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/SP3836SP
The Operator is: BAE Systems Marine Limited
The Installation is: Barrow Shipyards
This Variation Notice number is: EPR/SP3836SP/V006

What this document is about

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

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

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

As well as considering the review of the operating techniques used by the Operator for the operation of the plant and activities of the installation, the consolidated variation notice takes into account and brings together in a single document all previous variations that relate to the original permit issued. It also modernises the entire permit to reflect the conditions contained in our current generic permit template.

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

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

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

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

How this document is structured

Glossary of acronyms used in this document

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

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

1 Our decision

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

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

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

2 How we reached our decision

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

We issued a Notice under Regulation 61(1) of the Environmental Permitting (England and Wales) Regulations 2016 (a Regulation 61 Notice) on 01 May 2018 requiring the Operator to provide information to demonstrate how the operation of their installation currently meets, or will subsequently meet, the revised standards described in the LCP BAT Conclusions document. The notice also required that where the revised standards are not currently met, the Operator should provide information that:

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

Where the Operator proposed that they were not intending to meet a BAT standard that also included a BAT Associated Emission Level (BAT AEL) described in the BAT Conclusions document, the Regulation 61 notice requested that the Operator make a formal request for a 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. We did not receive any such request.

The Regulation 61 Notice response from the Operator was received on 30 October 2018.

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

Request for information sent to Operator 08/08/19	Response received 29/08/19: BAT Conclusions 1, 4, 5, 6, 8, 12, 13, 15, 16, 28, 29 and 30.
	Response received 24/09/19: BAT Conclusions 1, 4, 28, 29 and 30.
	Response received 01/10/19: BAT Conclusion 28
Request for information sent to Operator 08/10/19	Response received 15/10/19 Clarification on a number of items
	Response received 06/11/19 Site plan (superseded)
	Response received 13/11/19 Site plan for inclusion in permit

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 BAT-associated energy efficiency levels (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.

a) LCP (and other combustion plant) configuration

LCP438, LCP439 and LCP450

The LCP comprises three boilers operated within the Submarine Machinery Installation & Testing Establishment (SMITE) facility. The boilers are used to support testing of marine propulsion machinery prior to its installation in submarines under construction.

Each boiler is fired on gas-oil and has a thermal input capacity as follows:

LCP438 – 85.59 MWth

LCP439 – 85.21 MWth

LCP450 – 97.98 MWth

They vent via emission points A1, A2 and A3 within a common support structure. Each flue is fitted with a continuous emissions monitor (CEM).

The boilers operate intermittently as required by construction programme demands. Generally boiler operation is cyclic in nature covering a time of approximately 22 months, with 18 months in care and maintenance and 4 months supporting trials.

For the majority of the time only one boiler is required, operating at lower loads. There are short periods of time when two boilers are needed. The third boiler is for standby purposes only.

Other combustion plant

In addition, there is estimated to be approximately 1,200 combustion processes across the entire Barrow Shipyards site .

A significant number of these are <1MWth and consist of radiant heaters, direct fired air heaters, hot water heaters and small ovens. These are all gas-fired.

A number of more significant combustion processes with a thermal input of >1MWth and with point source emissions to air are present on the site and are as follows:

- D14 powerhouse - two 2.5MWth gas-fired boilers, venting via emission points A4 and A5; and
- Boiler barge - 25MWth oil-fired boiler, plus a 2.2MWth auxiliary boiler, venting via emission point A10.

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

- The emission limit values (ELVs) and AELs are based on 'unlimited hours operation' operating regime.

b) LCP Emission limits

The following tables outline the limits that have been incorporated into the permit for LCP438, LCP439 and LCP450, 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 3% volume reference oxygen concentration in flue gases. The emission limits and monitoring requirements have been incorporated into Schedule 3 of the permit.

i) BAT Conclusion 28 – NOx and indicative CO limits

NOx limits

NOx limits (mg/Nm^3)						
Averaging	**IED (Annex V Part 1) - Existing**	**BREF (Table 14 BAT-C)**	**Expected permit limits**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**270**	**270**	BREF	MSUL/MSDL to baseload	Continuous
Monthly	**450**	**None**	**450**	IED	MSUL/MSDL to baseload	
Daily	**495**	**330**	**330**	BREF	MSUL/MSDL to baseload	
95th %ile of hr means	**900**	**None**	**900**	IED	MSUL/MSDL to baseload	

Indicative CO limits

CO indicative emission levels are a yearly average of 30 mg/Nm^3 for existing combustion plant of <100 MWth operated for > 1,500 hours/year.

There are no limits in the existing permit. We have included the yearly average indicative limit of 30 mg/Nm^3 in the varied permit.

ii) BAT Conclusion 29 – SO_2 limits

SO_2 limits (mg/Nm^3)						
Averaging	**IED (Annex V Part 1) - Existing**	**BREF (Table 15 BAT-C)**	**Expected permit limits**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**175**	**175**	BREF	MSUL/MSDL to baseload	Continuous
Monthly	**350**	**None**	**350**	IED	MSUL/MSDL to baseload	
Daily	**385**	**200**	**200**	BREF	MSUL/MSDL to baseload	
95th %ile of hr means	**700**	**None**	**700**	IED	MSUL/MSDL to baseload	

iii) BAT Conclusion 30 – dust limits

Dust limits (mg/Nm^3)						
Averaging	**IED (Annex V Part 1) - Existing**	**BREF (Table 16 BAT-C)**	**Expected permit limits**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**20**	**20**	BREF	MSUL/MSDL to baseload	Continuous
Monthly	**30**	**None**	**30**	IED	MSUL/MSDL to baseload	
Daily	**33**	**25** Note 1	**25** Note 1	BREF	MSUL/MSDL to baseload	
95th %ile of hr means	**60**	**None**	**60**	IED	MSUL/MSDL to baseload	
Note 1: The higher end of the BAT-AEL range is 25 mg/Nm^3 for plants put into operation no later than 7 January 2014						

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

An energy efficiency level associated with the BAT-AEEL refers to the ratio between the combustion unit's net energy outputs and the combustion unit's fuel/feedstock energy input at actual unit design. The net energy outputs 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 LCP 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 is detailed in Section 5 of this document. 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
LCP 438, LCP 439, LCP 450						
35.6 – 37.4	80 - 96	None	NA	LCP 438 & 439	80.55	NA
				LCP 450	80.77	

