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/FP3137CG
The Operator is: Lynemouth Power Limited
The Installation is: Lynemouth Power Station
This Variation Notice number is: EPR/FP3137CG/V009

Consultation commences on: 30 May 2019
Consultation ends on: 27 June 2019

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 draft decision document, which explains the reasoning for the consolidated variation notice that we are minded to issue.

It explains how we have reviewed and considered the techniques used by the Operator in the operation and control of the plant and activities of the installation. This review has been undertaken with reference to the decision made by the European Commission establishing best available techniques (BAT) conclusions ('BAT Conclusions') for 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.

The document is in draft at this stage, because we have yet to make a final decision. Before we make this decision we want to explain our thinking to the public and other interested parties, to give them a chance to understand that thinking and, if they wish, to make relevant representations to us. We will make our final decision only after carefully taking into account any relevant matter raised in the responses we receive. Our mind remains open at this stage: although we believe we have covered all the relevant issues and reached a reasonable conclusion, our ultimate decision could yet be affected by any information that is relevant to the issues we have to consider. However, unless we receive information that leads us to alter the conditions in the draft permit, we will issue the permit in its current form.

In this document where we say "we have decided", that gives the impression that our mind is already made up; but as we have explained above, we have not yet done so. The language we use enables this document to become the final decision document in due course with no more re-drafting than is absolutely necessary.

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-AEL	BAT Associated Emission Level
BAT-AEEL	BAT-associated energy efficiency levels
BATc	BAT conclusion
BREF	Best available techniques reference document
CEM	Continuous emissions monitor
CHP	Combined heat and power
CROW	Countryside and rights of way Act 2000
CV	Calorific value
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
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 2010 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
PC	Process Contribution
PEC	Predicted Environmental Concentration
PHE	Public Health England
PPS	Public participation statement
SAC	Special Area of Conservation
SGN	Sector guidance note
SO_2	Sulphur dioxide
TGN	Technical guidance note
TNP	Transitional National Plan
TOC	Total Organic Carbon
WFD	Water Framework Directive (2000/60/EC)

1 Our decision

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

As part of our decision we have decided to grant the Operator's request for a derogation from the requirements of BAT Conclusions 24 and 26 as identified in the LCP BAT Conclusions document. The way we assessed the Operator's derogation requests and how we subsequently arrived at our conclusion is recorded in Section 7 of this document.

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

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

2 How we reached our decision

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

We issued a Notice under Regulation 61(1) of the Environmental Permitting (England and Wales) Regulations 2016 (a Regulation 61 Notice) on 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 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 considered that the responses were in the correct form and contained sufficient information for us to begin our determination of the permit review but not that they necessarily contained all the information we would need to complete that review: we requested additional information, see below.

Description	Received
Regulation 61 Notice response	31 October 2018
Derogation request from BAT Conclusions 24 & 26	15 November 2018
BAT Conclusion 24 CBA clarification	05 December 2018
	17 December 2018
Updated CBA and supporting information for BAT Conclusions 24 & 26	11 January 2019
BAT Conclusion 26, annual average BAT AEL and operating costs	04 February 2019
Response to request for further information sent 12 March 2019 covering BAT Conclusions 2, 3, 4, 9, 24 & 25 and the BAT AEEL.	18 March 2019
List of air emission points	08 May 2019

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

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

In relation to BAT Conclusion 4, we agree with the Operator in respect to their current stated capability as recorded in their Regulation 61 Notice response and have set an improvement condition to ensure that the requirements are delivered by 17 August 2021. This is discussed in more detail in Annex 1.

2.3 Summary of how we considered the responses from public consultation

To be completed following consultation on the draft decision.

3 The legal framework

The consolidated variation notice will be issued, if appropriate, under Regulation 20 of the Environmental Permitting Regulations (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, if it is issued, 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 Overview of the site and installation

Lynemouth Power Station was commissioned in 1972, at which time it was designed to burn Northumberland coal and primarily provide power to a nearby aluminium smelter. With the closure of the smelter and the changes in coal fired plant economics, coal burning ceased in December 2015 to allow for the conversion of the plant to combust 100% biomass.

The power station is a LCP (referenced LCP418) comprising three boilers with a net thermal input of 1050 MW (3 x 350 MW) providing electricity to the National Grid. The boilers vent via multiple flues within a common windshield at emission points AU1, AU2 and AU3.

A LCP is defined as a combustion plant discharging waste gases through a common windshield, where the total thermal input is 50 MW or more.

Biomass pellets are burnt in each boiler. The high pressure steam produced drives three steam turbine generators. Each generator unit is capable of having an output of 140 MWe, for a total gross output of 420 MWe.

The detailed engineering design, contract placement and commencement of works for the conversion of the power station from coal to biomass feedstock was developed prior to the publication of the LCP Best Available Techniques Reference Document (BREF) and BAT Conclusions. Therefore, in view of uncertainty of the final applicable BAT AELs in the BREF at that time, the conversion project was designed to comply with the Emission Limit Values (ELVs) defined in Chapter III and Annex V of the IED.

The conversion required substantial changes to the original fuel handling and combustion systems; however building infrastructure, and major plant systems and components such as cooling water systems, boilers, turbines etc, have not been substantially modified from the existing plant, and as such, the plant is classed as an existing plant under the IED.

The furnaces are different from nearly all other utility-scale boilers in the UK. The original plant was not designed to be a utility-scale boiler, but to provide a customised amount of power to the smelter. The furnaces have been designed specifically around the parameters of local coal, which includes a narrow vertical combustion chamber with narrow spaces between elements. They have a very short residence time and are of a much smaller size than utility generators with fewer burners.

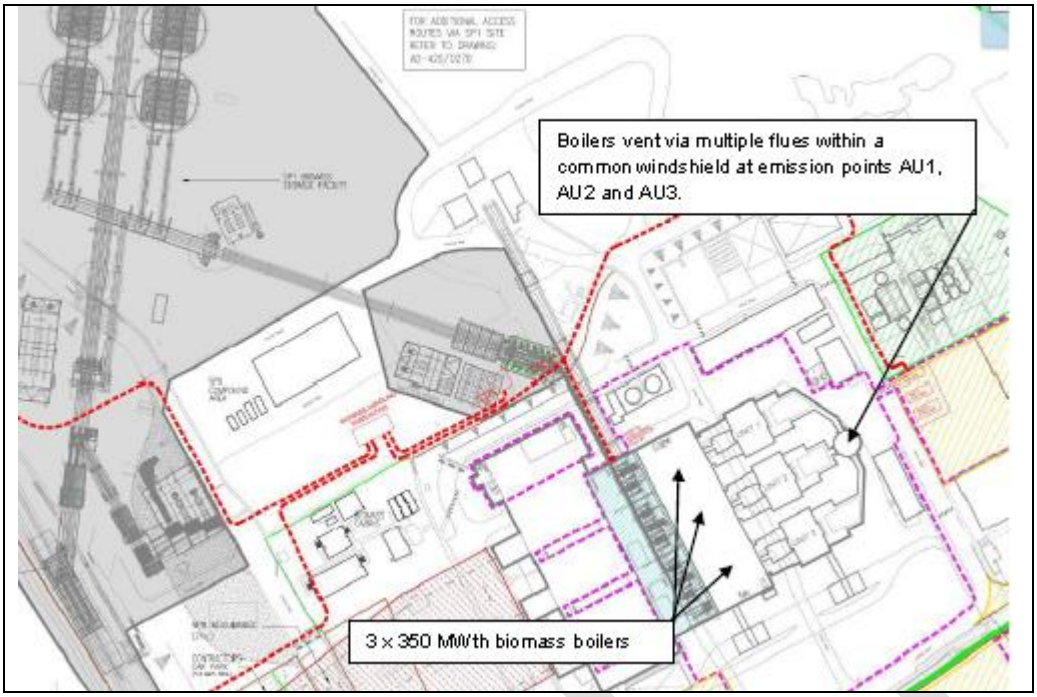
Additional primary and secondary measures were implemented to improve the efficiency of biomass combustion:

- Low NOx burners (primary)
- Boosted Over Fire Air (BOFA) (primary)
- Upgrading of existing electrostatic precipitators (ESPs) to improve control of dust (secondary).

At the time of submission of the Regulation 61 response, the biomass conversion project was in the combustion optimisation and performance guarantee testing phase. This was anticipated to be complete by June 2019 following which it would operate, providing electricity to the National Grid.

The biomass conversion project receives support under the governments Final Investment Decision Enabling for Renewables (FTDeR) Contract for Difference (CfD) scheme. The project economics and viability are based upon this scheme which is valid until March 2027. The March 2027 end date for the CfD contract does not require installation closure but introduces sufficient commercial and regulatory uncertainty to prevent investment decisions being made past that date.

LCP 418 biomass boilers configuration	
LCP 418	Three biomass boilers
Fuel	Biomass only
Compliance route	TNP (until 30 June 2020)
Operation	**Unlimited hours**
Thermal input MWth	1050 MWth (3 x 350 MWth)
Electrical output	140 MWe, total gross output of 420 MWe
Emission points	Boilers vent via multiple flues within a common windshield at emission points AU1, AU2 and AU3



5 The key issues

The key issues arising during this permit review are:

- The review and assessment of the derogation applications from meeting the relevant AELs for BAT Conclusions 24 and 26 detailed in Section 7 of this document.
- Emissions to air and the emission limits applied to the plant.
- The energy efficiency levels associated with the BAT-associated energy efficiency levels (BAT-AEELs).
- BAT 4 to monitor emissions to air.

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

5.1 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 to demonstrate that an alternative limit was more appropriate.

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

The emission limit values (ELVs) and AELs are based on the following operating regime:

- Unlimited hours operation

LCP 418 is in the Transitional National Plan (TNP). For this plant operating under the TNP, oxides of nitrogen (NOx), sulphur dioxide (SO_2) and dust ELVs were set which were derived for the period 01 January 2016 to 30 June 2020 (the duration of the TNP). At the end of this period both Annex V and the LCP BREF are applicable (whichever is stricter).

BAT Conclusion 24 NOx and BAT Conclusion 26 dust AELs are stricter and the Operator requested a derogation from meeting the AELs and compliance instead with IED Annex V ELVs. By the end of the TNP on 30 June 2020, as a minimum, plant must meet the limits set out in Annex V of the IED subject to BAT assessment and the principle of no backsliding.

The IED Annex V limits will apply for NOx and dust from the 01 July 2020 at the end of the TNP.

The following tables outline the limits that have been incorporated into the permit for LCP 418, where these were derived from, and the reference periods at which they apply. The emission limits and monitoring tables have been incorporated into Schedule 3 of the consolidated variation notice.

5.1.1 BAT Conclusion 24 NOx emission limits & indicative CO limits

We have set the NOx limits for biomass firing in accordance with Part 1 of Annex V (applicable to existing plant) of the IED, which will apply from 01 July 2020. The annual average BAT AEL limit reporting requirement will come into effect from 17 August 2021. Refer to Section 7 of this document for the detailed derogation assessment and explanation of the various limits.

NOx limits (mg/Nm^3) – corrected to 6% oxygen									
Averaging	**IED (Annex V Part 1) – Existing plant**	**BREF (Table 9 BAT-c) Footnotes (7) & (8)**	**Existing to 30 June 2020 TNP ELV**	**Operator interim limits**	**Permit limits from 01 July 2020 (after TNP) to 16 August 2021**	**Permit limits from 17 August 2021 (Note 1)**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**160**	**None**	**None**	**None**	**200**	Derogation from BREF	MSUL/MSDL to baseload	Continuous
Monthly	**200**	**None**	**450**	**IC19**	**200**	**200**	IED	MSUL/MSDL to baseload	
Daily	**220**	**200**	**550**	**IC19**	**220**	**220**	IED and Derogation from BREF	MSUL/MSDL to baseload	
95th %ile of hourly means	**400**	**None**	**None**	**IC19**	**400**	**400**	IED	MSUL/MSDL to baseload	
(7) The higher end of the BAT-AEL range is 160 mg/Nm^3 for plants put into operation no later than 7 January 2014. (8) The higher end of the BAT-AEL range is 200 mg/Nm^3 for plants put into operation no later than 7 January 2014. Note 1: We have set an improvement condition which will require a review of NOx emissions over the longer term to assess whether a lower limit could be set.									

The outcome of existing improvement condition IC 17 shall be used to determine an appropriate CO limit prior to the 17 August 2021 BAT Conclusions implementation date. If the Operator concludes that they cannot meet the indicative CO AEL based on the relationship with NOx, then this would need to be fully justified and an appropriate limit proposed.

CO limits (mg/Nm^3) – indicative in *italics* – corrected to 6% oxygen							
Averaging	**IED (Annex V Part 1) – Existing plant**	**BREF**	**Existing**	**Permit limits from 17 August 2021**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	***80***	**None**	***IC17***	BREF	MSUL/MSDL to baseload	Continuous
Monthly	**None**	**None**	**None**	**None**	NA	NA	NA
Daily	**None**	**None**	**None**	**None**	NA	NA	NA
95th %ile of hourly means	**None**	**None**	**None**	**None**	NA	NA	NA

5.1.2 BAT Conclusion 25 SO_2, HCl and HF emission limits

We have set the sulphur dioxide (SO_2) limits for biomass firing in accordance with Part 1 of Annex V (applicable to existing plant) of the IED, which will apply from 01 July 2020. The annual average BAT AEL limit will apply from 17 August 2021.
We have set the sulphur dioxide (SO_2) limits for biomass firing in accordance with Table 10 of the BAT Conclusion.

SO_2 limits (mg/Nm^3) – corrected to 6% oxygen								
Averaging	**IED (Annex V Part 1) – Existing plant**	**BREF**	**Existing to 30 June 2020 TNP ELV**	**Permit limits from 01 July 2020 (after TNP) to 16 August 2021**	**Permit limits from 17 August 2021**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**50**	**None**	**None**	**50**	BREF	MSUL/MSDL to baseload	Continuous
Monthly	**200**	**None**	**350**	**200**	**200**	IED	MSUL/MSDL to baseload	
Daily	**220**	**85**	**None**	**220**	**85**	BREF	MSUL/MSDL to baseload	
95th %ile of hr means	**400**	**None**	**None**	**400**	**400**	IED	MSUL/MSDL to baseload	
95th %ile of daily means	**None**	**None**	**440**	**None**	**None**	NA	NA	

We have set the hydrogen chloride (HCl) and hydrogen fluoride (HF) limits for biomass firing in accordance with Table 11 of the BAT Conclusion.

HCl limits (mg/Nm^3) – corrected to 6% oxygen							
Averaging	**IED (Annex V Part 1) – Existing plant**	**BREF**	**Existing**	**Permit limits from 17 August 2021**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**5**	**None**	**5**	BREF	MSUL/MSDL to baseload	Footnote 13
Monthly	**None**	**None**	**None**	**None**	NA	NA	
Daily	**None**	**12**	**None**	**12**	BREF	MSUL/MSDL to baseload	
(13) BAT Conclusion 4 confirms that if the emission levels are proven to be sufficiently stable, periodic measurements may be carried out each time that a change of the fuel and/or waste characteristics may have an impact on the emissions, but in any case at least once every six months.							

We have set an improvement condition to determine the applicability of footnote 13 in accordance with BAT Conclusion 4.

HF limits (mg/Nm^3) – corrected to 6% oxygen							
Averaging	**IED (Annex V Part 1) – Existing plant**	**BREF**	**Existing**	**Permit limits from 17 August 2021**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**None**	**None**	**None**	NA	NA	NA
Monthly	**None**	**None**	**None**	**None**	NA	NA	NA
Daily	**None**	**None**	**None**	**None**	NA	NA	NA
Average over sampling period	**None**	**<1**	**None**	**<1**	BREF	MSUL/MSDL to baseload	Annually

5.1.3 BAT Conclusion 26 dust emission limits

We have set the dust limits for biomass firing in accordance with Part 1 of Annex V (applicable to existing plant) of the IED, which will apply from 01 July 2020. The annual average BAT AEL limit reporting requirement will come into effect from 17 August 2021. Refer to Section 7 of this document for the detailed derogation assessment and explanation of the various limits.

Dust limits (mg/Nm^3) – corrected to 6% oxygen									
Averaging	**IED (Annex V Part 1) – Existing plant**	**BREF (Table 12 BAT-c)**	**Existing to 30 June 2020 TNP ELV**	**Operator interim limits**	**Permit limits from 01 July 2020 (after TNP) to 16 August 2021**	**Permit limits from 17 August 2021 (Note 1)**	**Basis**	**Limits apply**	**Monitoring**
Annual	**None**	**10**	**None**	**None**	**None**	**20**	Derogation from BREF	MSUL/MSDL to baseload	Continuous
Monthly	**20**	**None**	**35**	**IC19**	**20**	**20**	IED	MSUL/MSDL to baseload	
Daily	**22**	**16**	**42**	**IC19**	**22**	**22**	IED and Derogation from BREF	MSUL/MSDL to baseload	
95th %ile of hourly means	**40**	**None**	**None**	**IC19**	**40**	**40**	IED	MSUL/MSDL to baseload	
Note 1: We have set an improvement condition which will require a review of dust emissions over the longer term to assess whether a lower limit could be set.									

5.1.4 BAT Conclusion 27 mercury emission limits

We have set the mercury (Hg) limit for biomass firing at 5 µg/Nm^3 (average over the sampling period), in accordance with the BAT Conclusion. The monitoring frequency is annually; however if the emission levels are proven to be sufficiently stable due to the low mercury content in the fuel, periodic measurements may be carried out only each time that a change of the fuel characteristics may have an impact on the emissions. This is set out in a footnote to table S3.1b.

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

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

The table below sets out the AEELs specified in the BAT Conclusions for the LCP on the site and the energy efficiency levels confirmed through the Regulation 61 notice response. The evidence required to demonstrate that the AEELs will be met will be provided in response to existing permit improvement condition IC17, see Section 6 below.

