

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/RP3438GG
The Operator is: Carrington Power Limited
The Installation is: Carrington Power Station
This Variation Notice number is: EPR/RP3438GG/V006

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 terms

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

Glossary of acronyms used in this document

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

APC	Air Pollution Control
BAT	Best Available Technique(s)
BAT-AEEL	BAT Associated Energy Efficiency Level
BAT-AEL	BAT Associated Emission Level
BATc	BAT conclusion
BREF	Best available techniques reference document
CCGT	Combined Cycle Gas Turbine
CEM	Continuous emissions monitor
CHP	Combined heat and power
CV	Calorific value
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
DLN	Dry Low NOx burners
DLN-E	Dry Low NOx effective
EIONET	European environment information and observation network is a partnership network of the European Environment Agency
ELV	Emission limit value derived under BAT or an emission limit value set out in IED
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No. 1154)
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
PHE	Public Health England
SGN	Sector guidance note
TGN	Technical guidance note
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 31 October 2018.

We considered that the response did not contain sufficient information for us to commence the permit review. We therefore issued a further information request to the Operator on 03 September 2019. Suitable further information was provided by the Operator on 01 October 2019.

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 unless adequate justification is provided.
- 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 NO_x is effective (DLN-E), we have used DLN-E as a default across all monitoring requirements for NO_x and CO.

The LCPs on site consist of two natural gas Combined Cycle Gas Turbines referenced LCP406 and LCP407. They are both 753MWth input and discharge exhaust gases through their own 75m stacks.

The plant was granted a permit prior to 2013 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 regimes:

- Unlimited hours operation

The following tables outline the limits that have been incorporated into the permit for both LCP406 and LCP407, where these were derived from and the reference periods at which they apply. These will be applicable from August 2021. The emission limits refer to concentrations, expressed as mass of emitted substance per volume of flue-gas under the following standard

conditions: dry gas at a temperature of 273,15 K, pressure of 101,3 kPa and 15% volume reference oxygen concentration if flue gases. The emission limits and monitoring requirements have been incorporated into Schedule 3 of the permit. We have only included one table for air emissions in Schedule 3 so the BAT Conclusions will be implemented from variation issue. This was at the request of the operator to simplify the process of monitoring and reporting in the future.

NOx limits (mg/Nm ³)						
Averaging	IED (Annex V Part 1) - Existing	BREF (Table 24 BAT-c)	Expected permit limits	Basis	Limits apply	Monitoring
Annual	None	42 ^{Note 1}	42	BREF	DLN effective to baseload	Continuous
Monthly	50	None	50	IED	DLN effective to baseload	
Daily	55	50	50	BREF	DLN effective to baseload	
95 th %ile of hr means	100	None	100	IED	DLN effective to baseload	

Note 1: The limit of 42mg/m³ is based on provisions for uplift in limit for plant with energy efficiency greater than 55%. The energy efficiency of the Carrington Plant is 58% as set out in Table 24 of the BAT Conclusions.

CO limits (mg/Nm ³)						
Averaging	IED (Annex V Part 1) - Existing	BREF	Expected permit limits	Basis	Limits apply	Monitoring
Annual	None	50 ^{Note 1}	50	BREF	DLN effective to baseload	Continuous
Monthly	100	None	50	Proposed by the operator – tighter than IED	DLN effective to baseload	
Daily	110	None	75	Proposed by the operator – tighter than IED	DLN effective to baseload	
95 th %ile of hr means	200	None	100	Proposed by the operator – tighter than IED	DLN effective to baseload	

Note 1: The limit of 50mg/m³ is based on provisions for low load operation set out in BAT 44.

The existing additional daily limit covering MSUL/MSDL to baseload has been amended in response to the change of operational mode of the plant to low load. The operator demonstrated that the appropriate daily limit is 60mg/m³ rather than the existing 50mg/m³. This is to maintain the flexibility of the plant required by the operation in low load. This has been incorporated into table S3.1.

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 confirmed through the Regulation 61 notice response. The evidence that the efficiency level is within the BAT AEEL range was a commissioning test carried out in September 2016. Station net efficiency calculated at 58.15% at ISO Base Load Conditions. Performance tests performed according to test procedure which references a range of ISO standards. We consider this plant is BAT in relation to the AEELs.

BAT AEELs (%)			Plant efficiency (%)		
Net electrical efficiency	Net total fuel utilisation	Net mechanical efficiency	Net electrical efficiency	Net total fuel utilisation	Net mechanical efficiency
LCP406 and LCP407: Combined Cycle Gas Turbine ≥600MWth					
50 - 60	None	None	58.15	NA	NA

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	S3.1
Monitoring	2.3, 3.5 and 3.6	S1.5, S1.2, S3.1.
Energy efficiency	1.2 and 2.3	S3.3
Noise	3.4 and 2.3	S1.2
Other operating techniques	1.2	S1.2

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

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

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
General			
1	<p>In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features:</p> <ul style="list-style-type: none"> i. commitment of the management, including senior management; ii. definition of an environmental policy that includes the continuous improvement of the installation by the management; iii. planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment; iv. implementation of procedures <ul style="list-style-type: none"> (a) Structure and responsibility (b) Training (c) Communication (d) Employee involvement (e) Documentation (f) Efficient process control (g) Maintenance programmes (h) Emergency preparedness and response (i) Safeguarding compliance with environmental legislation v. checking performance and taking corrective action, paying particular attention to: <ul style="list-style-type: none"> (a) monitoring and measurement (see also the Reference Document on the General Principles of Monitoring) (b) corrective and preventive action (c) maintenance of records (d) independent (where practicable) internal and external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; vi. review of the EMS and its continuing suitability, adequacy and effectiveness by senior management; vii. following the development of cleaner technologies; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life; ix. application of sectoral benchmarking on a regular basis. <p>Etc. - see BAT Conclusions</p>	CC	EMS certified to ISO14001 in place and meets the requirements (i) through to (xvi).

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement												
	<p>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.</p>														
2	<p>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.</p>	CC	<p>Performance test for station performed for plant contractual guarantee testing in September 2016. Station net efficiency calculated at 58.15% at ISO Base Load Conditions. Performance tests performed according to test procedure which references a range of ISO standards.</p>												
3	<p>BAT is to monitor key process parameters relevant for emissions to air and water including those given below.</p> <table border="1" data-bbox="322 831 1494 1007"> <thead> <tr> <th>Stream</th> <th>Parameter(s)</th> <th>Monitoring</th> </tr> </thead> <tbody> <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> </tbody> </table>	Stream	Parameter(s)	Monitoring	Flue-gas	Flow	Periodic or continuous determination	Oxygen content, temperature, and pressure	Periodic or continuous measurement	Water vapour content ⁽³⁾	Waste water from flue-gas treatment	Flow, pH, and temperature	Continuous measurement	CC	<p>Flue-gas, flow, oxygen content, temperature and pressure are all monitored continuously for both LCPs.</p> <p>No waste water from flue-gas treatment so NA.</p>
Stream	Parameter(s)	Monitoring													
Flue-gas	Flow	Periodic or continuous determination													
	Oxygen content, temperature, and pressure	Periodic or continuous measurement													
	Water vapour content ⁽³⁾														
Waste water from flue-gas treatment	Flow, pH, and temperature	Continuous measurement													
4	<p>BAT is to monitor emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.</p> <table border="1" data-bbox="322 1110 1494 1390"> <thead> <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> </thead> <tbody> <tr> <td>NO_x</td> <td> <ul style="list-style-type: none"> — Coal and/or lignite including waste co-incineration — Solid biomass and/or peat including waste co-incineration </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</td> </tr> </tbody> </table>	Substance/Parameter	Fuel/Process/Type of combustion plant	Combustion plant total rated thermal input	Standard(s) ⁽⁴⁾	Minimum monitoring frequency ⁽⁵⁾	Monitoring associated with	NO _x	<ul style="list-style-type: none"> — 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 32 BAT 37 BAT 41 BAT 42	CC	<p>Continuous monitoring of NO_x and CO carried out for both LCPs.</p>
Substance/Parameter	Fuel/Process/Type of combustion plant	Combustion plant total rated thermal input	Standard(s) ⁽⁴⁾	Minimum monitoring frequency ⁽⁵⁾	Monitoring associated with										
NO _x	<ul style="list-style-type: none"> — 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 32 BAT 37 BAT 41 BAT 42										

