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/DP3433DM
The Operator is: Drax Generation Enterprise Limited
The Installation is: Shoreham Power Station
This Variation Notice number is: EPR/DP3433DM/V003

What this document is about

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

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

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

As well as considering the review of the operating techniques used by the Operator for the operation of the plant and activities of the installation, the consolidated variation notice takes into account and brings together in a single document all previous variations that relate to the original permit

issued. It also modernises the entire permit to reflect the conditions contained in our current generic permit template.

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

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

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

How this document is structured

Glossary of acronyms used in this document

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

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

1 Our decision

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

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

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

2 How we reached our decision

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

We issued a Notice under Regulation 61(1) of the Environmental Permitting (England and Wales) Regulations 2016 (a Regulation 61 Notice) on 1st May 2018 requiring the Operator to provide information to demonstrate how the operation of their installation currently meets, or will subsequently meet, the revised standards described in the large combustion plant BAT Conclusions document. The Notice also required that where the revised standards are not currently met, the operator should provide information that:

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

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

The Regulation 61 Notice response from the Operator was received on 6 November 2018.

We considered it was in the correct form and contained sufficient information for us to begin our determination of the permit review.

Apart from the issues and information just described, we have not received any information in relation to the Regulation 61 Notice response that appears to be confidential in relation to any party.

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

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

3 The legal framework

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

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

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

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

4 The key issues

The key issues arising during this permit review are:

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

We therefore describe how we determined these issues in most detail in the relevant sections of this document.

4.1 Emissions to air and the emission limits applied to the plant

A number of general principles were applied during the permit review. These included:

- The upper value of the BAT AELs ranges specified were used unless use of the tighter limit was justified.
- The principle of no backsliding where if existing limits in the permit were already tighter than those specified in the BREF, the existing permit limits were retained.
- Where a limit was specified in both IED Annex V and the BAT Conclusions for a particular reference period, the tighter limit was applied and in the majority of cases this was from the BAT Conclusions.
- Where AELs are indicative in the BAT Conclusions, these were applied unless adequate justification was provided by the operator to demonstrate that an alternative limit was more appropriate.
- For gas turbines where the IED specified that limits applied over 70% load and the BAT Conclusions specified that AELs applied when dry low NOx is effective (DLN-E), we have used DLN-E as a default across all monitoring requirements for NOx and CO.

The LCP on site consists of:

LCP306 – combined cycle gas turbine, fired on natural gas, with a thermal input of 716MW and operating for unlimited hours.

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

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

- Unlimited hours operation.
- ≥600 MWth input
- <75% efficiency.

The following tables outline the limits that have been incorporated into the permit for LCP306, where these were derived from and the reference periods at which they apply. The emission limits refer to concentrations, expressed as mass of emitted substance per volume of flue-gas under the following standard conditions: dry gas at a temperature of 273.15 K, pressure of 101.3 kPa and 15% volume reference oxygen concentration in flue gases. The emission limits and monitoring requirements have been incorporated into Schedule 3 of the permit.

The operator confirmed that the top of the range of BAT-AELs for the annual and daily NOx limits could be achieved so these have been specified in the permit. We asked the operator to propose a daily limit for NOx for MSUL/MSDL to baseload as the industry sector had requested that these values be retained in the permits. For consistency, where the current permit does not include this limit we have asked the operator to propose this limit.

NOx limits (mg/Nm^3)						
Averaging	**IED (Annex V Part 1)**	**BREF (Table 24 BAT-c)**	**Revised permit limits**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**40**	**40**	BREF	When DLN is effective	Continuous
Monthly	**50**	**None**	**50**	IED	When DLN is effective	
Daily	**55**	**50**	**50**	BREF	When DLN is effective	
			50	Proposed by operator	MSUL/MSDL to baseload	
95th %ile of hr means	**100**	**None**	**50** [1]	Current permit	When DLN is effective	

Notes:

1. Limit retained from the current permit, based on the no-backsliding principle

The operator stated that CO emissions are generally low and requested that the applicable indicative BAT-AEL for CO should be the top of the range for plant that operate at low load. They also requested that the daily CO of 385 mg/m^3 as specified in the current permit be retained for MSUL/MSDL to baseload.

We have set the annual limit for CO as 50 mg/Nm^3 as requested as such a limit is reasonable for this plant. The limits specified in the BAT Conclusions for CO are indicative.

CO limits (mg/Nm^3)						
Averaging	**IED (Annex V Part 1)**	**BREF (Table 24 BAT-c)**	**Revised permit limits**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**30 (50 for plants that operate at low load)**	**50**	BREF	When DLN is effective	Continuous
Monthly	**100**	**None**	**100**	IED	When DLN is effective	
Daily	**110**	**None**	**110**	IED	When DLN is effective	
			385	Current permit	MSUL/MSDL to baseload	
95th %ile of hr means	**200**	**None**	**200**	IED	When DLN is effective	

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 provided to demonstrate that the AEELs are met was in the form of confirmation that periodic operational assessments have been carried out to confirm the level. 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**
LCP306: existing CCGT, ≥600MWth					
50-60	**None**	**None**	**55**	**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	S3.1a
Monitoring	2.3, 3.5 and 3.6	S1.4, S1.5, S1.2, S3.1a
Energy efficiency	1.2 and 2.3	S3.4
Noise	3.4 and 2.3	S1.2
Other operating techniques	2.3	S1.2

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

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

Note: Reference to Scottish Power Generation Limited or SPGL in the following table shall mean Drax Generation Enterprise Limited.

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
General			
1	**In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features:** i. commitment of the management, including senior management; ii. definition of an environmental policy that includes the continuous improvement of the installation by the management; iii. planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment; iv. implementation of procedures (a) Structure and responsibility (b) Training (c) Communication (d) Employee involvement (e) Documentation (f) Efficient process control (g) Maintenance programmes (h) Emergency preparedness and response (i) Safeguarding compliance with environmental legislation v. checking performance and taking corrective action, paying particular attention to: (a) monitoring and measurement (see also the Reference Document on the General Principles of Monitoring) (b) corrective and preventive action (c) maintenance of records (d) independent (where practicable) internal and external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; vi. review of the EMS and its continuing suitability, adequacy and effectiveness by senior management; vii. following the development of cleaner technologies; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life; ix. application of sectoral benchmarking on a regular basis.	CC	The operator provided the following response: **i to vi. General EMS aspects** Scottish Power Generation Limited (SPGL) holds ISO14001:2015 accreditation for its EMS. The EMS applies to all of SPGL's Thermal Power Stations – Damhead Creek, Shoreham, Blackburn Mill and Rye House The EMS is re-certified every three years and there are also annual surveillance audits of the system. The current accreditation runs to September 2019. The EMS comprises an environmental policy and common management documents, which are applicable to all sites, as well as site specific management procedures tailored to each site's operations. The site specific procedures provide the contact details for applicable responsible personnel on the site, and their roles and responsibilities. The EMS certification clearly demonstrates that the EMS includes all elements listed under BATc 1 items as required under ISO14001. **v. Performance monitoring and corrective actions** a) Monitoring and Measurement – Emissions to Air: Procedure '*Monitoring and Reporting for Compliance with Environmental Permitting Regulations*' (reference: GEN-TG-ENV-7002, issued in: November 2016) is the overarching document for the four power stations, that describes the monitoring of emissions to air required by the

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
	Etc - see BAT Conclusions **Applicability**. The scope (e.g. level of detail) and nature of the EMS (e.g. standardised or non-standardised) will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have.		Environmental Permit for Shoreham. The document describes the data monitoring and calculation processes to estimate the emissions of Sulphur dioxide (SO2), Oxides of nitrogen (NOx), Particulates (dust) and Carbon monoxide (CO) from the various emission points on site for reporting purposes. This procedure also covers the procedures for monitoring emissions to air during periods of abnormal operation (such as start-up and shut-down), which are defined by a site specific Minimum Start-up Load (MSUL) and a Minimum Shut-Down Load (MSDL). The MSDL is the same as the MSUL, as defined by criteria set out in the IED protocol in Schedule S1.4 of the Environmental Permit. Section 5 of the document comprises the responsibilities of site personnel with regards to emissions monitoring, applicable daily, monthly and annual emission limits for each pollutant, control measures applied for each pollutant, and reporting methods and requirements. The EC&I Team Leader, EC&I Lead Engineer, Chemist, Environment Lead, Production Day Team Leaders, Contractors, , O&M Managers, Performance & Compliance Manager, Production Technicians and Deputy Personnel have all been designated specific responsibilities within the procedure with regards to emissions to air. In addition to the above, there is a separate procedure for the '*Maintenance & Calibration of Environmental Monitoring Equipment'* (reference: GEN-TG-ENV-7005, issued in: Nov 2016) for ensuring all equipment on site is appropriately maintained and calibrated as required to ensure monitoring and reporting of emissions for regulatory compliance and other requirements. This includes

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
			equipment used for the continuous and discontinuous monitoring of emissions to air and water. - Emissions to Water: Procedure '*Monitoring and Reporting for Compliance with Environmental Permitting Regulations*' (reference: GEN-TG-ENV-7002, issued in: Nov 2016) also covers the management of all releases to water from the Shoreham Power Station. The EC&I Team Leader, EC&I Lead Engineer, Chemist, Environment Lead, Production Day Team Leaders, Contractors, O&M Managers, Performance & Compliance Manager, Production Technicians and Deputy Personnel have all been designated specific responsibilities by the procedure with regards to all permitted and accidental releases to controlled waters. – Maintenance Plan: All plant and equipment at the site is regularly maintained. Maintenance works at the site are scheduled using the maintenance software system. The site has a long term service agreement with the main power train original equipment manufacturer who carry out the maintenance works at a fixed periodicity. All Balance of Plant maintenance is carried out by qualified and competent staff or contractors. b) Corrective and Preventative Actions – The plant is covered by a Distributed Control System (DCS) to continuously monitor the operation of the plant and equipment at the site. Any non-conformance or deviation in normal operating parameters is identified by the DCS to allow Production Technicians to take action to avoid a breach of permitted emission levels. – SPGL uses an electronic Environmental, Health and Safety (EHS) system to record data on plant performance, incidents, and potential incidents and to record subsequent incident investigation, and

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
			implementation of actions arising from the investigations. The EHS system also logs the responsibilities for action implementation and action close out. c) Records – The EMS clearly defines the requirements for maintaining and storing records. d) Auditing – Performance against the objectives for the Environmental Management System is subject to review by senior management on a quarterly basis as part of a wider review of the integrated management system plan. The EMS is also subject to internal corporate audits as well as external certification audits. **vi. Management review of EMS –**see v. d) above **vii. Development of cleaner technologies –**See ix. below. **viii. Consideration of decommissioning impacts** The site is regulated under the Environmental Permitting Regulations 2016 and is required to give due consideration to the impact of decommissioning. SPGL follows procedure GEN-ENV-7150 Site Acquisition, Development, Closure and Demolition covering decommissioning. This identifies the matters that the sites are to consider in respect of decommissioning and states that operational sites should prepare and update formal site closure plans in accordance with the requirements of the current. Shoreham power station's permit required the development of a site closure plan which was produced and submitted in 2009.