BAT AEELs (%)	
Net electrical efficiency **28 - 38**	**Net total fuel utilisation** **NA-plant generating electricity only**
LCP 418: for the combustion of solid biomass	
Refer to Section 6 below	**NA**

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

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 Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
General			
1	**In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features:** i. commitment of the management, including senior management; ii. definition of an environmental policy that includes the continuous improvement of the installation by the management; iii. planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment; iv. implementation of procedures (a) Structure and responsibility (b) Training (c) Communication (d) Employee involvement (e) Documentation (f) Efficient process control (g) Maintenance programmes (h) Emergency preparedness and response (i) Safeguarding compliance with environmental legislation v. checking performance and taking corrective action, paying particular attention to: (a) monitoring and measurement (see also the Reference Document on the General Principles of Monitoring) (b) corrective and preventive action (c) maintenance of records (d) independent (where practicable) internal and external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; vi. review of the EMS and its continuing suitability, adequacy and effectiveness by senior management; vii. following the development of cleaner technologies; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life;	FC	The Operator confirmed the following: That they maintain a management system that is certified to ISO14001:2015 (EMS 589158) and ISO50001:2011 (ENMS 622968), in addition to OHSAS 18001:2007. The management system complies with the full requirements of BAT. **i to vi** The general requirements of BAT 1 (**i-vi**) are met through implementation of the EMS to ISO14001:2015. Specific BAT requirements are met as follows: **(vii) Following the development of cleaner technologies** - Additional EMS process required to document this requirement. **(viii) Consideration of environmental impacts from eventual decommissioning** - Additional EMS process required to document this requirement. **(ix) Application of sectoral benchmarking on a regular basis** - Additional EMS process required to document this requirement. **(x) QA/QC programmes for fuels** - Solid and liquid fuel contracts including specifications and reject limits, sampling and analysis programmes, fuel management system (FMS) (also see BAT Conclusion 9) **(xi) Management of emissions during other than normal operating conditions (OTNOC)** - EMS procedures LPLDOC-108-44 to LPLDOC-108-47 (also see BAT Conclusions 10 & 11) **(xii) Waste management plan** - LPLDOC-108-13 (also see BAT Conclusion 16) **(xiii) Systematic method to identify and manage potential uncontrolled and/or unplanned emissions to the environment** - EMS procedure LPLDOC-108-91

BAT C Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	ix. application of sectoral benchmarking on a regular basis. Etc - see BAT Conclusions **Applicability**. The scope (e.g. level of detail) and nature of the EMS (e.g. standardised or non-standardised) will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have.		(**xiv) Dust management plan** - EMS procedure LPLDOC-108-85 **(xv) Noise management plan** - EMS procedure LPLDOC-108-64 **(xvi) Odour management plan** - Not considered necessary following risk assessment (Register of aspects and impacts) The Operator confirm that they will be compliant by 31 July 2021. Additional procedures are required to comply with features vii to ix. We agree with the Operator's stated compliance.
2	BAT is to determine the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the gasification, IGCC and/or combustion units by carrying out a performance test at full load (1), according to EN standards, after the commissioning of the unit and after each modification that could significantly affect the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the unit. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	FC	The Operator confirmed the following: Boiler efficiency testing at full load will be carried out during performance guarantee testing following conversion of the power station from coal to biomass firing. For the same period sent out efficiency will be determined from the boiler efficiency, as determined above, and the turbine heat rate which is a calculated value. The turbine heat rate is determined using measured steam conditions, generator output and electrical export which utilises calibrated electrical metering complying with Ofgem requirements. Testing will be in accordance with EPR/FP3137CG pre-operational condition PO05 and the results are to be reported through existing permit improvement condition IC17. The projected efficiency meets the BAT-AEEL. They also confirmed the following in the additional information received 18 March 2019: Boiler performance testing will be carried out during commissioning acceptance tests in accordance with EN 12952-15, with the efficiency being calculated using the methodology prescribed within the same standard. The testing will be undertaken at maximum continuous rating (MCR).

<table>
<tr><th>BAT C Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>The steam turbines were not subject to significant modification during the biomass conversion project/ maintenance outage and therefore, in view of the significant cost of steam cycle testing (est. >£50,000 per unit), it is proposed that the steam cycle efficiency will be determined using the calculated gross efficiency with the boiler efficiency determined in accordance with EN 12952-15, as stated above.

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>Flue-gas</td><td>Flow</td><td>Periodic or continuous determination</td></tr>
<tr><td rowspan="2"></td><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 the following:

The following relevant process parameters are monitored/ determined in compliance with BAT:

Flue-gas:
Flow - Calculated (hourly average)
Oxygen (O_2) content - Continuous (ABB AZ20 CEMS, Certificate No. Sira MC 110191/03)
Water vapour content and pressure - Continuous emissions monitor (Procal P200, Certificate No.Sira MC 050060/07)
Temperature - Thermocouple

They also confirmed the following in the additional information received 18 March 2019:

• Flue gas flow is calculated in accordance with EN ISO 16911 Part 1 (Annex E) as prescribed through the permit referenced in guidance document 'Electricity Supply Industry – IED Compliance Protocol for Utility Boilers and Gas Turbines (Update December 2015), JEP. They determine hourly averaged normalised flows for each generating unit using metered generation data (MWe). The calculated monthly gross net net efficiency for that unit and a fuel factor specific to wood biomass fuels.

• Flue gas temperature is continuously measured at the CEMS sampling plane using a thermocouple. Data from the thermocouple is directly captured by the MCERTS certified data acquisition system (Envirosoft CEMSuite) for use</td></tr>
</table>

<table>
<tr><th>BAT C Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>in normalisation calculations.

Waste water from flue-gas treatment:
Not applicable. No wet flue-gas treatment installed.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td>4</td><td>BAT is to monitor emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.
<table>
<tr><th>Substance/ Parameter</th><th>Fuel/Process/Type of combustion plant</th><th>Combustion plant total rated thermal input</th><th>Standard(s) [4]</th><th>Minimum monitoring frequency [5]</th><th>Monitoring associated with</th></tr>
<tr><td>NH_3</td><td>— When SCR and/or SNCR is used</td><td>All sizes</td><td>Generic EN standards</td><td>Continuous [6] [7]</td><td>BAT 7</td></tr>
<tr><td>NO_X</td><td>— Coal and/or lignite including waste co-incineration
— Solid biomass and/or peat including waste co-incineration
— HFO- and/or gas-oil-fired boilers and engines</td><td>All sizes</td><td>Generic EN standards</td><td>Continuous [6] [8]</td><td>BAT 20
BAT 24
BAT 28
BAT 32
BAT 37
BAT 41
BAT 42
BAT 43
BAT 47
BAT 48
BAT 56
BAT 64
BAT 65
BAT 73</td></tr>
</table></td><td>FC</td><td>The Operator confirmed the following:

Monitoring of the following parameters for emissions to air apply to solid biomass combustion plant:

NOx - Continuous emissions monitor (Procal P200, Certificate No.Sira MC 050060/07).

CO - Continuous emissions monitor (Procal P200, Certificate No.Sira MC 050060/07)

SO_2 - Continuous emissions monitor (Procal P200, Certificate No.Sira MC 050060/07)

HCl - Continuous emissions monitor not currently installed. Assessment of fuel chlorine content has commenced through analysis of monthly composite fuel samples, combined with twice yearly sampling using FTIR to EA TGG M22 (MCERTS stack test laboratory).

The Operator has questioned whether CEMS are required with reference to the applicability of footnote (13):

(13) If the emission levels are proven to be sufficiently stable, periodic measurements may be carried out each time that a change of the fuel and/or waste characteristics may have an impact on the emissions, but in any case at least once every six months

We have set an improvement condition to determine the applicability of footnote (13).</td></tr>
</table>

BAT C Number	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		— 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						**HF** - Annually, FTIR to EA TGG M22 (MCERTS stack test laboratory) **Dust** - Continuous emissions monitor (SICK C200, Certificate No.Sira MC 090150/00), EN 13284-1 & 13284-2 **Metals and metalloids except mercury** (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Se, Tl, V, Zn) - Annually (EN 14385) (MCERTS stack test laboratory) **Hg** - Currently carried out in accordance with EA MID14385 which allows test houses to utilise the same sampling train as used for the EN 14385 test for mercury (where the test house has accreditation to EN 13211 and can follow the full requirements of MID 14385 to combine the sample trains). If this application of MID 13211 through MID 14385 for the testing of mercury is no longer supported by the Environment Agency then the Operator commits to carry out separate testing to EN 13211. Permit condition 3.5.3 provides provision for alternative equivalent methods. Footnote 19 to the table makes an allowance for reduced monitoring where the emission levels are proven to be sufficiently stable due to the low mercury content in the fuel. Periodic measurements may be carried out only each time that a change of the fuel characteristics may have an impact on the emissions. The consolidated variation notice includes provision for this, footnote to Table S3.1b. Table S2.1 of the consolidated variation notice also includes a limit for the mercury content of the fuel in accordance with the fuel contract specification. **NH_3, N_2O, SO_3, TVOC, formaldehyde, CH4 and PCDD/F** Monitoring of these emissions are not applicable. We agree with the Operator's stated compliance.
		— Combustion plants on offshore platforms	All sizes	EN 14792	Once every year [9]	BAT 53		
	N_2O	— Coal and/or lignite in circulating fluidised bed boilers — Solid biomass and/or peat in circulating fluidised bed boilers	All sizes	EN 21258	Once every year [10]	BAT 20 BAT 24		
	CO	— Coal and/or lignite including waste co-incineration — Solid biomass	All sizes	Generic EN standards	Continuous [6] [8]	BAT 20 BAT 24 BAT 28 BAT 33 BAT 38 BAT 44 BAT 49 BAT 56		

BAT C Number	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		— and/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 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	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 Number	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		— gas-oil-fired boilers — HFO- and/or gas-oil-fired engines — Gas-oil-fired gas turbines — Iron and steel process gases — Process fuels from the chemical industry in boilers — IGCC plants						
	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	All sizes	No EN standard available	Once every three months (6) (13) (14)	BAT 21 BAT 57		

BAT C Number	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		— from the chemical industry in boilers						
		— Solid biomass and/or peat	All sizes	No EN standard available	Once every year	BAT 25		
		— Waste co-incineration	All sizes	Generic EN standards	Continuous ([6]) ([16])	BAT 66 BAT 67		
	Dust	— Coal and/or lignite — Solid biomass and/or peat — HFO- and/or gas-oil-fired boilers — Iron and steel process gases — Process fuels from the chemical industry in boilers — IGCC plants — HFO- and/or gas-oil-fired engines — Gas-oil-fired gas turbines	All sizes	Generic EN standards and EN 13284-1 and EN 13284-2	Continuous ([6]) ([17])	BAT 22 BAT 26 BAT 30 BAT 35 BAT 39 BAT 51 BAT 58 BAT 75		
		— Waste co-incineration	All sizes	Generic EN standards and	Continuous	BAT 68 BAT 69		

BAT C Number	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
				EN 13284-2				
	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		

BAT C Number	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		— Waste co-incineration with solid biomass and/or peat	All sizes	EN 13211	Once every three months (13)	BAT 70		
		— IGCC plants	≥ 100 M W_{th}	EN 13211	Once every year (23)	BAT 75		
	TVOC	— HFO- and/or gas-oil-fired engines — Process fuels from chemical industry in boilers	All sizes	EN 12619	Once every six months (13)	BAT 33 BAT 59		
		— Waste co-incineration with coal, lignite, solid biomass and/or peat	All sizes	Generic EN standards	Continuous	BAT 71		
	Formaldehyde	— Natural-gas in spark-ignited lean-burn gas and dual fuel engines	All sizes	No EN standard available	Once every year	BAT 45		
	CH_4	— Natural-gas-fired engines	All sizes	EN ISO 25139	Once every year (24)	BAT 45		
	PCDD/F	— Process fuels from chemical industry in boilers — Waste co-incineration	All sizes	EN 1948-1, EN 1948-2, EN 1948-3	Once every six months (13) (25)	BAT 59 BAT 71		

<table>
<tr><th>BAT C Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td>5</td><td>BAT is to monitor emissions to water from flue-gas treatment with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.
<table>
<tr><th colspan="2">Substance/Parameter</th><th>Standard(s)</th><th>Minimum monitoring frequency</th><th>Monitoring associated with</th></tr>
<tr><td colspan="2">Total organic carbon (TOC) (26)</td><td>EN 1484</td><td rowspan="14">Once every month</td><td rowspan="13">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="8">Metals and metalloids</td><td>As</td><td rowspan="7">Various EN standards available (e.g. EN ISO 11885 or EN ISO 17294-2)</td></tr>
<tr><td>Cd</td></tr>
<tr><td>Cr</td></tr>
<tr><td>Cu</td></tr>
<tr><td>Ni</td></tr>
<tr><td>Pb</td></tr>
<tr><td>Zn</td></tr>
<tr><td>Hg</td><td>Various EN standards available (e.g. EN ISO 12846 or EN ISO 17852)</td></tr>
<tr><td colspan="2">Chloride (Cl^-)</td><td>Various EN standards available (e.g. EN ISO 10304-1 or EN ISO 15682)</td><td>—</td></tr>
</table></td><td>NA</td><td>The Operator confirmed the following:

Wet flue-gas treatment is not applied at the installation and as such there are no related emissions to water.

We agree this BAT Conclusion isn't applicable to the activities carried out at the installation.</td></tr>
</table>

<table>
<tr><th>BAT C Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td><table><tr><td>Total nitrogen</td><td>EN 12260</td><td></td><td>—</td></tr></table></td><td></td><td></td></tr>
<tr><td>6</td><td>In order to improve the general environmental performance of combustion plants and to reduce emissions to air of CO and unburnt substances, BAT is to ensure optimised combustion and to use an appropriate combination of the techniques given below.<table><tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr><tr><td>a.</td><td>Fuel blending and mixing</td><td>Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type</td><td rowspan="2">Generally applicable</td></tr><tr><td>b.</td><td>Maintenance of the combustion system</td><td>Regular planned maintenance according to suppliers' recommendations</td></tr><tr><td>c.</td><td>Advanced control system</td><td>See description in Section 8.1</td><td>The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system</td></tr><tr><td>d.</td><td>Good design of the combustion equipment</td><td>Good design of furnace, combustion chambers, burners and associated devices</td><td>Generally applicable to new combustion plants</td></tr><tr><td>e.</td><td>Fuel choice</td><td>Select or switch totally or partially to another fuel(s) with a better environmental profile (e.g. with low sulphur and/or mercury content) amongst the available fuels, including in start-up situations or when back-up fuels are used</td><td>Applicable within the constraints associated with the availability of suitable types of fuel with a better environmental profile as a whole, which may be impacted by the energy policy of the Member State, or by the integrated site's fuel balance in the case of combustion of industrial</td></tr></table></td><td>CC</td><td>The Operator confirmed the following:

That they are compliant with the requirements through a combination of techniques, as set out below:

a. Fuel blending and mixing - Blending of different biomass wood pellet supplies will be carried out at site using the biomass fuel handling system, as required.

b. Maintenance of combustion system - Maintenance is carried out to the supplier's recommendations on a planned basis using the Operator’s maintenance planning and maintenance outage system.

c. Advanced control systems - Within the constraints imposed by the existing plant and equipment, upgrades have been made to controls systems, including the introduction of a distributed control system (DCS) to achieve efficient combustion and comply with IED Annex V ELVs as a minimum.

d. Good design of combustion equipment - Within the constraints imposed by the existing infrastructure, upgrades have been made to the combustion equipment through the introduction of a new DCS to achieve efficient combustion and IED Annex V ELVs as a minimum. Parameters accounted for in the DCS control loop include the following:
- combustion air inlet temperature (Primary air (PA), forced draft (FD) and boosted overfire air (BOFA));
- temperature compensated combustion airflow PA, FD and BOFA;
- flue-gas oxygen content (economiser outlet);
- fuel feeding (gravimetric feeders to pulverised fuel mills);
- steam pressures in the whole steam network (boiler output steam pressure);
- air to fuel ratio at pulverised fuel outlet.

e. Fuel choice - The LCP ceased coal-firing during December 2015 and was permanently converted to 100% biomass-firing over the period 2016 to 2018. The change in fuel has enabled a significant reduction in the emissions of SO_2, NOx and dust. Processed fuel oil (PFO) used as a start-up fuel has been changed to cleaner-burning gas oil as a component of the biomass conversion project.</td></tr>
</table>

BAT C Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	process fuels. For existing combustion plants, the type of fuel chosen may be limited by the configuration and the design of the plant		We agree with the Operator's stated compliance.
7	In order to reduce emissions of ammonia to air from the use of selective catalytic reduction (SCR) and/or selective non-catalytic reduction (SNCR) for the abatement of NO_X emissions, BAT is to optimise the design and/or operation of SCR and/or SNCR (e.g. optimised reagent to NO_X ratio, homogeneous reagent distribution and optimum size of the reagent drops). **BAT-associated emission levels** The BAT-associated emission level (BAT-AEL) for emissions of NH_3 to air from the use of SCR and/or SNCR is < 3–10 mg/Nm^3 as a yearly average or average over the sampling period. The lower end of the range can be achieved when using SCR and the upper end of the range can be achieved when using SNCR without wet abatement techniques. In the case of plants combusting biomass and operating at variable loads as well as in the case of engines combusting HFO and/or gas oil, the higher end of the BAT-AEL range is 15 mg/Nm^3.	NA	The Operator confirmed the following: SCR and SCNR are not applied at the installation and therefore the NH_3 BAT-AEL is not applicable. We agree this BAT Conclusion isn't 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.	FC	The Operator confirmed the following: That at the time of submission, they were optimising the combustion and emissions performance of the converted power station. This process will be complete by 31 July 2021 i.e. it is anticipated that commissioning will be complete by June 2019. The BAT Conclusions compliance date is 17 August 2021. We agree with the Operator's stated compliance.
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):	CC	The Operator confirmed the following: **(i) Full characterisation of the fuel used including at least the parameters listed in BAT 9 and in accordance with EN standards** - All listed parameters are tested for under a standard fuel analysis suite using a UKAS accredited laboratory.

<table>
<tr><th>BAT C Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr>
<td></td>
<td>
(i) Initial full characterisation of the fuel used including at least the parameters listed below and in accordance with EN standards. ISO, national or other international standards may be used provided they ensure the provision of data of an equivalent scientific quality;
(ii) Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications. The frequency of testing and the parameters chosen from the table below are based on the variability of the fuel and an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed);
(iii) Subsequent adjustment of the plant settings as and when needed and practicable (e.g. integration of the fuel characterisation and control in the advanced control system (see description in Section 8.1)).
Description
Initial characterisation and regular testing of the fuel can be performed by the operator and/or the fuel supplier. If performed by the supplier, the full results are provided to the operator in the form of a product (fuel) supplier specification and/or guarantee.
<table>
<tr><th>Fuel(s)</th><th>Substances/Parameters subject to characterisation</th></tr>
<tr><td rowspan="2">Biomass/peat</td><td>— LHV
— moisture</td></tr>
<tr><td>— Ash
— C, Cl, F, N, S, K, Na
— Metals and metalloids (As, Cd, Cr, Cu, Hg, Pb, Zn)</td></tr>
<tr><td rowspan="3">Coal/lignite</td><td>— LHV
— Moisture
— Volatiles, ash, fixed carbon, C, H, N, O, S</td></tr>
<tr><td>— Br, Cl, F</td></tr>
<tr><td>— Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)</td></tr>
</table>
</td>
<td></td>
<td>
(ii) Regular testing of the fuel quality to check that it is consistent with initial characterisation and according to the plant specification - All biomass fuel shipments are tested at load port and on receipt at the Operator’s Port of Tyne biomass handling facility. Biomass fuel feed to the power station is sampled automatically using an automatic sampler which builds up a representative sample for daily, weekly and monthly composite analysis.

(iii) Subsequent adjustment of plant settings as and when needed and practicable - The control system is designed to allow combustion settings to be adjusted for variations in fuel characteristics (within the ranges reasonably expected under fuel supply contracts).

They also confirmed the following in the additional information received 18 March 2019:

Provision of fuel sampling and analysis procedures; method statements from the Ofgem accepted fuel management system, a requirement for the contract for difference (CfD) payments.

The biomass conversion project was designed to combust fuels meeting a particular specification only and therefore they do not have any specific procedures for operating the plant where the fuel has failed to meet specified limits. Within the accepted fuel specification the distributed control system (DCS) automatically accommodates for the natural variability of the fuels.