5 Decision checklist regarding relevant BAT Conclusions

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

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

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

BAT Conclusion requirement topic	Permit conditions	Permit tables
Environmental Management System	1.1.1	S1.2
BAT AELs	3.1.1 and 3.5.1	S3.1a
Monitoring	2.3, 3.5 and 3.6	S1.4, S1.2, S3.1a
Energy efficiency	1.2 and 2.3	S3.4
Noise	3.4 and 2.3	S2.1
Other operating techniques	1.2	S1.2

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

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

BAT C No.	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
General			
1	**In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features:** i. commitment of the management, including senior management; ii. definition of an environmental policy that includes the continuous improvement of the installation by the management; iii. planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment; iv. implementation of procedures (a) Structure and responsibility (b) Training (c) Communication (d) Employee involvement (e) Documentation (f) Efficient process control (g) Maintenance programmes (h) Emergency preparedness and response (i) Safeguarding compliance with environmental legislation v. checking performance and taking corrective action, paying particular attention to: (a) monitoring and measurement (see also the Reference Document on the General Principles of Monitoring) (b) corrective and preventive action (c) maintenance of records (d) independent (where practicable) internal and external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; vi. review of the EMS and its continuing suitability, adequacy and effectiveness by senior management; vii. following the development of cleaner technologies; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life; ix. application of sectoral benchmarking on a regular basis. Etc - see BAT Conclusions	CC	The Operator confirmed that: There is an EMS certified to ISO14001:2015 standard in place and it meets requirements (i) through to (xvi) set out in the BAT Conclusion. In their response to our request for further information the Operator provided a response which included an EMS reference for each of the features. They also provided their certification certificate which is valid until 31 December 2020. We agree with the Operator's stated compliance.

<table>
<tr><th>BAT C No.</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>Applicability. The scope (e.g. level of detail) and nature of the EMS (e.g. standardised or non-standardised) will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have.</td><td></td><td></td></tr>
<tr><td>2</td><td>BAT is to determine the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the gasification, IGCC and/or combustion units by carrying out a performance test at full load (1), according to EN standards, after the commissioning of the unit and after each modification that could significantly affect the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the unit. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.</td><td>CC</td><td>The Operator confirmed that:

Full load tests to maximum continuous rating (MCR) as part of commissioning for Boat 6 Trials - current calculated efficiencies for the boilers are: LCP 438 & LCP 439 are at 80.55% net; LCP 450 is at 80.77% net.

NOTE: the purpose of the marine boiler plant at SMITE is to mimic the steam raising characteristics of equipment on board submarines. Because the plant is so unconventional in what it is and the intermittent nature of the running schedule it is not available to the normal efficiency interventions.

We agree with the Operator’s stated 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 confirmed that:

Pressure - continuously monitored;
Flow - periodic measurement;
Oxygen - continuously measured;
Water vapour - periodic.

The existing permit requires continuous monitoring of oxygen, water vapour, temperature and pressure.

We conclude that the Operator is currently compliant as they currently monitor the relevant key process parameters.</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</th><th>Standard(s) (4)</th><th>Minimum monitoring frequency (5)</th><th>Monitoring associat</th></tr>
</table></td><td>FC</td><td>The Operator confirmed that:

TGN 2, MCERTs CEMS, BS:EN 14181 BS EN 15267-4:2017 Metalloids - annual monitoring to EN 14385 - not currently undertaken. They confirm that metals monitoring will be undertaken once per monitoring campaign.</td></tr>
</table>

BAT C No.	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			rated thermal input			ed with		The existing permit requires continuous monitoring of NOx, SO_2 and dust. In their response to our request for further information they confirmed that NOx, SO_2, dust, water vapour and oxygen will be continuously monitored to BS EN 14181. They also confirmed that their CEMs monitors for carbon monoxide (CO) and that metals will be monitored using the fuel assay process and via third party periodic monitoring. We agree with the Operator's stated compliance.
	NH_3	— When SCR and/or SNCR is used	All sizes	Generic EN standards	Continuous [6] [7]	BAT 7		
	NO_X	— Coal and/or lignite including waste co-incineration — Solid biomass and/or peat including waste co-incineration — HFO- and/or gas-oil-fired boilers and engines — Gas-oil-fired gas turbines — Natural-gas-fired boilers, engines, and turbines — Iron and steel process gases — Process fuels from the chemical industry — IGCC plants	All sizes	Generic EN standards	Continuous [6] [8]	BAT 20 BAT 24 BAT 28 BAT 32 BAT 37 BAT 41 BAT 42 BAT 43 BAT 47 BAT 48 BAT 56 BAT 64 BAT 65 BAT 73		
		— Combustion plants on offshore platforms	All sizes	EN 14792	Once every year [9]	BAT 53		
	N_2O	— Coal and/or lignite in circulating fluidised bed boilers — Solid biomass and/or peat in circulating fluidised bed boilers	All sizes	EN 21258	Once every year [10]	BAT 20 BAT 24		
	CO	— Coal and/or lignite including waste co-incineration	All sizes	Generic EN standards	Continuous [6] [8]	BAT 20 BAT 24 BAT 28		

BAT C No.	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		— 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				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 — Iron and steel process gases — Process fuels from the chemical industry in boilers	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 C No.	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		— 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 — HFO- and/or gas-oil-fired engines — Gas-oil-fired gas turbines	All sizes	Generic EN standards and EN 13284-1 and EN 13284-2	Continuous (6) (17)	BAT 22 BAT 26 BAT 30 BAT 35 BAT 39 BAT 51 BAT 58 BAT 75		

BAT C No.	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		— 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		
		— Waste co-incineration with coal, lignite, solid biomass and/or peat	All sizes	Generic EN standards	Continuous	BAT 71		