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
			Any plant alterations or new plant additions will be subject to the site change management controls which include the consideration of decommissioning aspects. This is also required under the Construction Design and Management Regulations 2015. **ix. Sectoral benchmarking.** The site is regulated under the Environmental Permitting Regulations 2016, which include a requirement for the application of BAT to the operation of the facility. This requires the operator to undertake sectoral benchmarking as and when revised sector guidance is issued e.g. EU BAT reference documents and associated BAT conclusions and to implement compliance with the sector guidance within 4 years of issue. This is implemented through the Regulation 61 notice process. **x. Fuel quality control** –See response under BATc 9. **xi. Other than normal operating conditions (OTNOC) management plan** –see response to BATc10 and 11. **xii. Waste management plan** The plant is covered under the SPGL wide procedure Waste Management Procedure ("WMP") (reference: GEN-ENV-7145, issued in: September 2017 which details the waste storage and handling procedures on site. The WMP describes the responsibilities of the O&M Manager, Compliance & Performance (C&P) Team Leader, All Team Leaders and Contract Officers, and all employees and contractors for ensuring that all waste generated on site is managed appropriately in line with applicable regulations. The WMP outlines the identification of

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			waste streams and how they must be handled, including appropriate segregation and storage within designated waste storage areas on site. Moreover, the Assessment of Environmental Aspects & Impacts Register for the site (reference: GEN-TG-ENV-7000) identifies waste as an 'aspect' of the site operations, and provides information on how waste generated is controlled and managed on site. The operator furthermore explores the methods to minimise waste arisings from the site operations as part of the site's annual objectives. **xiii. Management of uncontrolled or unplanned emissions** – Site Protection: SPGL's EMS includes a suite of documents that help control any unplanned and uncontrolled release of emissions to prevent them damaging the environment. The documents are "controlled" meaning they must be regularly reviewed, updated and re-authorised and they are readily available as hard copies in the main control room. The underlying processes are also audited both internally and externally annually. – Fugitive Emissions: Fugitive emissions are not routine and could only occur as a result of spills or other unplanned releases. The potential for fugitive emissions are regularly reviewed as part of the EMS environmental aspect and impact identification procedure GEN-ENV-7140 and recorded in the spreadsheet GEN-TG-ENV-7000. One of the requirements of the daily site inspections by production personnel is to check for spills or other fugitive emissions. Procedure 'Data Collection & Reporting for Non Statutory Purposes' (reference: GEN-TG-ENV-7004, issued in June 2017) describes the processes to be

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
			followed at SPGL sites with respect to the monitoring and reporting of emissions for regulatory compliance (outside of those required under the Environmental Permitting Regulations (EPR)) and internal and external compliance requirements; including the recording of releases to air for pollution inventory reporting. **xiv. Dust management plan** Due to the inherent nature of the site operations, the potential for dust generation at the site is minimal. Therefore, no specific dust management plan is in place. However, dust emissions are monitored and reported to the Environment Agency annually in compliance with the site's Environmental Permit. **xv. Noise management plan** Shoreham has not been notified under clause 3.4.2 of the Environmental Permit that its activities have given rise to noise pollution and as such there has been no requirement to produce a noise management plan. The original planning permission set noise limits considered to be appropriate for the plant. Procedure 'Data Collection & Reporting for Non Statutory Purposes' (reference: GEN-TG-ENV-7004, issued in June 2017 identifies an annual assessment to demonstrate continuing compliance with these limits. **xvi. Odour management plan** Since the Power Station uses natural gas directly from the National Transmission System (NTS) as a fuel, the sources of odour at the site are considered to be negligible; no Odour Management Plan is in place on site. We agree with the operator's assessment of compliance.

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
2	BAT is to determine the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the gasification, IGCC and/or combustion units by carrying out a performance test at full load (1), according to EN standards, after the commissioning of the unit and after each modification that could significantly affect the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the unit. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	CC	The operator provided the following response: The total fuel used by the station is recorded daily and compared to output with departures from trend efficiency reported and investigated routinely. Energy efficiency data is included in the monthly UK Thermal Plant Performance Report which is reviewed in the regular Thermal Generation Management meeting. At least once each year formal performance tests are carried out at maximum export limit (MEL) and minimum stable export load (SEL) within environmental limits and these are tracked and trended to check any anomalies. In-house electricity consumption mainly comprising the running of auxiliary plant and the power station start-up consumption are also consistently reviewed with a view to assessing trends and identifying potential savings. The reduction of electricity usage and costs are also looked at during annual Energy Savings Audit Scheme (ESOS) audits which are carried out across the Thermal region and the findings agreed and actions identified for the succeeding Thermal Environment Plan. In addition the site is covered under the EU-ETS scheme (certificate reference: SH-UK-E-IN-13372 and there is a procedure for monitoring and reporting of fuel consumption (both natural gas and other fuels used on site) and energy output from the site - 'Thermal Region -Greenhouse Gases Monitoring & Reporting' (reference: GEN-TG-ENV-7104, issued in: June 2017) to meet our obligations under the scheme. The data is reviewed on a monthly basis

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>and is verified on an annual basis. The procedure ascribes the responsibilities of the Thermal Region Environmental Coordinator, O&M Manager, and other Designated Personnel with regards to the monitoring and reporting for the EU-ETS emissions.

SPGL has an agreement with an external contractor for the verification and submission of the data. The submissions are completed by the site, verified by the contractor before being submitted to the EA by the contractor.

We asked the operator to confirm which standards are used for the performance testing and on 10/06/2020 they confirmed that ISO standards are used.

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

The flue gases from the site are all monitored using MCERTS certified Continuous Emissions Monitoring systems (CEMs) in accordance with BS EN 14181. This system continuously monitors flow, O_2 and water vapour content as well as pollutant species to facilitate the conversion of recorded pollutant emission data to standard conditions within the CEM and data handling systems.

All monitoring equipment on site is maintained and calibrated regularly in line with Procedure – ‘Maintenance & Calibration of Environmental Monitoring Equipment’ (reference: GEN-TG-ENV-7005, issued in: Nov 2016) to ensure appropriate measurements are recorded.</td></tr>
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<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>No flue gas treatment is undertaken on site; therefore no waste water is generated from the process.

We agree with the operator’s assessment of compliance.</td></tr>
<tr><td>4</td><td>BAT is to monitor emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.
<table>
<tr><th>Substance/Parameter</th><th>Fuel/Process/Type of combustion plant</th><th>Combustion plant total rated thermal input</th><th>Standard(s) [4]</th><th>Minimum monitoring frequency [5]</th><th>Monitoring associated with</th></tr>
<tr><td>NH_3</td><td>— When SCR and/or SNCR is used</td><td>All sizes</td><td>Generic EN standards</td><td>Continuous [6] [7]</td><td>BAT 7</td></tr>
<tr><td>NO_X</td><td>— Coal and/or lignite including waste co-incineration
— Solid biomass and/or peat including waste co-incineration
— HFO- and/or gas-oil-fired boilers and engines
— Gas-oil-fired gas turbines
— Natural-gas-fired boilers, engines, and turbines
— Iron and steel process gases
— Process fuels from the chemical industry
— IGCC plants</td><td>All sizes</td><td>Generic EN standards</td><td>Continuous [6] [8]</td><td>BAT 20
BAT 24
BAT 28
BAT 32
BAT 37
BAT 41
BAT 42
BAT 43
BAT 47
BAT 48
BAT 56
BAT 64
BAT 65
BAT 73</td></tr>
<tr><td></td><td>— Combustion plants on offshore platforms</td><td>All sizes</td><td>EN 14792</td><td>Once every year [9]</td><td>BAT 53</td></tr>
</table></td><td>CC</td><td>The operator provided the following response:

The flue gases from the site are all monitored using MCERTS certified Continuous Emissions Monitoring systems (CEMs) in accordance with BS EN 14181. This system continuously monitors NOx and CO. Emissions of CH4 are monitored on an annual basis; this is referenced under Procedure ‘Data Collection & Reporting for Non Statutory Purposes’ (reference: GEN-TG-ENV-7004, issued in June 2017).

