Permitting decisions

Bespoke permit

We have decided to grant the permit for Progress Power Station operated by Drax Power Limited.

The permit number is EPR/AP3936EA.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

Purpose of this document

This decision document provides a record of the decision making process. It:

- highlights key issues in the determination
- summarises the decision making process in the decision checklist to show how all relevant factors have been taken into account
- shows how we have considered the consultation responses.

Unless the decision document specifies otherwise we have accepted the applicant's proposals.

Read the permitting decisions in conjunction with the environmental permit. The introductory note summarises what the permit covers.

Key issues of the decision

Contents:

GLOSSARY

Baseload	means: (i) as a mode of operation, operating for >4000hrs per annum; and (ii) as a load, the maximum load under ISO conditions that can be sustained continuously, i.e. maximum continuous rating
BAT	best available techniques
BREF	best available techniques reference document
CCGT	combined cycle gas turbine
Emergency use	<500 operating hours per annum
ELV	emission limit value set out in either IED or LCPD
GT	gas turbine
IED	Industrial Emissions Directive 2010/75/EC
LCP	large combustion plant – combustion plant subject to Chapter III of IED
MCR	Maximum Continuous Rating
Mid merit	1500-4000 operating hours per annum
MSUL/MSDL	Minimum start up load/minimum shut-down load
OCGT	Open Cycle Gas Turbine
Peaking	500-1500 operating hours per annum
Part load operation	operation during a 24 hr period that includes loads between MSUL/MSDL and maximum continuous rating (MCR). Also referred to as low load operation.
SCR	selective catalytic reduction
SNCR	selective non catalytic reduction

1. Chapter III of the IED

Chapter III of the Industrial Emissions Directive applies to new and existing large combustion plants (LCPs) which have a total rated thermal input which is greater or equal to 50MW. Articles 28 and 29 explain exclusions to chapter III and aggregation rules respectively.

The aggregation rule is as follows:

- A LCP has a total rated thermal input ≥50MW.
- Where waste gases from two or more separate combustion plant discharge through a common windshield, the combination formed by the plants are considered as a single large combustion plant.
- The size of the LCP is calculated by adding the capacities of the plant discharging through the common windshield disregarding any units <15MWth.

A “common windshield” is frequently referred to as a common structure or windshield and may contain one or more flues.

The OCGT on this site consists of an individual combustion unit with a total rated thermal input ≥50MW making it an LCP.

Chapter III lays out special provisions for LCP and mandatory maximum ELVs are defined in part 2 of Annex V for new plant, however it is worth noting that BAT requirements may lead to the application of lower ELVs than these mandatory values. Mandatory ELVs cannot be exceeded even if a site specific assessment can be used to justify emission levels higher than BAT.

2. Large Combustion Plant Description and Number

The Permit uses the DEFRA LCP reference numbers to identify each LCP. The LCP permitted is as follows:

LCP 651, this LCP consists of one x 730 MWth OCGT which vents via emission point A1. The unit burns natural gas as the only fuel.

The LCP will operate as a peaking power generating station supported by an electrical generator and transformer. The Generating Station will be controlled from the control room at Drax Power Station. The plant will be used to ‘balance out’ the grid at times of peak electricity demand and will also support the grid at times when other technologies (e.g. wind and solar farms) cannot generate electricity due to their intermittent operation.

3. Compliance Route

The Applicant has proposed to operate LCP651 under the ELV compliance route, complying with the emission limits set out in part 2 of annex V of the IED.

4. Net thermal input

The Applicant has stated that the Net Thermal Input of LCP 651 is 730 MWth. They have justified this figure by providing input data based on a number of potential manufacturers.

The Applicant has not provided sufficient information to demonstrate the accurate net thermal input of the LCP as the plant has not been built yet. Consequently we have set improvement condition IC02, requiring them to provide this information within 12 months of the plant starting up.

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.

5. Minimum start up load and Minimum shut-down load (MSUL/MSDL)

The Applicant has not provided sufficient information to set the MSUL/MSDL as the plant has not been built yet. Consequently we have set improvement condition IC01, requiring them to provide this information within 12 months of the plant starting up. Table S1.5 in the permit, which details the MSUL/MSDL has been completed to reflect this too.

6. Large Combustion Plant Best Available Techniques reference document conclusions (BATc)

We have reviewed the permit application against the revised BAT Conclusions for the large combustion plant sector published on 31st July 2017.

BAT conclusions 1 – 17 applicable to all sites and 40 – 45 applicable to plant combusting gaseous fuels (but excluding those relating to iron and steel and chemical industries) have been considered. The response to each is set out in section 11 of this decision document.

The BAT AELs for emissions of NOx and CO have been included in table S3.1 of the permit.

7. The Installation's environmental impact

Regulated activities can present different types of risk to the environment, these include odour, noise and vibration; accidents, fugitive emissions to air and water; as well as point source releases to air, discharges to ground or groundwater, global warming potential and generation of waste and other environmental impacts. Consideration may also have to be given to the effect of emissions being subsequently deposited onto land (where there are ecological receptors). All these factors are discussed in this and other sections of this document.

For an installation of this kind, the principal emissions are those to air, although we also consider those to land.

The next sections of this document explain how we have approached the critical issue of assessing the likely impact of the emissions to air from the Installation on human health and the environment.

7.1 Assessment Methodology

7.1.1 Application of Environment Agency Web Guide for Air Emissions Risk Assessment

A methodology for risk assessment of point source emissions to air, which we use to assess the risk of applications we receive for permits, is set out in our Web Guide and has the following steps:

- Describe emissions and receptors
- Calculate process contributions
- Screen out insignificant emissions that do not warrant further investigation
- Decide if detailed air modelling is needed
- Assess emissions against relevant standards
- Summarise the effects of emissions

The methodology uses a concept of "process contribution (PC)", which is the estimated concentration of emitted substances after dispersion into the receiving environmental media at the point where the magnitude of the concentration is greatest. The guidance provides a simple method of calculating PC primarily for screening purposes and for estimating process contributions where environmental consequences are relatively low. It is based on using dispersion factors. These factors assume worst case dispersion conditions with no allowance made for thermal or momentum plume rise and so the process contributions calculated are likely to be an overestimate of the actual maximum concentrations. More accurate calculation of process contributions can be achieved by mathematical dispersion models, which take into account relevant parameters of the release and surrounding conditions, including local meteorology.

7.1.2 Use of Air Dispersion Modelling

For LCP applications, we normally require the applicant to submit a full air dispersion model as part of their application, for the key pollutants. Air dispersion modelling enables the process contribution to be predicted at any environmental receptor that might be impacted by the plant.

Once short-term and long-term PCs have been calculated in this way, they are compared with Air Quality Standards (AQS).

Where an EU EQS exists, the relevant standard is the EU EQS. Where an EU EQS does not exist, our guidance sets out a National EQS (also referred to as Environmental Assessment Level - EAL) which has been derived to provide a similar level of protection to Human Health and the Environment as the EU EQS levels. In a very small number of cases, e.g. for emissions of Lead, the National EQS is more stringent that the EU EQS. In such cases, we use the National EQS standard for our assessment.

National EQSs do not have the same legal status as EU EQSs, and there is no explicit requirement to impose stricter conditions than BAT in order to comply with a national EQS. However, national EQSs are a standard for harm and any significant contribution to a breach is likely to be unacceptable.

PCs are considered **Insignificant** if:

- the **long-term** process contribution is less than **1%** of the relevant EQS; and
- the **short-term** process contribution is less than **10%** of the relevant EQS.

The **long term** 1% process contribution insignificance threshold is based on the judgements that:

- It is unlikely that an emission at this level will make a significant contribution to air quality;
- The threshold provides a substantial safety margin to protect health and the environment.

The **short term** 10% process contribution insignificance threshold is based on the judgements that:

- spatial and temporal conditions mean that short term process contributions are transient and limited in comparison with long term process contributions;
- the threshold provides a substantial safety margin to protect health and the environment.

Where an emission is screened out in this way, we would normally consider that the applicant's proposals for the prevention and control of the emission to be BAT. That is because if the impact of the emission is already insignificant, it follows that any further reduction in this emission will also be insignificant.

However, where an emission cannot be screened out as insignificant, it does not mean it will necessarily be significant.

For those pollutants which do not screen out as insignificant, we determine whether exceedances of the relevant EQS are likely. This is done through detailed audit and review of the applicant's air dispersion modelling taking background concentrations and modelling uncertainties into account. Where an exceedance of an EU EQS is identified, we may require the applicant to go beyond what would normally be considered BAT for the installation or we may refuse the application if the applicant is unable to provide suitable proposals. Whether or not exceedances are considered likely, the application is subject to the requirement to operate in accordance with BAT.

This is not the end of the risk assessment, because we also take into account local factors (for example, particularly sensitive receptors nearby such as a SSSIs, SACs or SPAs). These additional factors may also lead us to include more stringent conditions than BAT.