BAT Concn. Number	Summary of BAT Conclusion requirement					Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		<ul style="list-style-type: none"> — 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 43 BAT 47 BAT 48 BAT 56 BAT 64 BAT 65 BAT 73	
CO		<ul style="list-style-type: none"> — 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	Once every year ⁽⁹⁾	BAT 53	
SO ₂		<ul style="list-style-type: none"> — Coal and/or lignite incl waste co-incineration — Solid biomass and/or peat incl waste co-incineration 	All sizes	Generic EN standards and EN 14791	Continuous ⁽⁶⁾ ⁽¹¹⁾ ⁽¹²⁾	BAT 20 BAT 24 BAT 28 BAT 33 BAT 38 BAT 44 BAT 49 BAT 56 BAT 64 BAT 65 BAT 73	

BAT Concn. Number	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement																							
		<ul style="list-style-type: none"> — 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 50 BAT 57 BAT 66 BAT 67 BAT 74																									
5	BAT is to monitor emissions to water from flue-gas treatment with at least the frequency given in BAT Conclusion 5 and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.						NA	No flue-gas treatment on site.																							
6	In order to improve the general environmental performance of combustion plants and to reduce emissions to air of CO and unburnt substances, BAT is to ensure optimised combustion and to use an appropriate combination of the techniques given below. <table border="1" data-bbox="331 922 1491 1378" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;"></th> <th style="width: 15%;">Technique</th> <th style="width: 35%;">Description</th> <th style="width: 45%;">Applicability</th> </tr> </thead> <tbody> <tr> <td>a.</td> <td>Fuel blending and mixing</td> <td>Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type</td> <td rowspan="2">Generally applicable</td> </tr> <tr> <td>b.</td> <td>Maintenance of the combustion system</td> <td>Regular planned maintenance according to suppliers' recommendations</td> </tr> <tr> <td>c.</td> <td>Advanced control system</td> <td>See description in Section 8.1</td> <td>The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system</td> </tr> <tr> <td>d.</td> <td>Good design of the combustion equipment</td> <td>Good design of furnace, combustion chambers, burners and associated devices</td> <td>Generally applicable to new combustion plants</td> </tr> <tr> <td>e.</td> <td>Fuel choice</td> <td>Select or switch totally or partially to another fuel(s) with a better environmental profile (e.g. with low sulphur and/or mercury)</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</td> </tr> </tbody> </table>							Technique	Description	Applicability	a.	Fuel blending and mixing	Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type	Generally applicable	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)	Applicable within the constraints associated with the availability of suitable types of fuel with a better environmental profile as a whole, which may be	CC	A. A. Fuel Blending and Mixing: Continuous monitoring of fuel gas by monitoring with on line Gas Chromatograph with performance verified to ISO 17023 standard by an ISO 17025 accredited laboratory and used for EU ETS reporting. B. Maintenance of the combustion system: Regular planned maintenance according to suppliers recommendations. C. Advanced control system: Automated computer based system used to control combustion efficiency. Combustion monitoring techniques continually used for monitoring of conditions by site control room. This includes the
	Technique	Description	Applicability																												
a.	Fuel blending and mixing	Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type	Generally applicable																												
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)	Applicable within the constraints associated with the availability of suitable types of fuel with a better environmental profile as a whole, which may be																												

BAT Concn. Numbe r	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement				
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 30%;">content) amongst the available fuels, including in start-up situations or when back-up fuels are used</td> <td style="width: 40%;">impacted by the energy policy of the Member State, or by the integrated site's fuel balance in the case of combustion of industrial process fuels. For existing combustion plants, the type of fuel chosen may be limited by the configuration and the design of the plant</td> </tr> </table>			content) amongst the available fuels, including in start-up situations or when back-up fuels are used	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		<p>monitoring of acoustic pulsations and the uniformity of circumferential gas temperature profiles in order to maintain the health of the lean premix combustion system.</p> <p>D: Good design of the combustion equipment: Latest technology of an established gas turbine combustion system fitted.</p> <p>E. Fuel choice: Fuel supplied from national grid transmission system at appropriate quality.</p>
		content) amongst the available fuels, including in start-up situations or when back-up fuels are used	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				
7	<p>In order to reduce emissions of ammonia to air from the use of selective catalytic reduction (SCR) and/or selective non-catalytic reduction (SNCR) for the abatement of NO_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).</p> <p>BAT-associated emission levels</p> <p>The BAT-associated emission level (BAT-AEL) for emissions of NH₃ to air from the use of SCR and/or SNCR is < 3–10 mg/Nm³ 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/Nm³.</p>	NA	No SCR/SNCR used on site.				
8	<p>In order to prevent or reduce emissions to air during normal operating conditions, BAT is to ensure, by appropriate design, operation and maintenance, that the emission abatement systems are used at optimal capacity and availability.</p>	CC	<p>Regular planned maintenance of the combustion system according to suppliers recommendations to maintain efficiency and minimise emissions to air. Dry Low NO_x (DLN) firing systems such as those installed on the GT26 turbines are precision engineered systems, and must be maintained with to ensure the adequate environmental performance and</p>				