Procedure –‘Monitoring and Reporting for Compliance with Environmental Permitting Regulations’ (reference: GEN-TG-ENV-7002, issued in: November 2016) is the overarching document that describes the monitoring of emissions to air required by the Environmental Permit for the Shoreham Power Station . The document describes the data monitoring and calculation processes to estimate the emissions of Sulphur dioxide (SO2), Oxides of nitrogen (NOx), Particulates (dust) and Carbon monoxide (CO) from the various emission points on site for reporting purposes. This procedure also covers the procedures for monitoring emissions to air during periods of abnormal operation (such as start-up and shut-down), which are defined by a site specific Minimum Start-up Load (MSUL) and a Minimum Shut-Down Load (MSDL). The MSDL is the same as the MSUL, as defined by criteria set out in the IED protocol is schedule S1.4 of the permit.</td></tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	N_2O	— Coal and/or lignite in circulating fluidised bed boilers — Solid biomass and/or peat in circulating fluidised bed boilers	All sizes	EN 21258	Once every year ([10])	BAT 20 BAT 24		Section 5 of the document comprises the responsibilities of site personnel with regards to emissions monitoring, applicable daily, monthly and annual emission limits for each pollutant, control measures applied for each pollutant, and reporting methods and requirements. The EC&I Team Leader, EC&I Lead Engineer, Chemist, Environment Lead, Production Day Team Leaders, Contractors O&M Managers, Production Technicians and Deputy Personnel have all been designated specific responsibilities by the procedure with regards to emissions to air. In addition to the above, there is a separate procedure for the '*Maintenance & Calibration of Environmental Monitoring Equipment'* (reference: GEN-TG-ENV-7005, issued in: Nov 2016) for ensuring all equipment on site is appropriately maintained and calibrated as required to ensure monitoring and reporting of emissions for regulatory compliance and other requirements. This includes equipment used for the continuous and discontinuous monitoring of emissions to air and water. We agree with the operator's assessment of compliance.
	CO	— Coal and/or lignite including waste co-incineration — Solid biomass and/or peat including waste co-incineration — HFO- and/or gas-oil-fired boilers and engines — Gas-oil-fired gas turbines — Natural-gas-fired boilers, engines, and turbines — Iron and steel process gases — Process fuels from the chemical industry — IGCC plants	All sizes	Generic EN standards	Continuous ([6]) ([8])	BAT 20 BAT 24 BAT 28 BAT 33 BAT 38 BAT 44 BAT 49 BAT 56 BAT 64 BAT 65 BAT 73		
		— Combustion plants on offshore platforms	All sizes	EN 15058	Once every year ([9])	BAT 54		
	SO_2	— Coal and/or lignite incl waste co-incineration — Solid biomass and/or peat incl waste co-incineration — HFO- and/or gas-oil-fired boilers — HFO- and/or gas-oil-fired engines — Gas-oil-fired gas turbines	All sizes	Generic EN standards and EN 14791	Continuous ([6]) ([11]) ([12])	BAT 21 BAT 25 BAT 29 BAT 34 BAT 39 BAT 50 BAT 57 BAT 66 BAT 67 BAT 74		

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
		— Iron and steel process gases — Process fuels from the chemical industry in boilers — IGCC plants						
	SO_3	— When SCR is used	All sizes	No EN standard available	Once every year	—		
	Gaseous chlorides, expressed as HCl	— Coal and/or lignite — Process fuels from the chemical industry in boilers	All sizes	EN 1911	Once every three months (6) (13) (14)	BAT 21 BAT 57		
		— Solid biomass and/or peat	All sizes	Generic EN standards	Continuous (15) (16)	BAT 25		
		— Waste co-incineration	All sizes	Generic EN standards	Continuous (6) (16)	BAT 66 BAT 67		
	HF	— Coal and/or lignite — Process fuels from the chemical industry in boilers	All sizes	No EN standard available	Once every three months (6) (13) (14)	BAT 21 BAT 57		
		— Solid biomass and/or peat	All sizes	No EN standard available	Once every year	BAT 25		
		— Waste co-incineration	All sizes	Generic EN standards	Continuous (6) (16)	BAT 66 BAT 67		
	Dust	— Coal and/or lignite — Solid biomass and/or peat — HFO- and/or gas-oil-fired boilers — Iron and steel process gases — Process fuels from the chemical industry in boilers — IGCC plants	All sizes	Generic EN standards and EN 13284-1 and EN 13284-2	Continuous (6) (17)	BAT 22 BAT 26 BAT 30 BAT 35 BAT 39 BAT 51 BAT 58 BAT 75		

BAT Concn. Number	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		— HFO- and/or gas-oil-fired engines — Gas-oil-fired gas turbines						
		— Waste co-incineration	All sizes	Generic EN standards and EN 13284-2	Continuous	BAT 68 BAT 69		
	Metals and metalloids except mercury (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Se, Tl, V, Zn)	— Coal and/or lignite — Solid biomass and/or peat — HFO- and/or gas-oil-fired boilers and engines	All sizes	EN 14385	Once every year (18)	BAT 22 BAT 26 BAT 30		
		— Waste co-incineration	< 300 MW_{th}	EN 14385	Once every six months (13)	BAT 68 BAT 69		
			≥ 300 MW_{th}	EN 14385	Once every three months (19) (13)			
		— IGCC plants	≥ 100 MW_{th}	EN 14385	Once every year (18)	BAT 75		
	Hg	— Coal and/or lignite including waste co-incineration	< 300 MW_{th}	EN 13211	Once every three months (13) (20)	BAT 23		
			≥ 300 MW_{th}	Generic EN standards and EN 14884	Continuous (16) (21)			
		— Solid biomass and/or peat	All sizes	EN 13211	Once every year (22)	BAT 27		
		— Waste co-incineration with solid biomass and/or peat	All sizes	EN 13211	Once every three months (13)	BAT 70		
		— IGCC plants	≥ 100 MW_{th}	EN 13211	Once every year (23)	BAT 75		
	TVOC	— HFO- and/or gas-oil-fired engines — Process fuels from chemical industry in boilers	All sizes	EN 12619	Once every six months (13)	BAT 33 BAT 59		

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

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

5

BAT is to monitor emissions to water from flue-gas treatment with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.

Substance/Parameter		Standard(s)	Minimum monitoring frequency	Monitoring associated with
Total organic carbon (TOC) (26)		EN 1484	Once every month	BAT 15
Chemical oxygen demand (COD) (26)		No EN standard available		
Total suspended solids (TSS)		EN 872		
Fluoride (F^-)		EN ISO 10304-1		
Sulphate (SO_4^{2-})		EN ISO 10304-1		
Sulphide, easily released (S^{2-})		No EN standard available		
Sulphite (SO_3^{2-})		EN ISO 10304-3		
Metals and metalloids	As	Various EN standards available (e.g. EN ISO 11885 or EN ISO 17294-2)		
	Cd			
	Cr			

NA

No flue gas treatment is undertaken on site. This is therefore not applicable.

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	<table><tr><td></td><td>Cu</td><td></td><td></td><td></td></tr><tr><td></td><td>Ni</td><td></td><td></td><td></td></tr><tr><td></td><td>Pb</td><td></td><td></td><td></td></tr><tr><td></td><td>Zn</td><td></td><td></td><td></td></tr><tr><td></td><td>Hg</td><td>Various EN standards available (e.g. EN ISO 12846 or EN ISO 17852)</td><td></td><td></td></tr><tr><td colspan="2">Chloride (Cl^-)</td><td>Various EN standards available (e.g. EN ISO 10304-1 or EN ISO 15682)</td><td></td><td>—</td></tr><tr><td colspan="2">Total nitrogen</td><td>EN 12260</td><td></td><td>—</td></tr></table>		
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><tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr><tr><td>a.</td><td>Fuel blending and mixing</td><td>Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type</td><td>Generally applicable</td></tr><tr><td>b.</td><td>Maintenance of the combustion system</td><td>Regular planned maintenance according to suppliers' recommendations</td><td></td></tr><tr><td>c.</td><td>Advanced control system</td><td>See description in Section 8.1</td><td>The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system</td></tr><tr><td>d.</td><td>Good design of the combustion equipment</td><td>Good design of furnace, combustion chambers, burners and associated devices</td><td>Generally applicable to new combustion plants</td></tr><tr><td>e.</td><td>Fuel choice</td><td>Select or switch totally or partially to another fuel(s) with a better environmental profile (e.g. with low sulphur and/or mercury content) amongst the available fuels,</td><td>Applicable within the constraints associated with the availability of suitable types of fuel with a better environmental profile as a whole, which may be impacted by the energy policy of the Member State, or by the integrated site's fuel balance in</td></tr></table>	CC	The operator responded as follows: a) Fuel blending and mixing The plant has a contractual agreement to receive natural gas from the National Transmission System (NTS) via the Local Distribution Zone (LDZ), which requires the gas to comply with specified quality criteria. Hence the operator has no control over the quality of the fuel received by the site. A gas chromatograph (GC) is in place to ensure that the quality of the fuel is maintained. As such, any issues with received gas quality are picked up on the GC. The received gas is pre-heated on site prior to being fed to the CCGT in order to improve the efficiency of the combustion process. The gas goes through various filtration stages before entering the gas turbine but no other gas conditioning is undertaken on site prior to combustion, and

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
			there is no requirement to blend or mix fuels. b) Maintenance of the combustion system The station has a long term service agreement (LTSA) with the gas turbine original equipment manufacturer (OEM) under which planned preventative maintenance of the gas turbine combustion system is carried out at pre-determined intervals. The plant is covered by a Distributed Control System (DCS) to continuously monitor the operation of the plant and equipment at the site. Any non-conformance or deviation in normal operating parameters is identified by the DCS to allow operators to take action to avoid a breach of permitted emission levels. The operation of the gas turbine can also be remotely monitored by the OEM through a service provided under the LTSA. SPGL uses an EHS system to record data on plant performance, incidents, and potential incidents and to record subsequent incident investigation, and implementation of actions arising from the investigations. The EHS system also logs the responsibilities for action implementation and action close out. c) Advanced control system Operation of the CCGT units is controlled by trained site operators using a DCS system which is used to control the operation of the plant and also records data

		including in start-up situations or when back-up fuels are used	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

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
			on the plant performance which can be used by the operations team to identify potential issues. The operation of the gas turbine can also be remotely monitored by the OEM through a service provided under the LTSA. The OEM is able to use data and expertise built up from analysis of many other plants in the worldwide fleet to identify and notify times of suboptimal combustion. After each episode of planned maintenance the combustion system is tuned to ensure an optimal balance of emissions and performance. The combustion system is equipped with pulsation probes which monitor for combustion pulsation and regulate load accordingly to protect hardware and reduce emissions. d) Good design of the combustion equipment Low emissions are one of the key drivers for successful gas turbine (GT) design and the GT installed at Shoreham is equipped with a two stage combustion system that ensures very low emissions of NOx. e) Fuel choice The plant comprises a CCGT, which is operated using de-odourised natural gas. Natural gas is considered to represent the fuel with the best environmental profile for this installation and is a relatively clean fuel compared to other fuels such as coal and diesel.