If, as a result of reviewing of the risk assessment and taking account of any additional techniques that could be applied to limit emissions, we consider that emissions **would cause significant pollution**, we would refuse the application.

7.2 Assessment of Impact on Air Quality

The Applicant's assessment of the impact of air quality is set out in *Progress Power Air Dispersion Modelling Study, Environmental Permit Application Ref 70041304-AQ1 No. V2 December 2017* of the Application. The assessment comprises:

- A screening assessment of emissions to air from the operation of the Installation.
- Dispersion modelling of emissions to air from the operation of the Installation.
- A study of the impact of emissions on nearby sensitive habitat / conservation sites.

This section of the decision document deals primarily with the dispersion modelling of emissions to air from the Installation and its impact on local air quality. The impact on conservation sites is considered in section 7.3.

The Applicant has assessed the Installation's potential emissions to air against the relevant air quality standards, and the potential impact upon local conservation and habitat sites and human health. These assessments predict the potential effects on local air quality from the Installation's stack emissions using the ADMS 5.2.1 dispersion model, which is a commonly used computer

model for regulatory dispersion modelling. The model used 5 years of meteorological data collected from the weather station at RAF Wattisham between 2011 and 2015, located 25km to the south-west of the Power Generation Plant. Both the location of the Power Generation Plant and RAF Wattisham are inland sites, in areas of limited terrain influence. As such, the data from the airport is considered appropriate for the assessment. The impact of the terrain surrounding the site upon plume dispersion was considered in the dispersion modelling.

The air impact assessments, and the dispersion modelling upon which they were based, employed the following assumptions.

First, they assumed that the ELVs in the Permit would be the maximum permitted by either Annex V of the IED or under the BAT conclusions for the sector. These substances are:

- Oxides of nitrogen (NO_x), expressed as NO_2
- Carbon monoxide (CO)

Second, they assumed that the Installation operates at full load for 1500 hours per annum at the relevant long-term or short-term emission limit values, i.e. the maximum permitted emission rate. They scaled their mean annual NOx results by a factor of 1500/8760 to adjust for the maximum 1500 hours operation per year when considering long-term impacts of NO_2 on human health and NOx on ecological receptors.

We are in agreement with this approach. The assumptions underpinning the model have been checked and are reasonably precautionary.

The Applicant has used a combination of background data to establish an appropriate background. They have utilised available from local authority monitoring from 2011 - 2015, Defra mapped background pollutant concentrations for the UK on a 1km x 1km grid and the Air Pollution Inventory System (APIS). This data is summarised in the Application and has been used by the Applicant to establish the background (or existing) air quality against which to measure the potential impact of the Installation.

The Applicant's air quality modelling used data from monitoring undertaken by local authorities and Defra background map data. As no justification was provided for their use of the Defra background map data we considered alternative background values as part of our assessment. We considered alternative background concentrations, using local background grid data based on Defra 2013 background maps and South Norfolk District Council monitoring data from Victoria Road, Diss.

As well as calculating the peak ground level concentration, the Applicant has modelled the concentration of key pollutants at a number of specified locations within the surrounding area.

The way in which the Applicant used dispersion models, its selection of input data, use of background data and the assumptions it made have been reviewed by the Environment Agency's modelling specialists to establish the robustness of the Applicant's air impact assessment. The output from the model has then been used to inform further assessment of health impacts and impact on habitats and conservation sites.

Our review of the Applicant's assessment leads us to agree with the Applicant's conclusions.

The Applicant's modelling predictions are summarised in the following sections.

7.2.1 Assessment of Air Dispersion Modelling Outputs

The Applicant's modelling predictions are summarised in the tables below.

The Applicant has reported the maximum predicted concentration in modelled grids of 200 m, 100 m and 25 m resolutions to assess human health impact. The Applicant has not modelled at discrete sensitive human receptors. We identified a number of discrete locations to be representative of sensitive human receptors for inclusion in our check modelling.

The Applicant's modelling predicted peak ground level exposure to pollutants in ambient air. We have conservatively assumed that the maximum concentrations occur at the location of receptors.

The table below show the ground level concentrations at the most impacted grids.

Pollutant	**EQS / EAL**	**Back-ground**	**Process Contribution (PC)**		**Predicted Environmental Concentration (PEC)**	
	µg/m³	**µg/m³**	**µg/m³**	**% of EAL**	**µg/m³**	**% of EAL**
NO_2	40[1] 200[2]	12 24	0.4 14.6	0.90 7.3	12.4 38.6	30.9 19.3
CO	10000[2]	224	113.8	1.1	338	3.4

Notes:
Figures Process contribution figures rounded up to one decimal place
[1] Long term emissions
[2] Short term emissions

(i) Screening out emissions which are insignificant

From the tables above the following emissions can be screened out as insignificant in that the process contribution is < 1% of the long term EQS/EAL and <10% of the short term EAQ/EAL. These are:

- NO_2
- CO

Therefore we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation subject to the detailed audit referred to below.

All emissions either screen out as insignificant.

7.2.2 Consideration of key pollutants

(i) Nitrogen dioxide (NO_2)

The impact on air quality from NO_2 emissions has been assessed against the EU EQS of 40 $\mu g/m^3$ as a long term annual average and a short term hourly average of 200 $\mu g/m^3$. The model assumes a 70% NO_x to NO_2 conversion for the long term and 35% for the short term assessment in line with Environment Agency guidance on the use of air dispersion modelling.

The above table shows that the peak long term PC is less than 1% of the EU EQS and the peak short term PC is less than 10% of the EU EQS and so can be screened out as insignificant. Therefore we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation.

(ii) Dust

Natural gas is an ash-free fuel and high efficiency combustion in the gas turbine does not generate additional particulate matter. The fuel gas is always filtered and, in the case of gas turbines, the inlet air is also filtered resulting in a lower dust concentration in the flue than in the surrounding air. Thus for natural gas fired turbines dust emissions are not an issue.

(iii) Sulphur Dioxide

Natural gas, that meets the standard for acceptance into the National Transmission System, is considered to be sulphur free fuel. Hence, sulphur dioxide emissions from burning natural gas were not considered to be significant and were not modelled by the Applicant. We agree with this approach.

(iv) Carbon Monoxide

The above tables show that for CO emissions, the peak long term PC is less than 1% of the EAL/EQS and the peak short term PC is less than 10% of the EAL/EQS and so can be screened out as insignificant. Therefore we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation.

7.3 Impact on Habitats sites, SSSIs, non-statutory conservation sites etc.

7.3.1 Sites Considered

The following Habitats (i.e. Special Areas of Conservation, Special Protection Areas and Ramsar) sites are located within 10km of the Installation:

- Waveney & Little Ouse Valley Fens SAC
- Redgrave & Lopham Fens Ramsar

The following Sites of Special Scientific Interest are located within 2km of the Installation:

- Redgrave & Lopham Fens SSSI

The following non-statutory local wildlife and conservation sites are located within 2 km of the Installation:

- Broome Field (LWS)

7.3.2 Habitats Assessment

The Applicant's Habitats assessment was reviewed by the Environment Agency's technical specialists for modelling, air quality, conservation and ecology technical services, who agreed with the assessment's conclusions, that there would be no likely significant effect on the interest feature(s) of the protected site(s).

Waveney & Little Ouse Valley Fens SAC

Pollutant	EQS / EAL (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of EQS / EAL	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % EQS / EAL
Direct Impacts[2]						
NO_x Annual	30	15.98	0.02	0.1	16.0	53.4
NO_x Daily Mean	75	32	0.7	1.0	32.7	43.7

Pollutant	EQS / EAL (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of EQS / EAL	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % EQS / EAL
Deposition Impacts[2]						
N Deposition (kg N/ha/yr)	*15*	-	0.002	0.01	-	-
Acidification - Nitrogen Dep (Keq/ha/yr)	*0.549*	-	0.0001	0.03	-	-

(2) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.

Redgrave & Lopham Fens Ramsar

Pollutant	EQS / EAL (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of EQS / EAL	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % EQS / EAL
Direct Impacts[2]						
NO_x Annual	30	15.97	0.03	0.1	16.0	53.4
NO_x Daily Mean	75	31.8	1.3	1.7%	33.3	44.4%
Deposition Impacts[2]						
N Deposition (kg N/ha/yr)	*15*	-	0.003	0.02	-	-
Acidification - Nitrogen Dep (Keq/ha/yr)	*0.549*	-	0.0002	0.04	-	-

(2) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.

7.3.3 SSSI Assessment

The Applicant's assessment of SSSIs was reviewed by the Environment Agency's technical specialists for modelling, air quality, conservation and ecology technical services, who agreed with the assessment's conclusions, that the proposal does not damage the special features of the SSSI.

Redgrave & Lopham Fens SSSI

Pollutant	EQS / EAL (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of EQS / EAL		Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % EQS / EAL
	Direct Impacts[2]						
NO_x Annual	30	15.97	0.03	0.1		16.0	53.4
NO_x Daily Mean	75	31.8	1.3	1.7%		33.3	44.4%
	Deposition Impacts[2]						
N Deposition (kg N/ha/yr)	15	-	0.003	0.02		-	-
Acidification - Nitrogen Dep (Keq/ha/yr)	0.549	-	0.0002	0.04		-	-

(2) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.