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

BAT C Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	HFO: — Ash; — C, S, N, Ni, V Gas oil: — Ash; — N, C, S Natural gas: — LHV; — CH_4, C_2H_6, C_3, C_4+, CO_2, N_2, Wobbe index Process fuels from the chemical industry (27): — Br, C, Cl, F, H, N, O, S; — Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn) Iron and steel process gases: — LHV, CH_4 (for COG), C_XH_Y (for COG), CO_2, H_2, N_2, total sulphur, dust, Wobbe index Waste (28): — LHV; — Moisture; — Volatiles, ash, Br, C, Cl, F, H, N, O, S; — Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)		
10	In order to reduce emissions to air and/or to water during other than normal operating conditions (OTNOC), BAT is to set up and implement a management plan as part of the environmental management system (see BAT 1), commensurate with the relevance of potential pollutant releases, that includes the following elements: — appropriate design of the systems considered relevant in causing OTNOC that may have an impact on emissions to air, water and/or soil (e.g. low-load design concepts for reducing the minimum start-up and shutdown loads for stable generation in gas turbines), — set-up and implementation of a specific preventive maintenance plan for these relevant systems, — review and recording of emissions caused by OTNOC and associated circumstances and implementation of corrective actions if necessary, — periodic assessment of the overall emissions during OTNOC (e.g. frequency of events, duration, emissions quantification/estimation) and	CC	The Operator confirmed the following: The installation is designed and operated as a base-load power station operating at maximum continuous rating (MCR) where conditions permit. The reasonably foreseeable OTNOC scenario is start-up and shut-down, the requirements for which are minimised by the base-load mode of operation, failure of emissions reduction equipment (e.g. BOFA or ESP system components) and by planned maintenance activities to reduce the amount of unplanned down-time. The management system includes the following BAT elements: **Appropriate design of systems relevant to OTNOC**: Documented site specific start-up and shut-down procedures incorporating manufacturers design requirements, including Unit Cold Start-procedure (LPLDOC-108-46); Unit Warm Start-up Procedure (LPLDOC-108-44); Unit Hot Start Procedure (LPLDOC-108-45) and Unit Controlled Shut-down Procedure

BAT C Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	implementation of corrective actions if necessary.		(LPLDOC-108-47). The current CEMS are considered suitable for the monitoring of stack emissions to air during start-up and shut-down. Under the CfD contract that the installation operates under, strict restrictions apply to the use of gas oil as a support fuel and all such use, e.g. for start-up and combustion stabilisation, must be recorded and reported to Ofgem. In the case of a sudden major combustion failure or the loss of critical instrumentation, the DCS automatically trips the combustion system resulting in a controlled shut-down. Management of variations in fuel quality is minimised by the upstream testing of fuels to demonstrate compliance with the fuel contract specification. However, any significant unexpected variation in fuel characteristics will be managed through the advanced control system, e.g. low or high excursions of fuel calorific value (CV). Other scenarios such as planned testing periods are dealt with on a case-by-case basis. **Set-up and implementation of specific preventative maintenance plan for these relevant systems** - Preventative maintenance systems apply to all critical and significant plant to minimise unplanned OTNOC and to ensure that the approaches summarised above can be implemented in the event of unplanned occurrences. **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) and implementation of corrective actions if necessary** - Releases to air during OTNOC are monitored using CEMS and captured within the environmental data acquisition system allowing quantification of emissions. Plant availability and generation are business key performance indicators (KPIs) and as such is subject to detailed monitoring and analysis, particularly for breakdowns, malfunctions and other unplanned events.

<table>
<tr><th>BAT C Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>We agree with the Operator’s stated compliance.</td></tr>
<tr><td>11</td><td>BAT is to appropriately monitor emissions to air and/or to water during OTNOC.
Description
The monitoring can be carried out by direct measurement of emissions or by monitoring of surrogate parameters if this proves to be of equal or better scientific quality than the direct measurement of emissions. Emissions during start-up and shutdown (SU/SD) may be assessed based on a detailed emission measurement carried out for a typical SU/SD procedure at least once every year, and using the results of this measurement to estimate the emissions for each and every SU/SD throughout the year.</td><td>CC</td><td>The Operator confirmed the following:

Emissions to air - The CEMS utilised for normal operations are considered suitable for the monitoring of releases of major combustion gases (SO_2, NOx and CO) and dust during OTNOC. Emissions of trace species are not considered to be significant given, under normal operation, the base-load generation and low levels of unplanned downtime of the power station.

Emissions to water - NA. No relevant emissions.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td>12</td><td>In order to increase the energy efficiency of combustion, gasification and/or IGCC units operated ≥ 1 500 h/yr, BAT is to use an appropriate combination of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Combustion optimisation</td><td>See description in Section 8.2. Optimising the combustion minimises the content of unburnt substances in the flue-gases and in solid combustion residues</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Optimisation of the working medium conditions</td><td>Operate at the highest possible pressure and temperature of the working medium gas or steam, within the constraints associated with, for example, the control of NO_X emissions or the characteristics of energy demanded</td><td></td></tr>
<tr><td>c.</td><td>Optimisation of the steam cycle</td><td>Operate with lower turbine exhaust pressure by utilisation of the lowest possible temperature of the condenser cooling water, within the design conditions</td><td></td></tr>
</table></td><td>CC</td><td>The Operator confirmed the following:

The installation achieves a high level of energy efficiency through the application of a combination of techniques, as detailed below:

a. Combustion optimisation - The biomass conversion project incorporates the installation of a new mill classifier design to improve pulverised fuel (PF) grind and quality, replaced PF pipework and trifurcators to improve fuel distribution, bespoke biomass low NOx burners (LNB), new induced draft (ID) and primary air (PA) fans, refurbished forced draft (FD) fans, introduction of a boosted over-fire air (BOFA) system, upgrades to the combustion control system including a new DCS, combustion optimisation during commissioning and normal operation, and replacement of the wet bottom with a dry furnace bottom.

b. Optimisation of the working medium conditions - Boiler modelling has been carried out to identify the maximum temperature and pressure that the surface heating surface area can achieve taking into account the boiler element materials of construction to determine the optimum superheater conditions. This has been integrated into boiler control systems.

c. Optimisation of the steam cycle - The condenser vacuum is continuously measured and displayed on the unit control desks as a key operational parameter. The DCS alarms if condenser pressure increases above a set-point. The installation uses low temperature seawater which enables low condenser pressures thereby maximising low pressure (LP) turbine cylinder efficiency.</td></tr>
</table>

BAT C Number	Summary of BAT Conclusion requirement				Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	d.	Minimisation of energy consumption	Minimising the internal energy consumption (e.g. greater efficiency of the feed-water pump)			**d. Minimisation of energy consumption** – Operation of an energy management system certified to ISO50001:2011 which supports the setting of objectives and targets related to energy efficiency including monitoring and analysing energy consumption and selection of energy efficient plant and techniques. **e**. **Pre-heating of combustion air** - Forced draft air is heated to approximately 270ºC utilising heat recovered from exhaust flue gas. **f. Fuel pre-heating** - Biomass fuels are effectively pre-heated and subject to further drying in the pulverised fuel mills. Additional pre-heating is not considered appropriate for the installation. **g. Advanced control systems** - Implemented as above. **h. Feed-water pre-heating using recovered heat** - The installation utilises three low pressure (LP) heaters to heat condensate to 120ºC using heat from the LP steam cycle and three high pressure (HP) heaters to heat feed-water to 230ºC utilising bled-steam from the LP and HP steam circuits. A new primary air (PA) cooler is used to control mill inlet air temperature and recovers heat to the condensate. **i. Heat recovery by co-generation (CHP)** – NA. Only applicable to CHP plants. **j. CHP readiness** - NA. Only applicable to new units when there is a realistic potential for the future use of heat in the vicinity of the unit. Further response due separately under existing permit improvement condition IC21. **k. Flue-gas condenser** - NA. Only applicable to CHP plants. **l. Heat accumulation** - NA. Only applicable to CHP plants. **m. Wet stack** - NA. Applicable to plant fitted with wet FGD. **n. Cooling tower discharge** - NA. Only applicable to units fitted with wet FGD and where the unit cooling system is a cooling tower. The installation utilises a once-through seawater cooling system.
	e.	Preheating of combustion air	Reuse of part of the heat recovered from the combustion flue-gas to preheat the air used in combustion	Generally applicable within the constraints related to the need to control NO_X emissions		
	f.	Fuel preheating	Preheating of fuel using recovered heat	Generally applicable within the constraints associated with the boiler design and the need to control NO_Xemissions		
	g.	Advanced control system	See description in Section 8.2. Computerised control of the main combustion parameters enables the combustion efficiency to be improved	Generally applicable to new units. The applicability to old units may be constrained by the need to retrofit the combustion system and/or control command system		
	h.	Feed-water preheating using recovered heat	Preheat water coming out of the steam condenser with recovered heat, before reusing it in the boiler	Only applicable to steam circuits and not to hot boilers. Applicability to existing units may be limited due to constraints associated with the plant configuration and the amount of recoverable heat		
	i.	Heat recovery by cogeneration (CHP)	Recovery of heat (mainly from the steam system) for producing hot water/steam to be used in industrial processes/activities or in a public network for district heating. Additional heat recovery is possible from: — flue-gas	Applicable within the constraints associated with the local heat and power demand. The applicability may be limited in the case of gas compressors with an unpredictable operational heat profile		

BAT C Number	Summary of BAT Conclusion requirement				Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
						o. Fuel pre-drying - Pelletised wood biomass fuels utilised with a contract specification maximum moisture/ water content of 10%. Further drying is achieved inherently through the fuel milling operation. **p. Minimisation of heat losses** - The furnace is fully lagged to minimise radiant thermal losses. The introduction of a dry furnace bottom reduces heat loss through quenching of slag. The PA cooler has further reduced furnace gas exit temperatures. **q. Advanced materials** - NA. Only applicable to new plant. **r. Steam turbine upgrades** - During 1999/ 2000 the LP and HP turbines were comprehensively replanted which, in addition to a number of other improvements, increased the installed generation capacity from 390 MW to 420 MW. **s. Supercritical and ultra-supercritical steam conditions** - N/A. Not considered applicable to existing plant of <600 MWth. We agree with the Operator's stated compliance.
			— grate cooling — circulating fluidised bed			
	j.	CHP readiness	See description in Section 8.2.	Only applicable to new units where there is a realistic potential for the future use of heat in the vicinity of the unit		
	k.	Flue-gas condenser	See description in Section 8.2.	Generally applicable to CHP units provided there is enough demand for low-temperature heat		
	l.	Heat accumulation	Heat accumulation storage in CHP mode	Only applicable to CHP plants. The applicability may be limited in the case of low heat load demand		
	m.	Wet stack	See description in Section 8.2.	Generally applicable to new and existing units fitted with wet FGD		
	n.	Cooling tower discharge	The release of emissions to air through a cooling tower and not via a dedicated stack	Only applicable to units fitted with wet FGD where reheating of the flue-gas is necessary before release, and where the unit cooling system is a cooling tower		
	o.	Fuel pre-drying	The reduction of fuel moisture content before combustion to improve combustion conditions	Applicable to the combustion of biomass and/or peat within the constraints associated with spontaneous combustion risks (e.g. the moisture content of peat is kept above 40 % throughout the delivery chain). The retrofit of existing plants may be restricted by the extra calorific value that can be obtained from the drying operation and by the		

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

			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

<table>
<tr><th>BAT C Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td><table><tr><td></td><td></td><td></td><td>in the case of certain biomasses</td></tr></table></td><td></td><td></td></tr>
<tr><td>13</td><td>In order to reduce water usage and the volume of contaminated waste water discharged, BAT is to use one or both of the techniques given below.<table><tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr><tr><td>a.</td><td>Water recycling</td><td>Residual aqueous streams, including run-off water, from the plant are reused for other purposes. The degree of recycling is limited by the quality requirements of the recipient water stream and the water balance of the plant</td><td>Not applicable to waste water from cooling systems when water treatment chemicals and/or high concentrations of salts from seawater are present</td></tr><tr><td>b.</td><td>Dry bottom ash handling</td><td>Dry, hot bottom ash falls from the furnace onto a mechanical conveyor 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 the following:

a. Water recycling - Retro-fitting water recycling systems is not considered practicable due to limitations imposed by the quality requirements of the recipient water streams. The condenser cooling water cycle utilises a once-through seawater system which is unsuitable for the majority of other applications with the exception of seawater used for fire-fighting purposes.

The most significant freshwater consumer is the demineralisation plant which treats municipal water to produce high purity demineralised water for the steam/water cycle. Previous rainwater recovery trials have encountered difficulties with concentrations of dust entrained in recovered rainwater thereby reducing the efficiency of the demineralisation plant.

Opportunities will continue to be explored but none have been identified as cost-effective. The priority is to minimise the use of municipal freshwater through prevention of losses and efficient use, e.g. prevention of losses through leaks.

Operation of the waste water treatment plant is solely for the treatment of domestic foul effluent. Surface water run-off remains separate from this effluent to reduce the discharged volumes of treated effluent.

b. Dry bottom ash handling - Technique applied. Legacy wet furnace bottom deasher systems retrofitted with dry bottom ash handling system during biomass conversion project.

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</td><td>CC</td><td>The Operator confirmed the following:

Uncontaminated surface run-off resulting from precipitation is discharged directly to the environment without mixing with effluent streams. Following retrofit of the dry furnace bottom systems and removal of coal stocks during the biomass conversion project, limited effluent sources now exist in the power station installation. There are no wet air emissions abatement systems.</td></tr>
</table>

<table>
<tr><th>BAT C Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>treatment.
Applicability
The applicability may be restricted in the case of existing plants due to the configuration of the drainage systems.</td><td></td><td>The power station utilises a once-through seawater cooling water system which requires no further treatment before discharge.

Drainage from process areas (boiler house and turbine hall internal drainage), including oily effluents, is segregated from other surface water run-off for treatment in a mechanical oil separator before discharge with the cooling water discharge.

Water discharged from the boiler water and steam circuits (with the exception of acid clean effluent) and demineralisation plant regeneration effluent are discharged with the seawater cooling discharge via the same route.

Ash handling systems are now fully dry, i.e. the legacy wet (FBA) deashers and ash (PFA) slurry transfer systems have been decommissioned and/or removed.

Operation of a biological (oxigest process) waste water treatment plant which is solely for the treatment of domestic foul effluent. Surface water run-off remains separate from this effluent to reduce the discharged volumes of treated effluent.

Surface water (run-off) drainage from non-process areas requires no treatment and is discharged directly to the environment.

Effluent from boiler chemical cleaning is removed from site for off-site treatment.

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.
<table>
<tr><th colspan="2">Technique</th><th>Typical pollutants prevented/abated</th><th>Applicability</th></tr>
<tr><td colspan="4">Primary techniques</td></tr>
<tr><td>a.</td><td>Optimised combustion (see</td><td>Organic compounds,</td><td>Generally applicable</td></tr>
</table></td><td>NA</td><td>The Operator confirmed the following:

The BAT Conclusion is not applicable as wet flue-gas treatment is not applied at the installation. There are no related emissions to water.

We agree this BAT Conclusion isn’t applicable to the activities carried out at the installation.</td></tr>
</table>

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

	BAT 6) and flue-gas treatment systems (e.g. SCR/SNCR, see BAT 7)	ammonia (NH_3)	
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,	Generally applicable

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

		sulphate (SO_4^{2-}), fluoride (F^-)	
m.	Sedimentation	Suspended solids	Generally applicable
n.	Stripping	Ammonia (NH_3)	Generally applicable

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

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

Substance/Parameter		BAT-AELs
		Daily average
Total organic carbon (TOC)		20–50 mg/l [30] [31] [32]
Chemical oxygen demand (COD)		60–150 mg/l [30] [31] [32]
Total suspended solids (TSS)		10–30 mg/l
Fluoride (F^-)		10–25 mg/l [32]
Sulphate (SO_4^{2-})		1,3–2,0 g/l [32] [33] [34] [35]
Sulphide (S^{2-}), easily released		0,1–0,2 mg/l [32]
Sulphite (SO_3^{2-})		1–20 mg/l [32]
Metals and metalloids	As	10–50 µg/l
	Cd	2–5 µg/l
	Cr	10–50 µg/l
	Cu	10–50 µg/l
	Hg	0,2–3 µg/l
	Ni	10–50 µg/l
	Pb	10–20 µg/l
	Zn	50–200 µg/l

16	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;	CC	The Operator confirmed the following: **a. Generation of gypsum as a by-product** - NA. FGD not installed **b. Recycling or recovery of residues in the construction sector** - Under the Quality protocol; pulverised fuel ash (PFA) and furnace bottom ash (FBA), pre-

<table>
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<tr><td></td><td>
b) waste preparation for reuse, e.g. according to the specific requested quality criteria;
c) waste recycling;
d) other waste recovery (e.g. energy recovery),
by implementing an appropriate combination of techniques such as:
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Generation of gypsum as a by-product</td><td>Quality optimisation of the calcium-based reaction residues generated by the wet FGD so that they can be used as a substitute for mined gypsum (e.g. as raw material in the plasterboard industry). The quality of limestone used in the wet FGD influences the purity of the gypsum produced</td><td>Generally applicable within the constraints associated with the required gypsum quality, the health requirements associated to each specific use, and by the market conditions</td></tr>
<tr><td>b.</td><td>Recycling or recovery of residues in the construction sector</td><td>Recycling or recovery of residues (e.g. from semi-dry desulphurisation processes, fly ash, bottom ash) as a construction material (e.g. in road building, to replace sand in concrete production, or in the cement industry)</td><td>Generally applicable within the constraints associated with the required material quality (e.g. physical properties, content of harmful substances) associated to each specific use, and by the market conditions</td></tr>
<tr><td>c.</td><td>Energy recovery by using waste in the fuel mix</td><td>The residual energy content of carbon-rich ash and sludges generated by the combustion of coal, lignite, heavy fuel oil, peat or biomass can be recovered for example by mixing with the fuel</td><td>Generally applicable where plants can accept waste in the fuel mix and are technically able to feed the fuels into the combustion chamber</td></tr>
<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</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>
2016 transferred all coal FBA off-site for recycling with opportunities for coal PFA recycling utilised when applicable. The balance of the PFA was disposed of in the on-site separate ash lagoon installation (EPR/FP3437CZ). The change from coal-to biomass-firing has resulted in a significant reduction in the quantity of ash generated due to the lower ash inherent in biomass fuels (<1.5% for wood) compared to coal (>10%).

The Operator is actively exploring opportunities for the cost-beneficial and legally compliant routes for the recycling of biomass PFA and FBA, but the market for wood ash is generally considered less mature than that for coal ash in view of the significantly differing characteristics and the constraints imposed by the required material quality for established coal ash markets. Until a commercially viable recycling route is identified the biomass ash is disposed of in Operator's on-site ash lagoon installation in such a way that future recovery for recycling is not precluded if opportunities arise.

c. Energy recovery by using waste in the fuel mix - The installation is designed and permitted to utilise only those wastes listed under the relevant exempt biomass codes (EWC 02 01 07 wastes from forestry and EWC 03 03 01 waste bark and wood).

d. Preparation of spent catalyst for reuse - NA. SCR not installed.

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

<table>
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<tr><td></td><td><table><tr><td></td><td></td><td>reuse is integrated in a catalyst management scheme</td><td></td></tr></table></td><td></td><td></td></tr>
<tr><td>17</td><td>In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below.<table><tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr><tr><td>a.</td><td>Operational measures</td><td>These include:
— improved inspection and maintenance of equipment
— closing of doors and windows of enclosed areas, if possible
— equipment operated by experienced staff
— avoidance of noisy activities at night, if possible
— provisions for noise control during maintenance activities</td><td>Generally applicable</td></tr><tr><td>b.</td><td>Low-noise equipment</td><td>This potentially includes compressors, pumps and disks</td><td>Generally applicable when the equipment is new or replaced</td></tr><tr><td>c.</td><td>Noise attenuation</td><td>Noise propagation can be reduced by inserting obstacles between the emitter and the receiver. Appropriate obstacles include protection walls, embankments and buildings</td><td>Generally applicable to new plants. In the case of existing plants, the insertion of obstacles may be restricted by lack of space</td></tr><tr><td>d.</td><td>Noise-control equipment</td><td>This includes:
— noise-reducers
— equipment insulation
— enclosure of noisy equipment
— soundproofing of buildings</td><td>The applicability may be restricted by lack of space</td></tr></table></td><td>CC</td><td>The Operator confirmed the following:

Within the constraints imposed by the existing plant, BAT is applied to minimise noise and vibration emissions. A full demonstration is to be reported under existing improvement condition IC18, including the results of noise surveys associated with the converted power station. However, the installation does not have a history of external nuisance noise complaints and noise is considered to be a low risk environmental aspect. In order to reduce noise emissions the combination of techniques described below is used:

a. Operational measures - The installation is typically characterised by base-load power and continuous noise levels. Exceptional activities including project and maintenance works are timed to avoid nuisance, particularly at night or weekends. All significant noise generating equipment is enclosed within buildings or using other similar local noise attenuation measures. Maintenance and operational measures include requirements to minimise noise generation. Periodic environmental and occupational noise monitoring is used to demonstrate compliance with the relevant compliance obligations.

b. Low-noise equipment – Operation of a 'buy-quiet' purchasing policy for new plant and equipment including specification requirements setting criteria for new equipment noise levels, requiring manufacturers to submit noise level specifications prior to equipment selection, and including the noise levels data in bid evaluations. This approach has been applied throughout the biomass conversion project with noise levels included in project contract performance guarantees.

c. Noise attenuation - In view of the results of periodic environmental noise surveys, including monitoring at sensitive receptors, and the lack of historical noise nuisance complaints, it has not been considered necessary to implement any additional noise attenuation measures.

d. Noise-control equipment - All significant noise generating equipment is enclosed within buildings or using other similar local noise attenuation measures such as equipment insulation.</td></tr>
</table>

<table>
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<tr><td></td><td>
<table>
<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>e. Appropriate location of equipment and buildings - NA. Existing plant. However, the installation is located a significant distance (ca. 1 km) from the nearest sensitive noise receptors.

