is burnt.- 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

<table>
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<tr><td></td><td>
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>
<tr><td>HFO</td><td>— Ash
— C, S, N, Ni, V</td></tr>
<tr><td>Gas oil</td><td>— Ash
— N, C, S</td></tr>
<tr><td>Natural gas</td><td>— LHV</td></tr>
</table>
</td><td></td><td></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
	<table><tr><td></td><td>— CH_4, C_2H_6, C_3, C_4+, CO_2, N_2, Wobbe index</td></tr><tr><td>Process fuels from the chemical industry ([27])</td><td>— Br, C, Cl, F, H, N, O, S — Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)</td></tr><tr><td>Iron and steel process gases</td><td>— LHV, CH_4 (for COG), C_XH_Y (for COG), CO_2, H_2, N_2, total sulphur, dust, Wobbe index</td></tr><tr><td>Waste ([28])</td><td>— 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)</td></tr></table>		
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	The operator has confirmed the following : GTs and HRSGs are of OEM design planned preventative maintenance is undertaken. Start-up, open cycle operations and HRSG only operating periods are monitored and recorded as part of the environmental permit reporting requirements
11	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	CC	In their response to the regulation 60 notice they stated that they do not have any specific OTNOC operations with regard to monitoring emissions to air. Monitoring is undertaken in

<table>
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<tr><td></td><td>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></td><td>accordance with permits i.e. periodic emission monitoring undertaken.

However, preventative maintenance and responding to accidents and emergencies are adequately described in their EMS.

Emissions to water are visually checked on a routine basis and this would also cover OTNOC.</td></tr>
<tr><td>12</td><td>In order to increase the energy efficiency of combustion, gasification and/or IGCC units operated ≥1500 h/yr, BAT is to use an appropriate combination of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Combustion optimisation</td><td>See description in Section 8.2. Optimising the combustion minimises the content of unburnt substances in the flue-gases and in solid combustion residues</td><td rowspan="4">Generally applicable</td></tr>
<tr><td>b.</td><td>Optimisation of the working medium conditions</td><td>Operate at the highest possible pressure and temperature of the working medium gas or steam, within the constraints associated with, for example, the control of NO_x emissions or the characteristics of energy demanded</td></tr>
<tr><td>c.</td><td>Optimisation of the steam cycle</td><td>Operate with lower turbine exhaust pressure by utilisation of the lowest possible temperature of the condenser cooling water, within the design conditions</td></tr>
<tr><td>d.</td><td>Minimisation of energy consumption</td><td>Minimising the internal energy consumption (e.g. greater efficiency of the feed-water pump)</td></tr>
</table></td><td>FC</td><td>The operator confirmed that improvements are required. combustion optimisation has been optimised in one HRSG following the implementation of burners designed to meet IED regulations. The second HRSG is to undergo the same modification in 2019. In addition it is anticipated that the site will be installing 2 DLE GTs during 2019.
(B) Optimisation of the working medium conditions - Not applicable
(C) Optimisation of the steam cycle - Plant is CHP therefore Steam cycle is optimised to supply steam at required process conditions.
(D) Minimisation of energy consumption - All feedwater is preheated
(E) Preheating of combustion air - Not applicable
(F) Fuel preheating - Not applicable
(G) Advanced control system - Control system in place via Eurotherm Network, PLC & Burner Management System
H) Feed-water preheating using recovered heat - not applicable.
i) Heat recovery by cogeneration (CHP) - steam used at the Stallingborough Titanium Dioxide Site.
j) CHP readiness - not applicable.
k) Flue gas condenser - currently no demand for low grade heat.</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
	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_X emissions 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: — flue-gas — grate cooling — circulating fluidised bed — Applicable within the constraints associated with the local heat and power demand. The applicability may be limited in the case of gas compressors with an unpredictable operational heat profile j. CHP readiness — See description in Section 8.2. — Only applicable to new units where there is a realistic potential for the future use of heat in the vicinity of the unit k. Flue-gas condenser — See description in Section 8.2. — Generally applicable to CHP units provided there is enough		l) Heat accumulation - currently no demand for low grade heat. m) Wet stack - not applicable. n) Cooling tower discharge - not applicable. o) Fuel pre-drying - not applicable. p) Minimisation of heat losses - not applicable. q) Advanced materials - not applicable. r) Steam turbine upgrades - not applicable. s) Supercritical and ultra-supercritical steam conditions - not applicable.