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
			It would not be possible to change the fuel used at the site without a significant upgrades to the existing plant being undertaken. Considering the remaining operating life of the plant, this is not deemed to be environmental best practice. We agree with the operator's assessment of compliance.
7	In order to reduce emissions of ammonia to air from the use of selective catalytic reduction (SCR) and/or selective non-catalytic reduction (SNCR) for the abatement of NO_X emissions, BAT is to optimise the design and/or operation of SCR and/or SNCR (e.g. optimised reagent to NO_X ratio, homogeneous reagent distribution and optimum size of the reagent drops). **BAT-associated emission levels** The BAT-associated emission level (BAT-AEL) for emissions of NH_3 to air from the use of SCR and/or SNCR is < 3–10 mg/Nm^3 as a yearly average or average over the sampling period. The lower end of the range can be achieved when using SCR and the upper end of the range can be achieved when using SNCR without wet abatement techniques. In the case of plants combusting biomass and operating at variable loads as well as in the case of engines combusting HFO and/or gas oil, the higher end of the BAT-AEL range is 15 mg/Nm^3.	NA	Not Applicable as the plant does not operate a SCR, and therefore does not have any associated emissions of ammonia. SNCRs are not applicable to the operation of CCGTs.
8	In order to prevent or reduce emissions to air during normal operating conditions, BAT is to ensure, by appropriate design, operation and maintenance, that the emission abatement systems are used at optimal capacity and availability.	NA	The operator has provided the following response: The CCGT plant has been operational since 2001; it was constructed in accordance to the applicable standards at the time. The plant systems continuously monitor the plant performance with periodic assessment of overall efficiency being undertaken to ensure that the plant is operating in line with the designed electrical efficiency. The data collated from the CEMS is used to demonstrate that the emissions from the plant are within the permitted levels. The plant is operated using a Distributed Control System (DCS) to continuously monitor the operation of the plant and equipment at the site. Any non-

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
			conformance or deviation in normal operating parameters is identified by the DCS to allow operators to take action to avoid inefficient operation and potential permit non compliances or significant environmental impacts. SPGL uses an EHS system to record data on plant performance, incidents, and potential incidents and to record subsequent incident investigation, and the implementation of actions arising from the investigations. The EHS system also logs the responsibilities for action implementation and action close out. The gas turbine is equipped with a two stage combustion system that ensures very low emissions of NOx. Periodic maintenance and major overhauls of the plant equipment are undertaken to ensure appropriate and optimised operation of the plant. All plant and equipment at the site is regularly maintained. Maintenance works at the site are scheduled using the maintenance software system. The site has a long term service contract with a qualified maintenance contractor who carries out the maintenance works regularly. As there is no abatement fitted to the LCPs, we consider that this is not applicable to the plant.
9	In order to improve the general environmental performance of combustion and/or gasification plants and to reduce emissions to air, BAT is to include the following elements in the quality assurance/quality control programmes for all the fuels used, as part of the environmental management system (see BAT 1): (i) Initial full characterisation of the fuel used including at least the parameters listed below and in accordance with EN standards. ISO, national or other international standards may be used provided they ensure the provision of data of an equivalent scientific quality;	CC	The operator provided the following response: The plant has a contractual agreement to receive natural gas from the NTS via the LDZ. National Grid is responsible for ensuring that the gas in the NTS meets a specified standard, Shoreham Power Station therefore has no direct control over the quality of the gas being received. However all gas

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>(ii) Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications. The frequency of testing and the parameters chosen from the table below are based on the variability of the fuel and an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed);
(iii) Subsequent adjustment of the plant settings as and when needed and practicable (e.g. integration of the fuel characterisation and control in the advanced control system (see description in Section 8.1)).
Description
Initial characterisation and regular testing of the fuel can be performed by the operator and/or the fuel supplier. If performed by the supplier, the full results are provided to the operator in the form of a product (fuel) supplier specification and/or guarantee.
<table>
<tr><th>Fuel(s)</th><th>Substances/Parameters subject to characterisation</th></tr>
<tr><td>Biomass/peat</td><td>— LHV
— moisture</td></tr>
<tr><td></td><td>— Ash
— C, Cl, F, N, S, K, Na
— Metals and metalloids (As, Cd, Cr, Cu, Hg, Pb, Zn)</td></tr>
<tr><td>Coal/lignite</td><td>— LHV
— Moisture
— Volatiles, ash, fixed carbon, C, H, N, O, S</td></tr>
<tr><td></td><td>— Br, Cl, F</td></tr>
<tr><td></td><td>— Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)</td></tr>
<tr><td>HFO</td><td>— Ash
— C, S, N, Ni, V</td></tr>
<tr><td>Gas oil</td><td>— Ash
— N, C, S</td></tr>
<tr><td>Natural gas</td><td>— LHV
— CH_4, C_2H_6, C_3, C_4+, CO_2, N_2, Wobbe index</td></tr>
</table></td><td></td><td>supplied to the station is monitored via a gas chromatograph (GC). Data from the GC is also used in the calculation of CO2 emissions under the site’s EUETS obligations but where there are indications of suboptimal combustion the GC data can be assessed to understand whether the cause is fuel quality.

We agree with the operator’s assessment of compliance.

We consider that for plants which burn natural gas from the National Grid as a fuel it is not necessary for the operator to replicate the testing carried out by the National Grid.</td></tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	<table><tr><td>Process fuels from the chemical industry (27)</td><td>— Br, C, Cl, F, H, N, O, S — Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)</td></tr><tr><td>Iron and steel process gases</td><td>— LHV, CH_4 (for COG), C_XH_Y (for COG), CO_2, H_2, N_2, total sulphur, dust, Wobbe index</td></tr><tr><td>Waste (28)</td><td>— LHV — Moisture — Volatiles, ash, Br, C, Cl, F, H, N, O, S — Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)</td></tr></table>		
10	In order to reduce emissions to air and/or to water during other than normal operating conditions (OTNOC), BAT is to set up and implement a management plan as part of the environmental management system (see BAT 1), commensurate with the relevance of potential pollutant releases, that includes the following elements: — appropriate design of the systems considered relevant in causing OTNOC that may have an impact on emissions to air, water and/or soil (e.g. low-load design concepts for reducing the minimum start-up and shutdown loads for stable generation in gas turbines), — set-up and implementation of a specific preventive maintenance plan for these relevant systems, — review and recording of emissions caused by OTNOC and associated circumstances and implementation of corrective actions if necessary, — periodic assessment of the overall emissions during OTNOC (e.g. frequency of events, duration, emissions quantification/estimation) and implementation of corrective actions if necessary.	CC	The operator provided the following response: The plant and associated control systems have been designed to minimise the potential for OTNOC events to occur. The plant is operated using a Distributed Control System (DCS) to continuously monitor the operation of the plant and equipment at the site. Any non-conformance or deviation in normal operating parameters is identified by the DCS to allow operators to take action to avoid OTNOC events. Site operators are trained to monitor plant operation and take appropriate action in the event of a potential OTNOC event being identified. Start up and Shutdown procedures are in place and aim to minimise the time during which the plant is operating at non-optimal conditions and operators are trained in the appropriate actions required should the potential for an OTNOC event be identified. All plant and equipment at the site is regularly maintained including those systems provided to

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
			minimise the potential for OTNOC conditions to occur. Maintenance works at the site are scheduled using the Maintenance software system. The site has a long term service contract with qualified maintenance contractors who carry out the maintenance works regularly. SPGL uses an EHS system to record data on plant performance, incidents, and potential incidents and to record subsequent incident investigation, and the implementation of actions arising from the investigations. The EHS system also logs the responsibilities for action implementation and action close out. All plant operators are trained and tested on their response to OTNOC events. The plant also has emergency response procedures for the management of spills, firewater, and the blocking of discharge outlet to the river. We agree with the operator's assessment of compliance.
11	BAT is to appropriately monitor emissions to air and/or to water during OTNOC. ***Description*** The monitoring can be carried out by direct measurement of emissions or by monitoring of surrogate parameters if this proves to be of equal or better 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.	CC	The operator provided the following response: The flue gases from the site are all monitored using MCERTS certified Continuous Emissions Monitoring systems (CEMs) in accordance with BS EN 14181. Emissions to water are monitored on a monthly basis using MCERTS compliant manual sampling and analysis (complaint with UKAS). Monitoring of various pollutants is carried out in accordance with applicable standards. This system will capture emissions data during OTNOC situations and can be used to inform subsequent incident investigation.