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement						
			mechanical integrity through the outage cycle and overall life of the plant. The maintenance of the hot gas path (including the combustion system) is as recommended by the manufacturer and is a function of the running hours accrued and the number and type of start-ups/shutdowns.						
9	<p>In order to improve the general environmental performance of combustion and/or gasification plants and to reduce emissions to air, BAT is to include the following elements in the quality assurance/quality control programmes for all the fuels used, as part of the environmental management system (see BAT 1):</p> <ul style="list-style-type: none"> (i) Initial full characterisation of the fuel used including at least the parameters listed below and in accordance with EN standards. ISO, national or other international standards may be used provided they ensure the provision of data of an equivalent scientific quality; (ii) Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications. The frequency of testing and the parameters chosen from the table below are based on the variability of the fuel and an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed); (iii) Subsequent adjustment of the plant settings as and when needed and practicable (e.g. integration of the fuel characterisation and control in the advanced control system (see description in Section 8.1)). <p>Description Initial characterisation and regular testing of the fuel can be performed by the operator and/or the fuel supplier. If performed by the supplier, the full results are provided to the operator in the form of a product (fuel) supplier specification and/or guarantee.</p> <table border="1" data-bbox="322 1129 1491 1249"> <thead> <tr> <th data-bbox="322 1129 712 1166">Fuel(s)</th> <th data-bbox="712 1129 1491 1166">Substances/Parameters subject to characterisation</th> </tr> </thead> <tbody> <tr> <td data-bbox="322 1166 712 1203">Natural gas</td> <td data-bbox="712 1166 1491 1203">— LHV</td> </tr> <tr> <td data-bbox="322 1203 712 1249"></td> <td data-bbox="712 1203 1491 1249">— CH₄, C₂H₆, C₃, C₄+, CO₂, N₂, Wobbe index</td> </tr> </tbody> </table>	Fuel(s)	Substances/Parameters subject to characterisation	Natural gas	— LHV		— CH ₄ , C ₂ H ₆ , C ₃ , C ₄ +, CO ₂ , N ₂ , Wobbe index	CC	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. However, the Regulation 61 response does confirm that the fuel is characterised quasi-continuously using an on-line gas chromatograph, verified to ISO 17023 standard by an ISO 17025 accredited laboratory and used for EU ETS reporting. This includes all of the fuel parameters listed in BAT 9.
Fuel(s)	Substances/Parameters subject to characterisation								
Natural gas	— LHV								
	— CH ₄ , C ₂ H ₆ , C ₃ , C ₄ +, CO ₂ , N ₂ , Wobbe index								
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:	CC	Gas Turbines are designed to have minimal run up times before minimum start up load is reached when the combustion system is						

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement						
	<ul style="list-style-type: none"> — 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. 		<p>optimised for efficiency to avoid unnecessary consumption of fuel prior to achieving the required load.</p> <p>Regular planned maintenance of the combustion system according to suppliers recommendations to ensure efficiency and minimise emissions to air.</p> <p>Gas Turbines are remapped and tuned after each major outage, as noted in response to BAT 9 above.</p>						
11	<p>BAT is to appropriately monitor emissions to air and/or to water during OTNOC.</p> <p>Description</p> <p>The monitoring can be carried out by direct measurement of emissions or by monitoring of surrogate parameters if this proves to be of equal or better scientific quality than the direct measurement of emissions. Emissions during start-up and shutdown (SU/SD) may be assessed based on a detailed emission measurement carried out for a typical SU/SD procedure at least once every year, and using the results of this measurement to estimate the emissions for each and every SU/SD throughout the year.</p>	CC	<p>The minimum requirement is for emissions to be assessed during start-up and shutdown on a typical SU/SD at least once per year and this data to be used to estimate the emissions for each SU/SD throughout the year.</p> <p>Emissions will be measured continuously during the whole of the plant operation, for the purposes of reporting mass release data. However, during the very earliest phase of start-up, the raw emissions concentrations are very low and the oxygen content is so high that it is not possible to apply the usual oxygen correction.</p>						
12	<p>In order to increase the energy efficiency of combustion, gasification and/or IGCC units operated $\geq 1\,500$ h/yr, BAT is to use an appropriate combination of the techniques given below.</p> <table border="1" data-bbox="320 1305 1494 1342"> <thead> <tr> <th data-bbox="320 1305 577 1342">Technique</th> <th data-bbox="577 1305 1057 1342">Description</th> <th data-bbox="1057 1305 1494 1342">Applicability</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Technique	Description	Applicability				CC	<p>A. Combustion optimisation: Latest technology of an established gas turbine combustion system fitted, regular monitoring of gas turbine</p>
Technique	Description	Applicability							

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		<p>conditions and regular planned maintenance according to suppliers recommendations followed by mapping and tuning of Gas Turbine to ensure optimum efficiency and emission profile.</p> <p>B. Optimisation of the working medium conditions: Regular planned maintenance according to suppliers recommendations, plant conditions continually monitored in control room and regular plant condition monitoring performed by specialist contractor, in order to maintain, as far as is practicable, actual performance in line with design performance.</p> <p>C. Optimisation of the steam cycle: Cooling water system maintained according to suppliers recommendations with regular inspections and conditions monitored in site control room to ensure lowest possible temperature of condenser cooling water to enable lower turbine exhaust pressure within the design conditions.</p> <p>D. Minimisation of energy consumption: Internal energy consumption minimised by regular planned maintenance to plant and equipment according to suppliers recommendations and regular performance monitoring to ensure</p>
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				
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 _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:	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
		<ul style="list-style-type: none"> — flue-gas — grate cooling — circulating fluidised bed 			<p>early detection of any plant issues.</p> <p>E. Preheating of combustion air: Combustion air heated via GT compressor.</p> <p>F. Fuel preheating: Plant design includes preheating of fuel using recovered heat.</p> <p>G. Advanced control system: Automated computer based system used to control combustion efficiency and minimise emissions. Combustion monitoring techniques continually used for monitoring of conditions by site control room. As noted in response to BAT 9 above, the GT26 control system makes allowance for the instantaneous level of higher hydrocarbons (C2+) within the fuel and this is additionally measured, as a separate parameter, using a fast-response infra-red measurement system.</p> <p>H. Feed-water preheating using recovered heat: Plant design includes feedwater preheating via HRSG to optimise cycle efficiency.</p> <p>I. Heat recovery by cogeneration (CHP): Not applicable (applicable within the constraints associated with the local heat and power demand).</p> <p>J. CHP readiness: Not applicable (only applicable to new units)</p>
	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. Numbe r	Summary of BAT Conclusion requirement				Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	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		<p>where there is a realistic potential for the future use of heat in the vicinity of the unit).</p> <p>K. Flue-gas condenser: Not applicable, and not likely to be feasible to retrofit due to plant layout (generally applicable to CHP units provided there is enough demand for low-temperature heat).</p> <p>I. Heat accumulation: Not applicable (only applicable to CHP plants).</p> <p>M. Wet stack: Not fitted with wet FGD.</p> <p>N. Cooling tower discharge: only applicable to units fitted with wet FGD.</p> <p>O. Fuel pre-drying: Not applicable (applicable to the combustion of biomass and/or peat within the constraints associated with spontaneous combustion risks).</p> <p>P. Minimisation of heat losses: Not applicable (only applicable to solid-fuel-fired combustion units and to gasification/IGCC units).</p> <p>Q. Advanced materials only applicable to new plants.</p> <p>R. Steam turbine upgrades: Not applicable (the applicability restricted by demand and steam conditions).</p> <p>S. Supercritical and ultra-supercritical steam conditions: Not applicable (plant temperatures</p>
	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	<p>Only applicable to new units of $\geq 600 \text{ MW}_{\text{th}}$ operated $> 4\,000 \text{ h/yr}$.</p> <p>Not applicable when the purpose of the unit is to produce low steam temperatures and/or pressures in process industries.</p> <p>Not applicable to gas turbines and engines generating steam in CHP mode.</p> <p>For units combusting biomass, the applicability may be constrained by high-temperature corrosion in the case of certain biomasses</p>		