7.3.4 Assessment of other conservation sites

Conservation sites are protected in law by legislation. The Habitats Directive provides the highest level of protection for SACs and SPAs, domestic legislation provides a lower but important level of protection for SSSIs. Finally the Environment Act provides more generalised protection for flora and fauna rather than for specifically named conservation designations. It is under the Environment Act that we assess other sites (such as local wildlife sites) which prevents us from permitting something that will result in significant pollution; and which offers levels of protection proportionate with other European and national legislation. However, it should not be assumed that because levels of protection are less stringent for these other sites that they are not of considerable importance. Local sites link and support EU and national nature conservation sites together and hence help to maintain the UK's biodiversity resilience.

For SACs SPAs, Ramsars and SSSIs we consider the contribution PC and the background levels in making an assessment of impact. In assessing these other sites under the Environment Act we look at the impact from the installation alone in order to determine whether it would cause significant pollution. This is a proportionate approach, in line with the levels of protection offered by the conservation legislation to protect these other sites (which are generally more numerous than Natura 2000 or SSSIs) whilst ensuring that we do not restrict development.

Critical levels and loads are set to protect the most vulnerable habitat types. Thresholds change in accordance with the levels of protection afforded by the legislation. Therefore the thresholds for SAC SPA and SSSI features are more stringent than those for other nature conservation sites.

Therefore, we would generally conclude that the installation is not causing significant pollution at these other sites if the PC is less than the relevant critical level or critical load, provided that the applicant is using BAT to control emissions.

The Local Wildlife Site Broomefields is within 2km of the Installation. The Applicant did not include this site in their air quality modelling assessment. We did however, include the site in our sensitivity checks and determined that the air emission impact on the site can be considered to be insignificant.

7.4 Emissions to Water

There are no discharges to water from the facility of waste process water

The only discharge from the Installation is uncontaminated surface water.

7.5 Noise Impacts

The Application contained a noise impact assessment which identified local noise-sensitive receptors, potential sources of noise at the proposed plant and noise attenuation measures. Measurements were taken of the prevailing ambient noise levels to produce a baseline noise survey and an assessment was carried out in accordance with BS 4142:1997 to compare the predicted plant rating noise levels with the established background levels. We noted that the Applicant had undertaken their assessment in line with a standard that has now been superseded and that the noise survey data used was 5 years old. We therefore went back to the Applicant and requested further information to require the Applicant to undertake a new noise survey and subject this data to an assessment which reflects the latest noise assessment methodology BS 4142:2014.

The table below shows how the predicted rating level compares to the background levels at the receptors near to the Installation. Impacts at receptors further away will be lower.

Sensitive receptor	Rating level compared to background (dB A)
1 Haygate	+7.9
2 Hammond Farm	-3.3
3 Goswald Hall	+6.4
4 Maltings	+3.8
5 Four Oaks	+3.2
6 Mulberrybush Nursery	+6.7
7 The Leys	+2.7
8 Judas Lane	+5.6

We have audited the Applicant's assessment and we agree with the conclusion that based on just the rating above there is the potential for impact, but considering the context of the location in line with BS 4142:2014, 'significant adverse impacts' are unlikely at nearby receptors. However, because of the initial BS 4142:2014 estimate of impact and the overall absolute sound levels we are unable to rule out potential 'adverse impact' based on the site context. We have therefore ensured the Operator will implement appropriate measures to minimise the potential for impact in line with the Best Available Techniques (BAT) and will require that the Installation is constructed to the design and mitigation measures as proposed in the Application.

The Applicant has outlined the following measures to minimise noise impacts:

- The Generating Station has been designed from the outset to ensure its noise impact is minimised.
- The gas turbine and major compressors are to be housed in individual acoustic enclosures of heavy construction, specified at 85 db(A) sound power level at 1m;
- Turbine filter and ventilation apertures fitted with high performance silencers and designed such that all sensitive receptors benefit from screening and/or directional corrections;

- A high performance silencer installed in the outlet duct between the gas turbine and exhaust. Due to the impracticability of screening stack noise, discharge noise will be controlled using the silencer. The silencer will be tuned to attenuate low frequencies from the gas turbine exhaust;
- Unit transformers will be housed in an appropriate enclosure or three sided berth to provide full screening to noise sensitive receptors;
- Acoustic lagging and low noise trims will be fitted to all pipework and noise generating valves;
- Plant items will be regularly maintained in accordance with the manufacturer's specifications; and
- To minimise the potential for impact, noise limits for specific monitoring locations on the site boundary will be implemented. To ensure compliance with the boundary noise limits, noise measurements at each of the identified locations will be undertaken following the date of final commissioning of the Generating Station with the Generating Station running at base load.

We have reviewed the noise management techniques proposed by the Applicant and we are satisfied they represent BAT. We have therefore incorporated the proposed measures into the Permit as operating techniques in table S1.2 of the Permit which will require the Operator to effectively implement these measures. We have also set improvement condition (IC5) to require the Operator to repeat the noise assessment once the plant is operating to ensure the proposed measures are effective in practice in managing noise from the site and for the Operator to propose additional works if further noise management measures are required.

Based upon the information in the Application, the additional information submitted in response to a schedule 5 request and the conditions in the Permit, we are satisfied that the appropriate measures will be in place to prevent, or where that is not practicable, to minimise noise and vibration and to prevent pollution from noise and vibration outside the site.

8. Application of Best Available Techniques

8.1 Scope of Consideration

In this section, we explain how we have determined whether the Applicant's proposals are the Best Available Techniques for this Installation.

- We address the fundamental choice of combustion technology. There are a number of alternatives, and the Applicant has explained why they have chosen one particular kind for this Installation.
- We consider energy efficiency, and options for Combined Heat and Power, and the compliance with the Energy Efficiency Directive.

Chapter III of the IED specifies a set of maximum emission limit values. Although these limits are designed to be stringent, and to provide a high level of environmental protection, they do not necessarily reflect what can be achieved by new plant. Article 14(3) of the IED says that BAT Conclusions shall be the reference for setting the permit conditions, so it may be possible and desirable to achieve emissions below the limits referenced in Chapter III.

Operational controls complement the emission limits and should generally result in emissions below the maximum allowed; whilst the limits themselves provide headroom to allow for unavoidable process fluctuations. Actual emissions are therefore almost certain to be below emission limits in practice, because any operator who sought to operate its installation continually at the maximum permitted level would almost inevitably breach those limits regularly, simply by virtue of normal fluctuations in plant performance, resulting in enforcement action (including potentially prosecution) being taken. Assessments are therefore "worst-case" scenarios.

We are satisfied that emissions at the permitted limits will ensure a high level of protection for human health and the environment in any event.

8.2 Consideration of Combustion Plant

The operator has chosen to operate an OCGT plant which we consider to be BAT.

Open cycle gas turbines operate without a heat recovery steam generator (HRSG) and therefore have a lower efficiency when compared with a Combined Cycle Gas Turbine (CCGT). The exhaust gases are emitted to atmosphere without any energy recovery.

Operation of gas turbines in open cycle is not considered a best available technique due to reduced energy efficiency and the potential increase of pollutants released to air in comparison to operating gas turbines in combined cycle mode. However, operating in open cycle enables a quick start up time of 30 minutes in order to provide energy to the National Grid to maintain electrical generation for emergency use compared with a CCGT with a time of around 240 minutes. With no steam turbine generating equipment, OCGTs can start faster and ramp quicker since there are no constraints requiring a steam turbine to warm-up prior to generation. The comparison of start-up times is significant when dealing with the challenges associated with managing greater capacity of intermittent renewables on the system. The Operator is authorised to install one gas turbine for operation in open cycle mode. It does not set BAT for open cycle operation.