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

			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	Only applicable to new plants

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<tr><td></td><td>
<table>
<tr><td></td><td></td><td>increased steam/combustion process efficiencies</td><td></td></tr>
<tr><td>r.</td><td>Steam turbine upgrades</td><td>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</td><td>The applicability may be restricted by demand, steam conditions and/or limited plant lifetime</td></tr>
<tr><td>s.</td><td>Supercritical and ultra-supercritical steam conditions</td><td>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</td><td>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</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>13</td><td>In order to reduce water usage and the volume of contaminated waste water discharged, BAT is to use one or both of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Water recycling</td><td>Residual aqueous streams, including run-off water, from the plant are reused for other purposes. The degree of recycling is limited by the quality requirements of the recipient water stream and the water balance of the plant</td><td>Not applicable to waste water from cooling systems when water treatment chemicals and/or high concentrations of salts from seawater are present</td></tr>
<tr><td>b.</td><td>Dry bottom ash handling</td><td>Dry, hot bottom ash falls from the furnace onto a mechanical conveyor</td><td>Only applicable to plants combusting solid fuels.</td></tr>
</table>
</td><td>CC</td><td>The operator confirmed that a closed cooling system is used that minimises water usage. Waste water discharged from the cooling system contains water treatment chemicals which is not suitable for reuse.</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

		system and is cooled down by ambient air. No water is used in the process.	There may be technical restrictions that prevent retrofitting to existing combustion 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
14	In order to prevent the contamination of uncontaminated waste water and to reduce emissions to water, BAT is to segregate waste water streams and to treat them separately, depending on the pollutant content. ***Description*** Waste water streams that are typically segregated and treated include surface run-off water, cooling water, and waste water from flue-gas treatment. ***Applicability*** The applicability may be restricted in the case of existing plants due to the configuration of the drainage systems.	NA	No direct discharge of water from the CHP plant to either water or sewer, all waste water and surface water enters the installation waste water system and is treated by Tronox Pigment UK Limited (formerly Cristal Pigment UK Ltd) before being discharged to the River Humber.
15	In order to reduce emissions to water from flue-gas treatment, BAT is to use an appropriate combination of the techniques given below, and to use secondary techniques as close as possible to the source in order to avoid dilution.	NA	The operator confirmed that No Flue gas treatment is undertaken.

	Technique	Typical pollutants prevented/abated	Applicability
	Primary techniques		
a.	Optimised combustion (see BAT 6) and flue-gas treatment systems (e.g. SCR/SNCR, see BAT 7)	Organic compounds, ammonia (NH_3)	Generally applicable
	Secondary techniques [29]		
b.	Adsorption on activated carbon	Organic compounds, mercury (Hg)	Generally applicable
c.	Aerobic biological treatment	Biodegradable organic compounds, ammonium (NH_4^+)	Generally applicable for the treatment of organic compounds. Aerobic biological treatment of ammonium (NH_4^+) may not be applicable in the case of high chloride concentrations (i.e. around 10 g/l)

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

d.	Anoxic/anaerobic biological treatment	Mercury (Hg), nitrate (NO_3^-), nitrite (NO_2^-)	Generally applicable
e.	Coagulation and flocculation	Suspended solids	Generally applicable
f.	Crystallisation	Metals and metalloids, sulphate (SO_4^{2-}), fluoride (F^-)	Generally applicable
g.	Filtration (e.g. sand filtration, microfiltration, ultrafiltration)	Suspended solids, metals	Generally applicable
h.	Flotation	Suspended solids, free oil	Generally applicable
i.	Ion exchange	Metals	Generally applicable
j.	Neutralisation	Acids, alkalis	Generally applicable
k.	Oxidation	Sulphide (S^{2-}), sulphite (SO_3^{2-})	Generally applicable
l.	Precipitation	Metals and metalloids, sulphate (SO_4^{2-}), fluoride (F^-)	Generally applicable
m.	Sedimentation	Suspended solids	Generally applicable
n.	Stripping	Ammonia (NH_3)	Generally applicable