<table>
<tr><th>BAT C No.</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>Formaldehyde</td><td>— Natural-gas in spark-ignited lean-burn gas and dual fuel engines</td><td>All sizes</td><td>No EN standard available</td><td>Once every year</td><td>BAT 45</td></tr>
<tr><td>CH_4</td><td>— Natural-gas-fired engines</td><td>All sizes</td><td>EN ISO 25139</td><td>Once every year (24)</td><td>BAT 45</td></tr>
<tr><td>PCDD/F</td><td>— Process fuels from chemical industry in boilers
— Waste co-incineration</td><td>All sizes</td><td>EN 1948-1, EN 1948-2, EN 1948-3</td><td>Once every six months (13) (25)</td><td>BAT 59
BAT 71</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>5</td><td>
BAT is to monitor emissions to water from flue-gas treatment with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.
<table>
<tr><th colspan="2">Substance/Parameter</th><th>Standard(s)</th><th>Minimum monitoring frequency</th><th>Monitoring associated with</th></tr>
<tr><td colspan="2">Total organic carbon (TOC) (26)</td><td>EN 1484</td><td rowspan="11">Once every month</td><td rowspan="11">BAT 15</td></tr>
<tr><td colspan="2">Chemical oxygen demand (COD) (26)</td><td>No EN standard available</td></tr>
<tr><td colspan="2">Total suspended solids (TSS)</td><td>EN 872</td></tr>
<tr><td colspan="2">Fluoride (F^-)</td><td>EN ISO 10304-1</td></tr>
<tr><td colspan="2">Sulphate (SO_4^{2-})</td><td>EN ISO 10304-1</td></tr>
<tr><td colspan="2">Sulphide, easily released (S^{2-})</td><td>No EN standard available</td></tr>
<tr><td colspan="2">Sulphite (SO_3^{2-})</td><td>EN ISO 10304-3</td></tr>
<tr><td rowspan="5">Metals and metalloids</td><td>As</td><td rowspan="5">Various EN standards available (e.g. EN ISO 11885 or EN ISO 17294-2)</td></tr>
<tr><td>Cd</td></tr>
<tr><td>Cr</td></tr>
<tr><td>Cu</td></tr>
<tr><td>Ni</td></tr>
</table>
</td><td>NA</td><td>The Operator confirmed in their response to our request for further information that there is no flue gas treatment for the LCPs.

We agree that this BAT Conclusion is not applicable to the activities carried out at the installation.</td></tr>
</table>

<table>
<tr><th>BAT C No.</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>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>
</td><td></td><td></td></tr>
<tr><td>6</td><td>In order to improve the general environmental performance of combustion plants and to reduce emissions to air of CO and unburnt substances, BAT is to ensure optimised combustion and to use an appropriate combination of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Fuel blending and mixing</td><td>Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Maintenance of the combustion system</td><td>Regular planned maintenance according to suppliers' recommendations</td><td></td></tr>
<tr><td>c.</td><td>Advanced control system</td><td>See description in Section 8.1</td><td>The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system</td></tr>
<tr><td>d.</td><td>Good design of the combustion equipment</td><td>Good design of furnace, combustion chambers, burners and associated devices</td><td>Generally applicable to new combustion plants</td></tr>
<tr><td>e.</td><td>Fuel choice</td><td>Select or switch totally or partially to another fuel(s) with a better environmental profile (e.g. with</td><td>Applicable within the constraints associated with the availability of suitable types of fuel with a better</td></tr>
</table>
</td><td>FC</td><td>The Operator confirmed that:

a) They do not mix fuels as they only use BS2869:2010 - Class D - middle distillate fuel for heating applications;
b) They are compliant, scheduled maintenance undertaken in line with a written scheme;
c) They are working towards this and it will be implemented in 2019.

In their response to our request for further information they confirm that:

e) Having switched previously from heavy fuel oil, SMITE, as existing combustion plant, is limited by the configuration and the design of the plant to the type of fuel chosen. Natural gas has been/is being considered for the long term, however security of supply is an issue and a complete redesign of the combustion plant would be required.

We agree with the Operator’s stated compliance.</td></tr>
</table>

BAT C No.	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	<table><tr><td></td><td></td><td>low sulphur and/or mercury content) amongst the available fuels, including in start-up situations or when back-up fuels are used</td><td>environmental profile as a whole, which may be impacted by the energy policy of the Member State, or by the integrated site's fuel balance in the case of combustion of industrial process fuels. For existing combustion plants, the type of fuel chosen may be limited by the configuration and the design of the plant</td></tr></table>		
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	The Operator did not provide a response to this BAT Conclusion. There is no SCR or SNCR in place. We can conclude that this BAT Conclusion is not applicable to the activities carried out at the installation.
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	In their response to our request for further information they confirm that: There is no flue gas treatment for any of the LCPs. This BAT Conclusion is not applicable to the activities carried out at the installation.
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	CC	The Operator confirmed that: Periodic tests are done by the supplier and reported via fuel specification currently including ash and sulphur. One sample is tested per campaign by on site chemists for:

<table>
<tr><th>BAT C No.</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>be used provided they ensure the provision of data of an equivalent scientific quality;
(ii) Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications. The frequency of testing and the parameters chosen from the table below are based on the variability of the fuel and an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed);
(iii) Subsequent adjustment of the plant settings as and when needed and practicable (e.g. integration of the fuel characterisation and control in the advanced control system (see description in Section 8.1)).
Description
Initial characterisation and regular testing of the fuel can be performed by the operator and/or the fuel supplier. If performed by the supplier, the full results are provided to the operator in the form of a product (fuel) supplier specification and/or guarantee.
<table>
<tr><th>Fuel(s)</th><th>Substances/Parameters subject to characterisation</th></tr>
<tr><td rowspan="2">Biomass/peat</td><td>— LHV
— moisture</td></tr>
<tr><td>— Ash
— C, Cl, F, N, S, K, Na
— Metals and metalloids (As, Cd, Cr, Cu, Hg, Pb, Zn)</td></tr>
<tr><td rowspan="3">Coal/lignite</td><td>— LHV
— Moisture
— Volatiles, ash, fixed carbon, C, H, N, O, S</td></tr>
<tr><td>— Br, Cl, F</td></tr>
<tr><td>— Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)</td></tr>
<tr><td>HFO</td><td>— Ash
— C, S, N, Ni, V</td></tr>
<tr><td>Gas oil</td><td>— Ash
— N, C, S</td></tr>
<tr><td>Natural gas</td><td>— LHV</td></tr>
</table></td><td></td><td>Nitrogen content - <0.01%;
Carbon content - 86.4%;
Ash content - max. 0.01%; and
Sulphur content - max 0.1%.