We agree with the Operator’s stated compliance.</td></tr>
<tr><td>2.2.1 Table 8</td><td>BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of solid biomass and/or peat
<table>
<tr><th rowspan="3">Type of combustion unit</th><th colspan="4">BAT-AEELs [73] [74]</th></tr>
<tr><th colspan="2">Net electrical efficiency (%) [75]</th><th colspan="2">Net total fuel utilisation (%) [76] [77]</th></tr>
<tr><th>New unit [78]</th><th>Existing unit</th><th>New unit</th><th>Existing unit</th></tr>
<tr><td>Solid biomass and/or peat boiler</td><td>33,5–to > 38</td><td>28–38</td><td>73–99</td><td>73–99</td></tr>
</table>
</td><td>FC</td><td>The Operator confirmed the following:

See response to BAT 12 above for techniques applied.

Efficiency testing at full load will be carried out during performance guarantee testing following conversion of the power station from coal- to biomass-firing.

Testing will be in accordance with existing pre-operational condition PO05 and the results are to be reported through existing improvement condition IC17.

The predicted performance of the converted power station is 37.6% 'sent out' efficiency which is broadly comparable to the net electrical efficiency and therefore the Operator expect to be compliant with the BAT-AEEL.

Net total fuel utilisation BAT-AEELs do not apply as the installation generates electricity only. This is set out in footnote 5 of Table 8 in this BAT Conclusion.

They also confirmed the following in the additional information received 18 March 2019:

The following definitions are applied for efficiency:
• Gross Cycle Efficiency: A measure of the whole cycle efficiency without any allowance for auxiliary electrical demands or parasitic losses, i.e. (Electrical generation / Total energy input) * 100.
• Gross Net Net (GNN) Efficiency: Theoretical whole cycle efficiency value calculated by deducting measured auxiliary loads from generated power, i.e. ((Electrical Generation – Measured auxiliary load) / Total Energy Input) * 100
• Sent Out Efficiency: Whole cycle efficiency at the point of export to National</td></tr>
</table>

<table>
<tr><th>BAT C Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>Grid, including all auxiliary power demands and parasitic losses, e.g. transmission losses in overhead lines. Values are recorded at the main Grid Transformer LV terminals and corrected to include main grid transformer losses, i.e. (Grid transmission export / Total energy input) * 100

Therefore, ‘sent out’ efficiency is a more conservative measure for comparison with the BAT-AEEL.

We agree with the Operator’s stated compliance which will be verified by IC17.</td></tr>
<tr><td>24</td><td>In order to prevent or reduce NO_X emissions to air while limiting CO and N_2O emissions to air from the combustion of solid biomass and/or peat, 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>Combustion optimisation</td><td rowspan="5">See descriptions in Section 8.3</td><td rowspan="5">Generally applicable</td></tr>
<tr><td>b.</td><td>Low-NO_X burners (LNB)</td></tr>
<tr><td>c.</td><td>Air staging</td></tr>
<tr><td>d.</td><td>Fuel staging</td></tr>
<tr><td>e.</td><td>Flue-gas recirculation</td></tr>
<tr><td>f.</td><td>Selective non-catalytic reduction (SNCR)</td><td>See description in Section 8.3.
Can be applied with ‘slip’ SCR</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>
</table></td><td>NC</td><td>The Operator confirmed the following:

That they will not be compliant and a derogation from the NOx BAT AELs has been requested. Refer to Section 7 of this document for the detailed assessment.

A range of techniques are implemented at the installation to minimise emissions of NOx and CO to air. However, due to the technical characteristics of the existing installation, the Operator is requesting a derogation from the NOx BAT AELs.

The following techniques are implemented:
a. Combustion optimisation - Implemented as described above (BAT Conclusion 12).

b. Low-NOx burners (LNB) - Bespoke biomass LNB have been installed as an integral component of the biomass conversion project.

c. Air staging - A new boosted over-fire air (BOFA) system has been installed as an integral component of the biomass conversion project.

d. Fuel staging - Not implemented. Not considered applicable to the installation. Refer to Section 7 of this document for details.

e. Flue-gas recirculation - Not implemented. Not considered applicable at the installation. Refer to Section 7 of this document for details.

f. Selective non-catalytic reduction (SNCR) - Not implemented. Refer to Section 7 of this document for details.</td></tr>
</table>

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

			For existing combustion plants, applicable within the constraints associated with the required temperature window and residence time for the injected reactants
g.	Selective catalytic reduction (SCR)	See description in Section 8.3. The use of high-alkali fuels (e.g. straw) may require the SCR to be installed downstream of the dust abatement system	Not applicable to combustion plants operated < 500 h/yr. There may be economic restrictions for retrofitting existing combustion plants of < 300 MW_{th}. Not generally applicable to existing combustion plants of < 100 MW_{th}

BAT-associated emission levels (BAT-AELs) for NO_X emissions to air from the combustion of solid biomass and/or peat

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 (79)	New plant	Existing plant (80)
50–100	70–150 (81)	70–225 (82)	120–200 (83)	120–275 (84)
100–300	50–140	50–180	100–200	100–220
≥ 300	40–140	40–150 (85)	65–150	95–165 (86)

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

g. Selective catalytic reduction (SCR) - Not implemented. Refer to Section 7 of this document for details.

The achievable NOx performance of the converted installation is still to be demonstrated following completion of combustion optimisation and performance guarantee testing. This assessment must take into account the full range of biomass wood fuels that the installation is contracted to receive. The results of this assessment will be reported through existing improvement conditions IC17 & IC19. However, the design performance for the biomass conversion project is for NOx emissions to be compliant with the relevant IED Annex V ELVs as a minimum requirement.

NOx BAT-AEL:
Yearly average = 40-160 mg/Nm^3 (Note 7)
Daily average = 95 - 200 mg/Nm^3 (Note 8)

Footnotes 7 & 8 to Table 9 of this BAT Conclusion are applicable; i.e. For existing plant >300 MWth put into operation no later than 7 January 2014. The higher end of the BAT AEL range is 160 mg/Nm^3 (yearly average) and 200 mg/Nm^3 (daily average).

NOx limits have been set as detailed in Section 5.1.1 of this document.

CO indicative BAT-AEL:
Yearly average = 30-80 mg/Nm^3 for existing plant >300 MWth operated >1,500 hr/yr

The achievable CO performance of the converted installation is still to be demonstrated following completion of combustion optimisation and performance guarantee testing. This assessment must take into account the full range of biomass wood fuels that the installation is contracted to receive and the inter-relationship between NOx and CO emissions performance.

The results of this assessment will be provided through existing improvement conditions IC17 & IC19 once a representative CO emissions dataset is available.

The issue of CO emissions performance has already been raised in pre-

BAT C Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	be: — < 30–250 mg/Nm^3 for existing combustion plants of 50–100 MW_{th} operated ≥ 1 500 h/yr, or new combustion plants of 50–100 MW_{th}, — < 30–160 mg/Nm^3 for existing combustion plants of 100–300 MW_{th} operated ≥ 1 500 h/yr, or new combustion plants of 100–300 MW_{th}, — < 30–80 mg/Nm^3 for existing combustion plants of ≥ 300 MW_{th} operated ≥ 1 500 h/yr, or new combustion plants of ≥ 300 MW_{th}.		application discussions with the Environment Agency. Although in principle we will set indicative AELs, deviation from CO indicative emission levels may be accepted where an appropriate BAT assessment shows that the CO indicative emission level cannot be achieved when meeting mandatory NOx limits. It is also recognised that some older plant were not specifically designed to meet the current indicative CO levels. Such a deviation requires a BAT justification, which will be provided through existing improvement conditions IC17 & IC19. The Appraisal of BAT for NOx, Dust and CO, dated November 2018 and provided with the derogation application confirmed the following: CO emissions have an inverse relationship with NOx; if carbon monoxide emissions are reduced it is likely that NOx will increase. On coal to biomass conversions residence times are lower than other boiler types making them more sensitive to CO formation. The fluctuations in fuel characteristics can lead to deviations in mill and burner throughput. This makes achieving the correct local air to fuel ratios for both NOx and CO control difficult. This means that the plant will have high CO emissions if NOx emissions are to be kept as low as possible. NOx is considered to be a higher priority pollutant than CO as such emissions at the installation have been optimised for lower NOx emissions. There are no IED Annex V ELVs for CO. A CO limit has been set as detailed in Section 5.1.1 of this document. We agree with the Operator's stated compliance.
25	In order to prevent or reduce SO_X, HCl and HF emissions to air from the combustion of solid biomass and/or peat, BAT is to use one or a combination of the techniques given below. **Technique** | **Description** | **Applicability**	FC	The Operator confirmed the following: To a significant extent the emissions of SO_2, HCl and HF to air are dependent upon the concentrations of sulphur, chlorine and fluorine in the fuel with a quantity of these species remaining in the ash. The installation does not have any installed abatement specifically for these emissions and instead manages these

<table>
<tr><th>BAT C Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<tr><td>a.</td><td>Boiler sorbent injection (in-furnace or in-bed)</td><td rowspan="8">See descriptions in Section 8.4</td><td rowspan="7">Generally applicable</td></tr>
<tr><td>b.</td><td>Duct sorbent injection (DSI)</td></tr>
<tr><td>c.</td><td>Spray dry absorber (SDA)</td></tr>
<tr><td>d.</td><td>Circulating fluidised bed (CFB) dry scrubber</td></tr>
<tr><td>e.</td><td>Wet scrubbing</td></tr>
<tr><td>f.</td><td>Flue-gas condenser</td></tr>
<tr><td>g.</td><td>Wet flue-gas desulphurisation (wet FGD)</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</td></tr>
<tr><td>h.</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 combustion of solid biomass and/or peat
<table>
<tr><th rowspan="2">Combustion plant total rated thermal input (MW_{th})</th><th colspan="2">BAT-AELs for SO_2 (mg/Nm^3)</th></tr>
<tr><th>Yearly average</th><th>Daily average or average over the sampling period</th></tr>
</table>
</td><td></td><td>through fuel choice and limits on trace elements concentrations inherent in the wood biomass fuel.

a. Boiler sorbent injection (in-furnace or in-bed) - Not implemented. Not applicable.

b. Duct sorbent injection - Not implemented. Not applicable.

c. Spray dry absorber (SDA) - Not implemented. Not applicable.

d. Circulating fluidised bed (CFB) dry scrubber - Not implemented. Not applicable.

e. Wet scrubbing - Not implemented. Not applicable.

f. Flue-gas condenser - Not implemented. Not applicable.

g. Wet flue-gas desulphurisation (wet FGD) - Not implemented. Not applicable.

h. Fuel choice - Implemented through biomass fuel supply contracts.

Sulphur content 0.05% for deliveries through 30 September 2019 and 0.02% from and after 01 October 2019.

Chlorine content <0.01%.

No contractual limits for fuel fluorine content. Analysis of monthly composite fuel samples commenced June 2018.

<u>SO_2 emissions to air:</u>
The contractual limit on fuel sulphur content, applicable from 01/10/2019, is 0.02%. Using the JEP surrogate CEM method, this equates to an upper stack emission concentration of approximately 60 mg/Nm^3 at 100% of the measured value although this assumes that there is no fractionation of SOx into the PFA which would further reduce emissions. Further data is necessary to determine this, but current stack emissions measurements report values well below the upper BAT AEL range.</td></tr>
</table>

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

	New plant	Existing plant (87)	New plant	Existing plant (88)
< 100	15–70	15–100	30–175	30–215
100–300	< 10–50	< 10–70 (89)	< 20–85	< 20–175 (90)
≥ 300	< 10–35	< 10–50 (89)	< 20–70	< 20–85 (91)

BAT-associated emission levels (BAT-AELs) for HCl and HF emissions to air from the combustion of solid biomass and/or peat

Combustion plant total rated thermal input (MW_{th})	BAT-AELs for HCl (mg/Nm^3) (92) (93)				BAT-AELs for HF (mg/Nm^3)	
	Yearly average or average of samples obtained during one year		Daily average or average over the sampling period		Average over the sampling period	
	New plant	Existing plant (94) (95)	New plant	Existing plant (96)	New plant	Existing plant (96)
< 100	1–7	1–15	1–12	1–35	< 1	< 1,5
100–300	1–5	1–9	1–12	1–12	< 1	< 1
≥ 300	1–5	1–5	1–12	1–12	< 1	< 1

It is anticipated that compliance with the BAT AEL will be achieved, but this is still to be confirmed through further monitoring and analysis.

SO_2 BAT-AEL:
Yearly average < 10 - 50 mg/Nm^3
Daily average < 20-85 mg/Nm^3
Existing plant operated >1,500 hours/year

SO_2 limits have been set as detailed in Section 5.1.2 of this document.

HCl emissions to air:
The contractual limits on fuel chlorine content are 0.01%. Using the JEP surrogate CEM method, this equates to an upper stack emission concentration of approximately 16 mg/Nm^3 at 100% of the measured value.

Further data on actual chlorine content over the range of fuels is required but stack emissions testing to TGN M22 over the period 18 July 2018 – 15 August 2018 reported an average HCl concentration of 0.45 mg/Nm^3 with a maximum of 0.50 mg/Nm^3.

It is anticipated that compliance with the BAT AEL will be achieved, but this is still to be confirmed through further monitoring and analysis.

HCl BAT-AEL:
Yearly average = 1 - 5 mg/Nm^3
Daily average = 1 - 12 mg/Nm^3
Existing plant >300 MWth operated >1,500 h/yr

HCl limits have been set as detailed in Section 5.1.2 of this document.

HF emissions to air:
There are no contractual limits on fuel fluorine content and further data on actual fluorine content over the range of fuels is required to determine typical ranges and calculate maximum stack emission concentrations.

Stack emissions testing to TGN M22 over the period 18 July 2018 – 15 August 2018 reported an average HF concentration of 0.37 mg/Nm^3 with a maximum of

<table>
<tr><th>BAT C Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>0.41 mg/Nm^3.

It is anticipated that compliance with the BAT AEL will be achieved, but this is still to be confirmed through further monitoring and analysis.

<u>HF BAT-AEL</u>:
Average <1 mg/Nm^3 over sampling period.

HF limits have been set as detailed in Section 5.1.2 of this document.

They also confirmed the following in relation to the SO_2, HCl and HF emissions in the additional information received 18 March 2019:

Data is still being collected for SO_2, HCl and HF emissions performance; however they do not currently consider these substances to present a compliance risk. This is however based on a limited dataset so they suggest it is addressed by an improvement condition.

This information will be verified ahead of the BAT implementation date by existing improvement conditions IC 17 and IC 19.

The Operator’s stated compliance will be verified for SO_2, HCl and HF emissions prior to the BAT implementation date.

Also refer to Section 9 below and changes to table S2.1 of the consolidated variation notice.</td></tr>
<tr><td>26</td><td>In order to reduce dust and particulate-bound metal emissions to air from the combustion of solid biomass and/or peat, 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>See description in Section 8.5</td><td rowspan="3">Generally applicable</td></tr>
<tr><td>b.</td><td>Bag filter</td><td rowspan="2"></td></tr>
<tr><td>c</td><td>Dry or semi-</td><td>See descriptions</td></tr>
</table></td><td>NC</td><td>The Operator confirmed the following:

That they will not be compliant and a derogation from the dust BAT AELs has been requested. Refer to Section 7 of this document for the detailed assessment.

Significant reductions in emissions of dust have been achieved through the cessation of coal burning and the permanent conversion to biomass-firing. However a derogation from the BAT AEL for emissions of dust is requested on the basis of technical criteria.

The following relevant BAT techniques are applied at the Lynemouth installation:</td></tr>
</table>

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

.	dry FGD system	in Section 8.5 The techniques are mainly used for SO_X, HCl and/or HF control	
d.	Wet flue-gas desulphurisation (wet FGD)		See applicability in BAT 25
e.	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 solid biomass and/or peat

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 ([97])	New plant	Existing plant ([98])
< 100	2–5	2–15	2–10	2–22
100–300	2–5	2–12	2–10	2–18
≥ 300	2–5	2–10	2–10	2–16

a. Electrostatic precipitator (ESP) - Implemented including refurbishment and upgrades made during the biomass conversion project to improve capture efficiency for biomass PFA, i.e. introduction of new high frequency switched integrated rectifiers (SIR) and modifications to ESP hoppers to ensure free flow of PFA in to the ash collection system.

b. Bag filter - Not implemented. Not considered applicable to pulverised biomass combustion due to hazards associated with potentially high carbon in the ash.

c. Dry or semi-dry FGD system - Dust abatement considered a secondary benefit to SO_2 emissions reduction which is not required at the installation due to inherently low sulphur in biomass wood fuels.

d. Wet flue-gas desulphurisation (wet FGD) - As above for dry or semi-dry flue gas FGD.

e. Fuel choice - Implemented through biomass fuel supply contracts. Ash content <1.5% annual limit with rejection limit <2.0% individual consignment (EN 14775).

The achievable performance of the converted installation is still to be demonstrated following completion of performance guarantee testing. This will be reported through existing improvement conditions IC17 & IC19. However, the design performance for the biomass conversion project is for dust emissions < $20mg/Nm^3$, i.e. compliance with the IED Annex V ELVs as a minimum requirement.

Dust BAT-AEL:
Yearly average = 2 - 10 mg/Nm^3
Daily average = 2 - 16 mg/Nm^3
Existing plant >300 MWth operated > 1,500 hours/year

Dust limits have been set as detailed in Section 5.1.3 of this document.

We agree with the Operator's stated compliance.