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>We agree with the operator’s assessment of compliance.</td></tr>
<tr><td>12</td><td>In order to increase the energy efficiency of combustion, gasification and/or IGCC units operated ≥ 1 500 h/yr, BAT is to use an appropriate combination of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Combustion optimisation</td><td>See description in Section 8.2. Optimising the combustion minimises the content of unburnt substances in the flue-gases and in solid combustion residues</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Optimisation of the working medium conditions</td><td>Operate at the highest possible pressure and temperature of the working medium gas or steam, within the constraints associated with, for example, the control of NO_X emissions or the characteristics of energy demanded</td><td></td></tr>
<tr><td>c.</td><td>Optimisation of the steam cycle</td><td>Operate with lower turbine exhaust pressure by utilisation of the lowest possible temperature of the condenser cooling water, within the design conditions</td><td></td></tr>
<tr><td>d.</td><td>Minimisation of energy consumption</td><td>Minimising the internal energy consumption (e.g. greater efficiency of the feed-water pump)</td><td></td></tr>
<tr><td>e.</td><td>Preheating of combustion air</td><td>Reuse of part of the heat recovered from the combustion flue-gas to preheat the air used in combustion</td><td>Generally applicable within the constraints related to the need to control NO_X emissions</td></tr>
<tr><td>f.</td><td>Fuel preheating</td><td>Preheating of fuel using recovered heat</td><td>Generally applicable within the constraints associated with the boiler design and the need to control NO_X emissions</td></tr>
<tr><td>g.</td><td>Advanced control system</td><td>See description in Section 8.2.</td><td>Generally applicable to new units. The applicability to old units may be constrained by the need to retrofit the</td></tr>
</table></td><td>CC</td><td>The operator provided the following response:

a) Combustion optimisation
Low emissions are one of the key drivers for successful gas turbine design and the gas turbine is equipped with a two stage combustion system that ensures very low emissions of NOx. Combustion performance is monitored at site by operations staff via the wider control system and can also be monitored remotely by the OEM. Performance monitoring measuring the load, fuel used, and power output so as to calculate overall efficiencies are undertaken in accordance with applicable BE EN standards. Formal tests are undertaken at least annually.

b) Optimisation of the working medium conditions
The efficiency of the plant is largely driven by the design of the CCGT and the Heat Recovery Steam Generator (HRSG). These plants have been designed to operate to maximise efficiency and exploit optimum steam pressure and temperature settings to maximise overall efficiency.

c) Optimisation of the steam cycle
The plant is cooled using seawater at ambient temperature which determines the</td></tr>
</table>

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

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

condenser temperature in the steam circuit and will be subject to seasonal temperature variation. This is considered the most efficient form of steam cooling for this type of installation.

d) Minimisation of energy consumption
All plant and equipment on site is maintained regularly to ensure optimal operation. The station is running regular performance reports that monitor internal consumption to facilitate optimisation of plant energy use. The pumping systems used for cooling water comprise a fixed speed system, with two plants operating at 75% of duty.

e) Pre-heating of combustion air
The plant is designed to operate using ambient air; therefore no pre-heating of combustion air is required in general running. The GT compressor is equipped with a de-icing system that pre-heats combustion air to ensure ice does not enter the compressor. Use of the de-icing system impacts efficiency and the site has developed a procedure to ensure the system is only used when justified by risk.

f) Fuel pre-heating
The natural gas used as a fuel on site is pre-heated via an on-site pre-heater fed from the IP economiser, to optimise operation. Natural gas is passed through a pre-conditioning system for temperature and pressure conditioning prior to combustion.

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
						g) Advanced control system Operation of the CCGT units is controlled by trained site operators using a DCS system, which is used to control the operation of the plant and also records data on the plant performance, and which can be used by the operations team to identify potential issues. h) Feed-water preheating using recovered heat The normal make-up of the feed-water is around 2t/hour. There is no separate preheat for the make-up water, however, it is fed via a combined High Pressure (HP)/Intermediate Pressure (IP) feed water pump into the plant economisers to recover heat from the process into the feed water as part of the hot water / steam circuit. i) Heat recovery by cogeneration (CHP) The plant has the potential to supply heat; however investigations by the site have demonstrated no realistic demand for the heat and hence the plant is not operated as a CHP. j) CHP readiness The plant has the potential to supply heat; however investigations by the site have demonstrated no realistic demand for the heat and hence the plant is not operated as a CHP. k) Flue gas condenser The plant does not operate as a CHP; hence no flue gas condenser is installed on site.
				spontaneous combustion risks (e.g. the moisture content of peat is kept above 40 % throughout the delivery chain). The retrofit of existing plants may be restricted by the extra calorific value that can be obtained from the drying operation and by the limited retrofit possibilities offered by some boiler designs or plant configurations		
	p.	Minimisation of heat losses	Minimising residual heat losses, e.g. those that occur via the slag or those that can be reduced by insulating radiating sources	Only applicable to solid-fuel-fired combustion units and to gasification/IGCC units		
	q.	Advanced materials	Use of advanced materials proven to be capable of withstanding high operating temperatures and pressures and thus to achieve increased steam/combustion process efficiencies	Only applicable to new plants		
	r.	Steam turbine upgrades	This includes techniques such as increasing the temperature and pressure of medium-pressure steam, addition of a low-pressure turbine, and modifications to the geometry of the turbine rotor blades	The applicability may be restricted by demand, steam conditions and/or limited plant lifetime		
	s.	Supercritical and ultra-supercritical steam conditions	Use of a steam circuit, including steam reheating systems, in which steam can reach pressures above 220,6 bar and temperatures above 374 °C in the case of supercritical conditions, and above 250 – 300 bar and temperatures above 580 – 600 °C in the case of ultra-supercritical conditions	Only applicable to new units of ≥ 600 MW_{th} operated > 4 000 h/yr. Not applicable when the purpose of the unit is to produce low steam temperatures and/or pressures in process industries. Not applicable to gas turbines and engines generating steam in CHP mode. For units combusting biomass, the applicability may be constrained by high-temperature corrosion in the case of certain biomasses		

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			l) Heat accumulation This is applicable when a CHP is installed. This technique is therefore not applied at the Shoreham Power Station. m) Wet stack These are only applicable to plants where FGDs are installed. Due to the inherent nature of the fuel used at the Shoreham Power Station, no flue gas desulphurisation is required. Therefore, the site does not have a wet stack. n) Cooling tower discharge Not applicable as this technique is only applicable to plants with wet FGD systems. o) Fuel pre-drying This technique is stated to be pertinent with regards to biomass and/or peat combustion plants only. Therefore this technique is not considered to apply to the site. p) Minimisation of heat losses Not applicable, as it only applies to where solid fuel combustion is undertaken. q) Advanced materials The site is an existing Power Station, which was designed using suitable materials available at the time of construction. The plant is reported to be operating as designed and installed. r) Steam turbine upgrades The steam turbine technology introduced during construction of the power station

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>produced the best combined cycle efficiency available at that time. Low pressure steam cycle was implemented as part of the overall plant design.
SPGL carry out regular reviews of the technology at the power plant to ensure that BAT is applied to the steam turbines.

s) Supercritical and ultra-supercritical steam conditions
Not applicable to site operations.

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

The site has two cooling systems - a seawater cooling system and a closed circuit cooling system. The seawater cooling system is a once through system, operated using seawater abstracted from the dockside of the Shoreham Harbour and is therefore not suitable for recycling. The closed loop system is operated using deionised water made up of Towns water treated on-site with appropriate chemical dosing to prevent freezing, biofilm and corrosion. The top-up requirements for the cooling system closed circuit are reportedly small with any liquid drain down being unsuitable for recycling on site.

Boiler blow down is not suitable for re-use on site due to high dissolved solids content and is therefore disposed of as effluent.

As the Power Station utilises gaseous fuel, no ash is generated; therefore, no associated wastewater is generated at the site.</td></tr>
</table>

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>We agree with the operator’s assessment of compliance.</td></tr>
<tr><td>14</td><td>In order to prevent the contamination of uncontaminated waste water and to reduce emissions to water, BAT is to segregate waste water streams and to treat them separately, depending on the pollutant content.
Description
Waste water streams that are typically segregated and treated include surface run-off water, cooling water, and waste water from flue-gas treatment.
Applicability
The applicability may be restricted in the case of existing plants due to the configuration of the drainage systems.</td><td>CC</td><td>The operator responded as follows:

The site produces a number of waste water streams, all of which are discharged as a combined effluent stream. As discussed at BATc No. 13 the opportunities for reuse and/or recycling of the various waste water streams are minimal and hence the disposal via a common wastewater stream is considered appropriate for this site.

We agree with the operator’s assessment of compliance.</td></tr>
<tr><td>15</td><td>In order to reduce emissions to water from flue-gas treatment, BAT is to use an appropriate combination of the techniques given below, and to use secondary techniques as close as possible to the source in order to avoid dilution.
<table>
<tr><th colspan="2">Technique</th><th>Typical pollutants prevented/abated</th><th>Applicability</th></tr>
<tr><td colspan="4">Primary techniques</td></tr>
<tr><td>a.</td><td>Optimised combustion (see BAT 6) and flue-gas treatment systems (e.g. SCR/SNCR, see BAT 7)</td><td>Organic compounds, ammonia (NH_3)</td><td>Generally applicable</td></tr>
<tr><td colspan="4">Secondary techniques [29]</td></tr>
<tr><td>b.</td><td>Adsorption on activated carbon</td><td>Organic compounds, mercury (Hg)</td><td>Generally applicable</td></tr>
<tr><td>c.</td><td>Aerobic biological treatment</td><td>Biodegradable organic compounds, ammonium (NH_4^+)</td><td>Generally applicable for the treatment of organic compounds. Aerobic biological treatment of ammonium (NH_4^+) may not be applicable in the case of high chloride concentrations (i.e. around 10 g/l)</td></tr>
</table></td><td>NA</td><td>Flue gas treatment is not implemented at the installation.</td></tr>
</table>

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

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

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

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

Substance/Parameter		BAT-AELs
		Daily average
Total organic carbon (TOC)		20–50 mg/l [30] [31] [32]
Chemical oxygen demand (COD)		60–150 mg/l [30] [31] [32]
Total suspended solids (TSS)		10–30 mg/l
Fluoride (F^-)		10–25 mg/l [32]
Sulphate (SO_4^{2-})		1,3–2,0 g/l [32] [33] [34] [35]
Sulphide (S^{2-}), easily released		0,1–0,2 mg/l [32]
Sulphite (SO_3^{2-})		1–20 mg/l [32]
Metals and metalloids	As	10–50 µg/l
	Cd	2–5 µg/l
	Cr	10–50 µg/l