We conclude that the Operator is currently compliant as they currently test for the gas-oil parameters.</td></tr>
</table>

BAT C No.	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	<table><tr><td></td><td>— CH_4, C_2H_6, C_3, C_4+, CO_2, N_2, Wobbe index</td></tr><tr><td>Process fuels from the chemical industry (27)</td><td>— Br, C, Cl, F, H, N, O, S — Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)</td></tr><tr><td>Iron and steel process gases</td><td>— LHV, CH_4 (for COG), C_XH_Y (for COG), CO_2, H_2, N_2, total sulphur, dust, Wobbe index</td></tr><tr><td>Waste (28)</td><td>— LHV — Moisture — Volatiles, ash, Br, C, Cl, F, H, N, O, S — Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)</td></tr></table>		
10	In order to reduce emissions to air and/or to water during other than normal operating conditions (OTNOC), BAT is to set up and implement a management plan as part of the environmental management system (see BAT 1), commensurate with the relevance of potential pollutant releases, that includes the following elements: — appropriate design of the systems considered relevant in causing OTNOC that may have an impact on emissions to air, water and/or soil (e.g. low-load design concepts for reducing the minimum start-up and shutdown loads for stable generation in gas turbines), — set-up and implementation of a specific preventive maintenance plan for these relevant systems, — review and recording of emissions caused by OTNOC and associated circumstances and implementation of corrective actions if necessary, — periodic assessment of the overall emissions during OTNOC (e.g. frequency of events, duration, emissions quantification/estimation) and implementation of corrective actions if necessary.	FC	The Operator confirmed that: An advanced control system is to be installed and commissioned in 2019, coupled with the upgraded burner management system, to ensure optimum performance during all conditions. Operating procedures have been written and will be kept up to date to ensure efficient operation during OTNOC. During shutdown periods (2 years in 3) preventive maintenance is undertaken. During campaigns periodic review of emissions data is to be planned in. We agree with the Operator's stated 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	CC	The Operator confirmed that: CEMS continuously monitors boiler outputs. For reporting purposes normal operating conditions are used. We agree with the Operator's stated compliance.

<table>
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<tr><td></td><td>carried out for a typical SU/SD procedure at least once every year, and using the results of this measurement to estimate the emissions for each and every SU/SD throughout the year.</td><td></td><td></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_Xemissions</td></tr>
<tr><td>g.</td><td>Advanced control system</td><td>See description in Section 8.2. Computerised control of the main combustion parameters enables the combustion efficiency to be improved</td><td>Generally applicable to new units. The applicability to old units may be constrained by the need to retrofit the combustion system</td></tr>
</table></td><td>CC</td><td>The Operator confirmed that:

NOTE: the SMITE facility operates for approximately 1,000 hours over a three year period.

a) Combustion optimisation - variable speed fans and fuel/air curves are used to optimise fuel combustion;
b) Optimisation of the working medium conditions - steam pressures and temperatures are dictated by the unusually variable load conditions required during steam trials. Only some test paths will use maximum temp and pressure;
c) Optimisation of the steam cycle - due to the unusual purpose for the steam, the pressure entering the condensers is governed by the design of the rig being tested. Seawater condensers receive water at ambient temperature so are as cool as is reasonably practicable;
d) Minimisation of energy consumption - there is a proposal to reduce energy consumption by replacing the turbo feed pumps with electrically driven variable speed pumps;
e) Preheating of combustion air - intakes are located in the boiler house above the main boilers;
f) Fuel preheating - No - limited benefit from heating gas-oil;
g) Advanced control system - due to be implemented in 2019;
h) Feed-water preheating using recovered heat - heat from boilers and exhaust steam from turbo feed pumps are used to pre-heat;
i) to s) are not applicable.

In their response to our request for further information on technique d) they confirm that:

They are looking to have a ‘hybrid’ electric / steam turbo feed pump system for Astute B7 trials (Oct 2020), with a full electric system in place by the Dreadnought trials (Q1 2023). The ‘hybrid’ system is due to time constraints (time it will take to implement the</td></tr>
</table>

BAT C No.	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement

			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

electrical changes and long-lead timescales for the pumps).

For the Dreadnought trials they confirm that:

Total duration of the trials is made up of:
Estimated 3 shifts x 40 hours per week x 36 weeks = 4320 hours,

Plus pre-trials commissioning and training, estimated at 5000 hours in 2023.

However the time the plant will be operating during this period will be significantly less, estimated at approximately 4000 hours.

We agree with the Operator's stated compliance.

BAT C No.	Summary of BAT Conclusion requirement				Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
				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		

<table>
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<tr><td></td><td><table><tr><td></td><td></td><td></td><td>biomasses</td></tr></table></td><td></td><td></td></tr>
<tr><td>13</td><td>In order to reduce water usage and the volume of contaminated waste water discharged, BAT is to use one or both of the techniques given below.<table><tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr><tr><td>a.</td><td>Water recycling</td><td>Residual aqueous streams, including run-off water, from the plant are reused for other purposes. The degree of recycling is limited by the quality requirements of the recipient water stream and the water balance of the plant</td><td>Not applicable to waste water from cooling systems when water treatment chemicals and/or high concentrations of salts from seawater are present</td></tr><tr><td>b.</td><td>Dry bottom ash handling</td><td>Dry, hot bottom ash falls from the furnace onto a mechanical conveyor 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 confirmed that:

During campaigns on-site chemists analyse the quality of the boiler waters to ensure efficient treatment to maintain optimum water chemistry.

There are currently proposals to automate the chemical dosing, effluent treatment and blow-down systems to further improve chemical treatment and reduce water wastage.

In their response to our request for further information they confirm that these works should be complete prior to the B7 trials planned for October 2020.

The freshwater (town mains) cooling loop is continuously recycled and only topped up as required.

Condensate is recovered within the feed systems and recycled within the steam system.

We agree with the Operator’s stated 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 confirmed that:

The seawater, freshwater and boiler water streams are all clearly segregated and treated separately.

Surface water run-off is also separated from other discharges. For example boiler water discharge is treated for pH and temperature prior to release to specified limits.