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement									
			and pressures below supercritical). Technique not routinely applied, or commercially available, to the HRSG of combined cycle power plant.									
13	<p>In order to reduce water usage and the volume of contaminated waste water discharged, BAT is to use one or both of the techniques given below.</p> <table border="1" data-bbox="320 595 1494 896"> <thead> <tr> <th data-bbox="320 595 521 632">Technique</th> <th data-bbox="521 595 1066 632">Description</th> <th data-bbox="1066 595 1494 632">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="320 632 521 762">a. Water recycling</td> <td data-bbox="521 632 1066 762">Residual aqueous streams, including run-off water, from the plant are reused for other purposes. The degree of recycling is limited by the quality requirements of the recipient water stream and the water balance of the plant</td> <td data-bbox="1066 632 1494 762">Not applicable to waste water from cooling systems when water treatment chemicals and/or high concentrations of salts from seawater are present</td> </tr> <tr> <td data-bbox="320 762 521 896">b. Dry bottom ash handling</td> <td data-bbox="521 762 1066 896">Dry, hot bottom ash falls from the furnace onto a mechanical conveyor system and is cooled down by ambient air. No water is used in the process.</td> <td data-bbox="1066 762 1494 896">Only applicable to plants combusting solid fuels. There may be technical restrictions that prevent retrofitting to existing combustion plants</td> </tr> </tbody> </table>	Technique	Description	Applicability	a. Water recycling	Residual aqueous streams, including run-off water, from the plant are reused for other purposes. The degree of recycling is limited by the quality requirements of the recipient water stream and the water balance of the plant	Not applicable to waste water from cooling systems when water treatment chemicals and/or high concentrations of salts from seawater are present	b. Dry bottom ash handling	Dry, hot bottom ash falls from the furnace onto a mechanical conveyor system and is cooled down by ambient air. No water is used in the process.	Only applicable to plants combusting solid fuels. There may be technical restrictions that prevent retrofitting to existing combustion plants	CC	<p>A. Water recycling: Reject water recovered from Water Treatment Plant Reverse Osmosis reject stream and utilised for cooling water. Other aqueous streams (for example boiler make-up water) restricted by water quality requirements and the water balance of the plant.</p> <p>B. Dry bottom ash handling: Not applicable (Only applicable to plants combusting solid fuels).</p>
Technique	Description	Applicability										
a. Water recycling	Residual aqueous streams, including run-off water, from the plant are reused for other purposes. The degree of recycling is limited by the quality requirements of the recipient water stream and the water balance of the plant	Not applicable to waste water from cooling systems when water treatment chemicals and/or high concentrations of salts from seawater are present										
b. Dry bottom ash handling	Dry, hot bottom ash falls from the furnace onto a mechanical conveyor system and is cooled down by ambient air. No water is used in the process.	Only applicable to plants combusting solid fuels. There may be technical restrictions that prevent retrofitting to existing combustion plants										
14	<p>In order to prevent the contamination of uncontaminated waste water and to reduce emissions to water, BAT is to segregate waste water streams and to treat them separately, depending on the pollutant content.</p> <p>Description Waste water streams that are typically segregated and treated include surface run-off water, cooling water, and waste water from flue-gas treatment.</p> <p>Applicability The applicability may be restricted in the case of existing plants due to the configuration of the drainage systems.</p>	CC	<p>Effluent from the Water Treatment Plant is segregated and neutralised separately to avoid contamination of other streams. Plant drains are segregated from surface water drains and treated through a separate oil separator. Sewage is segregated and treated on site. All water discharges are then ultimately released to the Manchester Ship Canal through the Homogenisation basin with continuous online analysis to ensure discharge specification is met.</p>									

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement															
15	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.	NA	No flue-gas treatment on site.															
16	<p>In order to reduce the quantity of waste sent for disposal from the combustion and/or gasification process and abatement techniques, BAT is to organise operations so as to maximise, in order of priority and taking into account life-cycle thinking:</p> <p>(a) waste prevention, e.g. maximise the proportion of residues which arise as by-products;</p> <p>(b) waste preparation for reuse, e.g. according to the specific requested quality criteria;</p> <p>(c) waste recycling;</p> <p>(d) other waste recovery (e.g. energy recovery),</p> <p>by implementing an appropriate combination of techniques such as:</p> <table border="1" data-bbox="322 754 1496 1347"> <thead> <tr> <th data-bbox="322 754 573 791">Technique</th> <th data-bbox="573 754 1081 791">Description</th> <th data-bbox="1081 754 1496 791">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="322 791 573 948">a. Generation of gypsum as a by-product</td> <td data-bbox="573 791 1081 948">Quality optimisation of the calcium-based reaction residues generated by the wet FGD so that they can be used as a substitute for mined gypsum (e.g. as raw material in the plasterboard industry). The quality of limestone used in the wet FGD influences the purity of the gypsum produced</td> <td data-bbox="1081 791 1496 948">Generally applicable within the constraints associated with the required gypsum quality, the health requirements associated to each specific use, and by the market conditions</td> </tr> <tr> <td data-bbox="322 948 573 1082">b. Recycling or recovery of residues in the construction sector</td> <td data-bbox="573 948 1081 1082">Recycling or recovery of residues (e.g. from semi-dry desulphurisation processes, fly ash, bottom ash) as a construction material (e.g. in road building, to replace sand in concrete production, or in the cement industry)</td> <td data-bbox="1081 948 1496 1082">Generally applicable within the constraints associated with the required material quality (e.g. physical properties, content of harmful substances) associated to each specific use, and by the market conditions</td> </tr> <tr> <td data-bbox="322 1082 573 1190">c. Energy recovery by using waste in the fuel mix</td> <td data-bbox="573 1082 1081 1190">The residual energy content of carbon-rich ash and sludges generated by the combustion of coal, lignite, heavy fuel oil, peat or biomass can be recovered for example by mixing with the fuel</td> <td data-bbox="1081 1082 1496 1190">Generally applicable where plants can accept waste in the fuel mix and are technically able to feed the fuels into the combustion chamber</td> </tr> <tr> <td data-bbox="322 1190 573 1347">d. Preparation of spent catalyst for reuse</td> <td data-bbox="573 1190 1081 1347">Preparation of catalyst for reuse (e.g. up to four times for SCR catalysts) restores some or all of the original performance, extending the service life of the catalyst to several decades. Preparation of spent catalyst for reuse is integrated in a catalyst management scheme</td> <td data-bbox="1081 1190 1496 1347">The applicability may be limited by the mechanical condition of the catalyst and the required performance with respect to controlling NO_x and NH₃ emissions</td> </tr> </tbody> </table>	Technique	Description	Applicability	a. Generation of gypsum as a by-product	Quality optimisation of the calcium-based reaction residues generated by the wet FGD so that they can be used as a substitute for mined gypsum (e.g. as raw material in the plasterboard industry). The quality of limestone used in the wet FGD influences the purity of the gypsum produced	Generally applicable within the constraints associated with the required gypsum quality, the health requirements associated to each specific use, and by the market conditions	b. Recycling or recovery of residues in the construction sector	Recycling or recovery of residues (e.g. from semi-dry desulphurisation processes, fly ash, bottom ash) as a construction material (e.g. in road building, to replace sand in concrete production, or in the cement industry)	Generally applicable within the constraints associated with the required material quality (e.g. physical properties, content of harmful substances) associated to each specific use, and by the market conditions	c. Energy recovery by using waste in the fuel mix	The residual energy content of carbon-rich ash and sludges generated by the combustion of coal, lignite, heavy fuel oil, peat or biomass can be recovered for example by mixing with the fuel	Generally applicable where plants can accept waste in the fuel mix and are technically able to feed the fuels into the combustion chamber	d. Preparation of spent catalyst for reuse	Preparation of catalyst for reuse (e.g. up to four times for SCR catalysts) restores some or all of the original performance, extending the service life of the catalyst to several decades. Preparation of spent catalyst for reuse is integrated in a catalyst management scheme	The applicability may be limited by the mechanical condition of the catalyst and the required performance with respect to controlling NO _x and NH ₃ emissions	NA	Not applicable (no solid waste residues produced from combustion or abatement techniques).
Technique	Description	Applicability																
a. Generation of gypsum as a by-product	Quality optimisation of the calcium-based reaction residues generated by the wet FGD so that they can be used as a substitute for mined gypsum (e.g. as raw material in the plasterboard industry). The quality of limestone used in the wet FGD influences the purity of the gypsum produced	Generally applicable within the constraints associated with the required gypsum quality, the health requirements associated to each specific use, and by the market conditions																
b. Recycling or recovery of residues in the construction sector	Recycling or recovery of residues (e.g. from semi-dry desulphurisation processes, fly ash, bottom ash) as a construction material (e.g. in road building, to replace sand in concrete production, or in the cement industry)	Generally applicable within the constraints associated with the required material quality (e.g. physical properties, content of harmful substances) associated to each specific use, and by the market conditions																
c. Energy recovery by using waste in the fuel mix	The residual energy content of carbon-rich ash and sludges generated by the combustion of coal, lignite, heavy fuel oil, peat or biomass can be recovered for example by mixing with the fuel	Generally applicable where plants can accept waste in the fuel mix and are technically able to feed the fuels into the combustion chamber																
d. Preparation of spent catalyst for reuse	Preparation of catalyst for reuse (e.g. up to four times for SCR catalysts) restores some or all of the original performance, extending the service life of the catalyst to several decades. Preparation of spent catalyst for reuse is integrated in a catalyst management scheme	The applicability may be limited by the mechanical condition of the catalyst and the required performance with respect to controlling NO _x and NH ₃ emissions																