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td>Cu</td><td>10–50 µg/l</td></tr>
<tr><td></td><td>Hg</td><td>0,2–3 µg/l</td></tr>
<tr><td></td><td>Ni</td><td>10–50 µg/l</td></tr>
<tr><td></td><td>Pb</td><td>10–20 µg/l</td></tr>
<tr><td></td><td>Zn</td><td>50–200 µg/l</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>16</td><td>
In order to reduce the quantity of waste sent for disposal from the combustion and/or gasification process and abatement techniques, BAT is to organise operations so as to maximise, in order of priority and taking into account life-cycle thinking:
(a) waste prevention, e.g. maximise the proportion of residues which arise as by-products;
(b) waste preparation for reuse, e.g. according to the specific requested quality criteria;
(c) waste recycling;
(d) other waste recovery (e.g. energy recovery),
by implementing an appropriate combination of techniques such as:
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Generation of gypsum as a by-product</td><td>Quality optimisation of the calcium-based reaction residues generated by the wet FGD so that they can be used as a substitute for mined gypsum (e.g. as raw material in the plasterboard industry). The quality of limestone used in the wet FGD influences the purity of the gypsum produced</td><td>Generally applicable within the constraints associated with the required gypsum quality, the health requirements associated to each specific use, and by the market conditions</td></tr>
<tr><td>b.</td><td>Recycling or recovery of residues in the construction sector</td><td>Recycling or recovery of residues (e.g. from semi-dry desulphurisation processes, fly ash, bottom ash) as a construction material (e.g. in road building, to replace sand in concrete production, or in the cement industry)</td><td>Generally applicable within the constraints associated with the required material quality (e.g. physical properties, content of harmful substances) associated to each specific use, and by the market conditions</td></tr>
<tr><td>c.</td><td>Energy recovery by using waste in the fuel mix</td><td>The residual energy content of carbon-rich ash and sludges generated by the combustion of coal, lignite, heavy fuel oil, peat or biomass can be recovered for example by mixing with the fuel</td><td>Generally applicable where plants can accept waste in the fuel mix and are technically able to feed the fuels into the combustion chamber</td></tr>
</table>
</td><td>CC</td><td>As the site does not treat flue gases and uses natural gas which does not produce fuel, this BAT Conclusion does not apply. However, the operator has provide information regarding their management of waste, as follows:

The plant is covered under the SPGL wide procedure ‘Waste Management Procedure’ (“WMP”) (reference: GEN-ENV-7145, issued in: September 2017) which details the waste storage and handling procedures on site. The WMP outlines identification of waste streams and how they must be handled, including appropriate segregation and storage within designated waste storage areas on site.

The site applies the waste hierarchy for the management of any waste produced on site. Due to the inherent nature of the site operations and fuel used, the site produces minor quantities of waste, primarily from maintenance. The main waste stream generated from the site activities is used lubricating oil. This waste stream is sent off-site for recycling. The site also produces general waste. Where possible, the waste generated on site is sent off site for recycling, with any hazardous waste streams sent off site for specialist disposal. The operator has reported that the opportunities for on-site reuse/recycling of waste is limited.

We agree with the operator’s assessment of compliance.</td></tr>
</table>

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<tr><td>d.</td><td>Preparation of spent catalyst for reuse</td><td>Preparation of catalyst for reuse (e.g. up to four times for SCR catalysts) restores some or all of the original performance, extending the service life of the catalyst to several decades. Preparation of spent catalyst for reuse is integrated in a catalyst management scheme</td><td>The applicability may be limited by the mechanical condition of the catalyst and the required performance with respect to controlling NO_X and NH_3 emissions</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>17</td><td>In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Operational measures</td><td>These include:
— improved inspection and maintenance of equipment
— closing of doors and windows of enclosed areas, if possible
— equipment operated by experienced staff
— avoidance of noisy activities at night, if possible
— provisions for noise control during maintenance activities</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Low-noise equipment</td><td>This potentially includes compressors, pumps and disks</td><td>Generally applicable when the equipment is new or replaced</td></tr>
<tr><td>c.</td><td>Noise attenuation</td><td>Noise propagation can be reduced by inserting obstacles between the emitter and the receiver. Appropriate obstacles include protection walls, embankments and buildings</td><td>Generally applicable to new plants. In the case of existing plants, the insertion of obstacles may be restricted by lack of space</td></tr>
<tr><td>d.</td><td>Noise-control equipment</td><td>This includes:
— noise-reducers
— equipment insulation
— enclosure of noisy equipment
— soundproofing of buildings</td><td>The applicability may be restricted by lack of space</td></tr>
</table>
</td><td>CC</td><td>The operator provided the following response:

a) Operational measures
The site has a maintenance schedule in place to ensure optimum operation of all plant and equipment. The gas turbine is situated within a skid enclosure inside a building; the steam turbine is not located in a skid but is contained within a building. The plant is available to be operated 24 hours and maintenance work is generally undertaken during daylight hours with the exception of major outages. Any potential noise issues from maintenance work are identified in the pre-commencement risk assessment for which mitigation measures are identified which are then applied to the Permit to Work.

Noise emissions are monitored regularly with annual noise surveys undertaken in line with procedure ‘Data Collection & Reporting for Non Statutory Purposes’ (reference: GEN-TG-ENV-7004, issued in June 2017.

b) Low noise equipment
The plant commenced operation in 2001, and hence is an existing plant. The equipment installed at this time was selected to avoid noise impacts either via</td></tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	e. 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		inherent design qualities, or where a noise risk exists via the installation of noise attenuation measures. c) Noise attenuation The fuel gas compressor has a noise attenuation enclosure, having louvres. The nearest residential receptors are located a few hundred meters from the site. A Noise Management Plan is in place at the site. No substantiated noise related complaints have been received recently. e) Appropriate location of equipment and buildings All plant and equipment likely to generate noise is enclosed within buildings. An issue related to tonal noise from the stack was identified 6 -7 years ago; the silencer was removed to resolve the issue. The mitigation measure has been agreed verbally with the EA. All steam valves are tested appropriately and regularly using Trevi testing to avoid excessive noise impacts. We agree with the operator's assessment of compliance.
Combustion of solid fuels only			
18 - 27	BAT conclusions for the combustion of solid fuels	NA	The LCP combusts natural gas.
Combustion of liquid fuels			
Table 13, 28-39	BAT Conclusions for the combustion of liquid fuels	NA	The LCP combusts natural gas.
Combustion of gaseous fuels			

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr>
<td>40</td>
<td>
In order to increase the energy efficiency of natural gas combustion, BAT is to use an appropriate combination of the techniques given in BAT 12 and below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Combined cycle</td><td>See description in Section 8.2</td><td>Generally applicable to new gas turbines and engines except when operated < 1 500 h/yr.
Applicable to existing gas turbines and engines within the constraints associated with the steam cycle design and the space availability.
Not applicable to existing gas turbines and engines operated < 1 500 h/yr.
Not applicable to mechanical drive gas turbines operated in discontinuous mode with extended load variations and frequent start-ups and shutdowns.
Not applicable to boilers</td></tr>
</table>
BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of natural gas
<table>
<tr><th rowspan="3">Type of combustion unit</th><th colspan="5">BAT-AEELs ([136]) ([137])</th></tr>
<tr><th colspan="2">Net electrical efficiency (%)</th><th rowspan="2">Net total fuel utilisation (%) ([138]) ([139])</th><th colspan="2">Net mechanical energy efficiency (%) ([139]) ([140])</th></tr>
<tr><th>New unit</th><th>Existing unit</th><th>New unit</th><th>Existing unit</th></tr>
<tr><td>Gas engine</td><td>39,5–44 ([141])</td><td>35–44 ([141])</td><td>56–85 ([141])</td><td colspan="2">No BAT-AEEL.</td></tr>
<tr><td>Gas-fired boiler</td><td>39–42,5</td><td>38–40</td><td>78–95</td><td colspan="2">No BAT-AEEL.</td></tr>
<tr><td>Open cycle gas turbine, ≥ 50 MWth</td><td>36–41,5</td><td>33–41,5</td><td>No BAT-AEEL</td><td>36,5–41</td><td>33,5–41</td></tr>
<tr><td colspan="6">Combined cycle gas turbine (CCGT)</td></tr>
<tr><td>CCGT, 50–600 MW_{th}</td><td>53–58,5</td><td>46–54</td><td>No BAT-AEEL</td><td colspan="2">No BAT-AEEL</td></tr>
<tr><td>CCGT, ≥ 600 MW_{th}</td><td>57–60,5</td><td>50–60</td><td>No BAT-AEEL</td><td colspan="2">No BAT-AEEL</td></tr>
<tr><td>CHP CCGT, 50–600 MW_{th}</td><td>53–58,5</td><td>46–54</td><td>65–95</td><td colspan="2">No BAT-AEEL</td></tr>
<tr><td>CHP CCGT, ≥ 600 MW_{th}</td><td>57–60,5</td><td>50–60</td><td>65–95</td><td colspan="2">No BAT-AEEL</td></tr>
</table>
</td>
<td>CC</td>
<td>
The operator has provided the following response:

The plant is a combined cycle gas turbine (CCGT) plant. The LCP-BREF identifies operation of a combined cycle in a combustion plant as one of the techniques to improve the energy efficiency of the plant.

The BAT-AEEL for an existing CCGT plant having thermal output of 50 – 600MWth is 46 – 54%; with a total output of 420MWth, the Shoreham Power Station falls within this category.

The un-degraded plant efficiency at base load operation is circa 55.0% LHV adjusted to ISO conditions. Periodic operational assessments have demonstrated that the plant continues to achieve efficiency with only limited degradation from this level. The plant is therefore considered to be compliant with the required BAT-AEEL.

The BAT- AEELs specified in the table relate to the thermal input of the plant and not to the output as stated by the operator. Therefore, the BAT-AEEL is 50 – 60%. This is because the LCP is an existing CCGT with a thermal input greater than 600MW.

The operator states that the plant efficiency is 55% which is within the range of the BAT-AEEL for this type of plant.