Also refer to Section 9 below and changes to table S2.1 of the consolidated

<table>
<tr><th>BAT C Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>variation notice.</td></tr>
<tr><td>27</td><td>In order to prevent or reduce mercury emissions to air from the combustion of solid biomass and/or peat, 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 colspan="4">Specific techniques to reduce mercury emissions</td></tr>
<tr><td>a.</td><td>Carbon sorbent (e.g. activated carbon or halogenated activated carbon) injection in the flue-gas</td><td rowspan="3">See descriptions in Section 8.5</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Use of halogenated additives in the fuel or injected in the furnace</td><td>Generally applicable in the case of a low halogen content in the fuel</td></tr>
<tr><td>c.</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>
<tr><td colspan="4">Co-benefit from techniques primarily used to reduce emissions of other pollutants</td></tr>
<tr><td>d.</td><td>Electrostatic precipitator (ESP)</td><td rowspan="2">See descriptions in Section 8.5. The techniques are mainly used for dust control</td><td rowspan="3">Generally applicable</td></tr>
<tr><td>e.</td><td>Bag filter</td></tr>
<tr><td>f.</td><td>Dry or semi-dry FGD system</td><td>See descriptions in</td></tr>
</table></td><td>FC</td><td>The Operator confirmed the following:

Emissions of mercury to air will be managed through the application of a combination of the techniques listed below:

a. Carbon sorbent - Not applicable. Not considered necessary.

b. Use of halogenated additives in the fuel or injected in the furnace - Not applicable. Not considered necessary.

c. Fuel choice - Implemented through biomass fuel supply contracts. Limit on mercury content of 0.1 mg/kg (EN 15297).

d. Electrostatic precipitator (ESP) - Implemented.

e. Bag filter - Not implemented. Not considered applicable to the installation.

f. Dry or semi-dry FGD system - Mercury abatement considered a secondary benefit to SO_2 emissions reduction which is not required at the installation due to inherently low sulphur in biomass wood fuels.

g. Wet flue-gas desulphurisation (wet FGD) - Not implemented. As above for dry or semi-dry flue gas FGD.

Fuel Hg content of 0.1 mg/kg equates approximately to an upper stack emission concentration of 0.02 mg/Nm^3.

Stack emissions testing to MID 14385 undertaken 18/07/2018 - 15/08/2018 reported an average mercury emission concentration of 0.7 ±2 µg/Nm^3.

<u>Hg BAT-AEL:</u>
Average = 1 - 5 µg/Nm^3 over the sampling period

A mercury limit has been set as detailed in Section 5.1.4 of this document.

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

BAT C Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	g. Wet flue-gas desulphurisation (wet FGD) — Section 8.5. The techniques are mainly used for SO_X, HCl and/or HF control — See applicability in BAT 25 The BAT-associated emission level (BAT-AEL) for mercury emissions to air from the combustion of solid biomass and/or peat is < 1–5 µg/Nm^3 as average over the sampling period.		Also refer to Section 9 below and changes to table S2.1 of the consolidated variation notice.

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

Article 15(4)

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.

Cost Benefit Analysis

If a derogation is applicable under Article 15(4) of the IED, then Cost Benefit Analysis (CBA) is undertaken. The CBA allows calculation to indicate whether the costs of compliance are greater or less than the environmental benefits.

It essentially groups all the costs on one side, with all the benefits, as far as possible, on the other side. It then includes the effect of time on the value of those costs and benefits in order to produce a Net Present Value (NPV).

This gives an indication of whether those costs are disproportionate or not, but there are many sensitivities in the analysis and many aspects of the environment that cannot yet be monetised so the actual decision on disproportionality rests with the National Derogation Panel (NDP).

Where the NPV is positive, this indicates that the cost of compliance with the BAT AEL(s) does not outweigh the environmental benefits.

Where the NPV is negative, this indicates that the costs of compliance with the BAT AEL(s) outweigh the environmental benefits.

Derogation requests
As part of their Regulation 61 Notice response, the Operator has requested a derogation from compliance with the AEL values included in BAT Conclusions 24 and 26.

We are minded to grant the derogations requested by the Operator in respect to the AEL values described in BAT Conclusions 24 and 26. We have set ELVs that are higher than the BAT AELs in the consolidated variation notice that will ensure suitable protection of the environment.

The justification for our decision to allow derogations in respect of the AEL values associated with BAT Conclusions 24 and 26 is set out below.

7.1 Derogation from BAT 24 NOx AELs

BAT Conclusion 24: In order to prevent or reduce NOx emissions to air while limiting carbon monoxide (CO) and nitrous oxide (N_2O) emissions to air from the combustion of solid biomass, BAT is to use one or a combination of primary and secondary techniques to achieve the NOx BAT AELs set out in Table 9 of the BAT Conclusion.

7.1.1 Part 1: First stage assessment

Description of the derogation request

BAT Conclusion: BAT Conclusion 24, to prevent or reduce NOx emissions apply to this emission. There are no valid applicability exclusions.

7.1.2 Operator derogation evidence

The Operator has concluded that they cannot meet the BAT AEL as defined in BAT Conclusion 24 by the BAT Conclusions implementation date of 17 August 2021. This is applicable to all three generating units. To support this conclusion the Operator supplied evidence in a number of reports which are listed below. We have provided a summary of this evidence below.

- IED Article 15(4) Derogation Request dated 14/11/2018;
- Technical Brief on Application of BAT for NOx and Particulates dated 26 July 2018
- (AECOM); Appraisal of BAT for NOx, Dust and CO dated November 2018 (RWE);
- BAT and Options Appraisal for Biomass Generation dated October 2018 (AECOM).

a Primary and secondary techniques
BAT is to use one or a combination of primary and secondary techniques described by the BAT Conclusion (techniques a. to g.) in order to meet the BAT AELs.

The biomass conversion project has implemented a combination of primary BAT techniques (combustion optimisation, low-NOx burners, and air staging) as described by the BAT Conclusion.

Implementation of the secondary techniques (SNCR & SCR, see below) specified by the BAT Conclusion are required to meet the NOx BAT AELs:

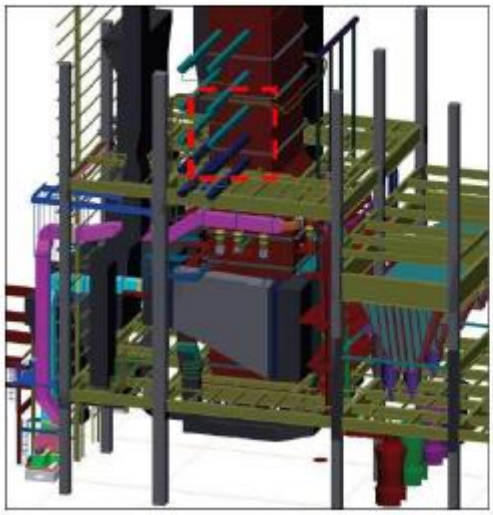
SNCR

SNCR is only applicable within the constraints associated with the required temperature window and the residence time for the injected reactants. These parameters are critical to the effectiveness of the SNCR system. This technique is not technically viable for the installation. This is because as a conversion from coal to biomass of an existing installation, available space, plant design and performance constraints prevent the effective retrofit of this secondary NOx reduction technique, see photos below.

Assessment of the SNCR abatement efficiency estimated that it would reduce NOx emissions by only 12%. The BREF states that SNCR typically achieves a 30 to 50% reduction. The supplier determined that they could not guarantee this level of performance, so the SNCR system proposed carried the same 200 mg/Nm^3 (monthly average) NOx guarantee as the conversion project utilising primary measures only.

The legacy configuration of the plant has resulted in a congested area between the boilers and the stack. This means that there is very little room for additional equipment.

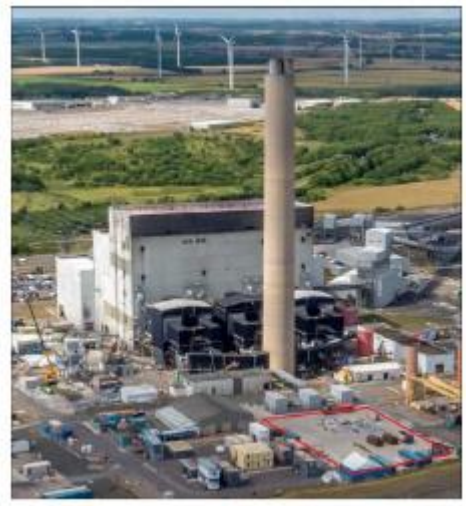
This picture shows practical constraints for the installation of nozzle lances on the side walls. The potential for any retrofit of additional equipment in these areas is severely restricted by the configuration of other existing equipment, including the soot blowers.



This graphic shows the post biomass conversion configuration of the boiler. The small area of the SNCR temperature window is highlighted at the top of the furnace with the soot blowing systems visible.

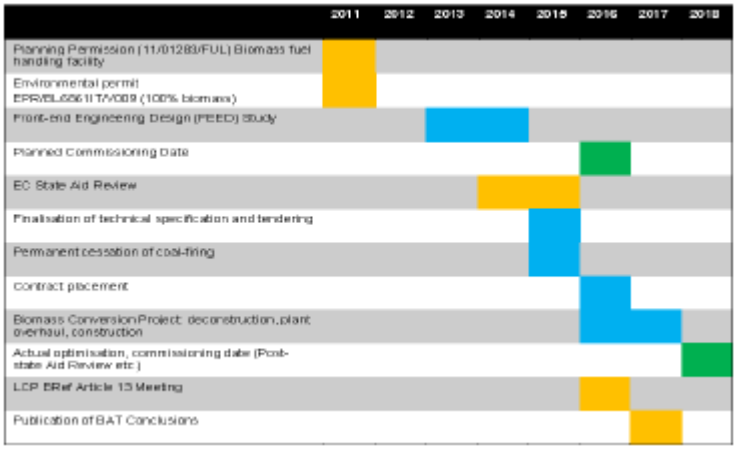
SCR

SCR could not be implemented without complex and costly engineering solutions. The most likely engineering solution would be to install additional ductwork to transfer gases to a remote SCR unit. This would be approximately 100m east of the stack as shown in the figure below. This would result in a significant pressure drop and a requirement to replace the existing ID fans.



b Time-line for biomass conversion project

Finalisation of the biomass conversion project design took place during 2015 and pre-dates the 2017 publication of the LCP BAT Conclusions. The design performance levels for NOx emissions were specified to comply with the relevant IED Annex V ELVs, see below.



c Combustion optimisation

Combustion optimisation is still being carried out with the achievable post-conversion emissions performance still being verified. This will be reported via existing permit improvement conditions IC17 (Commissioning report) and IC19 (Stack sampling and demonstration of BAT for emissions to air). Despite a significant reduction in emissions compared to the legacy coal-fired operation, the emissions will be unable to comply with the BAT AELs.

d Design emissions

Whilst performance guarantee testing may demonstrate emissions below the design performance levels, the short-term nature of these tests precludes verification of emissions representative of long-term plant performance over the full range of potential commercial grade biomass wood pellets. Therefore the emissions presented for post conversion are made using the design performance levels.

The derogation request includes a proposed ELV until March 2027 (end of CfD contract) or until the permit is next reviewed or following the next update of the BAT Conclusions.

The CfD contract provides support for biomass-fired generation through to March 2027. There are currently no published mechanisms for government support for utility-scale biomass-fired generation past this date and there are significant regulatory and commercial uncertainties for operation of the power station post 2027.

This 2027 timeline is used as the basis of the derogation request in alignment with the current regulatory context for biomass-fired generation. On the basis that the review of the IED BAT Conclusions remains on an eight year cycle, the next revised LCP BAT Conclusions will be published around 2025 and will come into force 2029.

Any extension to the power station operation post 2027 would therefore be regulated through the future LCP BAT Conclusions or equivalent permit review mechanism. We have undertaken manual sensitivity to this timeline in our second stage assessment, see below.

e ELVs: The Operator has proposed ELVs which will be applicable from 01 July 2020. Commissioning is expected to be complete by June 2019, after which, lower interim limits will be set by IC19.

NOx - Emission Limit Values (ELVs) comparison table – mg/Nm^3					
Averaging period	BAT AELs	IED Annex V	Current to 30 June 2020 TNP ELV	Operator interim limits	Operator proposed derogation from 1 July 2020-after TNP
Daily (95%ile of validated daily average over a year)	-	-	550	-	-
Hourly (95% of validated hourly averages within a calendar year)	-	400	-	IC19	400
Daily average (of validated hourly averages)	200	220	-	IC19	220
Monthly average	-	200	450	IC19	200
Annual average (of validated hourly averages)	160	-	-	-	200
Correction factors (% O_2)	6	6	6	6	6
Monitoring frequency	Continuous	Continuous	Continuous	Continuous	Continuous

BAT AELs – from 17 August 2021
The BAT AELs are set out in Table 9 of the BAT Conclusion, with footnotes 7 & 8 being applicable to the installation i.e. applicable to plant put into operation no later than 07 January 2014.

Current TNP ELVs – to 30 June 2020
Variation EPR/FP3137CG/V005 set limits for biomass boilers >100 MWth operating under the Transitional National Plan (TNP). NOx ELVs were set for biomass firing during the TNP, which are applicable once all three units are fully commissioned on biomass.

For plant operating under the TNP, NOx (also SO_2 and dust) ELVs were set which were derived for the period 01 January 2016 to 30 June 2020 (the duration of the TNP). At the end of this period both Annex V and the LCP BREF are applicable (whichever is stricter). The BAT Conclusion NOx AELs are stricter with the Operator requesting a derogation and compliance with IED Annex V ELVs.

The current ELVs become applicable once all three units are fully commissioned on biomass.

Interim limits – IC19
On completion of commissioning (expected to be June 2019), site specific ELVs are to be agreed in accordance with existing permit improvement condition IC19. These ELVs will remove some of the headroom, bringing emissions more in alignment with the achievable performance and IED Annex V ELVs.

Proposed ELVs (derogation) / IED Annex V – from 01 July 2020
The proposed ELVs are significantly below the current TNP ELVs. The proposed ELVs are aligned with the IED Annex V ELVs.

IED Annex V ELVs are mandatory and so must be met once the TNP finishes 30 June 2020.

Mandatory limits: The mandatory minimum emission limit values in Annex V of the IED apply to this release but the proposed emission does not exceed the Annex V limits. These limits will apply at the end of the TNP in 2020.

f Criteria: The derogation request is required for all three generating units on the basis of the technical characteristics of the combustion plant. The primary argument for the derogation is based on the configuration of the plant which makes it more difficult and costly to comply.

The Operator has provided evidence that as a biomass conversion of an existing coal-fired installation, significant space and plant performance related constraints restrict the performance of the BAT techniques, specifically Selective Non Catalytic Reduction (SNCR) and hence the ability to comply.

This is supported in paragraph 4.41 of the DEFRA IED EPR Guidance for Part A installations: *'the configuration of the plant on a given site, making it more technically difficult and costly to comply'*.
(https://www.gov.uk/government/publications/environmental-permitting-regulations-guidance-on-part-a-installations)

We consider that the technical characteristics of the installation, specifically the lack of space and the plant configuration may restrict delivery of the BAT AELs.

Derogation criteria assessment
Criteria detail
Technical – the configuration of the plant makes it more technically difficult and costly to comply
Operator proposal – linked to DEFRA IED EPR Guidance
Operator claims there is insufficient space to install SNCR plant and SCR could not be implemented without complex and costly solutions. As a biomass conversion of an existing coal-fired installation, significant space and plant performance related constraints restrict applicability of the BAT techniques.
Environment Agency view
The evidence included site layout photos (see above) and a site visit confirmed spacial restrictions. The original design was specifically around the parameters of local coal and based on a Canadian plant. This resulted in a very compact design with a small footprint, with the purpose of conserving heat. This makes it extremely difficult to retrofit secondary abatement. This means the combustion units are different from nearly all other utility-scale boilers in the UK, with narrow vertical combustion chambers and narrow spaces between elements. The original plant was not designed to be a utility-scale boiler, but to provide a customised amount of power to the smelter. Primary techniques alone would be expected to achieve emissions around 180 to 200 mg/Nm^3. Further secondary techniques are required to achieve the annual average BAT AEL for NOx emissions of 160 mg/Nm^3. SNCR Due to their smaller size compared with other utility-scale boilers, the residence time in the reaction zone of the combustion units is below the minimum required for SNCR. The temperature is highly stratified by the rapid temperature drop across the superheater bundles close above the likely location of the urea injection ports. This

means that the temperature window for efficient use of SNCR occurs within only a small zone of the combustion units. This reduces the reaction time of ammonia or urea with NOx which reduces the NOx reduction efficiency.

The limited effect of the additional abatement due to the limited residence time and temperature window, with a projected NOx reduction efficiency estimated to be 12%. It is unlikely that this would achieve the NOx BAT AEL.

Areas close to the boiler walls are cooler which can allow high levels of ammonia slip.

There would be a substantial loss in the thermal efficiency and the electrical generation capacity of the combustion units, with a 0.25 to 0.5% reduction in thermal efficiency expected. This runs counter to the BAT Conclusions BAT-Associated Energy Efficiency Levels (BAT-AEELs).

We conclude that there appears to be significant restrictions to installation of SNCR and even if installed, BAT AELs are unlikely to be met.

SCR

SCR requires a significant amount of space (refer to photos above). Installing a remote unit is possible; however this will be costly and complex due to the ducting requirements and lack of physical space on site.

Biomass fuels can cause deactivation of the catalyst.

As with SNCR, there would be a substantial loss in the thermal efficiency and the electrical generation capacity of the combustion units. A reduction in the net heat rate of approximately 4% is expected. This runs counter to the BAT Conclusions BAT-AEELs.

We conclude that there are significant spacial restrictions to installation of SCR.

As mentioned, there are a number of other relevant technical characteristics (Refer to Annex 1 below) supported in paragraph 4.41 of the DEFRA guidance, however it is our view that the criteria assessment tabulated above is the strongest candidate.

7.1.3 Options review

The Operator has addressed all the options for achieving the BAT AEL. The Operator has referred to the BAT Conclusions and addressed all reasonable techniques for achieving the BAT AEL. Where an option is considered appropriate for CBA it has been identified as such and considered further.

Review of all possible techniques to achieve BAT-AEL		
Type of techniques considered	Technique description	General applicability
a. Primary measures (control techniques) as defined in BATC: Combustion optimisation	Good design, optimisation of temperature and residence time in combustion zone & use of an advanced control system.	Generally applicable
b. Primary measures (control techniques) as defined in BATC: Low-NOx burners (LNB)	Reducing peak flame temperature, reducing the conversion of fuel-bound nitrogen to NOx and the formation of thermal NOx.	Generally applicable
c. Primary measures (control techniques) as defined in BATC: Air staging	Creation of several combustion zones in the combustion chamber with different oxygen contents.	Generally applicable
d. Primary measures (control techniques) as defined in BATC: Fuel staging	Reduction of flame temperature by creation of several combustion zones with different injection levels of fuel and air.	Generally applicable
e. Primary measures (control techniques) as defined in BATC: Flue gas recirculation	Recirculation of part of the flue gas to replace part of the fresh combustion air. Reduces the temperature and limits the oxygen content available for nitrogen oxidation.	Generally applicable
f. Secondary measures (abatement techniques) as defined in BATC: Selective non-catalytic reduction (SNCR)	Reaction of NOx with ammonia or urea at high temperatures between 800°C and 1000°C	For existing combustion plants, applicable within the constraints associated with the required temperature window and residence time for the injected reactants.
g. Secondary measures (abatement techniques) as defined in BATC: Selective catalytic reduction (SCR)	Reaction of NOx with ammonia or urea in the presence of a catalyst at temperatures between 300°C and 450°C	No applicability exclusions relating to this installation.

7.1.4 No CBA

The Operator is proposing not to conduct a cost effectiveness / CBA for the options listed below, and has adequately justified this decision:

Techniques not progressing to CBA	
Technique description	Reason not progressed to CBA
a. Primary measures (control techniques) as defined in BATC: Combustion optimisation	Already applied at the installation. This is currently being carried out in advance of performance guarantee testing.
b. Primary measures (control techniques) as defined in BATC: Low-NOx burners (LNB)	Already applied at the installation. Bespoke LNB installed as part of the biomass conversion project.
c. Primary measures (control techniques) as defined in BATC: Air staging	Already applied at the installation. Bespoke BOFA secondary air system enabling two combustion zones installed as part of the biomass conversion project.