We agree with the Operator’s stated 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.</td><td>NA</td><td>In their response to our request for further information they confirm that:

There is no flue gas treatment for any of the LCPs.</td></tr>
</table>

BAT C No.	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement

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

This BAT Conclusion is not applicable to the activities carried out at the installation.

<table>
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<tr><td></td><td>
<table>
<tr><td>m.</td><td>Sedimentation</td><td>Suspended solids</td><td>Generally applicable</td></tr>
<tr><td>n.</td><td>Stripping</td><td>Ammonia (NH_3)</td><td>Generally applicable</td></tr>
</table>
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
<table>
<tr><th colspan="2" rowspan="2">Substance/Parameter</th><th>BAT-AELs</th></tr>
<tr><th>Daily average</th></tr>
<tr><td colspan="2">Total organic carbon (TOC)</td><td>20–50 mg/l [30] [31] [32]</td></tr>
<tr><td colspan="2">Chemical oxygen demand (COD)</td><td>60–150 mg/l [30] [31] [32]</td></tr>
<tr><td colspan="2">Total suspended solids (TSS)</td><td>10–30 mg/l</td></tr>
<tr><td colspan="2">Fluoride (F^-)</td><td>10–25 mg/l [32]</td></tr>
<tr><td colspan="2">Sulphate (SO_4^{2-})</td><td>1,3–2,0 g/l [32] [33] [34] [35]</td></tr>
<tr><td colspan="2">Sulphide (S^{2-}), easily released</td><td>0,1–0,2 mg/l [32]</td></tr>
<tr><td colspan="2">Sulphite (SO_3^{2-})</td><td>1–20 mg/l [32]</td></tr>
<tr><td rowspan="8">Metals and metalloids</td><td>As</td><td>10–50 µg/l</td></tr>
<tr><td>Cd</td><td>2–5 µg/l</td></tr>
<tr><td>Cr</td><td>10–50 µg/l</td></tr>
<tr><td>Cu</td><td>10–50 µg/l</td></tr>
<tr><td>Hg</td><td>0,2–3 µg/l</td></tr>
<tr><td>Ni</td><td>10–50 µg/l</td></tr>
<tr><td>Pb</td><td>10–20 µg/l</td></tr>
<tr><td>Zn</td><td>50–200 µg/l</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>16</td><td>In order to reduce the quantity of waste sent for disposal from the combustion and/or gasification process and abatement techniques, BAT is to organise operations so as to maximise, in order of priority and taking into account life-cycle thinking:
(a) waste prevention, e.g. maximise the proportion of residues which arise as by-products;
(b) waste preparation for reuse, e.g. according to the specific requested quality criteria;
(c) waste recycling;</td><td>NA</td><td>In their response to our request for further information they confirm that:

Combustion of gas-oil does not create any waste or residues other than the dust quotient of the air emissions. There are no solid or liquid wastes to manage.

The configuration of the gas-oil burners does not allow for energy recovery.</td></tr>
</table>

<table>
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<tr><td></td><td>(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>
<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>This BAT Conclusion is not applicable to the activities carried out at the installation.</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</td><td>Generally applicable</td></tr>
</table></td><td>CC</td><td>The Operator confirmed that:

Maintenance schedules are developed and rigorously followed:
- The main test house doors are closed during operations;
- The plant is operated by SQEP personnel;
- The boiler plant is situated at the furthest point from local residents within the purpose built facility;</td></tr>
</table>

<table>
<tr><th>BAT C No.</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></td><td>— 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></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>
<tr><td>e.</td><td>Appropriate location of equipment and buildings</td><td>Noise levels can be reduced by increasing the distance between the emitter and the receiver and by using buildings as noise screens</td><td>Generally applicable to new plant</td></tr>
</table>
</td><td></td><td>- Noise monitoring equipment has been installed around the site perimeter. One of these stations is deliberately sited to capture noise emissions from the facility and is positioned between the facility and the nearest local residents. These noise monitoring stations operate 24/7;
- The facility operates under a noise management plan (BS 4142);
- New equipment is procured to specified noise levels where appropriate.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td colspan="4">Combustion of solid fuels only – BAT Conclusion 18 to 27 are not applicable-boilers are fired on liquid fuels only</td></tr>
<tr><td colspan="4">Combustion of liquid fuels</td></tr>
<tr><td>Table 13</td><td>BAT-associated energy efficiency levels (BAT-AEELs) for HFO and/or gas oil combustion in boilers
<table>
<tr><th rowspan="2">Type of combustion unit</th><th colspan="2">BAT-AEELs [99] [100]</th></tr>
<tr><th>Net electrical efficiency (%)</th><th>Net total fuel utilisation (%) [101]</th></tr>
</table>
</td><td>CC</td><td>The Operator confirmed that:

The applicable BAT AEEL is 80-96%.

Full load tests to MCR as part of commissioning for Boat 6 Trials - current calculated efficiencies for the boilers are:</td></tr>
</table>

<table>
<tr><th>BAT C No.</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><th></th><th>New unit</th><th>Existing unit</th><th>New unit</th><th>Existing unit</th></tr>
<tr><td>HFO- and/or gas-oil-fired boiler</td><td>> 36,4</td><td>35,6–37,4</td><td>80–96</td><td>80–96</td></tr>
</table>
</td><td></td><td>LCP 438 & LCP 439 are at 80.55% net;
LCP 450 is at 80.77% net.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td>28</td><td>In order to prevent or reduce NO_X emissions to air while limiting CO emissions to air from the combustion of HFO and/or gas oil 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 staging</td><td rowspan="5">See descriptions in Section 8.3</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Fuel staging</td><td></td></tr>
<tr><td>c.</td><td>Flue-gas recirculation</td><td></td></tr>
<tr><td>d.</td><td>Low-NO_X burners (LNB)</td><td></td></tr>
<tr><td>e.</td><td>Water/steam addition</td><td>Applicable within the constraints of water availability</td></tr>
<tr><td>f.</td><td>Selective non-catalytic reduction (SNCR)</td><td>See descriptions in Section 8.3</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></td><td>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.
Not generally applicable to combustion plants of < 100 MW_{th}</td></tr>
<tr><td>h</td><td>Advanced</td><td></td><td>Generally applicable to new combustion plants.</td></tr>
</table>
</td><td>CC</td><td>The Operator confirmed that the applicable BAT AELs are:

150 mg/m^3 to 270 mg/m^3 as a yearly average; and
210 mg/m^3 to 330 mg/m^3 as a daily average or over a monitoring campaign.