Therefore, we agree with the operator’s assessment of compliance but not with their determination of the BAT-AEEL.
</td>
</tr>
</table>

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td>41</td><td>In order to prevent or reduce NO_X emissions to air from the combustion of natural gas in boilers, BAT is to use one or a combination of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Air and/or fuel staging</td><td>See descriptions in Section 8.3.
Air staging is often associated with low-NO_X burners</td><td rowspan="3">Generally applicable</td></tr>
<tr><td>b.</td><td>Flue-gas recirculation</td><td rowspan="2">See description in Section 8.3</td></tr>
<tr><td>c.</td><td>Low-NO_X burners (LNB)</td></tr>
<tr><td>d.</td><td>Advanced control system</td><td>See description in Section 8.3.
This technique is often used in combination with other techniques or may be used alone for combustion plants operated < 500 h/yr</td><td>The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system</td></tr>
<tr><td>e.</td><td>Reduction of the combustion air temperature</td><td rowspan="3">See description in Section 8.3</td><td>Generally applicable within the constraints associated with the process needs</td></tr>
<tr><td>f.</td><td>Selective non–catalytic reduction (SNCR)</td><td>Not applicable to combustion plants operated < 500 h/yr with highly variable boiler loads.
The applicability may be limited in the case of combustion plants operated between 500 h/yr and 1 500 h/yr with highly variable boiler loads</td></tr>
<tr><td>g.</td><td>Selective catalytic reduction (SCR)</td><td>Not applicable to combustion plants operated < 500 h/yr.
Not generally applicable to combustion plants of < 100 MW_{th}.
There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr</td></tr>
</table></td><td>NA</td><td>The LCP is a combined cycle gas turbine, not boilers.</td></tr>
<tr><td>42</td><td>In order to prevent or reduce NO_X emissions to air from the combustion of natural gas in gas turbines, BAT is to use one or a combination of the techniques given below.
<table>
<tr><th>Technique</th><th>Description</th><th>Applicability</th></tr>
</table></td><td>CC</td><td>The operator provided the following response:

a) Advanced control system
All combustion activities occur in the Gas Turbine EV and SEV burners and there is</td></tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement				Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	a.	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		no supplementary firing in the Heat Recovery Steam Generators. Operation of the CCGT is controlled by trained site operators using a DCS system which is used to control the operation of the plant and also records data on the plant performance, which also can be used by the operations team to identify potential issues. The specific control settings for the combustion unit are pre-set in the control system during these maintenance checks and are set to achieve efficient combustion and optimise plant efficiency. The plant is covered by a Distributed Control System (DCS) to continuously monitor the operation of the plant and equipment at the site. Any non-conformance or deviation in normal operating parameters is identified by the DCS prior to a breach in permitted levels. b) Water/steam addition Water/steam addition for NOx control is not applied at the plant as Dry Low NOx burners are used for NOx control. c) Dry low NOx burners (DLN) The gas turbine is equipped with a two stage DLN combustion system that ensures very low emissions of NOx. Periodic major overhauls of the plant equipment are undertaken to ensure appropriate and optimised operation of the plant. d) Low load design concept
	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		

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>There is a minimum stable load for the plant below which the plant does not operate. The operational efficiency characteristics vary according to the plant load. The operation of the GT's control system regulates the inlet air flow through the Inlet Guide Vanes and adjusts the combustion by changing the position of the gas valves in order to maintain optimal efficiency and flame and combustion stability to align with GT load. No supplementary firing is undertaken in the HRSGs.

e) Low NOx burners (LNB)
The GT units are installed with DLNs, therefore LNBs are not appropriate. There is no supplementary firing in the HRSGs.

f) Selective catalytic reduction (SCR)
The NOx emissions from the plant are controlled using primary measures including a good design and DLNs and meet BAT AEL's for emissions of NOx. SCR is therefore not applied at the site.

We agree with the operator's assessment of compliance.</td></tr>
<tr><td>43</td><td>In order to prevent or reduce NO_X emissions to air from the combustion of natural gas in engines, BAT is to use one or a combination of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Advanced control system</td><td>See description in Section 8.3. This technique is often used in combination with other techniques or may be used alone for combustion plants operated < 500 h/yr</td><td>The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system</td></tr>
</table></td><td>NA</td><td>The LCPs are gas turbines and not gas engines.</td></tr>
</table>

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<tr><td>b.</td><td>Lean-burn concept</td><td>See description in Section 8.3. Generally used in combination with SCR</td><td>Only applicable to new gas-fired engines</td></tr>
<tr><td>c.</td><td>Advanced lean-burn concept</td><td rowspan="2">See descriptions in Section 8.3</td><td>Only applicable to new spark plug ignited engines</td></tr>
<tr><td>d.</td><td>Selective catalytic reduction (SCR)</td><td>Retrofitting existing combustion plants may be constrained by the availability of sufficient space.
Not applicable to combustion plants operated < 500 h/yr.
There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>44</td><td>In order to prevent or reduce CO emissions to air from the combustion of natural gas, BAT is to ensure optimised combustion and/or to use oxidation catalysts.
Description - See descriptions in Section 8.3.
BAT-associated emission levels (BAT-AELs) for NO_X emissions to air from the combustion of natural gas in gas turbines
<table>
<tr><th rowspan="2">Type of combustion plant</th><th rowspan="2">Combustion plant total rated thermal input (MW_{th})</th><th colspan="2">BAT-AELs (mg/Nm^3) (146) (147)</th></tr>
<tr><th>Yearly average (148) (149)</th><th>Daily average or average over the sampling period</th></tr>
<tr><td colspan="4">Open-cycle gas turbines (OCGTs) (146) (147)</td></tr>
<tr><td>New OCGT</td><td>≥ 50</td><td>15–35</td><td>25–50</td></tr>
<tr><td>Existing OCGT (excluding turbines for mechanical drive applications) — All but plants operated < 500 h/yr</td><td>≥ 50</td><td>15–50</td><td>25–55 (148)</td></tr>
<tr><td colspan="4">Combined-cycle gas turbines (CCGTs) (146) (149)</td></tr>
<tr><td>New CCGT</td><td>≥ 50</td><td>10–30</td><td>15–40</td></tr>
</table>
</td><td>CC</td><td>The operator responded as follows:

CO emissions
As an existing CCGT having output ≥50 MWth, the top of the range indicative BAT-AEL for CO emissions is <30 mg/Nm³ as an annual average.

For Shoreham the indicative yearly average BAT-AEL for CO increases to <5 – 50 mg/Nm3 to allow for the combustion characteristics of this gas turbine (i.e. plant operating at low load).

The current Environmental Permit also specifies the following ELVs for CO which are applicable when the CCGT load is >70% of the rated power output (and up to base load) :
• 110 mg/m³ as the Daily Mean of validated hourly averages;
• 100 mg/m³ as the Monthly Mean of validated hourly averages;
• 200 mg/m³ as the 95% of validated hourly averages within a calendar year.</td></tr>
</table>

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

Existing CCGT with a net total fuel utilisation of < 75 %	≥ 600	10–40	18–50
Existing CCGT with a net total fuel utilisation of ≥ 75 %	≥ 600	10–50	18–55 (150)
Existing CCGT with a net total fuel utilisation of < 75 %	50–600	10–45	35–55
Existing CCGT with a net total fuel utilisation of ≥ 75 %	50–600	25–50 (151)	35–55 (152)

Open- and combined-cycle gas turbines

Gas turbine put into operation no later than 27 November 2003, or existing gas turbine for emergency use and operated < 500 h/yr	≥ 50	No BAT-AEL	60–140 (153) (154)
Existing gas turbine for mechanical drive applications — All but plants operated < 500 h/yr	≥ 50	15–50 (155)	25–55 (156)

As an indication, the yearly average CO emission levels for each type of existing combustion plant operated ≥ 1 500 h/yr and for each type of new combustion plant will generally be as follows:

— New OCGT of ≥ 50 MW_{th}: < 5–40 mg/Nm^3. For plants with a net electrical efficiency (EE) greater than 39 %, a correction factor may be applied to the higher end of this range, corresponding to [higher end] × EE/39, where EE is the net electrical energy efficiency or net mechanical energy efficiency of the plant determined at ISO baseload conditions.

— Existing OCGT of ≥ 50 MW_{th} (excluding turbines for mechanical drive applications): < 5–40 mg/Nm^3. The higher end of this range will generally be 80 mg/Nm^3 in the case of existing plants that cannot be fitted with dry techniques for NO_X reduction, or 50 mg/Nm^3 for plants that operate at low load.

— New CCGT of ≥ 50 MW_{th}: < 5–30 mg/Nm^3. For plants with a net electrical efficiency (EE) greater than 55 %, a correction factor may be applied to the higher end of the range, corresponding to [higher

The following ELV for CO is also defined in the current Environmental Permit which is applicable when the load is above MSUL / MSDL (and up to Base Load) :

- 385 mg/m³ as the Daily Mean of validated hourly averages.

These ELVs do not apply during start up (MSUL) or shut-down (MSDL) defined as in Table S1.4 of current environmental permit as periods when the CCGT is operating at loads below 200MWe (47.62% of rated power output).

For gas turbines equipped with dry low NOx (DLN) burners, the BAT-AEL for CO is only applicable when the DLN system operation is effective. It is proposed that the Effective-DLN (E-DLN) i.e. the operating point above which compliance with the above Annual CO BAT-AEL can be achieved with the DLN combustion fully operational, be defined as > 70% of rated power output (or c294MW).

It is proposed that the existing ELVs applicable to CCGT loading >70% of the rated power output (Daily Mean, Monthly Mean and 95% of validated hourly averages within a calendar year) as currently defined in the Environmental Permit continue to apply to operations.

It is also proposed that the existing Daily Mean ELV of 385 mg/m³ continue to apply between MSUL and MSDL up to Base Load.

E-DLN, MSUL and MSDL are defined in relation to the current combustion and emissions characteristics whilst also taking into account potential future mechanical degradation of the gas turbine and the, as yet unknown, post-2021 operating regime.