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
17	In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below.			CC	<p>A. Operational measures: Regular performance monitoring by specialist external contractor, regular plant tours by staff with defects raised as appropriate, plant doors kept closed to reduce noise, equipment operated by experienced staff.</p> <p>B. Low-noise equipment: Existing plant built to contract spec to minimise noise levels during normal plant operation. Tender procedure to ensure any new equipment meets required standards.</p> <p>C. Noise attenuation: Acoustic enclosures fitted to Gas Turbine house, turbine and HRSG building fitted with sound absorbent walls, sound absorbing walls fitted to fuel gas control block, GT compressor inlet air intake manifold equipped with an absorbing inner liner.</p> <p>D. Noise-control equipment: Silencers fitted to air intakes in turbine and boiler buildings, silencers fitted to ventilation equipment for the gas compressor building, silencers fitted to atmospheric drains vessels.</p> <p>E. Appropriate location of equipment and buildings: Orientation of buildings and appropriate acoustic screening taken into account in plant design.</p>
Technique		Description	Applicability		
a.	Operational measures	These include: <ul style="list-style-type: none"> — 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 	Generally applicable		
b.	Low-noise equipment	This potentially includes compressors, pumps and disks	Generally applicable when the equipment is new or replaced		
c.	Noise attenuation	Noise propagation can be reduced by inserting obstacles between the emitter and the receiver. Appropriate obstacles include protection walls, embankments and buildings	Generally applicable to new plants. In the case of existing plants, the insertion of obstacles may be restricted by lack of space		
d.	Noise-control equipment	This includes: <ul style="list-style-type: none"> — 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		