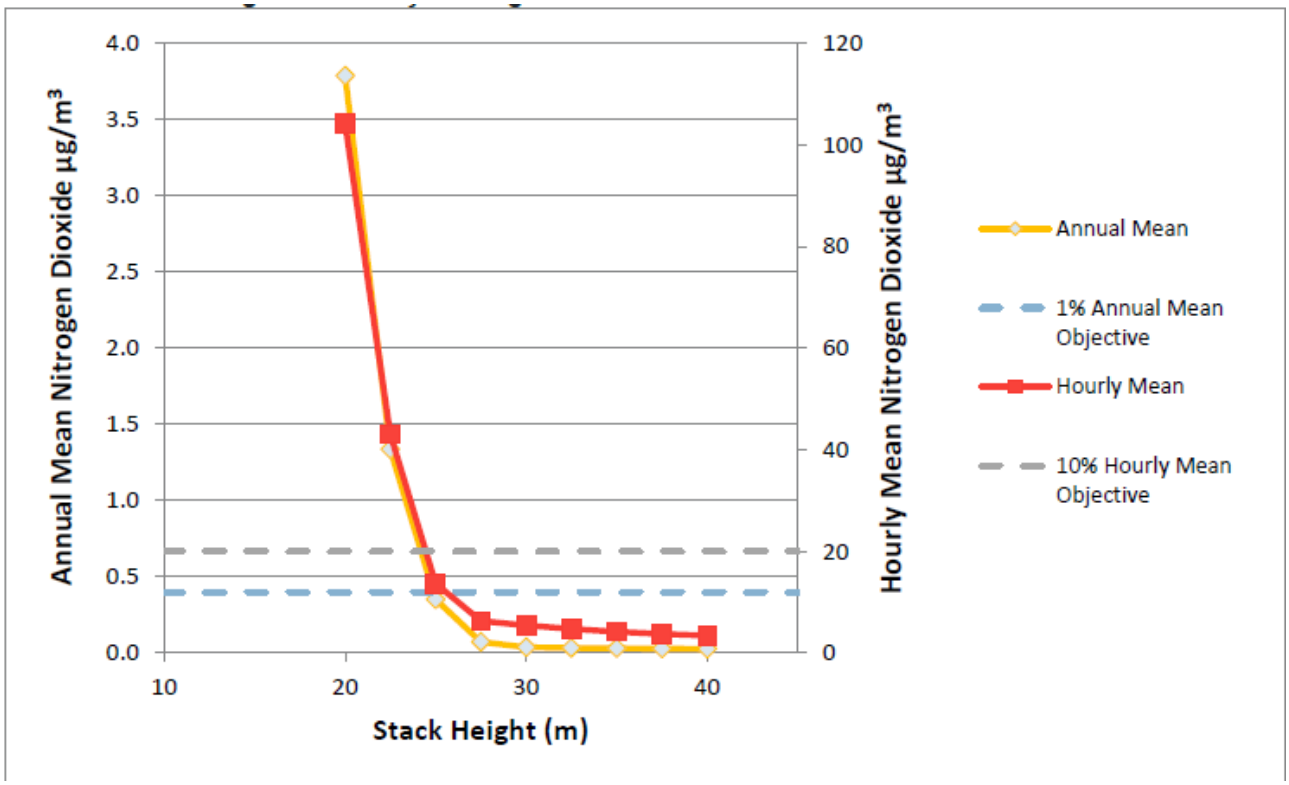
During open cycle operation the turbines will only burn natural gas and the main pollutant of concern will be NO_2. The Operator is restricted to operation in open cycle mode for no more than 1,500 hours in any one year over a five year period.

A Short Term Operating Reserve (STOR) contract requires the power station to generate power on demand within specific time windows to support the energy supply requirement of the National Grid. These typically occur six days per week for two periods per day of between approximately 5-6 hours. Generally open cycle runs would typically be two hours or less in duration.

The Application specifies that the need to operate gas turbines in open cycle mode is part of improving the resilience of the electrical supply industry and therefore contributes to the emergency preparedness of the country.

Stack height sensitivity testing indicated that a stack height of 25m would be required to achieve adequate dispersion of emissions, with the maximum ground level concentrations within the receptor grid as insignificant – see graph below. We accept that this indicates BAT for stack height.

Graph showing stack height sensitivity testing.



We have reviewed these proposal against the requirement of our guidance and are satisfied that at present OCGT presents BAT for serving the peaking market requirement and operational hours.

8.3 Consideration of emission control measures

We have reviewed the techniques used by the Operator and compared these with the relevant guidance notes. The OCGT will be fitted with dry low NOx burners to minimise emissions of NOx.

Emissions of NO_x and CO have been screened out as insignificant, so the Environment Agency agrees that the Applicant's proposed techniques are BAT for the Installation.

We consider that the emission limits included in the Installation Permit reflect the BAT for the sector.

8.4 Energy efficiency

8.4.1 Consideration of energy efficiency

We have considered the issue of energy efficiency in the following ways:

1. The use of energy within, and generated by, the Installation which are normal aspects of all EPR permit determinations. This issue is dealt with in this section.
2. The applicability of the combined heat and power ready (CHP-R) guidance to the installation.
3. The extent to which the Installation meets the requirement of Article 14(5) of the Energy Efficiency Directive which requires new thermal electricity generation installations with a total thermal input exceeding 20 MW to carry out a cost-benefit assessment to "*assess the cost and benefits of providing for the operation of the installation as a high-efficiency cogeneration installation*".

   Cogeneration means the simultaneous generation in one process of thermal energy and electrical or mechanical energy and is also known as combined heat and power (CHP)

   High-efficiency co-generation is cogeneration which achieves at least 10% savings in primary energy usage compared to the separate generation of heat and power – see Annex II of the Energy Efficiency Directive for detail on how to calculate this.
4. The extent to which the Applicant has demonstrated energy efficiency in line with the BAT AEELs set out in the BAT Conclusions.

8.4.2 Use of energy within the Installation

The gas turbine generator to be installed at the site will have an electrical efficiency between 38 and 40.5%. The Generating Station will operate as a peaking plant for no more than 1500 hours, will be fuelled by natural gas and limited to 1500 hours per year and therefore the provisions of Article 14 of the Energy Efficiency Directive do not apply to this plant.

Energy requirements for the peaking plant will be low with minimal heating and lighting requirements as the site will be unmanned at most times. The Operator has outlined that periodic and routine maintenance will take place on average once every six months, to ensure optimal operation and availability.

8.4.3 Choice of Steam Turbine

OCGT plant do not have any associated HRSG/steam turbine plant.

8.4.4 Choice of Cooling System

The current practice for operation of Combined Cycle Gas Turbines is to exhaust the combustion gases via the Heat Recovery Steam Generator (HRSG). As this system is running as an Open Cycle Gas Turbine no cooling is required for the condensing of steam due to the absence of a heat recovery system. There are however auxiliary cooling requirements (for lubricating oils, etc.) which would be met by a cooling system is in the form of air cooled fin-fan coolers. We consider that it is unlikely that water cooling would be considered BAT for plant that will be limited to 1500 hours per year as a rolling average.

Fin fan coolers within a closed cycle cooling water system are considered BAT for providing cooling to the gas turbine generator at this site for the following reasons.

- They have no significant water consumption requirement and hence are suited to the site location and operational profile of the site which is approximately 2.0km from the nearest main river (River Dove) at its closest point.
- There is no suitable source of water for abstraction in the volume needed within the vicinity of the site to sustain a once through system. The closest water features comprise small streams and ditches.
- The intermittent operation of the Generating Station means there would be potential maintenance issues with regard to biological control and fouling along with the potential for siltation if a once through water system was used.
- They will not result in additional effluent discharges.
- They have a lower visual impact when compared with evaporative techniques.

Fin fan coolers can give rise to greater noise impacts. The noise assessment undertaken as part of the EIA concluded that the noise effects from the Generating Station will not result in significant noise effects at the nearest noise sensitive receptors. In addition, fin fan coolers have a higher energy demand than other cooling options. However, the energy consumption by the fin fan coolers will not have a material impact on the overall energy efficiency for the project.

The Industrial Cooling Systems BREF guidance says “The principle of dry air-cooling can be found in smaller industrial as well as in large power plant applications in those situations where sufficient water is not available or water is very expensive”.

We have reviewed these proposals against our guidance on industrial cooling system and based on the fact that the site is located over 2km from a water source making water cooling unviable we are satisfied the Operator’s proposals represent BAT.

8.4.5 Combined Heat and Power

Our CHP Ready Guidance - February 2013 considers that BAT for energy efficiency for new combustion power plant is the use of CHP in circumstances where there are technically and economically viable opportunities for the supply of heat from the outset.

The term CHP in this context represents a plant which also provides a supply of heat from the electrical power generation process to either a district heating network or to an industrial / commercial building or process. However, it is recognised that opportunities for the supply of heat do not always exist from the outset (i.e. when a plant is first consented, constructed and commissioned).

In cases where there are no immediate opportunities for the supply of heat from the outset, the Environment Agency considers that BAT is to build the plant to be CHP Ready (CHP-R) to a degree which is dictated by the likely future opportunities which are technically viable and which may, in time, also become economically viable.

The Installation will generate electricity only and has been specified to maximise electrical output with little or no use of waste heat.

It was concluded that there are three other prohibitive barriers to the application of CHP at the site:

- There is no existing regional heat market. From local searches there are no suitable heat users of applicable scale to the unpredictable heat available.
- No potential future heat requirements in the area have been identified and none that would match the operational pattern of a peaking power station are anticipated.
- The intermittent and peaking modes of operation of OCGT are incompatible with the likely continuous demands of heat users. Because of the lack of applicable heat demands, provisions in the proposed scheme for exploiting and potential heat demand in the future can be excluded.
- The plant will be limited to 1500 hours per year as a rolling average and we recognise this is unlikely to be compatible with CHP as specified within the Energy Efficiency Directive exemption.