They also confirm that:

Recent monitoring during a trials campaign demonstrated compliance:

LCP 438 - 168 mg/Nm^3
LCP 439 - 171 mg/Nm^3
LCP 450 - 155 mg/Nm^3

We have set limits as detailed in Section 4.1 of this document.

In their response to our request for further information they confirm the following:</td></tr>
</table>

BAT C No.	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement

.	control system		The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system
i.	Fuel choice		Applicable within the constraints associated with the availability of different types of fuel, which may be impacted by the energy policy of the Member State

BAT-associated emission levels (BAT-AELs) for NO_X emissions to air from the combustion of HFO and/or gas oil in boilers

Combustion plant total rated thermal input (MW_{th})	BAT-AELs (mg/Nm^3)			
	Yearly average		Daily average or average over the sampling period	
	New plant	Existing plant ([102])	New plant	Existing plant ([103])
< 100	75–200	150–270	100–215	210–330 ([104])
≥ 100	45–75	45–100 ([105])	85–100	85–110 ([106]) ([107])

As an indication, the yearly average CO emission levels will generally be:

— 10-30 mg/Nm^3 for existing combustion plants of < 100 MW_{th} operated ≥ 1 500 h/yr, or new combustion plants of <100 MW_{th},

— 10–20mg/Nm^3 for existing combustion plants of ≥ 100 MW_{th} operated ≥ 1 500 h/yr, or new combustion plants of ≥ 100 MW_{th}.

Technique	Used	Justification
Air staging	No	BAT AEEL's achievable using low NOx burners
Fuel staging	No	BAT AEEL's achievable using low NOx burners
Flue gas re-circulation	No	BAT AEEL's achievable using low NOx burners
Low-NOX burners (LNB)	Yes	Low Nox fitted
Water/steam addition	Yes	Atomising steam used to ensure efficient burinign and manage burner temperature
Selective non- catalytic reduction (SNCR)	No	Not economically feasible, all units operate under 1500hrs per year and two of the three less than 500 hrs per year. Operated at highly variable loads.
Selective catalytic reduction (SCR)		Not economically feasible, all units operate under 1500hrs per year and two of the three less than 500 hrs per year. Operated at highly variable loads.
Advanced control system	Yes	(Can we claim the BMS ans DCMS here?)
Fuel choice		Low sulphur (less than 0.1%w/w) fuel oil used - material impact on NOx emissions

Regarding the 'Advanced control system' technique, the definition from Section 8.1 of the BAT Conclusions is:

'The use of a computer-based automatic system to control the combustion efficiency and support the prevention and/or reduction of emissions. This also includes the use of high-performance monitoring.'

The Operator confirmed that their systems require some manual input, so don't qualify as an advanced control system.

We agree with the Operator's stated compliance.

<table>
<tr><th>BAT C No.</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>29</td><td>In order to prevent or reduce SO_X, HCl and HF emissions to air from the combustion of HFO and/or gas oil 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>Duct sorbent injection (DSI)</td><td rowspan="6">See description in Section 8.4</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Spray dry absorber (SDA)</td><td rowspan="2"></td></tr>
<tr><td>c.</td><td>Flue-gas condenser</td></tr>
<tr><td>d.</td><td>Wet flue-gas desulphurisation (wet FGD)</td><td>There may be technical and economic restrictions for applying the technique to combustion plants of < 300 MW_{th}.
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>
<tr><td>e.</td><td>Seawater FGD</td><td>There may be technical and economic restrictions for applying the technique to combustion plants of < 300 MW_{th}.
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>
<tr><td>f.</td><td>Fuel choice</td><td>Applicable within the constraints associated with the availability of different types of fuel, which may be impacted by the energy policy of the Member State</td></tr>
</table>
BAT-associated emission levels (BAT-AELs) for SO_2 emissions to air from the</td><td>CC</td><td>The Operator confirmed that the applicable BAT AELs are:

50 to 175 mg/m^3 as a yearly average; and
150 to 200 mg/m^3 as a daily average or over monitoring campaign

They also confirm that:

Recent monitoring during a trials campaign demonstrated compliance:

LCP 438 - 75 mg/Nm^3
LCP 439 - 69 mg/Nm^3
LCP 450 - 87mg/Nm^3

We have set limits as detailed in Section 4.1 of this document.

In their response to our request for further information they confirm the following:</td></tr>
</table>

<table>
<tr><th>BAT C No.</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>
combustion of HFO and/or gas oil in boilers
<table>
<tr><th rowspan="2">Combustion plant total rated thermal input (MW_{th})</th><th colspan="4">BAT-AELs for SO_2 (mg/Nm^3)</th></tr>
<tr><th colspan="2">Yearly average</th><th colspan="2">Daily average or average over the sampling period</th></tr>
<tr><th></th><th>New plant</th><th>Existing plant (108)</th><th>New plant</th><th>Existing plant (109)</th></tr>
<tr><td>< 300</td><td>50–175</td><td>50–175</td><td>150–200</td><td>150–200 (110)</td></tr>
<tr><td>≥ 300</td><td>35–50</td><td>50–110</td><td>50–120</td><td>150–165 (111) (112)</td></tr>
</table>
</td><td></td><td>
<table>
<tr><th>Column1</th><th>Techniqu</th><th>Used</th><th>Justification</th></tr>
<tr><td>a.</td><td>Duct sorbent injection</td><td>No</td><td>No - can achieve BAT without using this measure</td></tr>
<tr><td>b.</td><td>Spray dry absorber</td><td>No</td><td>No - can achieve BAT without using this measure</td></tr>
<tr><td>c.</td><td>flue-gas condenser</td><td>No</td><td>No - can achieve BAT without using this measure</td></tr>
<tr><td>d.</td><td>Wet flue-gas desulpurisation wet (FGD)</td><td>No</td><td>LCP 439 and 438 operated less than 500hrs per year
LCP 450 operated less than 1500hrs per year
Not economically viable to retrofit</td></tr>
<tr><td>e.</td><td>Seawater FGD</td><td>No</td><td>LCP 439 and 438 operated less than 500hrs per year
LCP 450 operated less than 1500hrs per year
Not economically viable to retrofit</td></tr>
<tr><td>f.</td><td>Fuel choice</td><td>Yes</td><td>Ultra low sulphur gas oil used at less than 0.1% w/w (typically 0.03%)</td></tr>
</table>