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 of gaseous fuels																																																																		
40	<p>In order to increase the energy efficiency of natural gas combustion, BAT is to use an appropriate combination of the techniques given in BAT 12 and below.</p> <table border="1" data-bbox="322 485 1496 730"> <thead> <tr> <th data-bbox="322 485 353 523">Technique</th> <th data-bbox="353 485 501 523">Description</th> <th data-bbox="501 485 1496 523">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="322 523 353 730">a. Combined cycle</td> <td data-bbox="353 523 501 730">See description in Section 8.2</td> <td data-bbox="501 523 1496 730">Generally applicable to new gas turbines and engines except when operated < 1 500 h/yr. Applicable to existing gas turbines and engines within the constraints associated with the steam cycle design and the space availability. Not applicable to existing gas turbines and engines operated < 1 500 h/yr. Not applicable to mechanical drive gas turbines operated in discontinuous mode with extended load variations and frequent start-ups and shutdowns. Not applicable to boilers</td> </tr> </tbody> </table> <p>BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of natural gas</p> <table border="1" data-bbox="322 759 1496 1066"> <thead> <tr> <th data-bbox="322 759 595 912" rowspan="3">Type of combustion unit</th> <th colspan="5" data-bbox="595 759 1496 794">BAT-AEELs ⁽¹³⁶⁾ ⁽¹³⁷⁾</th> </tr> <tr> <th colspan="2" data-bbox="595 794 855 852">Net electrical efficiency (%)</th> <th data-bbox="855 794 1137 852" rowspan="2">Net total fuel utilisation (%) ⁽¹³⁸⁾ ⁽¹³⁹⁾</th> <th colspan="2" data-bbox="1137 794 1496 852">Net mechanical energy efficiency (%) ⁽¹³⁹⁾ ⁽¹⁴⁰⁾</th> </tr> <tr> <th data-bbox="595 852 712 912">New unit</th> <th data-bbox="712 852 855 912">Existing unit</th> <th data-bbox="1137 852 1290 912">New unit</th> <th data-bbox="1290 852 1496 912">Existing unit</th> </tr> </thead> <tbody> <tr> <td data-bbox="322 912 595 970">Gas engine</td> <td data-bbox="595 912 712 970">39,5–44 ⁽¹⁴¹⁾</td> <td data-bbox="712 912 855 970">35–44 ⁽¹⁴¹⁾</td> <td data-bbox="855 912 1137 970">56–85 ⁽¹⁴¹⁾</td> <td colspan="2" data-bbox="1137 912 1496 970">No BAT-AEEL.</td> </tr> <tr> <td data-bbox="322 970 595 1005">Gas-fired boiler</td> <td data-bbox="595 970 712 1005">39–42,5</td> <td data-bbox="712 970 855 1005">38–40</td> <td data-bbox="855 970 1137 1005">78–95</td> <td colspan="2" data-bbox="1137 970 1496 1005">No BAT-AEEL.</td> </tr> <tr> <td data-bbox="322 1005 595 1066">Open cycle gas turbine, ≥ 50 MW_{th}</td> <td data-bbox="595 1005 712 1066">36–41,5</td> <td data-bbox="712 1005 855 1066">33–41,5</td> <td data-bbox="855 1005 1137 1066">No BAT-AEEL</td> <td data-bbox="1137 1005 1290 1066">36,5–41</td> <td data-bbox="1290 1005 1496 1066">33,5–41</td> </tr> </tbody> </table> <p>Combined cycle gas turbine (CCGT)</p> <table border="1" data-bbox="322 1114 1496 1254"> <tbody> <tr> <td data-bbox="322 1114 595 1149">CCGT, 50–600 MW_{th}</td> <td data-bbox="595 1114 712 1149">53–58,5</td> <td data-bbox="712 1114 855 1149">46–54</td> <td data-bbox="855 1114 1137 1149">No BAT-AEEL</td> <td colspan="2" data-bbox="1137 1114 1496 1149">No BAT-AEEL</td> </tr> <tr> <td data-bbox="322 1149 595 1184">CCGT, ≥ 600 MW_{th}</td> <td data-bbox="595 1149 712 1184">57–60,5</td> <td data-bbox="712 1149 855 1184">50–60</td> <td data-bbox="855 1149 1137 1184">No BAT-AEEL</td> <td colspan="2" data-bbox="1137 1149 1496 1184">No BAT-AEEL</td> </tr> <tr> <td data-bbox="322 1184 595 1219">CHP CCGT, 50–600 MW_{th}</td> <td data-bbox="595 1184 712 1219">53–58,5</td> <td data-bbox="712 1184 855 1219">46–54</td> <td data-bbox="855 1184 1137 1219">65–95</td> <td colspan="2" data-bbox="1137 1184 1496 1219">No BAT-AEEL</td> </tr> <tr> <td data-bbox="322 1219 595 1254">CHP CCGT, ≥ 600 MW_{th}</td> <td data-bbox="595 1219 712 1254">57–60,5</td> <td data-bbox="712 1219 855 1254">50–60</td> <td data-bbox="855 1219 1137 1254">65–95</td> <td colspan="2" data-bbox="1137 1219 1496 1254">No BAT-AEEL</td> </tr> </tbody> </table>	Technique	Description	Applicability	a. Combined cycle	See description in Section 8.2	Generally applicable to new gas turbines and engines except when operated < 1 500 h/yr. Applicable to existing gas turbines and engines within the constraints associated with the steam cycle design and the space availability. Not applicable to existing gas turbines and engines operated < 1 500 h/yr. Not applicable to mechanical drive gas turbines operated in discontinuous mode with extended load variations and frequent start-ups and shutdowns. Not applicable to boilers	Type of combustion unit	BAT-AEELs ⁽¹³⁶⁾ ⁽¹³⁷⁾					Net electrical efficiency (%)		Net total fuel utilisation (%) ⁽¹³⁸⁾ ⁽¹³⁹⁾	Net mechanical energy efficiency (%) ⁽¹³⁹⁾ ⁽¹⁴⁰⁾		New unit	Existing unit	New unit	Existing unit	Gas engine	39,5–44 ⁽¹⁴¹⁾	35–44 ⁽¹⁴¹⁾	56–85 ⁽¹⁴¹⁾	No BAT-AEEL.		Gas-fired boiler	39–42,5	38–40	78–95	No BAT-AEEL.		Open cycle gas turbine, ≥ 50 MW _{th}	36–41,5	33–41,5	No BAT-AEEL	36,5–41	33,5–41	CCGT, 50–600 MW _{th}	53–58,5	46–54	No BAT-AEEL	No BAT-AEEL		CCGT, ≥ 600 MW _{th}	57–60,5	50–60	No BAT-AEEL	No BAT-AEEL		CHP CCGT, 50–600 MW _{th}	53–58,5	46–54	65–95	No BAT-AEEL		CHP CCGT, ≥ 600 MW _{th}	57–60,5	50–60	65–95	No BAT-AEEL		CC	Techniques applied are as per BAT 12. ISO Base Load Net efficiency as demonstrated by the previously conducted acceptance tests shown to be 58.15% for the plant (described in BAT2). The data provided shows that the Carrington CCGT modules both meet the requirements for energy efficiency as outlined in the BAT AEELs for this BAT Conclusion.
Technique	Description	Applicability																																																																
a. Combined cycle	See description in Section 8.2	Generally applicable to new gas turbines and engines except when operated < 1 500 h/yr. Applicable to existing gas turbines and engines within the constraints associated with the steam cycle design and the space availability. Not applicable to existing gas turbines and engines operated < 1 500 h/yr. Not applicable to mechanical drive gas turbines operated in discontinuous mode with extended load variations and frequent start-ups and shutdowns. Not applicable to boilers																																																																
Type of combustion unit	BAT-AEELs ⁽¹³⁶⁾ ⁽¹³⁷⁾																																																																	
	Net electrical efficiency (%)		Net total fuel utilisation (%) ⁽¹³⁸⁾ ⁽¹³⁹⁾	Net mechanical energy efficiency (%) ⁽¹³⁹⁾ ⁽¹⁴⁰⁾																																																														
	New unit	Existing unit		New unit	Existing unit																																																													
Gas engine	39,5–44 ⁽¹⁴¹⁾	35–44 ⁽¹⁴¹⁾	56–85 ⁽¹⁴¹⁾	No BAT-AEEL.																																																														
Gas-fired boiler	39–42,5	38–40	78–95	No BAT-AEEL.																																																														
Open cycle gas turbine, ≥ 50 MW _{th}	36–41,5	33–41,5	No BAT-AEEL	36,5–41	33,5–41																																																													
CCGT, 50–600 MW _{th}	53–58,5	46–54	No BAT-AEEL	No BAT-AEEL																																																														
CCGT, ≥ 600 MW _{th}	57–60,5	50–60	No BAT-AEEL	No BAT-AEEL																																																														
CHP CCGT, 50–600 MW _{th}	53–58,5	46–54	65–95	No BAT-AEEL																																																														
CHP CCGT, ≥ 600 MW _{th}	57–60,5	50–60	65–95	No BAT-AEEL																																																														
41	In order to prevent or reduce NO _x emissions to air from the combustion of natural gas in boilers, BAT is to use one or a combination of the techniques given in BAT 41.	NA	Applies to combustion of natural gas in boilers only.																																																															