8.4. Compliance with Article 14(5) of the Energy Efficiency Directive

The operator is exempt from the need to carry out a cost-benefit assessment under [Article 14(6)(a) of the Energy Efficiency Directive because the installation will operate for less than 1,500 operating hours per year as a rolling average over a period of five years.

(i) Permit conditions concerning energy efficiency

The Operator is required to report energy usage and energy generated under condition 4.2 and table S4.2 in Schedule 4. This will enable the Environment Agency to monitor energy efficiency at the Installation and take action if at any stage the energy efficiency is less than proposed.

There are no site-specific considerations that require the imposition of standards beyond indicative BAT, and so the Environment Agency accepts that the Applicant's proposals represent BAT for this Installation.

The Operator is required to report energy usage and energy generated under condition 4.2 and table S4.2 in Schedule 4. This will enable the Environment Agency to monitor energy efficiency at the Installation and take action if at any stage the energy efficiency is less than proposed.

There are no site-specific considerations that require the imposition of standards beyond indicative BAT, and so the Environment Agency accepts that the Applicant's proposals represent BAT for this Installation.

8.4.7 Compliance with energy BAT AEELs set out in BAT Conclusions

The BAT AEELs do not apply to plant operating <1500 hours however, the operator has specified that the OCGT will be 39% efficient which is within the range specified in the BAT Conclusions of 36 – 41.5% efficient.

9. Emission limits

The operator has proposed limits in line with part 2 annex V of the IED and BAT AELs set out within the BAT Conclusions for Large Combustion Plant. As discussed in section 8 above, emissions at these limits will not cause significant pollution. Consequently we have accepted the proposed limits and incorporated them into table 3.1 of the permit. Annex V of the IED is a backstop and these limits are included where there is no tighter limit specified within the BAT Conclusions.

The BAT Conclusions specify that the AELs will apply when dry low NOx (DLN) is effective. We have specified an improvement condition IC7 requiring the operator to define an output load or operational parameters and provide a written justification for when the dry low NO_x operation is effective. The report shall also include the NO_x profile through effective dry low NO_x to 70% and then to full load.

The Operator is also required to propose achievable emission limit values (ELV) for NO_x and CO expressed as a daily mean of validated hourly averages from Minimum start-up load (MSUL) to baseload through improvement condition IC8.

The annual AEL for CO from the BAT Conclusions is indicative. At this stage the Operator did not have adequate information to demonstrate whether the selected plant can meet the CO AEL. We have included improvement condition IC6 specifying that the Operator is required to propose an achievable ELV for carbon monoxide expressed as an annual mean of validated hourly averages within 4 months following commissioning. If the proposed ELV deviates from the indicative BAT AEL for CO of 40mg/m^3 then an associated BAT justification will need to be submitted to the Environment Agency as a written report.

Parameter	Reference Period	Annex V mg/m^3	BAT AEL	Permit limit mg/m^3
NO_x	95%ile of hourly averages	100	-	100
	Monthly averages	50	-	50
	Daily average or average over the sampling period	-	50	50
	Yearly average	-	35	35
CO	95%ile of hourly averages	200	-	200
	Monthly averages	100	-	100
	Daily average or average over the sampling period	110	-	110
	Yearly average	-	40	40

10. Monitoring & Reporting

The IED Annex V ELVs and BAT Conclusions AELs for oxides of nitrogen and carbon monoxide apply to OCGTs.

Gas fired plant:

Sulphur dioxide emissions from natural gas firing of gas turbines and boilers will be reported as six monthly concentrations on the basis of the fuel sulphur content without continuous or periodic monitoring since only trace quantities of sulphur are present in UK natural gas. Dust emissions for natural gas fired boilers are, likewise, reported on the basis of emission factors without continuous or periodic monitoring. For gas turbines we do not require any reporting as the dust emissions will always be reported as zero. This is because natural gas is an ash-free fuel and high efficiency combustion in the gas turbine does not generate additional particulate matter. The fuel gas is always filtered and, in the case of gas turbines, the inlet air is also filtered resulting in a lower dust concentration in the flue than in the surrounding air. Therefore, there is no requirement in the Permit to monitor or report dust emissions.

The IED Annex V ELVs and BAT Conclusions AELs for oxides of nitrogen and carbon monoxide apply to OCGTs.

Standards:

Standards for assessment of the monitoring location and for measurement of oxygen, water vapour, temperature and pressure have been added to the permit template for clarity.

A row has been included in table S3.1 which requires the operator to confirm compliance with BS EN 15259 in respect of monitoring location and stack gas velocity profile in the event there is a significant operational change (such as a change of fuel type) to the LCP. For a new plant, such as this, in pre-operational commissioning the same requirement applies.

Notifications:

A breach of permit condition is NOT implicit in notification under Part C.

Resource efficiency metrics:

A more comprehensive suite of reporting metrics has been added to the permit template for Electrical Supply Industry (ESI) plant. Table S4.2 “Resource Efficiency Metrics” has been added requiring the reporting of various resource parameters, as this is an ESI power plant. This table is being used for all ESI plant.

11. Meeting the requirements of the IED

The table below shows how each requirement of the IED has been addressed by the Permit conditions.

IED Article Reference	IED requirement	Permit condition
30(6)	If there is an interruption in the supply of gas, an alternative fuel may be used and the permit emission limits deferred for a period of up to 10 days, except where there is an overriding need to maintain energy supplies. The EA shall be notified immediately.	N/A plant runs on natural gas only
32(4)	For installations that have applied to derogate from the IED Annex V emission limits by means of the transitional national plan, the monitoring and reporting requirements set by UK Government shall be complied with.	N/A applies to existing plant only
33(1)b	For installations that have applied to derogate from the IED Annex V emission limits by means of the Limited Life Derogation, the operator shall submit annually a record of the number of operating hours since 1 January 2016;	N/A applies to existing plant only
37	Provisions for malfunction and breakdown of abatement equipment including notifying the EA.	N/A
38	Monitoring of air emissions in accordance with Ann V Pt 3	3.5, 3.6
40	Multi-fuel firing	N/A no multi fuel firing
41(a)	Determination of start-up and shut-down periods	2.3.5 Schedule 1 Table S1.3
Ann V Pt 1(1)	All emission limit values shall be calculated at a temperature of 273,15 K, a pressure of 101,3 kPa and after correction for the water vapour content of the waste gases and at a standardised O_2 content of 6 % for solid fuels, 3 % for combustion plants, other than gas turbines and gas engines using liquid and gaseous fuels and 15 % for gas turbines and gas	Schedule 6, Interpretation

IED Article Reference	IED requirement	Permit condition
	engines.	
Ann V Pt 1	Emission limit values	3.1.2 Schedule 3, Table S3.1
Ann V Pt 1	For plants operating less than 1500 hours per year, record the used operating hours	2.3.4, 4.2.2d
Ann V Pt 1(6(1))	Definition of natural gas	Schedule 6, Interpretation
Ann V Pt 2	Emission limit values	3.1.2 Schedule 3, Table S3.1
Ann V Pt 3(1)	Continuous monitoring for >100MWth for specified substances	3.5, 3.6 Schedule 3, Table S3.1
Ann V Pt 3(2, 3, 5)	Monitoring derogations	3.5.1 Schedule 3, Table S3.1
Ann V Pt3(4)	Measurement of total mercury	N/A
Ann V Pt3(6)	EA informed of significant changes in fuel type or in mode of operation so can check Pt3 (1-4) still apply	2.3.1 Schedule 1, Table S1.2
Ann V Pt3(7)	Monitoring requirements	3.5.1 Schedule 3, Table S3.1
Ann V Pt 3(8,9,10)	Monitoring methods	3.5, 3.6
AnnV Pt 4	Monthly, daily, 95%ile hourly emission limit value compliance	3.5.1 Schedule 3, Table S3.1
AnnV Pt7	Refinery multi-fuel firing SO_2 derogation	N/A

12. Meeting the requirements of the BAT Conclusions

This annex provides a record of decisions made in relation to each relevant BAT Conclusion considered potentially applicable to the Installation. This table should be read in conjunction with the Permit.

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) or where plant not built yet but will be compliance once operational

NC Not Compliant

PC Partially Compliant

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement	Relevant permit condition(s)
General				
1	**In order to improve the overall environmental performance of the plants for the refining of mineral oil and gas, 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	FC	An EMS will be in place at the installation and will be certified to ISO14001. An improvement condition IC03 requires the operator to report on the progress of this implementation to the Environment Agency.	1.1.1

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th><th>Relevant permit condition(s)</th></tr>
<tr><td></td><td>properly implemented and maintained;

vi. review of the EMS and its continuing suitability, adequacy and effectiveness by senior management;

vii. following the development of cleaner technologies;

viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life;

viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life;

ix. application of sectoral benchmarking on a regular basis.