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

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

Substance/Parameter	BAT-AELs
	Daily average
Total organic carbon (TOC)	20–50 mg/l [30] [31] [32]
Chemical oxygen demand (COD)	60–150 mg/l [30] [31] [32]
Total suspended solids (TSS)	10–30 mg/l
Fluoride (F^-)	10–25 mg/l [32]
Sulphate (SO_4^{2-})	1,3–2,0 g/l [32] [33] [34] [35]

<table>
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<tr><td></td><td>
<table>
<tr><td colspan="2">Sulphide (S^{2-}), easily released</td><td>0,1–0,2 mg/l ([32])</td></tr>
<tr><td colspan="2">Sulphite (SO_3^{2-})</td><td>1–20 mg/l ([32])</td></tr>
<tr><td rowspan="8">Metals and metalloids</td><td>As</td><td>10–50 µg/l</td></tr>
<tr><td>Cd</td><td>2–5 µg/l</td></tr>
<tr><td>Cr</td><td>10–50 µg/l</td></tr>
<tr><td>Cu</td><td>10–50 µg/l</td></tr>
<tr><td>Hg</td><td>0,2–3 µg/l</td></tr>
<tr><td>Ni</td><td>10–50 µg/l</td></tr>
<tr><td>Pb</td><td>10–20 µg/l</td></tr>
<tr><td>Zn</td><td>50–200 µg/l</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>16</td><td>In order to reduce the quantity of waste sent for disposal from the combustion and/or gasification process and abatement techniques, BAT is to organise operations so as to maximise, in order of priority and taking into account life-cycle thinking:
(a) waste prevention, e.g. maximise the proportion of residues which arise as by-products;
(b) waste preparation for reuse, e.g. according to the specific requested quality criteria;
(c) waste recycling;
(d) other waste recovery (e.g. energy recovery),
by implementing an appropriate combination of techniques such as:
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Generation of gypsum as a by-product</td><td>Quality optimisation of the calcium-based reaction residues generated by the wet FGD so that they can be used as a substitute for mined gypsum (e.g. as raw material in the plasterboard industry). The quality of limestone used in the wet FGD influences the purity of the gypsum produced</td><td>Generally applicable within the constraints associated with the required gypsum quality, the health requirements associated to each specific use, and by the market conditions</td></tr>
</table>
</td><td>CC</td><td>The operator confirmed that No waste produced as a result of the process - the hierarchy of waste protocol is followed and is documented in SCHP/EMS/05.</td></tr>
</table>

<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>
<table>
<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></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>
</table>
</td><td>CC</td><td>The operator confirmed that a noise monitoring regime is in place with the following techniques in use to minimise noise
• Noisy equipment is contained within enclosures.
• There is a inspection and maintenance of equipment
• new or replacement equipment is subject to limits.

We agree with the operators stated compliance</td></tr>
</table>

<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>
<table>
<tr><td>b.</td><td>Low-noise equipment</td><td>This potentially includes compressors, pumps and disks</td><td>Generally applicable when the equipment is new or replaced</td></tr>
<tr><td>c.</td><td>Noise attenuation</td><td>Noise propagation can be reduced by inserting obstacles between the emitter and the receiver. Appropriate obstacles include protection walls, embankments and buildings</td><td>Generally applicable to new plants. In the case of existing plants, the insertion of obstacles may be restricted by lack of space</td></tr>
<tr><td>d.</td><td>Noise-control equipment</td><td>This includes:
— noise-reducers
— equipment insulation
— enclosure of noisy equipment
— soundproofing of buildings</td><td>The applicability may be restricted by lack of space</td></tr>
<tr><td>e.</td><td>Appropriate location of equipment and buildings</td><td>Noise levels can be reduced by increasing the distance between the emitter and the receiver and by using buildings as noise screens</td><td>Generally applicable to new plant</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td colspan="4">Combustion of gaseous fuels</td></tr>
<tr><td>40</td><td>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.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Combined cycle</td><td>See description in Section 8.2</td><td>Generally applicable to new gas turbines and engines except when operated < 1 500 h/yr.
Applicable to existing gas turbines and engines within the constraints associated with the steam cycle design and the space availability.
Not applicable to existing gas turbines and engines operated < 1 500 h/yr.
Not applicable to mechanical drive gas turbines operated in discontinuous mode with extended load variations and frequent start-ups and shutdowns.
Not applicable to boilers</td></tr>
</table>
BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of natural gas</td><td>FC</td><td>As already Advanced control system in place via Eurotherm Network, PLC & Burner Management System