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																			
42	<p>In order to prevent or reduce NO_x emissions to air from the combustion of natural gas in gas turbines, BAT is to use one or a combination of the techniques given below.</p> <table border="1" data-bbox="320 440 1494 1276"> <thead> <tr> <th data-bbox="320 440 535 475">Technique</th> <th data-bbox="535 440 1093 475">Description</th> <th data-bbox="1093 440 1494 475">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="320 475 535 584">a. Advanced control system</td> <td data-bbox="535 475 1093 584">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 data-bbox="1093 475 1494 584">The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system</td> </tr> <tr> <td data-bbox="320 584 535 644">b. Water/steam addition</td> <td data-bbox="535 584 1093 644" rowspan="2">See description in Section 8.3</td> <td data-bbox="1093 584 1494 644">The applicability may be limited due to water availability</td> </tr> <tr> <td data-bbox="320 644 535 753">c. Dry low-NO_x burners (DLN)</td> <td data-bbox="1093 644 1494 753">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 data-bbox="320 753 535 884">d. Low-load design concept</td> <td data-bbox="535 753 1093 884">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 data-bbox="1093 753 1494 884">The applicability may be limited by the gas turbine design</td> </tr> <tr> <td data-bbox="320 884 535 992">e. Low-NO_x burners (LNB)</td> <td data-bbox="535 884 1093 992" rowspan="2">See description in Section 8.3</td> <td data-bbox="1093 884 1494 992">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 data-bbox="320 992 535 1276">f. Selective catalytic reduction (SCR)</td> <td data-bbox="1093 992 1494 1276">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> </tbody> </table>	Technique	Description	Applicability	a. Advanced control system	See description in Section 8.3. This technique is often used in combination with other techniques or may be used alone for combustion plants operated < 500 h/yr	The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system	b. Water/steam addition	See description in Section 8.3	The applicability may be limited due to water availability	c. Dry low-NO _x burners (DLN)	The applicability may be limited in the case of turbines where a retrofit package is not available or when water/steam addition systems are installed	d. Low-load design concept	Adaptation of the process control and related equipment to maintain good combustion efficiency when the demand in energy varies, e.g. by improving the inlet airflow control capability or by splitting the combustion process into decoupled combustion stages	The applicability may be limited by the gas turbine design	e. Low-NO _x burners (LNB)	See description in Section 8.3	Generally applicable to supplementary firing for heat recovery steam generators (HRSGs) in the case of combined-cycle gas turbine (CCGT) combustion plants	f. Selective catalytic reduction (SCR)	Not applicable in the case of combustion plants operated < 500 h/yr. Not generally applicable to existing combustion plants of < 100 MW _{th} . Retrofitting existing combustion plants may be constrained by the availability of sufficient space. There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr	CC	<p>A. Advanced control system: Automated computer based system used to control combustion efficiency. Combustion monitoring techniques continually used for monitoring of conditions by site control room.</p> <p>B. Water/steam addition: Not in plant design.</p> <p>C. Dry low-NO_x burners (DLN) installed.</p> <p>D. Low-load design concept looking to install upgrade by end of 2019.</p> <p>E. Low-NO_x burners (LNB) Not applicable.</p> <p>F. Selective catalytic reduction (SCR) Not applicable.</p>
Technique	Description	Applicability																				
a. Advanced control system	See description in Section 8.3. This technique is often used in combination with other techniques or may be used alone for combustion plants operated < 500 h/yr	The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system																				
b. Water/steam addition	See description in Section 8.3	The applicability may be limited due to water availability																				
c. Dry low-NO _x burners (DLN)		The applicability may be limited in the case of turbines where a retrofit package is not available or when water/steam addition systems are installed																				
d. Low-load design concept	Adaptation of the process control and related equipment to maintain good combustion efficiency when the demand in energy varies, e.g. by improving the inlet airflow control capability or by splitting the combustion process into decoupled combustion stages	The applicability may be limited by the gas turbine design																				
e. Low-NO _x burners (LNB)	See description in Section 8.3	Generally applicable to supplementary firing for heat recovery steam generators (HRSGs) in the case of combined-cycle gas turbine (CCGT) combustion plants																				
f. Selective catalytic reduction (SCR)		Not applicable in the case of combustion plants operated < 500 h/yr. Not generally applicable to existing combustion plants of < 100 MW _{th} . Retrofitting existing combustion plants may be constrained by the availability of sufficient space. There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr																				
43	In order to prevent or reduce NO _x emissions to air from the combustion of natural gas in engines, BAT is to use one or a combination of the techniques given in BAT 43.	NA	Only applicable of combustion of natural gas in engines.																			

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																																																						
44	<p>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.</p> <p>Description - See descriptions in Section 8.3.</p> <p>BAT-associated emission levels (BAT-AELs) for NO_x emissions to air from the combustion of natural gas in gas turbines</p> <table border="1" data-bbox="322 523 1491 1337"> <thead> <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/Nm³) ⁽¹⁴²⁾ ⁽¹⁴³⁾</th> </tr> <tr> <th>Yearly average ⁽¹⁴⁴⁾ ⁽¹⁴⁵⁾</th> <th>Daily average or average over the sampling period</th> </tr> </thead> <tbody> <tr> <td colspan="4" style="text-align: center;">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" style="text-align: center;">Combined-cycle gas turbines (CCGTs) ⁽¹⁴⁶⁾ ⁽¹⁴⁹⁾</td> </tr> <tr> <td>New CCGT</td> <td>≥ 50</td> <td>10–30</td> <td>15–40</td> </tr> <tr> <td>Existing CCGT with a net total fuel utilisation of < 75 %</td> <td>≥ 600</td> <td>10–40</td> <td>18–50</td> </tr> <tr> <td>Existing CCGT with a net total fuel utilisation of ≥ 75 %</td> <td>≥ 600</td> <td>10–50</td> <td>18–55 ⁽¹⁵⁰⁾</td> </tr> <tr> <td>Existing CCGT with a net total fuel utilisation of < 75 %</td> <td>50–600</td> <td>10–45</td> <td>35–55</td> </tr> <tr> <td>Existing CCGT with a net total fuel utilisation of ≥ 75 %</td> <td>50–600</td> <td>25–50 ⁽¹⁵¹⁾</td> <td>35–55 ⁽¹⁵²⁾</td> </tr> <tr> <td colspan="4" style="text-align: center;">Open- and combined-cycle gas turbines</td> </tr> <tr> <td>Gas turbine put into operation no later than 27 November 2003, or existing gas turbine for emergency use and operated < 500 h/yr</td> <td>≥ 50</td> <td>No BAT-AEL</td> <td>60–140 ⁽¹⁵³⁾ ⁽¹⁵⁴⁾</td> </tr> <tr> <td>Existing gas turbine for mechanical drive applications — All but plants operated < 500 h/yr</td> <td>≥ 50</td> <td>15–50 ⁽¹⁵⁵⁾</td> <td>25–55 ⁽¹⁵⁶⁾</td> </tr> </tbody> </table> <p>As an indication, the yearly average CO emission levels for each type of existing combustion plant operated ≥ 1 500 h/yr and for each type of new combustion plant will generally be as follows:</p>	Type of combustion plant	Combustion plant total rated thermal input (MW _{th})	BAT-AELs (mg/Nm ³) ⁽¹⁴²⁾ ⁽¹⁴³⁾		Yearly average ⁽¹⁴⁴⁾ ⁽¹⁴⁵⁾	Daily average or average over the sampling period	Open-cycle gas turbines (OCGTs) ⁽¹⁴⁶⁾ ⁽¹⁴⁷⁾				New OCGT	≥ 50	15–35	25–50	Existing OCGT (excluding turbines for mechanical drive applications) — All but plants operated < 500 h/yr	≥ 50	15–50	25–55 ⁽¹⁴⁸⁾	Combined-cycle gas turbines (CCGTs) ⁽¹⁴⁶⁾ ⁽¹⁴⁹⁾				New CCGT	≥ 50	10–30	15–40	Existing CCGT with a net total fuel utilisation of < 75 %	≥ 600	10–40	18–50	Existing CCGT with a net total fuel utilisation of ≥ 75 %	≥ 600	10–50	18–55 ⁽¹⁵⁰⁾	Existing CCGT with a net total fuel utilisation of < 75 %	50–600	10–45	35–55	Existing CCGT with a net total fuel utilisation of ≥ 75 %	50–600	25–50 ⁽¹⁵¹⁾	35–55 ⁽¹⁵²⁾	Open- and combined-cycle gas turbines				Gas turbine put into operation no later than 27 November 2003, or existing gas turbine for emergency use and operated < 500 h/yr	≥ 50	No BAT-AEL	60–140 ⁽¹⁵³⁾ ⁽¹⁵⁴⁾	Existing gas turbine for mechanical drive applications — All but plants operated < 500 h/yr	≥ 50	15–50 ⁽¹⁵⁵⁾	25–55 ⁽¹⁵⁶⁾	CC	<p>See section 4.1 for confirmation of emission limits applicable to the plant.</p> <p>Annual ELVs apply above the proposed Effective DLN (E-DLN) load point of 249 MWe which was justified by reference to both historic emissions data and commercial guarantees within the Regulation 61 response.</p>
Type of combustion plant	Combustion plant total rated thermal input (MW _{th})			BAT-AELs (mg/Nm ³) ⁽¹⁴²⁾ ⁽¹⁴³⁾																																																					
		Yearly average ⁽¹⁴⁴⁾ ⁽¹⁴⁵⁾	Daily average or average over the sampling period																																																						
Open-cycle gas turbines (OCGTs) ⁽¹⁴⁶⁾ ⁽¹⁴⁷⁾																																																									
New OCGT	≥ 50	15–35	25–50																																																						
Existing OCGT (excluding turbines for mechanical drive applications) — All but plants operated < 500 h/yr	≥ 50	15–50	25–55 ⁽¹⁴⁸⁾																																																						
Combined-cycle gas turbines (CCGTs) ⁽¹⁴⁶⁾ ⁽¹⁴⁹⁾																																																									
New CCGT	≥ 50	10–30	15–40																																																						
Existing CCGT with a net total fuel utilisation of < 75 %	≥ 600	10–40	18–50																																																						
Existing CCGT with a net total fuel utilisation of ≥ 75 %	≥ 600	10–50	18–55 ⁽¹⁵⁰⁾																																																						
Existing CCGT with a net total fuel utilisation of < 75 %	50–600	10–45	35–55																																																						
Existing CCGT with a net total fuel utilisation of ≥ 75 %	50–600	25–50 ⁽¹⁵¹⁾	35–55 ⁽¹⁵²⁾																																																						
Open- and combined-cycle gas turbines																																																									
Gas turbine put into operation no later than 27 November 2003, or existing gas turbine for emergency use and operated < 500 h/yr	≥ 50	No BAT-AEL	60–140 ⁽¹⁵³⁾ ⁽¹⁵⁴⁾																																																						
Existing gas turbine for mechanical drive applications — All but plants operated < 500 h/yr	≥ 50	15–50 ⁽¹⁵⁵⁾	25–55 ⁽¹⁵⁶⁾																																																						