Technique description	Reason not progressed to CBA
d. Primary measures (control techniques) as defined in BATC: Fuel staging	Not appropriate at the installation Typically natural gas is used as the re-burning fuel; however natural gas is not permitted and there is no natural gas supply to the installation. Low efficiency for NOx <200mg/Nm^3. Reduction in boiler efficiency and capacity. LNB operation outside of specification performance envelope. Limited space for installation of additional combustion zone between upper biomass burner and the BOFA ports.
e. Primary measures (control techniques) as defined in BATC: Flue gas recirculation	Not appropriate at the installation Low efficiency for NOx <200mg/Nm^3. Reduction in boiler efficiency and capacity. LNB operation outside of specification performance envelope. Higher temperatures at the ESPs which are already operating at their upper limit.

7.1.5 CBA options

Options for achieving the BAT AEL using available techniques that are considered as viable are taken forward for disproportionality assessment. The Operator is proposing to conduct a CBA of a number of options for achieving the BAT AEL and has adequately justified this decision.

Options considered as viable and taken forward for disproportionality assessment		
Option	Description	Timescale for completion
Business as usual (BAU)	Primary techniques to comply with IED Annex V ELVs	No change
Proposed derogation	Primary techniques to comply with IED Annex V ELVs	No change
BAT AEL SNCR on all three units	Secondary technique to achieve upper limit of the BAT AEL (200 mg/Nm^3 daily average and 160 mg/Nm^3 annual average)	BAT achieved by 2021. Note 1
SCR on all three units	Secondary technique to achieve upper limit of the BAT AEL (200 mg/Nm^3 daily average and 160 mg/Nm^3 annual average) Note 2	BAT achieved by 2022.
Note 1	Whilst SNCR has been taken forward for CBA, the Operator has concluded that it is not technically viable at the installation. For existing combustion plant, it is only applicable within the constraints associated with the required temperature window and residence time for the injected reactants.	
Note 2	Whilst the Operator also considered the option with SCR achieving the lower limit of the BAT AEL we have not included this option in our assessment. Our general approach is to set the upper value of the BAT AEL ranges specified unless use of the tighter limit is justified. In any event, this option does not alter the conclusions drawn, with the NPV remaining significantly negative at £214 million for the central case.	

7.1.6 Significance

The Operator has claimed that releases are insignificant and we agree with this, see below.

If the proposed derogation is accepted then the mass of emission released compared to the mass released if compliant with the BAT AEL would be **433** tonnes of NOx. However ammonia (NH_3) slip associated with SNCR/SCR techniques would result in 32 tonnes of ammonia being released.

7.1.7 Summary of first stage assessment

The Operator has supplied a valid derogation request against BAT Conclusion 24. The derogation request is based on technical characteristics of the installation. As a biomass conversion of an existing coal-fired installation, significant space and plant performance related constraints limit the performance of the BAT techniques, specifically Selective Non Catalytic Reduction (SNCR) and hence the ability to comply. The Operator has described two relevant options (secondary measures) for achieving the BAT AEL and justified the screening out of two options (primary measures). The two relevant options were taken forward to conduct a Cost Benefit Analysis (CBA) with the business as usual (BAU) and the proposed derogation options i.e. four options in total.

The proposed Emission Limit Values (ELVs) are significantly below the current ELVs and are aligned with the Industrial Emissions Directive (IED) Annex V ELVs, until the next permit review or following the next update of the BAT Conclusions.

ELVs in mg/Nm^3	Proposed	Current	IED Annex V	BATC
95%ile hourly averages over a year	400	550	400	
Daily Average	220		220	200
Monthly Average	200	450	200	
Annual Average	200			160

7.1.8 Part 2: Second Stage Assessment

Demonstrating disproportionality of costs and benefits

a Costs: The Operator has satisfactorily demonstrated that the stated criterion would result in increased costs of achieving the BAT AEL (as compared to the typical cost of installing the appropriate technique).

b CBA: The CBA has been reviewed and considered to support the derogation request. Key points from the CBA are summarised below.

Four options were presented in the main report of the 'BAT and Options Appraisal for Biomass Generation' report dated October 2018. An amendment was provided dated 10 January 2019.

Following an initial review of the original BAT assessment and CBA, we requested that the CBA model inputs for the BAU and proposed derogation options be revised

from the design performance emissions to the TNP ELVs for NOx from 2018 to June 2020. This is to reflect the maximum emissions allowed under the current permit. It must however be emphasised that current emission levels from the installation are significantly lower than the TNP ELVs so this represents a worst case.

We also queried the proposed 2021 timeline for the installation of SCR due to the extensive nature of the works. The Operator confirmed in their response received 17 December 2018 that the timeline for SCR would be 2022. This is based on one unit being completed at a time, in 2020, 2021 and 2022. Therefore, the assessment scenario for SCR to achieve the NOx BAT AELs has been revised to 2022.

c Data input - general

The weighted average cost of capital (WACC) is consistent with what we would expect for the sector.

The lifetime of the technology and the appraisal period are based on the March 2027 end date for the CfD contract. Whilst this does not require installation closure, it introduces sufficient commercial and regulatory uncertainty to prevent investment decisions being made past that date. Manual sensitivity checks have been carried out, see below.

SNCR would be installed on all units to meet the BAT AEL by 2021, with SCR installed on all units by 2022.

Option appraisal periods

Year that work on derogation application began (Year 0)	(?)	2018			
		Business as Usual (BAU)	Proposed derogation	BAT-AEL	SCR at 160mg/Nm3
First installation year (or if technology already installed leave 3.8, 3.9 and 3.10 blank and just fill in 3.11)	(?)	2018	2018	2021	2022
Length of time to complete installation (Years)					
Lifetime of technology once fully installed (Years)		10	10	7	6
Lifetime of technology remaining as of first appraisal year (only fill this in if your BAU technology is already installed) (Years)	(?)	10			
Last year of initial operation (Auto calculated value)		2027	2027	2027	2027
Does asset need to be 'renewed' over the appraisal period? (Auto calculated value)	(?)	No	No	No	No
Last year of appraisal period (Auto calculated value)	(?)	2027			

d Data input – options

Summary of the emissions and key costs of the proposed options:

Summary of emissions input for all options				
Option	BAU	Proposed derogation	BAT AEL / SNCR	SCR
NOx tonnes/yr 2018 & 2019	4,866	4,866	4,866	4,866
NOx tonnes/yr 2020	3,514	3,514	4,416	3,514
NOx tonnes/yr 2021	-	-	1,478	1,442
NOx tonnes/yr 2022	-	-	-	1,298
NOx tonnes/yr 2023	-	-	-	1,153
NOx tonnes/yr 2021 to 2027	2,163	2,163	1,730	-
NOx tonnes/yr 2022 to 2027	-	-	-	-
NOx tonnes/yr 2024 to 2027	-	-	-	1,730
NH_3 tonnes/yr 2021	0	0	24	32
NH_3 tonnes/yr 2022 to 2027	0	0	32	32

Summary of key costs for all options				
Option	BAU	Proposed derogation	BAT AEL / SNCR	SCR
Capital Costs £Million	-	-	8.3	17.15
Annual costs (not including energy consumption) £000's	55	55	3,794	1,430
Lost revenue £Millions	-	-	9.88	108.66

e Key data input for individual options

We are satisfied with the Operator's approach and justification for the data input for each of the options.

The evidence as described in the submission and the CBA tool was reviewed and considered to be applicable and correct and should be considered as part of the derogation request. The basis of some cost assumptions were challenged and considered reasonable.

The costs have been compared using the Environment Agency CBA tool V 6.17, which is based on HM Treasury's Green Book guidance. The results are summarised in terms of Net Present Value (NPV). The costs of meeting the BAT AEL outweigh the monetised benefits in comparison to the proposed derogation (i.e. NPV < 0).

Summary of NPV analysis			
Option	Proposed derogation	BAT AEL SNCR	SCR
Central (£millions)	0.00	-41.13	-154.21
Sensitivity analysis			
Lowest NPV–High upfront investment costs (£millions)	0.00	-43.39	-169.37
Highest NPV–Low upfront investment costs (£millions)	0.00	-38.88	-139.05
Scenario analysis			
Lowest NPV–High costs, Low benefits (£millions)	0.00	-47.91	-167.17
Highest NPV–Low costs, high benefits (£millions)	0.00	-34.64	-107.85

Detailed results- PV costs & PV benefits		
Option	BAT AEL SNCR	SCR
PV costs (£millions)	-43.5	-159.1
PV benefits (£millions)	-2.3	-4.8
Central (£millions)	-41.1	-154.2

f BAT AEL: The CBA using central assumptions shows a negative NPV for the BAT AEL of **£41** million and therefore the cost of compliance is disproportionate compared to the environmental benefit achieved.

g Other options: The costs of the SCR option were also disproportionate compared to the environmental benefit achieved, with a negative NPV of **£154** million using central assumptions.

h PV costs/benefits: BAT improves the environment by **£2.3** million over the time period but costs **£45** million upfront. This is a significant difference which is unlikely to be changed by sensitivity analysis.

i Sensitivity analysis:
The lowest negative NPV for the BAT AEL of **£43** million is caused by high upfront investment costs; and

The highest negative NPV for the BAT AEL of **£39** million is caused by low upfront investment costs.

j Manual sensitivity checks

We carried out manual sensitivity checks on specific parameters: Plant life-time, lost revenue, waste disposal costs and damage costs. This did not result in any changes to the conclusions, see table below.

We also ran manual sensitivity on the new damage costs using both of the lost revenue scenarios. These scenarios were chosen as they resulted in the most

significant changes in the NPV for the SCR options and so are considered to represent worst case for possible scenarios. The central case NPV was still significantly negative for the BAT AEL and SCR options.

Summary of manual sensitivity checks-comparison table Central case (£millions)			
Option	Proposed derogation	BAT AEL SNCR	SCR
Base case	0.00	-41.13	-154.21
Plant lifetime	0.00	-62.15	-170.03
Lost revenue (SCR)	0.00	-41.13	-36.37
Lost revenue (double counting NOx and dust)	0.00	-35.00	-89.00
Waste disposal	0.00	-27.74	-154.26
Damage costs	0.00	-40.04	-152.16

7.1.9 Summary of the second stage assessment

The Operator has provided a credible argument that the increased costs linked to the technical characteristics of the installation are disproportionate for achieving the BAT AEL. An appropriate range of options were reviewed and those identified as technically viable were considered further. A number of options were taken forward for CBA, were adequately described in the CBA and the cost of the BAT AEL and the Selective Catalytic Reduction (SCR) options were confirmed as disproportionate compared to the environmental benefits. The CBA using central case assumptions shows negative Net Present Values (NPV) for the BAT AEL of £**41** million and for the SCR option of £**154** million and therefore the cost of compliance is disproportionate compared to the environmental benefit achieved.

7.1.10 Risks of allowing the derogation

Allowing the proposed derogation would not cause any significant pollution or prevent a high level of protection of the environment as a whole to be achieved.

a Annual emissions: The current allowable annual emissions of NOx from the activity are 4,866 tonnes and this will reduce to 2,163 tonnes at the end of the TNP based on IED Annex V limits.

This would then reduce to at least 1,730 tonnes if the BAT AEL was met in accordance with the timeline set by the IED. However ammonia slip associated with SNCR/SCR techniques would result in 32 tonnes of ammonia being released.

The Operator's proposal will mean that NOx emissions will continue at their current rate until interim site specific ELVs are imposed in accordance with IC19. This will remove some of the headroom and bring emissions more in alignment with the achievable performance. NOx emissions will then reduce in line with IED Annex V limits from 01 July 2020 until the next BREF review.

There is no significant reduction in NOx emissions from the installation through the

adoption of additional secondary abatement.

Assessment of the impact is conservative, as it is based on the SNCR secondary abatement actually achieving the BAT AEL. This is unlikely to be the case.

b NECD: The National Emissions Ceiling Directive (NECD) for NOx is 1,167 kilotonnes (to 2019).

NECD for NOx		
Option	Annual emissions (tonnes)	% NECD (2019 ceiling)
Proposed derogation	2,163 from July 2020	0.19
SNCR/BAT AEL	1,730 from August 2021	0.15

We agree that the NOx emissions from the proposed derogation will have a limited impact on the UK's overall NOx emissions and the ability to remain below the NOx emission ceiling.

7.1.11 Predicted impacts: The predicted impact of derogating from the BAT AEL on any long or short term (LT/ST) Environmental Quality Standards (EQS) / Environmental Assessment Levels (EAL) is insignificant for the proposed derogation and the BAT AEL option i.e. LT process contribution (PC) < 1% of EQS and ST PC <10% of EQS:

Summary of predicted impacts – maximum at a receptor					
Option	NOx Tonnes per year	PC (µg/m³)	EQS (µg/m³)	PC as % of the EQS	Assessment of inputs
Proposed derogation	2,164 from July 2020	0.31	40 (LT)	0.8%	Insignificant for proposed derogation
		8.3	200 (ST)	4.1%	
SNCR/ BAT AEL	1,730 from August 2021	0.25	40 (LT)	0.6%	Insignificant for BAT AEL
		7.54	200 (ST)	3.8%	

7.1.12 Other potential environmental impacts: The habitats assessment conservatively assumes that the most sensitive habitat is present at the maximum impact location. The assessment of the proposed derogation and BAT AEL scenarios does not identify either scenario to have a lesser impact than the other.

7.1.13 Summary of the risks allowing a derogation

The Operator has demonstrated that the costs of achieving the BAT AEL are disproportionate to the environmental benefits. There is no significant reduction in NOx emissions from the installation through the adoption of additional secondary abatement and in any event, the impacts are screened out as insignificant for the proposed derogation and the BAT AEL options.

7.1.14 Final considerations

Significant improvements have already been implemented at the site (see project time-line above). The plant has been subject to a major overhaul and life extension works. Significant new or upgraded items of plant associated with NOx reduction include:

- New biomass low NOx burners (LNB) with combustion air control, core air fans, flame monitoring and burner management controls;
- Draught air system modifications including upgraded forced draft (FD) fan control and new induced draft (ID) fans to increase draught air flow capacity and flow control accuracy;
- New boosted over-fire air system (BOFA) including multiple over-fire air nozzles which combined with biomass burners control CO, NOx and maximise fuel burnout;
- New and modified furnace cleaning systems including new and upgraded soot blowers and water lances, to control slagging, fouling and furnace whitening.

There has been no public interest in this site, no reported local dissatisfaction or other complaints about the installation/Operator.

7.1.15 Permit conditions: Whilst we are accepting the derogation, the permit includes conditions requiring:

- The emissions to be reviewed following combustion optimisation. This will be reported via existing permit improvement conditions IC17 (Commissioning report) and IC19 (Stack sampling and demonstration of BAT for emissions to air).
- An IC has been set requiring a review of the emissions to assess the long-term plant performance over the full range of biomass wood pellets. The outcome of this will be used to determine appropriate longer term NOx limits for the plant.
- A further IC has been set for the Operator to provide an update on the March 2027 timeline.
- The operating techniques for this BAT Conclusion will be incorporated into the permit.

7.1.16 Summary of final considerations

Significant improvements to reduce NOx emissions have already been implemented as part of the biomass project. The plant has been subject to a major overhaul and life extension works.

The permit includes existing conditions requiring the emissions to be reviewed following combustion optimisation (IC19) and longer-term plant operation and incorporation of the operating techniques for this BAT Conclusion into the permit.

7.2 Derogation from BAT 26 Dust AELs

BAT Conclusion 26: In order to reduce dust and particulate-bound emissions to air from the combustion of solid biomass, BAT is to use one or a combination of primary and secondary techniques to achieve the dust BAT AELs set out in Table 12 of the BAT Conclusion.

7.2.1 Part 1: First stage assessment

Description of the derogation request

BAT Conclusion: BAT Conclusion 26, to reduce dust emissions apply to this emission. There are no valid applicability exclusions.

7.2.2 Operator derogation evidence

The Operator has concluded that they cannot meet the BAT AEL as defined in BAT Conclusion 26 by the BAT Conclusions implementation date of 17 August 2021. This is applicable to all three generating units. To support this conclusion the Operator supplied evidence in a number of reports which are listed below. We have provided a summary of this evidence below.

- IED Article 15(4) Derogation Request dated 14/11/2018;
- Technical Brief on Application of BAT for NOx and Particulates dated 26 July 2018 (AECOM);
- Appraisal of BAT for NOx, Dust and CO dated November 2018 (RWE);
- BAT and Options Appraisal for Biomass Generation dated October 2018 (AECOM).

(AECOM Infrastructure & Environment UK Limited (AECOM) and RWE were commissioned by the Operator to undertake BAT option appraisals).

a Primary and secondary techniques

BAT is to use one or a combination of primary and secondary techniques described by the BAT Conclusion (techniques a. to e.) in order to meet the BAT AELs.

The biomass conversion project has upgraded the ESPs to improve capture efficiency for biomass ash dust emissions. ESPs are identified as a secondary technique by the BAT Conclusion.

There are three, two-field ESPs, one for each combustion unit.

Implementation of secondary techniques (see below) as specified by the BAT Conclusion are required to meet the dust BAT AELs:

ESPs

The LCP BREF (Section 5.2.1.5.1.3) recognises ESPs as being the most commonly used technique for dust abatement in large scale pulverised biomass combustion plants. This technique is already applied at the installation. Installation of additional field(s) is complex due to the existing plant configuration, specifically with reference to the lack of a suitable duct section, and may not deliver BAT AEL compliance.

The lack of space is illustrated in the photos below. The legacy configuration of the plant has resulted in a congested area between the boilers and the stack. This means that there is very little room for additional equipment.

There is a limited amount of space between the boiler house and the stack, where the existing ESPs sit. There is a short run of horizontal duct exiting the boiler house from each side (A and B) of each ESP. The duct undergoes a rapid expansion during the transition to the ESP inlet, and then passes through the two ESP fields. The flue gas exits the ESP through a short section of horizontal duct.

Figure 11: Electrostatic Precipitators (Unit 1 A0 & B0 Fields – Boiler House Visible to Right)

Figure 12: Electrostatic Precipitators (Unit 1 ESP from Boiler House - right, to ID Fan Inlet - left)

Figure 13: Electrostatic Precipitators (Showing Close Proximity of Unit 1 & 2 ESP Outlets and ID Fan Ductwork to Stack Inlet)

Figure 14: Electrostatic Precipitators (Boiler House Rear, ESPs and Stack Ductwork)

The options for upgrade of the ESPs to achieve the dust BAT AEL were assessed, taking into account the constraints imposed by the existing installation. The general approach to increasing the efficiency of the ESPs is to maximise the collector electrode surface area that is available for dust collection. Options considered included:

- construction of a new ESP field;
- installation of additional collector plates in maintenance spaces in the existing fields; and
- the addition of an additional ESP pass.

However, limitations apply to this approach as the existing fields remove the bulk of the inlet dust burden and any additional collector area will therefore be less efficient at removing the remaining dust.

Taking into account the limited options available for upgrade of the ESPs within the constraints of the existing installation, and the low stack dust emissions when firing biomass, assuming a design level of 20 mg/Nm^3, both AECOM and RWE conclude that upgrading the ESPs would not guarantee dust emissions to be reduced to the upper end of the BAT AEL of 10 mg/Nm^3.

Bag filters

According to the LCP BREF (Section 3.2.2.1.2) bag filter material is usually sensitive to the temperature of the ash and flue-gases. The principle concern is unburnt carbon and hot fly ash agglomerates, like that observed in biomass fired plants, have the potential to damage the filter material. Furthermore, the LCP BREF notes that in

fuels where the ash has a high amount of unburnt matter, as would be expected at the installation, there is a risk of sparks or glowing particles reaching the bag filter due to higher combustion temperatures resulting in a high risk of hopper fires and bag damage.