Combustion optimisation - Combustion has been optimised in one HRSG following the implementation of burners designed to meet IED regulations. The second HRSG is to undergo the same modification in 2019. In addition it is anticipated that the site will be installing 2 DLE GTs during 2019.

CHP readiness - not applicable.

Combined cycle - two gas turbines each with its own supplementary fired heat recovery steam generator.</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
	Type of combustion unit / **BAT-AEELs [136] [137]**: **Net electrical efficiency (%)** (New unit / Existing unit); **Net total fuel utilisation (%) [138] [139]**; **Net mechanical energy efficiency (%) [139] [140]** (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		
41	In order to prevent or reduce NO_X emissions to air from the combustion of natural gas in boilers, BAT is to use one or a combination of the techniques given below. a. Air and/or fuel staging — See descriptions in Section 8.3. Air staging is often associated with low-NO_X burners — Generally applicable b. Flue-gas recirculation — See description in Section 8.3	FC	The operator has confirmed that an advanced control system in place via Eurotherm Network, PLC & Burner Management System Combustion optimisation - Combustion has been optimised in one HRSG following the implementation of burners designed to meet IED regulations.

<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>
<table>
<tr><td>c.</td><td>Low-NO_X burners (LNB)</td><td></td><td></td></tr>
<tr><td>d.</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>e.</td><td>Reduction of the combustion air temperature</td><td rowspan="3">See description in Section 8.3</td><td>Generally applicable within the constraints associated with the process needs</td></tr>
<tr><td>f.</td><td>Selective non–catalytic reduction (SNCR)</td><td>Not applicable to combustion plants operated < 500 h/yr with highly variable boiler loads.
The applicability may be limited in the case of combustion plants operated between 500 h/yr and 1 500 h/yr with highly variable boiler loads</td></tr>
<tr><td>g.</td><td>Selective catalytic reduction (SCR)</td><td>Not applicable to combustion plants operated < 500 h/yr.
Not generally applicable to combustion plants of < 100 MW_{th}.
There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr</td></tr>
</table>
</td><td></td><td></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</td></tr>
</table>
</td><td>FC</td><td>The operator has stated that improvements are required reference was made to these work being undertaken in 2019. We asked the operator to confirm whether the improvements had been completed or if outstanding the time scale for completion.

NOTE: Current limit set within the Permit is 125mg/Nm3</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
				system and/or control command system		Low-NOx burners: Combustion optimisation - Combustion has been optimised in one HRSG following the implementation of burners designed to meet IED regulations. The second HRSG is to undergo the same modification in 2019. In response received on 20/5/2020 the operator confirmed that a. Advanced operational controls c. DLN e. LNB will be installed by the end of 2020 Both LCP units will meet BAT
	b.	Water/steam addition	See description in Section 8.3	The applicability may be limited due to water availability		
	c.	Dry low-NO_X burners (DLN)		The applicability may be limited in the case of turbines where a retrofit package is not available or when water/steam addition systems are installed		
	d.	Low-load design concept	Adaptation of the process control and related equipment to maintain good combustion efficiency when the demand in energy varies, e.g. by improving the inlet airflow control capability or by splitting the combustion process into decoupled combustion stages	The applicability may be limited by the gas turbine design		
	e.	Low-NO_X burners (LNB)	See description in Section 8.3	Generally applicable to supplementary firing for heat recovery steam generators (HRSGs) in the case of combined-cycle gas turbine (CCGT) combustion plants		
	f.	Selective catalytic reduction (SCR)		Not applicable in the case of combustion plants operated < 500 h/yr. Not generally applicable to existing combustion plants of < 100 MW_{th}. Retrofitting existing combustion plants may be constrained by the availability of sufficient space. There may be technical and economic restrictions for		