Applicability. The scope (e.g. level of detail) and nature of the EMS (e.g. standardised or non-standardised) will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have.</td><td></td><td></td><td></td></tr>
<tr><td>2</td><td>BAT is to determine the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the gasification, IGCC and/or combustion units by carrying out a performance test at full load (1), according to EN standards, after the commissioning of the unit and after each modification that could significantly affect the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the unit. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.</td><td>FC</td><td>A process monitoring table specifies that the operator shall determine the net electrical efficiency after commissioning.</td><td>3.5.1 and table S3.3</td></tr>
<tr><td>3</td><td>BAT is to monitor key process parameters relevant for emissions to air and water including those given below.
<table><tr><th>Stream</th><th>Parameter(s)</th><th>Monitoring</th></tr><tr><td rowspan="3">Flue-gas</td><td>Flow</td><td>Periodic or continuous determination</td></tr><tr><td>Oxygen content, temperature, and pressure</td><td rowspan="2">Periodic or continuous measurement</td></tr><tr><td>Water vapour content ([3])</td></tr></table></td><td>FC</td><td>Monitoring parameters specified within the permit emissions table S3.1.</td><td>3.1.1 and 3.5.1 and table S3.1</td></tr>
</table>

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th><th>Relevant permit condition(s)</th></tr>
<tr><td></td><td>
<table>
<tr><td>Waste water from flue-gas treatment</td><td>Flow, pH, and temperature</td><td>Continuous measurement</td></tr>
</table>
</td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>BAT is to monitor emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.
<table>
<tr><th>Substance/Parameter</th><th>Fuel/Process/Type of combustion plant</th><th>Combustion plant total rated thermal input</th><th>Standard(s) [4]</th><th>Minimum monitoring frequency [5]</th><th>Monitoring associated with</th></tr>
<tr><td>NH_3</td><td>— When SCR and/or SNCR is used</td><td>All sizes</td><td>Generic EN standards</td><td>Continuous [6] [7]</td><td>BAT 7</td></tr>
<tr><td>NO_X</td><td>— Coal and/or lignite including waste co-incineration
— Solid biomass and/or peat including waste co-incineration
— HFO- and/or gas-oil-fired boilers and engines
— Gas-oil-fired gas turbines
— Natural-gas-fired boilers, engines, and turbines
— Iron and steel process gases
— Process fuels from the chemical industry</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>NOx, CO and SO_2 monitoring specified in table S3.1 for the gas turbine. Other parameters are not applicable to this plant.</td><td>3.1.1 and 3.5.1 and table S3.1</td></tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement	Relevant permit condition(s)
		— IGCC plants							
		— 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 and/or peat including waste co-incineration — HFO- and/or gas-oil-fired boilers and engines — Gas-oil-fired gas turbines — Natural-gas-fired boilers, engines, and turbines — Iron and steel process gases — Process fuels from the chemical industry — IGCC plants	All sizes	Generic EN standards	Continuous (6) (8)	BAT 20 BAT 24 BAT 28 BAT 33 BAT 38 BAT 44 BAT 49 BAT 56 BAT 64 BAT 65 BAT 73			

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement	Relevant permit condition(s)
	<table><tr><td></td><td>— Combustion plants on offshore platforms</td><td>All sizes</td><td>EN 15058</td><td>Once every year (9)</td><td>BAT 54</td></tr><tr><td>SO_2</td><td>— Coal and/or lignite incl waste co-incineration — Solid biomass and/or peat incl waste co-incineration — HFO- and/or gas-oil-fired boilers — HFO- and/or gas-oil-fired engines — Gas-oil-fired gas turbines — Iron and steel process gases — Process fuels from the chemical industry in boilers — IGCC plants</td><td>All sizes</td><td>Generic EN standards and EN 14791</td><td>Continuous (6) (11) (12)</td><td>BAT 21 BAT 25 BAT 29 BAT 34 BAT 39 BAT 50 BAT 57 BAT 66 BAT 67 BAT 74</td></tr><tr><td>SO_3</td><td>— When SCR is used</td><td>All sizes</td><td>No EN standard available</td><td>Once every year</td><td>—</td></tr></table>			
5	BAT is to monitor emissions to water from flue-gas treatment with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	NA	This BAT Conclusion is not applicable to this site because there is no flue-gas treatment.	
6	In order to improve the general environmental performance of combustion plants and to reduce emissions to air of CO and unburnt substances, BAT is to ensure optimised combustion and to use an appropriate combination of the techniques given below.	FC	(a) NA natural gas use only. (b) Regular and	2.3.1 and Table S1.2

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

	Technique	Description	Applicability
a.	Fuel blending and mixing	Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type	Generally applicable
b.	Maintenance of the combustion system	Regular planned maintenance according to suppliers' recommendations	
c.	Advanced control system	See description in Section 8.1	The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system
d.	Good design of the combustion equipment	Good design of furnace, combustion chambers, burners and associated devices	Generally applicable to new combustion plants
e.	Fuel choice	Select or switch totally or partially to another fuel(s) with a better environmental profile (e.g. with low sulphur and/or mercury content) amongst the available fuels, including in start-up situations or when back-up fuels are used	Applicable within the constraints associated with the availability of suitable types of fuel with a better environmental profile as a whole, which may be impacted by the energy policy of the Member State, or by the integrated site's fuel balance in the case of combustion of industrial process fuels. For existing combustion plants, the type of fuel chosen may be limited by the configuration and the design of the plant

planned maintenance will be implemented.

(c) An advanced control system will be implemented to automatically control and optimise combustion efficiency and manage prevention and reduction of emissions

(d) The combustion system selected will be of a proven design.

(e) Only natural gas will be used including for start up and shut down.

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement	Relevant permit condition(s)
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	This BAT Conclusion is not applicable to this site because there is no SCR.	
8	In order to prevent or reduce emissions to air during normal operating conditions, BAT is to ensure, by appropriate design, operation and maintenance, that the emission abatement systems are used at optimal capacity and availability.	NA	This BAT Conclusion is not applicable to this site because there is no abatement on site.	
9	In order to improve the general environmental performance of combustion and/or gasification plants and to reduce emissions to air, BAT is to include the following elements in the quality assurance/quality control programmes for all the fuels used, as part of the environmental management system (see BAT 1): (i) Initial full characterisation of the fuel used including at least the parameters listed below and in accordance with EN standards. ISO, national or other international standards may be used provided they ensure the provision of data of an equivalent scientific quality; (ii) Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications. The frequency of testing and the parameters chosen from the table below are based on the variability 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)).	FC	As the natural gas supplied by the National Grid is required to meet a standard we consider acceptable environmentally we have decided that plant fuelled on natural gas from the grid will not require characterisation or testing.	No condition required.

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th><th>Relevant permit condition(s)</th></tr>
<tr><td></td><td>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>Natural gas</td><td>— LHV
— CH_4, C_2H_6, C_3, C_4+, CO_2, N_2, Wobbe index</td></tr>
</table></td><td></td><td></td><td></td></tr>
<tr><td>10</td><td>In order to reduce emissions to air and/or to water during other than normal operating conditions (OTNOC), BAT is to set up and implement a management plan as part of the environmental management system (see BAT 1), commensurate with the relevance of potential pollutant releases, that includes the following elements:
— appropriate design of the systems considered relevant in causing OTNOC that may have an impact on emissions to air, water and/or soil (e.g. low-load design concepts for reducing the minimum start-up and shutdown loads for stable generation in gas turbines),
— set-up and implementation of a specific preventive maintenance plan for these relevant systems,
— review and recording of emissions caused by OTNOC and associated circumstances and implementation of corrective actions if necessary,
— periodic assessment of the overall emissions during OTNOC (e.g. frequency of events, duration, emissions quantification/estimation) and implementation of corrective actions if necessary.</td><td>NA</td><td>This BAT Conclusion is not applicable to this site because there is no provision for other than normal operations.</td><td></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</td><td>NA</td><td>This BAT Conclusion is not applicable to this site because there is no provision for other than</td><td></td></tr>
</table>

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th><th>Relevant permit condition(s)</th></tr>
<tr><td></td><td>measurement of emissions. Emissions during start-up and shutdown (SU/SD) may be assessed based on a detailed emission measurement carried out for a typical SU/SD procedure at least once every year, and using the results of this measurement to estimate the emissions for each and every SU/SD throughout the year.</td><td></td><td>normal operations.</td><td></td></tr>
<tr><td>12</td><td>In order to increase the energy efficiency of combustion, gasification and/or IGCC units operated ≥ 1 500 h/yr, BAT is to use an appropriate combination of the techniques.</td><td>NA</td><td>This BAT Conclusion is not applicable to this site as it operates <1500 hours</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>N/A

NA</td><td>(a) Water use at the site will be limited to fire water, inlet fogging during periods of high temperature and compressor blade washing. Demineralised water would be required for inlet fogging and compressor blade washing. Recycling of run-off water is not applicable due to the quality requirements of these systems.
No ash handing on site so NA.</td><td></td></tr>
<tr><td>14</td><td>In order to prevent the contamination of uncontaminated waste water and to reduce emissions to water, BAT is to segregate waste water streams and to treat them separately, depending on the pollutant content.
Description
Waste water streams that are typically segregated and treated include surface run-off water, cooling water, and waste water from flue-gas treatment.
Applicability</td><td>FC</td><td>A minimal number of waste water streams will be present on site - these are dealt with separately. Surface water runoff is not mixed with process effluent.</td><td>3.1.1 and table S3.2</td></tr>
</table>