We agree with the Operator’s stated compliance.
</td></tr>
<tr><td>30</td><td>
In order to reduce dust and particulate-bound metal emissions to air from the combustion of HFO and/or gas oil 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>Electrostatic precipitator (ESP)</td><td rowspan="2">See description in Section 8.5</td><td rowspan="2">Generally applicable</td></tr>
<tr><td>b.</td><td>Bag filter</td></tr>
<tr><td>c.</td><td>Multicyclones</td><td>See description in</td><td></td></tr>
</table>
</td><td>CC</td><td>
The Operator confirmed that the applicable BAT AELs are:

2 to 20 mg/Nm^3 as a yearly average; and
7 to 22 mg/Nm^3 as a daily average or as a campaign average

They also confirm that:

Recent monitoring during a trials campaign demonstrated compliance:

LCP 438 - 14mg/Nm^3
</td></tr>
</table>

BAT C No.	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement

.		Section 8.5. Multicyclones can be used in combination with other dedusting techniques	
d.	Dry or semi-dry FGD system	See descriptions in Section 8.5. The technique is mainly used for SO_X, HCl and/or HF control	
e.	Wet flue-gas desulphurisation (wet FGD)	See description in Section 8.5. The technique is mainly used for SO_X, HCl and/or HF control	See applicability in BAT 29
f.	Fuel choice	See description in Section 8.5	Applicable within the constraints associated with the availability of different types of fuel, which may be impacted by the energy policy of the Member State

BAT-associated emission levels (BAT-AELs) for dust emissions to air from the combustion of HFO and/or gas oil in boilers

Combustion plant total rated thermal input (MW_{th})	BAT-AELs for dust (mg/Nm^3)			
	Yearly average		Daily average or average over the sampling period	
	New plant	Existing plant ([113])	New plant	Existing plant ([114])
< 300	2–10	2–20	7–18	7–22 ([115])
≥ 300	2–5	2–10	7–10	7–11 ([116])

LCP 439 - 18mg/Nm^3
LCP 450 - 7mg/Nm^3

We have set limits as detailed in Section 4.1 of this document.

We note that the higher end of the BAT AEL range is 25 mg/Nm^3 for plants put into operation no later than 7 January 2014.

In their response to our request for further information they confirm the following:

<table>
<tr><th>BAT C No.</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>
<table>
<tr><th>Column1</th><th>Technique</th><th>Used</th><th>Justification</th></tr>
<tr><td>a.</td><td>Electrostatic precipitator (ESP)</td><td>No</td><td>Able to achieve BAT AEL without this measure using fuel oil manufactured to BS2869:2017 - Class D - Middle distillate fuel for heating applications, and combustion controls including atomisation of fuel and fuel-air mix</td></tr>
<tr><td>b.</td><td>Bag filter</td><td>No</td><td>Able to achieve BAT AEL without this measure using fuel oil manufactured to BS2869:2017 - Class D - Middle distillate fuel for heating applications, and combustion controls including atomisation of fuel and fuel-air mix</td></tr>
<tr><td>c.</td><td>Multicyclones</td><td>No</td><td>Able to achieve BAT AEL without this measure using fuel oil manufactured to BS2869:2017 - Class D - Middle distillate fuel for heating applications, and combustion controls including atomisation of fuel and fuel-air mix</td></tr>
<tr><td>d.</td><td>Dry or semi-dry FGD system</td><td>No</td><td>Able to achieve BAT AEL without this measure using fuel oil manufactured to BS2869:2017 - Class D - Middle distillate fuel for heating applications, and combustion controls including atomisation of fuel and fuel-air mix</td></tr>
<tr><td>e.</td><td>Wet flue-gas desulphurisation</td><td>No</td><td>Able to achieve BAT AEL without this measure using fuel oil manufactured to BS2869:2017 - Class D - Middle distillate fuel for heating applications, and combustion controls including atomisation of fuel and fuel-air mix
LCP 439 and 438 operated less than 500hrs per year
LCP 450 operated less than 1500hrs per year
Not economically viable to retrofit</td></tr>
<tr><td>f.</td><td>Fuel choice</td><td>Yes</td><td>Fuel oil manufactured to BS2869:2017 - Class D - Middle distillate fuel for heating applications, and combustion controls including atomisation of fuel and fuel-air mix</td></tr>
</table>

Fuel choice is used to achieve BAT and that the applicable BAT AEL is 25 mg/Nm^3.

We agree with the Operator’s stated compliance.
</td></tr>
<tr><td colspan="4">Reciprocating engines only – BAT Conclusions 31 to 35 are not applicable
Gas turbines only – BAT Conclusions 36 to 39 are not applicable</td></tr>
<tr><td colspan="4">Combustion of gaseous fuels only – BAT Conclusions 40 to 45 are not applicable</td></tr>
</table>

BAT C No.	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
Combustion of iron and steel process gases – BAT Conclusions 46 to 51 are not applicable			
Combustion of gaseous and/or liquid fuels on offshore platforms – BAT Conclusions 52 to 54 are not applicable			
Combustion of process fuels from the chemical industry – BAT Conclusions 55 to 59 are not applicable			
Co-incineration of waste – BAT Conclusions 60 to 71 are not applicable			
Gasification – BAT Conclusions 72 to 75 re not applicable			

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

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

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

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

(b) the technical characteristics of the installation concerned.

The Operator has not requested a derogation from compliance with the AEL values.

7. Emissions to water

The consolidated permit incorporates the five current discharges to controlled waters identified as W1 to W5.