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr>
<td></td>
<td>
end] × EE/55, where EE is the net electrical energy efficiency of the plant determined at ISO baseload conditions.
— Existing CCGT of ≥ 50 MW_{th}: < 5–30 mg/Nm^3. The higher end of this range will generally be 50 mg/Nm^3 for plants that operate at low load.
— Existing gas turbines of ≥ 50 MW_{th} for mechanical drive applications: < 5–40 mg/Nm^3. The higher end of the range will generally be 50 mg/Nm^3 when plants operate at low load.
In the case of a gas turbine equipped with DLN burners, these indicative levels correspond to when the DLN operation is effective.
BAT-associated emission levels (BAT-AELs) for NO_X emissions to air from the combustion of natural gas in boilers and engines
<table>
<tr><th rowspan="3">Type of combustion plant</th><th colspan="4">BAT-AELs (mg/Nm^3)</th></tr>
<tr><th colspan="2">Yearly average (157)</th><th colspan="2">Daily average or average over the sampling period</th></tr>
<tr><th>New plant</th><th>Existing plant (158)</th><th>New plant</th><th>Existing plant (159)</th></tr>
<tr><td>Boiler</td><td>10–60</td><td>50–100</td><td>30–85</td><td>85–110</td></tr>
<tr><td>Engine (160)</td><td>20–75</td><td>20–100</td><td>55–85</td><td>55–110 (161)</td></tr>
</table>
As an indication, the yearly average CO emission levels will generally be:
— < 5–40 mg/Nm^3 for existing boilers operated ≥ 1 500 h/yr,
— < 5–15 mg/Nm^3 for new boilers,
— 30–100 mg/Nm^3 for existing engines operated ≥ 1 500 h/yr and for new engines.
</td>
<td></td>
<td>
The emissions of CO from normal plant operations have been recorded to typically be extremely low and well below the IED ELVs specified in the permit and also below the BAT AEL range. The site is therefore considered to be able to comply with the indicative yearly average BAT-AEL for CO emissions which for this gas turbine is considered to be <5 –50 mg/Nm³ (for plant operating at low load).

As CO emissions are reported to be in line with the applicable BAT, no additional remediation measures for further reduction of CO emissions is considered to be required.

NOx emissions
As an existing CCGT having a thermal input of >600MW and with <75% net total fuel utilisation, the BAT-AELs for NOx emissions from the plant are:
• 18 – 50 mg/Nm³ as a daily average; and
• 10 – 40mg/Nm³ as an annual average.
•
The current Environmental Permit also specifies the following ELVs for NOx:
• 50 mg/m³ as the Daily Mean of validated hourly averages;
• 50 mg/m³ as the Monthly Mean of validated hourly averages;
• 50 mg/m³ as the 95% of validated hourly averages within a calendar year.

These ELVs do not apply during start up (MSUL) or shut-down (MSDL) defined as in Table S1.4 of current environmental permit as periods when the CCGT is operating at loads below 200MWe (47.62% of rated power output).

For gas turbines equipped with dry low NOx (DLN) burners, the BAT-AELs for NOx are only applicable
</td>
</tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			when the DLN system operation is effective. It is proposed that the Effective-DLN (E-DLN) i.e. the operating point above which compliance with the above Daily Average and Annual Average NOx BAT-AELs can be achieved with the DLN combustion fully operational, be defined as 70% of rated power output (c294MW). It is proposed that IED Daily, Monthly and average Hourly ELVs as currently defined in the Environmental Permit continue to apply to operation between MSUL and MSDL. E-DLN, MSUL and MSDL are defined in relation to the current combustion and emissions characteristics whilst also taking into account potential future mechanical degradation of the gas turbine and the, as yet unknown, post-2021 operating regime. The recorded NOx emissions from the plant are in line with the BAT AEL ranges and do not exceed the upper limits. Therefore the plant is compliant with the BAT –AEL values for NOx. The operator states that there is a low load design concept but that the DLN effectiveness is defined at 70%. We would expect this load to be lower based on low load design. However, this is in line with the current permit and we have accepted this as the load at which the DLN becomes effective. We agree with the operator's assessment of compliance.
45	In order to reduce non-methane volatile organic compounds (NMVOC) and methane (CH_4) emissions to air from the combustion of natural gas in spark-ignited lean-burn gas engines, BAT is to ensure optimised combustion and/or to use oxidation catalysts. ***Description***	NA	The LCPs are gas turbines and not engines.

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>See descriptions in Section 8.3. Oxidation catalysts are not effective at reducing the emissions of saturated hydrocarbons containing less than four carbon atoms.
BAT-associated emission levels (BAT-AELs) for formaldehyde and CH_4 emissions to air from the combustion of natural gas in a spark-ignited lean-burn gas engine
<table>
<tr><th rowspan="3">Combustion plant total rated thermal input (MW_{th})</th><th colspan="3">BAT-AELs (mg/Nm^3)</th></tr>
<tr><th>Formaldehyde</th><th colspan="2">CH_4</th></tr>
<tr><th colspan="3">Average over the sampling period</th></tr>
<tr><th>New or existing plant</th><th>New plant</th><th>Existing plant</th></tr>
<tr><td>≥ 50</td><td>5–15 (162)</td><td>215–500 (163)</td><td>215–560 (162) (163)</td></tr>
</table></td><td></td><td></td></tr>
<tr><td>46 - 51</td><td>BAT conclusions for the combustion of iron and steel process gases</td><td>NA</td><td>The LCP does not combust iron and steel process gases.</td></tr>
<tr><td>52 - 54</td><td>BAT conclusions for the combustion of gaseous and/or liquid fuels on offshore platforms</td><td>NA</td><td>The LCP is not on an offshore platform.</td></tr>
<tr><td>55 - 59</td><td>BAT conclusions for the combustion of process fuels from the chemical industry</td><td>NA</td><td>The LCP does not combust process fuels form the chemical industry.</td></tr>
<tr><td>60 - 71</td><td>BAT conclusions for the co-incineration of waste</td><td>NA</td><td>The LCP is not an incinerator.</td></tr>
<tr><td>72 – 75</td><td>BAT conclusions for gasification</td><td>NA</td><td>The LCP is not a gasifier.</td></tr>
</table>

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

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

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

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

(b) the technical characteristics of the installation concerned.

As part of their Regulation 61 Note response, the operator has not requested a derogation from compliance with any AEL values.

7. Emissions to Water

The consolidated permit incorporates the current discharge to controlled waters identified as W1.

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

8 Additional IED Chapter II requirements:

In the event of a black out National Grid would call on combustion plant to operate and may require them to do so outside their permitted conditions. We have dedicated black start plant and they are permitted to run as such but this scenario is relevant to the rest of the large combustion plant which could be called depending on the circumstances.

A risk assessment will be carried out by Energy UK/Joint Environmental Programme on behalf of Large Combustion Plant connected to the National Transmission System. Air emissions modelling will be based on generic black start scenarios to establish whether they have the potential to have local impact on the environment or not (on a national basis). If the modelling demonstrates that no significant impacts are likely, the plant can operate under condition 2.3.7. This conditions allows the hourly ELVs for plants operating under a black start instruction to be discounted for the purpose of reporting. We would also require there to be a procedure in place for minimisation of emissions in the case of a black start event and for reporting in the event of a black start. This modelling and the procedures have not been agreed in advance of the issue of the permit review and therefore a condition linking back to an improvement condition have been included in the permit.

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

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

Aspect considered	Decision
Receipt of application	
Confidential information	A claim for commercial or industrial confidentiality has not been made.
Identifying confidential information	We have not identified information provided as part of the application that we consider to be confidential. The decision was taken in accordance with our guidance on confidentiality.
The site	
Biodiversity, heritage, landscape and nature conservation	The application is within the relevant distance criteria of a site of heritage, landscape or nature conservation, and/or protected species or habitat. A full assessment of the application and its potential to affect the site(s)/species/habitat has not been carried out as part of the permit review process. We consider that the review will not affect the features of the site(s)/species/habitat as the conditions will provide at least the same level of protection as those in the previous permit and in some cases will provide a higher level of protection to those in the previous permit. We have not consulted Natural England on the application. The decision was taken in accordance with our guidance.
Operating techniques	
General operating techniques	We have reviewed the techniques used by the operator where they are relevant to the BAT Conclusions and compared these with the relevant guidance notes. The permit conditions ensure compliance with the relevant BREF, BAT Conclusions. The ELVs deliver compliance with the BAT-AELs. We have not made any changes in relation to the operator's request that dosing of hypochlorite should not cease when the chlorine monitor fails as the operator subsequently stated that it was no longer necessary as a standby chlorine analyser has been installed.

Aspect considered	Decision
Permit conditions	
Updating permit conditions during consolidation	We have updated permit conditions to those in the current generic permit template as part of permit consolidation. The conditions will provide at least the same level of protection as those in the previous permit and in some cases will provide a higher level of protection to those in the previous permit.
Changes to the permit conditions due to an Environment Agency initiated variation	We have varied the permit as stated in the variation notice.
Improvement programme	Based on the information on the application, we consider that we need to impose an improvement programme. We have imposed an improvement programme to ensure that the operator will assess the impact of emissions if called to participate in a Black Start scenario, as described in section 8 above. We have also removed the completed improvement conditions from the permit.
Emission limits	We have decided that emission limits should be set for the parameters listed in the permit. These are described in the relevant BAT Conclusions in Section 5 of this document. It is considered that the ELVs and technical measures described above will ensure that significant pollution of the environment is prevented and a high level of protection for the environment is secured.
Monitoring	We have decided that monitoring should be carried out for the parameters listed in the permit, using the methods detailed and to the frequencies specified. These are described in the relevant BAT Conclusions in Section 5 of this document. Table S3.4 Process monitoring requirements was added to include the requirement to monitor energy efficiency after overhauls on site in line with BAT2. In addition, the operator requested an amendment to the monitoring frequency and method in respect of measurement of flow in the discharge to the Channel. Following confirmation that the proposed methodology is MCERTS, we have amended table S3.2 so that flow is monitored by calculation based on pump rating and run time.

Aspect considered	Decision
	We have not made any changes with respect to the request to amend the footnote to table S3.2 to allow discharge of water with a higher temperature differential when the steam turbine is bypassed without providing prior notification of 10 days. We do not consider that this change is administrative.
Reporting	We have specified reporting in the permit for the following parameters: • Nitrogen dioxide • Carbon monoxide • Sulphur dioxide These are described in the relevant BAT Conclusions in Section 5 of this document.
Operator competence	
Management system	There is no known reason to consider that the operator will not have the management system to enable it to comply with the permit conditions.
Growth Duty	
Section 108 Deregulation Act 2015 – Growth duty	We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit. Paragraph 1.3 of the guidance says: "The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation." We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections. We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.