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
	retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr		
43	In order to prevent or reduce NO_X emissions to air from the combustion of natural gas in engines, BAT is to use one or a combination of the techniques given below. a. Advanced control system — See description in Section 8.3. This technique is often used in combination with other techniques or may be used alone for combustion plants operated < 500 h/yr — The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system b. Lean-burn concept — See description in Section 8.3. Generally used in combination with SCR — Only applicable to new gas-fired engines c. Advanced lean-burn concept — See descriptions in Section 8.3 — Only applicable to new spark plug ignited engines d. Selective catalytic reduction (SCR) — 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	NA	Gas engine are not in use
44	In order to prevent or reduce CO emissions to air from the combustion of natural gas, BAT is to ensure optimised combustion and/or to use oxidation catalysts. ***Description* - See descriptions in Section 8.3.** **BAT-associated emission levels (BAT-AELs) for NO_X emissions to air from the combustion of natural gas in gas turbines** Type of combustion plant | BAT-AELs (mg/Nm^3) (142) (143)	CC	Current limit set within the Permit is 100mg/Nm3, the operator has requested retention of this limit. Refer to section 4.1

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

	Combustion plant total rated thermal input (MW_{th})	Yearly average (144) (145)	Daily average or average over the sampling period
Open-cycle gas turbines (OCGTs) (146) (147)			
New OCGT	≥ 50	15–35	25–50
Existing OCGT (excluding turbines for mechanical drive applications) — All but plants operated < 500 h/yr	≥ 50	15–50	25–55 (148)
Combined-cycle gas turbines (CCGTs) (146) (149)			
New CCGT	≥ 50	10–30	15–40
Existing CCGT with a net total fuel utilisation of < 75 %	≥ 600	10–40	18–50
Existing CCGT with a net total fuel utilisation of ≥ 75 %	≥ 600	10–50	18–55 (150)
Existing CCGT with a net total fuel utilisation of < 75 %	50–600	10–45	35–55
Existing CCGT with a net total fuel utilisation of ≥ 75 %	50–600	25–50 (151)	35–55 (152)
Open- and combined-cycle gas turbines			
Gas turbine put into operation no later than 27 November 2003, or existing gas turbine for emergency use and operated < 500 h/yr	≥ 50	No BAT-AEL	60–140 (153) (154)
Existing gas turbine for mechanical drive applications — All but plants operated < 500 h/yr	≥ 50	15–50 (155)	25–55 (156)

<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>
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.
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,

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

<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>— 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>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>No spark-ignited lean-burn gas engines,</td></tr>
</table>

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 Note response, the operator has not requested a derogation from compliance with any AEL values.

7. Emissions to Water

There is no direct discharge of water from the CHP plant to either water or sewer, all waste water and surface water enters the installation waste water system and is treated by Tronox Pigment UK Limited before discharge to the River Humber.

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

8. Additional IED Chapter II requirements

There are no additional IED Chapter II requirements

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

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

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

Aspect considered	Decision
Permit conditions	
Updating permit conditions during consolidation	We have updated permit conditions to those in the current generic permit template as part of permit consolidation. The conditions will provide at least the same level of protection as those in the previous permit and in some cases will provide a higher level of protection to those in the previous permit.
Changes to the permit conditions due to an Environment Agency initiated variation	We have varied the permit as stated in the variation notice.
Improvement programme	Based on the information on the application, we consider that we need to impose an improvement programme. We have imposed an improvement programme to ensure that: • IC04 Following the completion of the works to both LCP's to improve NOX emissions as outlined in regulation 61 response of the 23/04/2020 the operator submit a report in writing to the Environment Agency for approval to define an output load or operational parameters for when the dry low NOx operation is effective in line with BAT42. 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 Sections 4.1and 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 Sections 4.1 and 5 of this document. Table S3.4 Process monitoring requirements was amended to include the requirement to monitor energy efficiency after overhauls on site in line with BAT2.

Aspect considered	Decision
	Based on the information in the application we are satisfied that the operator's techniques, personnel and equipment have either MCERTS certification or MCERTS accreditation as appropriate.
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 Sections 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.