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:

Permit condition/ table	Comments	
2.3.4	Deleted Subject to condition 2.3.5, visible smoke emitted from any flue shall not exceed the equivalent of Ringlemann Shade 1 except during boiler ignition or load changes.	The Operator confirmed that boiler engineers monitor the emissions and record their observations in a logbook for both SMITE and the Boiler barge. EOP 27 describes actions on emissions of dark smoke from SMITE stacks and the Boiler barge operating manual has a similar section. We are satisfied that the necessary controls are in place via the sites EMS.
2.3.5	Deleted During boiler ignition or load changes, dark smoke shall not be emitted for periods in excess of 60 seconds.	
Table S1.1	Amended to include the thermal input of LCPs in accordance with the response to improvement condition IP14. This is documented in our compliance assessment report (CAR) Report ID: CAR/BAE/19-003.	
	Amended to limit the thermal input of each boiler to < 100 MWth. The Operator intends to place a software restriction on the fuel supply to prevent non-compliant operation of the boilers. They confirmed that this is being added as part of the cold commissioning process in quarter 3 of 2019.	
	Amended to confirm that one of the boilers is for standby purposes only. The Operator confirmed that the boilers are used in rotation and as demand requires. This is usually LCP450 as main demand, with either LCP438 or LCP439 providing for peak demand and the third in a standby role. These roles are interchangeable based on each of the boilers states of readiness during any particular test path.	
	Amended wording of activity AR5, for boiler blow-down and effluent treatment. The Operator confirmed that the effluent from the previous demin. water plant required adjustment as it was an acid/alkali process. The new reverse osmosis plant does not rely on chemically treating the feed water in the same way. It does not discharge via W3 but to the common outfall shared with W3 and	

Permit condition/ table	Comments
	W4.
	Amended wording of activity AR2 for 'Fuel oil handling'. Removed D14 from the description as the Operator confirmed that the boilers are now gas fired.
	Amended to remove the A47 1.2MWth boiler. The Operator confirmed that it has been isolated and taken out of use.
Table S1.2	Amended to include the software restriction to limit the thermal input of each boiler to < 100 MWth.
	Amended to incorporate the approved site closure plan.
	Amended to replace operating techniques for the ion exchange plant with the reverse osmosis plant.
Table S1.3	Amended to confirm completion of IP13 and IP14 (CAR Report ID: CAR/BAE/19-003).
Table S1.4	Amended to include the MSUL/MSDL submitted in response to IP13. This is documented in our CAR Report ID: CAR/BAE/19-003.
Table S3.1	Amended to update the continuous monitoring standard from BS EN 15267-3 to BS EN 14181, in accordance with our permit template. Refer to CAR report ID: CAR/BAE/19-005.
	Amended to add air emission points A4 and A5 for the D14 powerhouse.
	Amended the monitoring method for particulate matter at emission point A10 from BS EN 13284-2 to BS EN 13284-1, consistent with our technical guidance note M2, for monitoring of stack emissions to air.
Table S3.1a	Added air emission points A4 and A5 for the D14 powerhouse.
Table S3.2	Monitoring methods amended as follows:
	pH amended from BS6068-2.50 — to BS ISO 10523
	cadmium amended from BS6068-2.89 — to BS EN ISO 11885 or EN ISO 17294-2
	mercury amended from BS EN 13500 — to EN ISO 12846 or EN ISO 17852
	The SMITE hot water discharge incident (see CAR-BAE-18-002) showed that significant debris was located around the drain leading to W4. As such we questioned whether total suspended

Permit condition/ table	Comments
	solids may be a relevant monitoring parameter to apply to this emission point. The Operator confirmed that the route to W4 passes through a number of chambers allowing for settlement. Sampling from the outfall of the interceptor may also be problematic as it is below ground level in a pit with no safe access. We questioned this, as the oil in water detector installed at this location is accessible for maintenance. We have added the requirement to monitor suspended solids quarterly to ensure that the necessary controls are in place to minimise the releases at emission point W4. W3 is not an actual discharge point. The Operator confirmed that the point of discharge is shared with a number of site surface drains as well as the RO plant and W4. The location in the permit for W4 enables monitoring of the characteristics of the process water prior to discharge.
Condition 4.2.2 and table S4.2	Condition amended to remove the sub paragraph for annual production/treatment data, which refers to table S4.2. This table contains no parameters and is deleted.

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

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

Aspect considered	Decision
Receipt of application	
Confidential information	A claim for commercial or industrial confidentiality has not been made.
Identifying confidential information	We have not identified information provided as part of the application that we consider to be confidential.
The site	
Extent of the site of the facility	The Operator has provided plans which we consider are satisfactory, showing the extent of the site of the facility. The plan is included in the permit.
Biodiversity, heritage, landscape and nature conservation	The application is within the relevant distance criteria of a site of heritage, landscape or nature conservation, and/or protected species or habitat. A full assessment of the application and its potential to affect the sites/species/habitat has not been carried out as part of the permit review process. We consider that the review will not affect the features of the sites/species/habitat as the conditions will provide at least the same level of protection as those in the previous permit and in some cases will provide a higher level of protection to those in the previous permit. 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

Aspect considered	Decision
	compared these with the relevant guidance notes. The permit conditions ensure compliance with the relevant BREF and BAT Conclusions. The ELVs deliver compliance with the BAT-AELs.
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 in the regulation 61 response, we do not consider that we need to impose an improvement programme. We have removed the completed improvement conditions from the permit.
Emission limits	We have decided that emission limits should be set for the parameters listed in the permit. These are described in the relevant BAT Conclusions in Sections 4.1 and 5 of this document. It is considered that the ELVs described above will ensure that significant pollution of the environment is prevented and a high level of protection for the environment is secured.
Monitoring	We have decided that monitoring should be carried out for the parameters listed in the permit, using the methods detailed and to the frequencies specified. These are described in the relevant BAT Conclusions in Section 5 of this document.

Aspect considered	Decision
	Table S3.4 Process monitoring requirements was added to include the requirement to monitor energy efficiency after overhauls on site in line with BAT Conclusion 2. Based on the information in the application we are satisfied that the Operator's techniques, personnel and equipment have either MCERTS certification or MCERTS accreditation as appropriate.
Reporting	We have specified reporting in the permit for the following parameters: • Nitrogen dioxide • Carbon monoxide • Sulphur dioxide • Dust 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."

Aspect considered	Decision
	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.