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th><th>Relevant permit condition(s)</th></tr>
<tr><td></td><td>The applicability may be restricted in the case of existing plants due to the configuration of the drainage systems.</td><td></td><td></td><td></td></tr>
<tr><td>15</td><td>In order to reduce emissions to water from flue-gas treatment, BAT is to use an appropriate combination of the techniques given below, and to use secondary techniques as close as possible to the source in order to avoid dilution.</td><td>NA</td><td>This BAT Conclusion is not applicable to this site as there is no flue gas treatment on the site.</td><td></td></tr>
<tr><td>16</td><td>In order to reduce the quantity of waste sent for disposal from the combustion and/or gasification process and abatement techniques, BAT is to organise operations so as to maximise, in order of priority and taking into account life-cycle thinking:
(a) waste prevention, e.g. maximise the proportion of residues which arise as by-products;
(b) waste preparation for reuse, e.g. according to the specific requested quality criteria;
(c) waste recycling;
(d) other waste recovery (e.g. energy recovery),
by implementing an appropriate combination of techniques such as:
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Generation of gypsum as a by-product</td><td>Quality optimisation of the calcium-based reaction residues generated by the wet FGD so that they can be used as a substitute for mined gypsum (e.g. as raw material in the plasterboard industry). The quality of limestone used in the wet FGD influences the purity of the gypsum produced</td><td>Generally applicable within the constraints associated with the required gypsum quality, the health requirements associated to each specific use, and by the market conditions</td></tr>
<tr><td>b.</td><td>Recycling or recovery of residues in the</td><td>Recycling or recovery of residues (e.g. from semi-dry desulphurisation processes, fly ash, bottom ash) as a</td><td>Generally applicable within the constraints associated with the required material quality (e.g.</td></tr>
</table></td><td>FC

NA

NA</td><td>The site is unlikely to generate significant quantities of waste. No ash residue. Any materials that are removed from site will be recycled or retained as spares.

No generation of gypsum on site

No generation of residues</td><td>1.4</td></tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement	Relevant permit condition(s)
	<table><tr><td></td><td>construction sector</td><td>construction material (e.g. in road building, to replace sand in concrete production, or in the cement industry)</td><td>physical properties, content of harmful substances) associated to each specific use, and by the market conditions</td></tr><tr><td>c.</td><td>Energy recovery by using waste in the fuel mix</td><td>The residual energy content of carbon-rich ash and sludges generated by the combustion of coal, lignite, heavy fuel oil, peat or biomass can be recovered for example by mixing with the fuel</td><td>Generally applicable where plants can accept waste in the fuel mix and are technically able to feed the fuels into the combustion chamber</td></tr><tr><td>d.</td><td>Preparation of spent catalyst for reuse</td><td>Preparation of catalyst for reuse (e.g. up to four times for SCR catalysts) restores some or all of the original performance, extending the service life of the catalyst to several decades. Preparation of spent catalyst for reuse is integrated in a catalyst management scheme</td><td>The applicability may be limited by the mechanical condition of the catalyst and the required performance with respect to controlling NO_X and NH_3 emissions</td></tr></table>	NA NA	No acceptance of waste. No catalyst used on site.	
17	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</td><td>Generally applicable</td></tr></table>	FC	Maintenance visits to take place. Due to the plant being peaking plant it is unlikely that it will be operated at night. Low noise equipment will be selected and mitigation measures used where possible. A silencer will be fitted to the stack. An improvement condition requires assessment of operational noise. See	3.4 and IC05 in table S1.3

BAT Concn. Number	Summary of BAT Conclusion requirement				Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement	Relevant permit condition(s)
			— avoidance of noisy activities at night, if possible — provisions for noise control during maintenance activities			section 6.5 above for further information.	
	b.	Low-noise equipment	This potentially includes compressors, pumps and disks	Generally applicable when the equipment is new or replaced			
	c.	Noise attenuation	Noise propagation can be reduced by inserting obstacles between the emitter and the receiver. Appropriate obstacles include protection walls, embankments and buildings	Generally applicable to new plants. In the case of existing plants, the insertion of obstacles may be restricted by lack of space			
	d.	Noise-control equipment	This includes: — noise-reducers — equipment insulation — enclosure of noisy equipment — soundproofing of buildings	The applicability may be restricted by lack of space			
	e.	Appropriate location of equipment and buildings	Noise levels can be reduced by increasing the distance between the emitter and the receiver and by using buildings as noise screens	Generally applicable to new plant			
Combustion of gaseous fuels							

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th><th>Relevant permit condition(s)</th></tr>
<tr>
<td>40</td>
<td>
In order to increase the energy efficiency of natural gas combustion, BAT is to use an appropriate combination of the techniques given in BAT 12 and below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Combined cycle</td><td>See description in Section 8.2</td><td>Generally applicable to new gas turbines and engines except when operated < 1 500 h/yr.
Applicable to existing gas turbines and engines within the constraints associated with the steam cycle design and the space availability.
Not applicable to existing gas turbines and engines operated < 1 500 h/yr.
Not applicable to mechanical drive gas turbines operated in discontinuous mode with extended load variations and frequent start-ups and shutdowns.
Not applicable to boilers</td></tr>
</table>
BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of natural gas
<table>
<tr><th rowspan="2">Type of combustion unit</th><th colspan="5">BAT-AEELs (136) (137)</th></tr>
<tr><th colspan="2">Net electrical efficiency (%)</th><th>Net total fuel utilisation (%) (138) (139)</th><th colspan="2">Net mechanical energy efficiency (%) (139) (140)</th></tr>
<tr><th>New unit</th><th>Existing unit</th><th></th><th>New unit</th><th>Existing unit</th></tr>
<tr><td>Gas engine</td><td>39,5–44 (141)</td><td>35–44 (141)</td><td>56–85 (141)</td><td colspan="2">No BAT-AEEL.</td></tr>
<tr><td>Gas-fired boiler</td><td>39–42,5</td><td>38–40</td><td>78–95</td><td colspan="2">No BAT-AEEL.</td></tr>
<tr><td>Open cycle gas turbine, ≥ 50 MWth</td><td>36–41,5</td><td>33–41,5</td><td>No BAT-AEEL</td><td>36,5–41</td><td>33,5–41</td></tr>
<tr><td colspan="6">Combined cycle gas turbine (CCGT)</td></tr>
<tr><td>CCGT, 50–600 MW_{th}</td><td>53–58,5</td><td>46–54</td><td>No BAT-AEEL</td><td colspan="2">No BAT-AEEL</td></tr>
<tr><td>CCGT, ≥ 600 MW_{th}</td><td>57–60,5</td><td>50–60</td><td>No BAT-AEEL</td><td colspan="2">No BAT-AEEL</td></tr>
<tr><td>CHP CCGT, 50–600 MW_{th}</td><td>53–58,5</td><td>46–54</td><td>65–95</td><td colspan="2">No BAT-AEEL</td></tr>
<tr><td>CHP CCGT, ≥ 600 MW_{th}</td><td>57–60,5</td><td>50–60</td><td>65–95</td><td colspan="2">No BAT-AEEL</td></tr>
</table>
</td>
<td>NA</td>
<td>This BAT Conclusion is not applicable to this installation as the gas turbine operates <1500 hours. However, the operator has confirmed that the efficiency of the plant will be 39% which is within the range specified within the BAT AEELs.</td>
<td></td>
</tr>
</table>

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th><th>Relevant permit condition(s)</th></tr>
<tr><td>41</td><td>In order to prevent or reduce NO_X emissions to air from the combustion of natural gas in boilers, BAT is to use one or a combination of the techniques specified.</td><td>NA</td><td>This BAT conclusion is not applicable to this site as there are no boilers on site</td><td></td></tr>
<tr><td>42</td><td>In order to prevent or reduce NO_X emissions to air from the combustion of natural gas in gas turbines, BAT is to use one or a combination of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Advanced control system</td><td>See description in Section 8.3.
This technique is often used in combination with other techniques or may be used alone for combustion plants operated < 500 h/yr</td><td>The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system</td></tr>
<tr><td>b.</td><td>Water/steam addition</td><td>See description in Section 8.3</td><td>The applicability may be limited due to water availability</td></tr>
<tr><td>c.</td><td>Dry low-NO_X burners (DLN)</td><td></td><td>The applicability may be limited in the case of turbines where a retrofit package is not available or when water/steam addition systems are installed</td></tr>
<tr><td>d.</td><td>Low-load design concept</td><td>Adaptation of the process control and related equipment to maintain good combustion efficiency when the demand in energy varies, e.g. by improving the inlet airflow control capability or by splitting the combustion process into decoupled combustion stages</td><td>The applicability may be limited by the gas turbine design</td></tr>
<tr><td>e.</td><td>Low-NO_X burners (LNB)</td><td>See description in Section 8.3</td><td>Generally applicable to supplementary firing for heat recovery steam generators (HRSGs) in the case of combined-cycle gas turbine</td></tr>
</table></td><td>FC</td><td>(a) An advanced electronic control system will be implemented to automatically control and optimise combustion efficiency and manage prevention and reduction of emissions.
(b) NA (OCGT with no steam cycle)
(c) Dry low NOx burners will be fitted.
(d) An advanced electronic control system will be implemented to optimise combustion efficiency and manage emissions.
(e) Dry low NOx burners fitted.
NA as no SCR.</td><td>2.3.1 and Table S1.2</td></tr>
</table>