The Operator concludes that bag filters are considered to be unsafe for use on the biomass-fired boilers, without additional operational techniques being employed, due to the high levels of unburned carbon in the ash and the associated risk of fire.

This option would either replace the ESPs which would require partial or complete removal or be installed downstream of the existing abatement. This option would require the replacement of the new induced draft (ID) fans with larger capacity units due to the high differential pressure across the filter bags.

The Operator has operational experience of fire risks at the installation during the 2012 biomass trials and again during the early combustion optimisation phase of the biomass conversion project. While these did not result in ESP fires there would have been a significant risk of a fire had bag filters been installed.

Technology options including fire resistant filter bags and upstream char burning traps are not considered to be sufficiently mature to fully mitigate this risk.

In AECOM's experience, this position is applied worldwide on biomass plants; this is also supported by the LCP BREF which acknowledges the issues with using bag filters for biomass fired plant, therefore requiring considerable additional equipment such as a pre-collector upstream of the bag filter to reduce the risk of hopper fires and bag damage.

Dry or semi-dry FGD system

The original coal-fired power station was not equipped with flue gas desulphurisation (FGD). While an existing FGD is listed as a BAT technique for the reduction of particulate emissions contributing to some degree of dust removal, it is not considered a "primary" technology. A new FGD system would not be applied solely for dust control.

Following conversion of the installation to 100% biomass-firing the inherent low sulphur content of the wood biomass pellet fuel will enable compliance with the BAT AEL for SO_2 without additional FGD abatement. FGD is primarily used for abatement of acid gases but emissions of these are already within the BAT AEL ranges.

Wet FGD

As above for the dry or semi-dry FGD system.

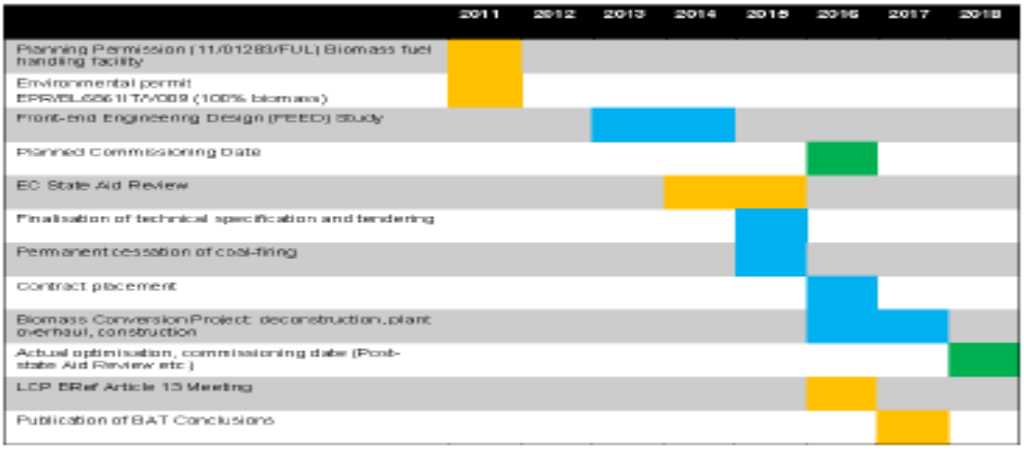
Fuel choice

This is already applied at the installation. Wood biomass is inherently lower in ash than coal, typically by an order of magnitude and therefore the conversion of the power station to biomass-firing represents the use of the fuel choice technique to reduce dust emissions.

Furthermore the Operator have imposed contractual limits, within the supply chain, on various fuel parameters of significance for dust emissions, including most significantly the proportion of ash in the fuel.

b Time-line for biomass conversion project

Finalisation of the biomass conversion project design took place during 2015 and pre-dates the 2017 publication of the LCP BAT Conclusions. The design performance levels for dust emissions were specified to comply with the relevant IED Annex V ELVs, see below.



c Combustion optimisation

Combustion optimisation is still being carried out with the achievable post-conversion emissions performance still being verified. This will be reported via existing permit improvement conditions IC17 (Commissioning report) and IC19 (Stack sampling and demonstration of BAT for emissions to air). Despite a significant reduction in emissions compared to the legacy coal-fired operation, the emissions will be unable to comply with the BAT AELs.

d Design emissions

Whilst performance guarantee testing may demonstrate emissions below the design performance levels, the short-term nature of these tests precludes verification of emissions representative of long-term plant performance over the full range of potential commercial grade biomass wood pellets. Therefore the emissions presented for post conversion are made using the design performance levels.

The derogation request includes a proposed ELV until March 2027 (end of CfD contract) or until the permit is next reviewed or following the next update of the BAT Conclusions.

The CfD contract provides support for biomass-fired generation through to March 2027. There are currently no published mechanisms for government support for utility-scale biomass-fired generation past this date and there are significant regulatory and commercial uncertainties for operation of the power station post 2027.

This 2027 timeline is used as the basis of the derogation request in alignment with the current regulatory context for biomass-fired generation. On the basis that the review of the IED BAT Conclusions remains on an eight year cycle, the next revised

LCP BAT Conclusions will be published around 2025 and will come into force 2029.

Any extension to the power station operation post 2027 would therefore be regulated through the future LCP BAT Conclusions or equivalent permit review mechanism. We have undertaken manual sensitivity to this timeline in our second stage assessment, see below.

e ELVs: The Operator has proposed ELVs which will be applicable from 01 July 2020. Commissioning is expected to be complete by June 2019, after which, lower interim limits will be set by IC19.

Dust - Emission Limit Values (ELVs) comparison table – mg/Nm^3					
Averaging period	**BAT AELs**	**IED Annex V**	**Current to 30 June 2020 TNP ELV**	**Operator interim limits**	**Operator proposed derogation from 1 July 2020-after TNP**
Daily (95%ile of validated daily average over a year)	-	-	42	-	-
Hourly (95% of validated hourly averages within a calendar year)	-	40	-	IC19	**40**
Daily average (of validated hourly averages)	**16**	22	-	IC19	**22**
Monthly average	-	20	35	IC19	**20**
Annual average (of validated hourly averages)	**10**	-	-	-	**20**

BAT AELs – from 17 August 2021

The BAT AELs are set out in Table 12 of the BAT Conclusion, with the AELs for 'existing' plant being applicable to the installation i.e. applicable to plant put into operation no later than 07 January 2014.

Current TNP ELVs – to 30 June 2020

Variation EPR/FP3137CG/V005 set limits for biomass boilers >100 MWth operating under the Transitional National Plan (TNP). Dust ELVs were set for biomass firing during the TNP, which are applicable once all three units are fully commissioned on biomass.

For plant operating under the TNP, dust (also SO_2 and NOx) ELVs were set which were derived for the period 01 January 2016 to 30 June 2020 (the duration of the TNP). At the end of this period both Annex V and the LCP BREF are applicable (whichever is stricter). The BAT Conclusion dust AELs are stricter with the Operator requesting a derogation and compliance with IED Annex V ELVs.

The current ELVs become applicable once all three units are fully commissioned on biomass.

Interim limits – IC19
On completion of commissioning (expected to be June 2019), site specific ELVs are to be agreed in accordance with existing permit improvement condition IC19. These ELVs will remove some of the headroom, bringing emissions more in alignment with the achievable performance.

Proposed ELVs (derogation) / IED Annex V – from 01 July 2020
The proposed ELVs are significantly below the current TNP ELVs. The proposed ELVs are aligned with the IED Annex V ELVs.

IED Annex V ELVs are mandatory and so must be met once the TNP finishes 30 June 2020.

Mandatory limits: The mandatory minimum emission limit values in Annex V of the IED apply to this release but the proposed emission does not exceed the Annex V limits. TNP limits will apply until 30 June 2020, the derogated BAT AEL i.e. Annex V IED limits will apply from 01 July 2020.

f Criteria: The derogation request is required for all three generating units on the basis of the technical characteristics of the combustion plant. The primary argument for the derogation is based on the configuration of the plant which makes it more difficult and costly to comply.

The Operator has provided evidence that as a biomass conversion of an existing coal-fired installation, significant space and plant performance related constraints restrict the performance of the BAT techniques, specifically upgrading the ESPs and hence the ability to comply.

This is supported in paragraph 4.41 of the DEFRA IED EPR Guidance for Part A installations: *'the configuration of the plant on a given site, making it more technically difficult and costly to comply'*.
(https://www.gov.uk/government/publications/environmental-permitting-regulations-guidance-on-part-a-installations)

We consider that the technical characteristics of the installation, specifically the lack of space and the plant configuration may restrict delivery of the BAT AELs.

Derogation criteria assessment
Criteria detail
Technical – the configuration of the plant makes it more technically difficult and costly to comply
Operator proposal – linked to DEFRA IED EPR Guidance
As a biomass conversion of an existing coal-fired installation, significant space and plant performance related constraints restrict applicability of the BAT techniques. There is insufficient space to install additional ESP banks without significant modifications being required to the ductwork and ID fan locations. Further ESP upgrades would have low dust capture efficiency and would not be expected to achieve the BAT AEL.

The use of bag filters would present an unacceptable fire risk due to the high unburnt carbon content of biomass ash and the likelihood of sparks and hot embers in the flue gas.
Environment Agency view
The evidence included site layout photos (see above) and a site visit confirmed spacial restrictions. The original design was specifically around the parameters of local coal and based on a Canadian plant. This resulted in a very compact design with a small footprint, with the purpose of conserving heat. This makes it extremely difficult to retrofit secondary abatement. This means the combustion units are different from nearly all other utility-scale boilers in the UK, with narrow vertical combustion chambers and narrow spaces between elements. The original plant was not designed to be a utility-scale boiler, but to provide a customised amount of power to the smelter. Primary techniques alone would be expected to achieve emissions around 20 mg/Nm^3. Further secondary techniques are required to achieve the annual average BAT AEL for dust emissions of 10 mg/Nm^3. <u>ESPs</u> We agree that the installation of additional field(s) is complex due to the existing plant configuration and even if installed compliance with the BAT AEL is not guaranteed. The existing fields remove the bulk of the inlet dust with any additional collector area being less efficient at removing the remaining dust. The configuration of the plant and lack of space is fundamental to the Operator's justification. Whilst we agree that there is very little room for additional equipment, it would be possible to re-site the ESPs. Whilst the additional space should ensure that the ESPs achieve the BAT AEL, the Operator's assessment is based on BAT AEL compliance. Also, this scenario would result in significantly increased costs and so would not change any of the conclusions. We conclude that there appears to be significant restrictions to upgrading the ESPs and even with the upgrades, the upper end of the BAT AEL range is unlikely to be met. <u>Bag filters</u> The BREF confirms that bag filters are applicable for biomass units of all sizes and combustion techniques. Bag filters are used on biomass plants covered by Chapter IV of the IED because they have a different abatement system including injection of activated carbon. They are not necessarily BAT for plants not covered by Chapter IV of the IED. It may be technically possible to pre-treat the flue gas prior to the bag filters to mitigate potential fire risks. Whilst we conclude that there appear to be safety risks associated with bag filters at the installation, we have updated the Operator's CBA to include this as an option. We used the costs that the Operator provided in their IED Article 15(4) report.

As mentioned, there are a number of other relevant technical characteristics (Refer to Annex 1 below) supported in paragraph 4.41 of the DEFRA guidance, however it is our view that the criteria assessment tabulated above is the strongest candidate.

7.2.3 Options review

The Operator has addressed all the options for achieving the BAT AEL. The Operator has referred to the BAT Conclusions and addressed all reasonable techniques for achieving the BAT AEL. Where an option is considered appropriate for CBA it has been identified as such and considered further.

Review of all possible techniques to achieve BAT-AEL		
Type of control techniques considered as defined in BATC	**Technique description**	**General applicability**
a. Secondary measures: ESP	Particles are charged and separated under the influence of an electrical field. The abatement efficiency depends on the number of fields, the residence time (size), catalyst properties, and upstream particle removal devices. ESPs generally include between two and five fields. The most modern (high-performance) ESPs have up to seven fields.	Generally applicable
b. Secondary measures: Bag filter	Bag or fabric filters are constructed from porous woven or felted fabric through which gases are passed to remove particles. The use of a bag filter requires the selection of a fabric suitable for the characteristics of the flue-gas and the maximum operating temperature.	Generally applicable
c. Primary measures: Dry or semi-dry FGD	The techniques are mainly used for oxides of sulphur (SOx), HCl and/or hydrogen fluoride (HF) control. The BAT Conclusions do however recognise that there are co-benefits in the form of a reduction in dust and metal emissions.	Generally applicable
d. Primary measures: Wet FGD		See applicability in BAT 25 to prevent or reduce SOx, HCl and HF emissions
e. Primary measures: Fuel choice	The use of a fuel with a low ash or metals (e.g. mercury) content.	Applicable within the constraints associated with the availability of different types of fuel.

7.2.4 No CBA

The Operator is proposing not to conduct a cost effectiveness / CBA for the options listed below, and has adequately justified this decision:

Techniques not progressing to CBA	
Technique description	**Reason not progressed to CBA**
b. Secondary measures: Bag filter	High risk of fire with biomass ash
c. Primary measures: Dry or semi-dry FGD	The techniques are mainly used for SOx, HCl and/or HF control, which are within the BAT AEL ranges.
d. Primary measures: Wet FGD	The techniques are mainly used for SOx, HCl and/or HF control, which are within the BAT AEL ranges.
e. Primary measures: Fuel choice	**Already applied at the installation** Fuel contract specification includes maximum ash content etc.

7.2.5 CBA options

Options for achieving the BAT AEL using available techniques that are considered as viable are taken forward for disproportionality assessment. The Operator is proposing to conduct a CBA which includes one option for achieving the BAT AEL and has adequately justified this decision.

Options considered as viable and taken forward for disproportionality assessment Note 1		
Option	**Description**	**Timescale for completion**
Business as usual (BAU)	Primary techniques and ESP to comply with IED Annex V ELVs. Use of primary measures and ESP to control dust emissions to comply with TNP limits until 30 June 2020, then IED Annex V limits.	No change
Proposed derogation	Primary techniques and ESP to comply with IED Annex V ELVs. Use of primary measures and ESP to control dust emissions to comply with TNP limits until 30 June 2020, then IED Annex V limits.	No change
BAT AEL ESP upgrade	Installation of additional ESP field to achieve 10mg/Nm³ of dust.	BAT achieved by 2021 Note 2
Note 1	Whilst the bag filters were not taken forward for CBA, costs were provided in the Operator's IED Article 15(4) Derogation Request report. We have added this option into the CBA tool to assess disproportionality of costs and benefits for this option.	
Note 2	Whilst the ESP upgrade has been taken forward for CBA, the Operator has concluded that the BAT AEL is unlikely to be met.	

7.2.6 Significance

The Operator has claimed that releases are insignificant and we agree with this, see below.

If the proposed derogation is accepted then the mass of emission released compared to the mass released if compliant with the BAT AEL would be **108** tonnes of dust.

7.2.7 Summary of first stage assessment

The Operator has supplied a valid derogation request against BAT Conclusion 26. The derogation request is based on technical characteristics of the installation. As a biomass conversion of an existing coal-fired installation, significant space and plant performance related constraints limit the performance of the BAT techniques, specifically upgrading the ESP and hence the ability to comply. The use of bag filters could present an unacceptable fire risk due to the high unburnt carbon content of biomass ash and the likelihood of sparks and hot embers in the flue gas.

The Operator has described one relevant option (secondary measure) for achieving the BAT AEL and justified the screening out of four options (primary and secondary

measures). The relevant option was taken forward to conduct a Cost Benefit Analysis (CBA) with the business as usual (BAU) and the proposed derogation options i.e. three options in total.

Whilst the bag filters were not taken forward for CBA, costs were provided in the Operator's IED Article 15(4) Derogation Request report. We added this option into the CBA tool to assess disproportionality of costs and benefits for bag filters.

The proposed Emission Limit Values (ELVs) are significantly below the current ELVs and are aligned with the Industrial Emissions Directive (IED) Annex V ELVs, until the next permit review or following the next update of the BAT Conclusions.

Proposed ELVs & IED Annex V ELVs
40 mg/Nm^3, 95%ile hourly averages over a year
22 mg/Nm^3, daily average
20 mg/Nm^3, monthly and annual average

Current ELVs
42 mg/Nm^3, 95%ile daily averages over a year
35 mg/Nm^3, monthly average

7.2.8 Part 2: Second Stage Assessment
Demonstrating disproportionality of costs and benefits

a Costs**:** The Operator has satisfactorily demonstrated that the stated criterion would result in increased costs of achieving the BAT AEL (as compared to the typical cost of installing the appropriate technique).

b CBA: The CBA has been reviewed and considered to support the derogation request. Key points from the CBA are summarised below.

One option for meeting the BAT AEL was presented in the main report of the 'BAT and Options Appraisal for Biomass Generation' report dated October 2018. An amendment was provided dated 10 January 2019.

Following an initial review of the original BAT assessment and CBA, we requested that the CBA model inputs for the BAU and proposed derogation option be revised from the design performance emissions to the TNP ELVs for dust from 2018 to June 2020. This is to reflect the maximum emissions allowed under the current permit. It must however be emphasised that current emission levels from the installation are significantly lower than the TNP ELVs so this represents a worst case.

Whilst the bag filters were not taken forward for CBA, costs were provided in the Operator's IED Article 15(4) Derogation Request report. We have added this option into the CBA tool to assess disproportionality of costs and benefits for this option.

c Data input - general

The weighted average cost of capital (WACC) is consistent with what we would expect for the sector.

The lifetime of the technology and the appraisal period are based on the March 2027 end date for the CfD contract. Whilst this does not require installation closure, it introduces sufficient commercial and regulatory uncertainty to prevent investment decisions being made past that date. Manual sensitivity checks have been carried out to assess the effect of changing specific parameters, see below.

ESPs to be upgraded to meet the BAT AEL by 2021.

Bag filters added as an additional BAT AEL option.

Option appraisal periods

Year that work on derogation application began (Year 0)	(?)	2018			
		Business as Usual (BAU)	Proposed derogation	BAT-AEL	BAT-AEL-bag filters
First installation year (or if technology already installed leave 3.8, 3.9 and 3.10 blank and just fill in 3.11)	(?)	2018	2018	2021	2021
Length of time to complete installation (Years)					
Lifetime of technology once fully installed (Years)		10	10	7	7
Lifetime of technology remaining as of first appraisal year (only fill this in if your BAU technology is already installed) (Years)	(?)	10			
Last year of initial operation (Auto calculated value)		2027	2027	2027	2027
Does asset need to be 'renewed' over the appraisal period? (Auto calculated value)	(?)	No	No	No	No
Last year of appraisal period (Auto calculated value)	(?)	2027			

d Data input – options

Summary of the emissions and key costs of the proposed options:

Summary of emissions input for all options			
Option	**Dust tonnes/yr 2018 & 2019**	**Dust tonnes/yr 2020**	**Dust tonnes/yr 2021 to 2027**
BAU	378	297	216
Proposed derogation	378	297	216
BAT AEL / upgrade ESP	378	198	108
BAT AEL / bag filters	378	198	108

Summary of key costs for all options			
Option	**Capital Costs £Million**	**Annual costs (not including energy consumption) £000's**	**Lost revenue £Millions**
BAU	-	56	-
Proposed derogation	-	56	-
BAT AEL / upgrade ESP	5	553	109
BAT AEL / bag filters	4	189	109

e Key data input for individual options

We are satisfied with the Operator's approach and justification for the data input for each of the options.

The evidence as described in the submission and the CBA tool was reviewed and considered to be applicable and correct and should be considered as part of the derogation request. The basis of some cost assumptions were challenged and considered reasonable.