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	<ul style="list-style-type: none"> — New OCGT of $\geq 50 \text{ MW}_{th}$: $< 5\text{--}40 \text{ mg/Nm}^3$. For plants with a net electrical efficiency (EE) greater than 39 %, a correction factor may be applied to the higher end of this range, corresponding to [higher end] \times EE/39, where EE is the net electrical energy efficiency or net mechanical energy efficiency of the plant determined at ISO baseload conditions. — Existing OCGT of $\geq 50 \text{ MW}_{th}$ (excluding turbines for mechanical drive applications): $< 5\text{--}40 \text{ mg/Nm}^3$. The higher end of this range will generally be 80 mg/Nm^3 in the case of existing plants that cannot be fitted with dry techniques for NO_x reduction, or 50 mg/Nm^3 for plants that operate at low load. — New CCGT of $\geq 50 \text{ MW}_{th}$: $< 5\text{--}30 \text{ mg/Nm}^3$. For plants with a net electrical efficiency (EE) greater than 55 %, a correction factor may be applied to the higher end of the range, corresponding to [higher end] \times EE/55, where EE is the net electrical energy efficiency of the plant determined at ISO baseload conditions. — Existing CCGT of $\geq 50 \text{ MW}_{th}$: $< 5\text{--}30 \text{ mg/Nm}^3$. The higher end of this range will generally be 50 mg/Nm^3 for plants that operate at low load. — Existing gas turbines of $\geq 50 \text{ MW}_{th}$ for mechanical drive applications: $< 5\text{--}40 \text{ mg/Nm}^3$. The higher end of the range will generally be 50 mg/Nm^3 when plants operate at low load. <p>In the case of a gas turbine equipped with DLN burners, these indicative levels correspond to when the DLN operation is effective.</p>		
45	<p>In order to reduce non-methane volatile organic compounds (NMVOC) and methane (CH_4) emissions to air from the combustion of natural gas in spark-ignited lean-burn gas engines, BAT is to ensure optimised combustion and/or to use oxidation catalysts.</p> <p>Description See descriptions in Section 8.3. Oxidation catalysts are not effective at reducing the emissions of saturated hydrocarbons containing less than four carbon atoms.</p>	NA	Only applicable to natural gas engines.

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

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

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

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

(b) the technical characteristics of the installation concerned.

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

The consolidated permit incorporates one current discharges to controlled waters identified as W1.

The reference period and frequency of monitoring chlorine in water emissions has been increased in frequency due to improved methods of monitoring on site for this parameter.

An existing improvement condition required the operator to carry out an assessment of the 'as built' environmental impact of the discharge of cooling water to the aquatic environment of the Manchester Ship Canal. The assessment was required to cover the impact of the biocide used in the cooling system and any biocide by-products (such as chloroform) that might be formed; and the thermal effects of the discharge, drawing upon operational emission, modelling, water quality and fish population data that is available and relevant. The response to this improvement condition has been submitted by the operator through the existing compliance mechanism and will be assessed by the Environment Agency outside of the remit of the permit review. 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 Review and assessment of changes that are not part of the BAT Conclusions derived permit review.

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

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

Aspect considered	Decision
Changes to the permit conditions due to an Environment Agency initiated variation	We have varied the permit as stated in the variation notice.
Emission limits	<p>We have decided that emission limits should be set for the parameters listed in the permit.</p> <p>These are described in the relevant BAT Conclusions in Section 5 of this document.</p> <p>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.</p> <p>In the event of a black out National Grid would call on combustion plant to operate and may require them to do so outside their permitted conditions. We have dedicated black start plant and they are permitted to run as such but this scenario is relevant to the rest of the large combustion plant which could be called depending on the circumstances.</p> <p>A risk assessment will be carried out by Energy UK/Joint Environmental Programme on behalf of 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 have been included in the permit.</p>
Monitoring	<p>We have decided that monitoring should be carried out for the parameters listed in the permit, using the methods detailed and to the frequencies specified.</p> <p>These are described in the relevant BAT Conclusions in Section 5 of this document.</p> <p>Table S3.3 Process monitoring requirements was amended to include the requirement to monitor energy efficiency after overhauls on site in line with BAT2.</p>

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	<p>We have specified reporting in the permit for the following parameters:</p> <ul style="list-style-type: none"> • Nitrogen dioxide • Carbon monoxide • Sulphur dioxide • Dust <p>These are described in the relevant BAT Conclusions in Section 5 of this document.</p>
Operator competence	
Management system	There is no known reason to consider that the operator will not have the management system to enable it to comply with the permit conditions.
Growth Duty	
Section 108 Deregulation Act 2015 – Growth duty	<p>We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit.</p> <p>Paragraph 1.3 of the guidance says:</p> <p>“The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation.”</p> <p>We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.</p> <p>We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.</p>