The costs have been compared using the Environment Agency CBA tool V 6.17, which is based on HM Treasury's Green Book guidance. The results are summarised in terms of Net Present Value (NPV). The costs of meeting the BAT AEL outweigh the monetised benefits in comparison to the proposed derogation (i.e. NPV < 0).

Summary of NPV analysis			
Option	**Proposed derogation**	**BAT AEL Upgrading ESPs**	**BAT AEL Bag filters**
Central (£millions)	0.00	-143.94	-127.73
Sensitivity analysis			
Lowest NPV–High upfront investment costs **(£millions)**	0.00	-158.05	-141.72
Highest NPV–Low upfront investment costs **(£millions)**	0.00	-129.84	-113.75
Scenario analysis			
Lowest NPV–High costs, Low benefits **(£millions)**	0.00	-172.71	-157.86
Highest NPV–Low costs, high benefits **(£millions)**	0.00	-106.20	-88.01

Detailed results-PV costs & PV benefits		
Option	**BAT AEL Upgrading ESPs**	**BAT AEL Bag filters**
PV costs **(£millions)**	146.3	130.6
PV benefits **(£millions)**	2.4	2.9
Central (£millions)	-143.9	-127.7

f BAT AEL: The CBA using central assumptions shows a negative NPV for the BAT AELs of **£144 and £128** million and therefore the cost of compliance is disproportionate compared to the environmental benefit achieved.

g Other options: Meeting the BAT AEL by upgrading the ESP's or installing bag filters were the only options considered.

h PV costs/benefits: BAT improves the environment by **£2.4 and £2.9** million over the time period but costs **£144 and £128** million upfront. This is a significant difference which is unlikely to be changed by sensitivity analysis.

i Sensitivity analysis:
The lowest negative NPV for the BAT AEL of **£158** million is caused by high upfront investment costs; and

The highest negative NPV for the BAT AEL of **£130** million is caused by low upfront investment costs.

j Manual sensitivity checks

We carried out manual sensitivity checks on specific parameters: Damage costs, plant life-time, lost revenue, waste disposal costs, bag filter capital costs and electrical consumption costs. This did not result in any changes to the conclusions.

7.2.9 Summary of the second stage assessment

The Operator has provided a credible argument that the increased costs linked to the technical characteristics of the installation are disproportionate for achieving the BAT AEL. Whilst the Operator did not include bag filters in their assessment, we amended the CBA to include this option. An appropriate range of options were reviewed and those identified as technically viable were considered further. A number of options were taken forward for CBA, were adequately described in the CBA and the cost of the BAT AEL options were confirmed as disproportionate compared to the environmental benefits. The CBA using central case assumptions shows negative Net Present Values (NPV) for the upgraded ESPs of £**144** million and for the bag filter option of £**128** million and therefore the cost of compliance is disproportionate compared to the environmental benefit achieved.

7.2.10 Risks of allowing the derogation

Allowing the proposed derogation would not cause any significant pollution or prevent a high level of protection of the environment as a whole to be achieved.

7.2.11 Annual emissions

The current allowable annual emissions of dust from the activity are **378** tonnes and this will reduce to **216** tonnes at the end of the TNP based on IED Annex V limits.

This would then reduce to at least **108** tonnes if the BAT AEL was met in accordance with the timeline set by the IED.

The Operator's proposal will mean that dust emissions will continue at their current rate until interim site specific ELVs are imposed in accordance with existing improvement condition IC19. This will remove some of the headroom and bring emissions more in alignment with the achievable performance. Dust emissions will then reduce in line with IED Annex V limits from 01 July 2020 until the next permit review.

There is no significant reduction in dust emissions from the installation through upgraded ESPs or additional secondary abatement (bag filters).

Assessment of the impact is conservative, as it is based on the upgraded ESPs actually achieving the BAT AEL. This is unlikely to be the case.

7.2.12 Predicted impacts

The predicted impact of derogating from the BAT AEL on any long or short term (LT/ST) Environmental Quality Standards (EQS) / Environmental Assessment Levels (EAL) is insignificant for the proposed derogation and the BAT AEL options i.e. LT process contribution (PC) <1% of EQS and ST PC <10% of EQS:

Summary of predicted impacts – maximum at a receptor					
Option	**PM_{10} Note 1 Tonnes per year**	**PC (µg/m³)**	**EQS (µg/m³)**	**PC as % of the EQS**	**Assessment of inputs**
Proposed derogation	**216** from July 2020	0.04	40 (LT)	0.1%	**Insignificant** for proposed derogation
		0.22	50 (ST)	0.4%	
Upgrade ESP/bag filter BAT AEL	**108** from August 2021	0.02	40 (LT)	0.1%	**Insignificant** for BAT AEL
		0.18	50 (ST)	0.4%	

Note 1: $PM_{2.5}$ emissions also screen out as insignificant for both options.

7.2.13 Other potential environmental impacts

The habitats assessment conservatively assumes that the most sensitive habitat is present at the maximum impact location. The assessment of the proposed derogation and BAT AEL scenarios does not identify either scenario to have a lesser impact than the other, with the impacts screened out as insignificant.

7.2.14 Summary of the risks allowing a derogation

The Operator has demonstrated that the costs of achieving the BAT AEL are disproportionate to the environmental benefits. There is no significant reduction in dust emissions from the installation by upgrading the ESPs or through the adoption of additional secondary abatement (bag filters) and in any event, the impacts are screened out as insignificant for the proposed derogation and the BAT AEL options.

7.2.15 Final considerations

Significant improvements have already been implemented at the site (see project time-line above). The plant has been subject to a major overhaul and life extension works. Significant new or upgraded items of plant associated with dust reduction include:

- Draught air system modifications including upgraded forced draft (FD) fan control and new induced draft (ID) fans to increase draught air flow capacity and flow control accuracy;
- New boosted over-fire air system (BOFA) including multiple over-fire air nozzles which combined with biomass burners control CO, NOx and maximise fuel burnout;
- New and modified furnace cleaning systems including new and upgraded soot blowers and water lances, to control slagging, fouling and furnace whitening.
- Existing ESP overhauled and upgraded with new high frequency switched integrated rectifier (SIR) technology including larger power supplies to increase the particulate collection efficiency and reduce particulate emissions. Final turning vanes were modified to improve gas flow, reduce erosion and improve capture. Existing ESP ash hoppers modified to ensure free flow of fly ash into the fly ash collection system.
- New fly ash collection system to collect and cool fly ash, emergency discharge facility, and new common conveyor leading to new sealed ash skip system housed in a new building.

There has been no public interest in this site or any reported historic local dissatisfaction or other complaints about the installation/Operator.

7.2.16 Permit conditions: Whilst we are accepting the derogation, the permit includes conditions requiring:

- The emissions to be reviewed following combustion optimisation. This will be reported via existing permit improvement conditions IC17 (Commissioning report) and IC19 (Stack sampling and demonstration of BAT for emissions to air).
- An IC has been set requiring a review of the emissions to assess the long-term plant performance over the full range of biomass wood pellets. The outcome of this will be used to determine appropriate longer term dust limits for the plant.
- A further IC has been set for the Operator to provide an update on the March 2027 timeline.
- The operating techniques for this BAT Conclusion will be incorporated into the permit.

7.2.17 Summary of final considerations

Significant improvements to reduce dust emissions have already been implemented as part of the biomass project. The plant has been subject to a major overhaul and life extension works.

The permit includes existing conditions requiring the emissions to be reviewed following combustion optimisation (IC19) and longer-term plant operation and incorporation of the operating techniques for this BAT Conclusion into the permit.

8 Emissions to water

The consolidated permit incorporates two current discharges to controlled waters identified as W1 and W3. There are no limits set by the existing permit.

As part of our delivery of the Water Framework Directive (WFD) requirements, we need to identify and assess the impact of sources of hazardous pollutants to surface waters from regulated industry. This is relevant to discharges to surface water and/or sewer where there are flue gas treatment activities to which BAT Conclusion 15 applies.

BAT Conclusion 15 requires a reduction in emissions to water from flue-gas treatment. The Operator confirmed that this is not applicable as there is no wet flue-gas treatment at the installation. We agree with the applicability of this BAT Conclusion, refer to Section 6 of this document.

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

9 Additional IED Chapter II requirements:

Condition	Justification
Condition 2.3.5 amended.	To reference Table S1.4 instead of S1.5, see below.
Condition 2.5.1 and associated Table S1.4 deleted	Submitted reports demonstrate compliance with the requirements of the pre-operational conditions. PO 01 submission received 10 July 2017. PO 02 submission received 31 May 2017. Incorporated into Table S1.2 to ensure that fugitive emissions are controlled as agreed. PO 03 submission received 31 May 2017. PO 04 submission received 06 July 2017. PO 05 submission received 06 July 2017. An energy efficiency report cannot be produced before biomass is burned in the first unit. The Operator submitted as much information as was possible at the time. A final report will be submitted under IC 17 and IC 21. PO 06 submission received 07 July 2017. The outcome of this was that we consider reintroducing emission points AU4 to AU21 into the permit air emissions tables. These emission points are manly dust extraction systems, designed with an ELV of 5 mg/m^3. Dust extracted is reintroduced back onto the conveyors at locations where the risk of the dust becoming airborne is reduced. See changes to Tables S3.1, S3.1a and S3.1b below. PO 07 submission received 06 July 2017.
Notification condition 4.3.1(d) amended.	To refer to condition 2.3.6 instead of 2.3.13

Table S1.1, existing activity reference A2 for other combustion activities, included with the AR1 combustion listed activity description.	Whilst we would not normally include combustion activities that are individually <1 MWth, this serves to highlight that there are other boilers on site. There are two liquefied petroleum gas (LPG) fired boilers each at 860 kWth, discharging via one windshield.
Table S1.2, inclusion of the biomass trial and fugitive emissions plan.	To incorporate the necessary operating techniques.
Table S1.3 IC 27 amended. IC 29 amended.	 LCP number amended from LCP 86 to LCP 418. To remove reference to Table S1.4, see below.
Table S1.3, IC 30 for SNCR abatement is deleted.	This improvement condition is no longer relevant, refer to Section 7 of this document for details of the NOx derogation.
Table S1.3 amended to add an improvement condition to address the impact from additional releases to air.	These have changed since the original submission and so have not been assessed as part of the permitting process.
Table S1.5 renumbered to Table S1.4.	Table S1.4 deleted due to completion of pre-operational conditions, see above.
Tables S3.1, S3.1a and S3.1b amended to include emission points AU5 to AU25.	Refer to air emission points information received 08 May 2019.
Table S4.4 amended	To require the submission of forms IED AR1, HR1 and REM1 to National *and Area.*
The addition of standard conditions for fire prevention plans are not required. The Operator shall refer to our document, 'Best Available Techniques for Pulverised Combustion of Wood Pellets in Power Plant.	

10 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 Regulation 61 response, any other 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 Operator confirmed that they did not require confidentiality for the CBA tool. The decision was taken in accordance with our guidance on confidentiality.
Consultation/Engagement	
Consultation	To be completed following consultation on the draft decision.
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 and the location of the part of the installation to which this permit applies on that site. 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. We have already assessed the application and its potential to affect all known sites of nature conservation, landscape and heritage and/or protected species or habitats identified in the nature conservation screening report as part of the permitting process. Given the conversion from coal to 100% biomass there

Aspect considered	Decision
	are significant reductions in emissions to air. We consider that the application will not affect any sites of nature conservation, landscape and heritage, and/or protected species or habitats identified. We have not consulted Natural England on the Regulation 61 response. The decision was taken in accordance with our guidance.
Operating techniques	
General operating techniques	We have reviewed the techniques used by the Operator where they are relevant to the BAT Conclusions and compared these with the relevant guidance notes. The permit conditions ensure compliance with the relevant BREF, BAT Conclusions. The ELVs deliver compliance with the BAT AELs. Where BAT AELs cannot be achieved we have incorporated the requirements of the derogation into the permit.
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 application, we consider that we need to impose an improvement programme. The conditions are described in the relevant BAT Conclusions in Sections 6 and 7 of this document.

Aspect considered	Decision
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 5.1, 6 and 7 of this document. It is considered that the ELVs/equivalent parameters or technical measures described above will ensure that significant pollution of the environment is prevented and a high level of protection for the environment is secured.
Monitoring	We have decided that monitoring should be carried out for the parameters listed in the permit, using the methods detailed and to the frequencies specified. These are described in the relevant BAT Conclusions in Section 6 of this document. Table S3.4 Process monitoring requirements was added to include the requirement to monitor energy efficiency. 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 a number of parameters. These are described in the relevant BAT Conclusions in Section 6 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.

Aspect considered	Decision
	Paragraph 1.3 of the guidance says: "The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation." We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections. We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.

Annex 1: Improvement conditions

Based on the information in the Operators Regulation 61 Notice responses and our own records of the capability and performance of the installation at this site, we consider that we need to set improvement conditions so that the outcome of the techniques detailed in the BAT Conclusions are achieved by the installation. These additional improvement conditions are set out below - justifications for them are provided at the relevant section of the decision document.

Table S1.3 Improvement programme requirements		
Ref.	**Requirement**	**Date**
IC 01 to IC 16	Complete Deleted	
IC 17	The operator shall submit a written report to the Environment Agency on the commissioning of the installation. The report shall summarise the environmental performance of the plant as installed against the design parameters set out in the Application. The report shall also include a review of the performance of the facility against the conditions of this Permit and details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions. This shall include: • reporting of the emission values from the stack, measured during the commissioning phase, that are representative of normal operations; • confirmation of the energy efficiency data in PO 05 and supporting information; • identification of any changes to the operating techniques during the design, build and commissioning of this plant and their impact on the compliance with the Permit and • a clear demonstration of BAT (Best Available Techniques) with references to the most recent guidance.	6 months after the completion of commissioning of the first main unit on solid biomass.

Table S1.3 Improvement programme requirements		
Ref.	**Requirement**	**Date**
IC 18	A written report shall be submitted to the Environment Agency at the Reporting Address for approval. The report shall include the results of noise surveys associated with the converted Power Station in accordance with the Combustion Technical Guidance Note and the Horizontal Guidance for Noise H3. Where appropriate, the report shall contain dates for the implementation of individual measures identified. The individual measures detailed in the report shall be designed and implemented by the operator from the date of approval or such other date as may be specified in that approval.	6 months after the completion of commissioning of the first main unit on solid biomass.
IC 19	A written report shall be submitted to the Environment Agency at the Reporting Address for approval. The report shall include the results of main boilers' stack sampling and/or monitoring, to demonstrate concentrations and mass flows of operational emissions of dust (PM10 and PM2.5), sulphur dioxide, oxides of nitrogen and HCl to air and their comparison with amounts predicted in the application and in accordance with the monitoring protocol submitted under pre-operational measure PO 03 and agreed by the Environment Agency. A clear demonstration of BAT (Best Available Technique) for air emissions shall be presented, including proposals for new site specific ELVs during the TNP.	Date of completion of biomass commissioning to be agreed with the EA. IC19 to be submitted within 1 month of the agreed end of commissioning date.
IC 20	A revised closure plan shall be submitted to the Environment Agency at the Reporting Address for approval. The plan shall take into consideration the biomass handling, storage and processing facilities in addition to any other changes made since the last update of the closure plan.	6 months after the completion of commissioning of the first main unit on solid biomass.

Table S1.3 Improvement programme requirements		
Ref.	**Requirement**	**Date**
IC 21	A written report shall be submitted to the Environment Agency at the Reporting Address for approval. The report shall demonstrate how effectively the unit / power station energy efficiency predicted in the response to PO05 has been met. The Operator shall also submit a Cost Benefit Analysis of the opportunities identified in a CHP-Ready report to expand provision of combined heat and power provided by the installation.	6 months after the completion of commissioning of the first main unit on solid biomass.
IC 22 to IC 25	Complete Deleted	
IC 26	The Operator shall submit a report in writing to the Environment Agency for approval. The report shall define and provide a written justification of the "minimum start up load" and "minimum shut-down load", for each unit within the LCP as required by the Implementing Decision 2012/249/EU in terms of: i. The output load (i.e. electricity, heat or power generated) (MW); and ii. This output load as a percentage of the rated thermal output of the combustion plant (%). And / Or iii. At least three criteria (operational parameters and / or discrete processes as detailed in the Annex) or equivalent operational parameters that suit the technical characteristics of the plant, which can be met at the end of start-up or start of shut-down as detailed in Article (9) 2012/249/EU.	Date of completion of biomass commissioning to be agreed with the EA. IC26 to be submitted within 1 month of the agreed end of commissioning date.

Table S1.3 Improvement programme requirements		
Ref.	**Requirement**	**Date**
IC 27	The operator shall provide a report in writing to the Environment Agency for acceptance, which provides the net rated thermal input for LCP86. The net rated thermal input is the 'as built' value unless the plant has been modified significantly resulting in an improvement of the plant efficiency or output that increases the rated thermal input (which typically requires a performance test to demonstrate that guaranteed improvements have been realised). Evidence to support this figure, in order of preference, shall be in the form of:- a) Performance test results* during contractual guarantee testing or at commissioning (quoting the specified standards or test codes), b) Performance test results after a significant modification (quoting the specified standards or test codes), c) Manufacturer's contractual guarantee value, d) Published reference data, e.g., Gas Turbine World Performance Specifications (published annually); e) Design data, e.g., nameplate rating of a boiler or design documentation for a burner system; f) Operational efficiency data as verified and used for heat accountancy purposes, g) Data provided as part of Due Diligence during acquisition, *Performance test results shall be used if these are available.	Date of completion of biomass commissioning to be agreed with the EA. IC27 to be submitted within 3 months of the agreed end of commissioning date.
IC 28	Complete Deleted	

Table S1.3 Improvement programme requirements		
Ref.	**Requirement**	**Date**
IC 29	The operator shall carry out an assessment of the impact on the environment of pulverised fuel ash and furnace bottom ash waste resulting from the burning of biomass. The assessment shall be carried out following the methodology agreed in accordance with pre operational condition PO 06 in table S1.4. A report on the findings of the assessment shall be submitted in writing to the Environment Agency for approval.	Within 12 months from the first deposit in the landfill of ash waste resulting from the burning of biomass or other period agreed in writing with the Agency
IC 30	Deleted. SNCR abatement is not currently relevant, refer to the NOx derogation in the Annex to this permit.	-
IC 31	<u>BAT Conclusion 4</u> The operator shall submit evidence to the Environment Agency for approval to demonstrate whether emissions of hydrogen chloride (HCl) from the plant are sufficiently stable in accordance with this BAT Conclusion. This shall include a site specific plan to demonstrate whether the emission remains sufficiently stable for the life of the plant.	30/06/21
IC 32	<u>BAT Conclusions 24 & 26</u> The operator shall submit a report to the Environment Agency for approval on the point source emissions of NOx and dust over the full range of biomass wood pellets to demonstrate the long term performance of the plant. The outcome of this shall be used to determine appropriate longer term NOx and dust limits at emission points AU1, AU2, AU3 in Table S3.1b of this permit.	15 months from the completion of commissioning
IC 33	<u>BAT Conclusions 24 & 26</u> The derogations from BAT Conclusion 24 & 26 are based on a timeline of March 2027. The operator shall update the Environment Agency on the operation of the installation and if necessary how compliance will be achieved beyond this date.	31/10/25

Table S1.3 Improvement programme requirements		
Ref.	**Requirement**	**Date**
IC 34	Air emission points The Operator shall carry out an assessment of the impact of dust emissions from air emission points AU5 to AU25. The assessment shall use the Environment Agency H1 tool or equivalent. A report on the assessment shall be submitted to the Environment Agency for approval. In the event that the assessment shows that an environmental standard could be exceeded, the report shall include proposals for further investigative and improvement works.	31/03/20

Annex 2: Advertising and Consultation on the draft decision

To be completed following consultation on the draft decision.