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement	Relevant permit condition(s)
	<table><tr><td></td><td></td><td></td><td>(CCGT) combustion plants</td></tr><tr><td>f.</td><td>Selective catalytic reduction (SCR)</td><td></td><td>Not applicable in the case of combustion plants operated < 500 h/yr. Not generally applicable to existing combustion plants of < 100 MW_{th}. Retrofitting existing combustion plants may be constrained by the availability of sufficient space. There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr</td></tr></table>			
43	In order to prevent or reduce NO_X emissions to air from the combustion of natural gas in engines, BAT is to use one or a combination of the techniques specified.	NA	This BAT conclusion is not applicable to this site as there are no engines on site	
44	In order to prevent or reduce CO emissions to air from the combustion of natural gas, BAT is to ensure optimised combustion and/or to use oxidation catalysts. ***Description* - See descriptions in Section 8.3.** **BAT-associated emission levels (BAT-AELs) for NO_X emissions to air from the combustion of natural gas in gas turbines** <table><tr><th>Type of combustion plant</th><th>Combustion plant total rated thermal input (MW_{th})</th><th colspan="2">BAT-AELs (mg/Nm^3) (142) (143)</th></tr><tr><th></th><th></th><th>Yearly average (144) (145)</th><th>Daily average or average over the sampling period</th></tr><tr><td colspan="4">Open-cycle gas turbines (OCGTs) (146) (147)</td></tr><tr><td>New OCGT</td><td>≥ 50</td><td>15–35</td><td>25–50</td></tr></table>	FC	The relevant BAT AELs are specified in table S3.1 The annual AEL for CO from the BAT Conclusions is indicative. At this stage the Operator did not have adequate information to demonstrate whether the selected plant can meet the CO AEL. We have included an improvement condition	3.5 and table S3.1 and IC6 and IC7

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

Existing OCGT (excluding turbines for mechanical drive applications) — All but plants operated < 500 h/yr	≥ 50	15–50	25–55 (148)

Combined-cycle gas turbines (CCGTs) (146) (149)

New CCGT	≥ 50	10–30	15–40
Existing CCGT with a net total fuel utilisation of < 75 %	≥ 600	10–40	18–50
Existing CCGT with a net total fuel utilisation of ≥ 75 %	≥ 600	10–50	18–55 (150)
Existing CCGT with a net total fuel utilisation of < 75 %	50–600	10–45	35–55
Existing CCGT with a net total fuel utilisation of ≥ 75 %	50–600	25–50 (151)	35–55 (152)

Open- and combined-cycle gas turbines

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

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

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

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

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

specifying that the Operator is required to propose an achievable ELV for carbon monoxide expressed as an annual mean of validated hourly averages within 4 months following commissioning. If the proposed ELV deviates from the indicative BAT AEL for CO of 40mg/m^3 then an associated BAT justification will need to be submitted to the Environment Agency as a written report.

Improvement condition IC7 requires the operator to define an output load or operational parameters and provide a written justification for when the dry low NO_x operation is effective. The report shall also include the NO_x profile through effective dry low NO_x to 70% and then to full load.

The Operator is also required to propose achievable emission limit values (ELV) for NO_x and CO expressed as a daily mean of validated hourly

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th><th>Relevant permit condition(s)</th></tr>
<tr><td></td><td>[higher end] × EE/55, where EE is the net electrical energy efficiency of the plant determined at ISO baseload conditions.

— Existing CCGT of ≥ 50 MW_{th}: < 5–30 mg/Nm^3. The higher end of this range will generally be 50 mg/Nm^3 for plants that operate at low load.

— Existing gas turbines of ≥ 50 MW_{th} for mechanical drive applications: < 5–40 mg/Nm^3. The higher end of the range will generally be 50 mg/Nm^3 when plants operate at low load.
In the case of a gas turbine equipped with DLN burners, these indicative levels correspond to when the DLN operation is effective.
BAT-associated emission levels (BAT-AELs) for NO_X emissions to air from the combustion of natural gas in boilers and engines
<table>
<tr><th rowspan="2">Type of combustion plant</th><th colspan="4">BAT-AELs (mg/Nm^3)</th></tr>
<tr><th colspan="2">Yearly average (157)</th><th colspan="2">Daily average or average over the sampling period</th></tr>
<tr><th>New plant</th><th>Existing plant (158)</th><th>New plant</th><th>Existing plant (159)</th></tr>
<tr><td>Boiler</td><td>10–60</td><td>50–100</td><td>30–85</td><td>85–110</td></tr>
<tr><td>Engine (160)</td><td>20–75</td><td>20–100</td><td>55–85</td><td>55–110 (161)</td></tr>
</table>
As an indication, the yearly average CO emission levels will generally be:
— < 5–40 mg/Nm^3 for existing boilers operated ≥ 1 500 h/yr,

— < 5–15 mg/Nm^3 for new boilers,

— 30–100 mg/Nm^3 for existing engines operated ≥ 1 500 h/yr and for new engines.</td><td></td><td>averages from Minimum start-up load (MSUL) to baseload through improvement condition IC8.

See section 9 – Emissions for further information.</td><td></td></tr>
<tr><td>45</td><td>In order to reduce non-methane volatile organic compounds (NMVOC) and methane (CH_4) emissions to air from the combustion of natural gas in spark-ignited lean-burn gas engines, BAT is to ensure optimised combustion and/or to use oxidation catalysts.</td><td>NA</td><td>This BAT conclusion is not applicable to this site as there are no engines on site</td><td></td></tr>
</table>

13. Decision checklist

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.
Consultation	
Consultation	The consultation requirements were identified in accordance with the Environmental Permitting Regulations and our public participation statement. The Application was publicised on the GOV.UK website. We consulted the following organisations: • Public Health England • Mid Suffolk Director of Environmental Health • Health and Safety Executive • Local Authority Environmental Health Department • Local Planning authority The comments and our responses are summarised in the consultation section.
Operator	
Control of the facility	We are satisfied that the Applicant (now the Operator) is the person who will have control over the operation of the facility after the grant of the Permit. The decision was taken in accordance with our guidance on legal operator for environmental permits.
The facility	
The regulated facility	We considered the extent and nature of the facility at the site in accordance with RGN2 'Understanding the meaning of regulated facility', Appendix 2 of RGN 2 'Defining the scope of the installation'. The extent of the facility is defined in the site plan and in the Permit. The activities are defined in table S1.1 of the Permit.
The site	
Extent of the site of the facility	The Operator has provided a plan which we consider is satisfactory, showing the extent of the site of the facility. The plan is included in the Permit.
Site condition report	The Operator has provided a description of the condition of the site, which we consider is satisfactory. The decision was taken in accordance with our guidance on site condition reports and baseline reporting under the Industrial Emissions Directive.
Biodiversity, heritage, landscape and nature	The Application is within the relevant distance criteria of a site of heritage,

Aspect considered	Decision
conservation	landscape or nature conservation, and/or protected species or habitat. We have 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. We consider that the Application will not affect any sites of nature conservation, landscape and heritage, and/or protected species or habitats identified. Due to the size of the operation we have consulted Natural England on our assessments, and taken their comments into account in the permitting decision.
Environmental risk assessment	
Environmental risk	We have reviewed the Operator's assessment of the environmental risk from the facility. The Operator's risk assessment is satisfactory. The assessment shows that, applying the conservative criteria in our guidance on environmental risk assessment, all emissions may be categorised as environmentally insignificant. See section 6 above for further information.
Operating techniques	
General operating techniques	We have reviewed the techniques used by the Operator and compared these with the relevant guidance notes and we consider them to represent appropriate techniques for the facility. The operating techniques that the Applicant must use are specified in table S1.2 in the environmental Permit.
Operating techniques for emissions that screen out as insignificant	Emissions of Nitrogen Dioxide and Carbon Dioxide have been screened out as insignificant, and so we agree that the Applicant's proposed techniques are BAT for the Installation. We consider that the emission limits included in the installation Permit reflect the BAT for the sector.
Permit conditions	
Pre-operational conditions	Based on the information in the application, we consider that we need to impose pre-operational conditions. PO1 for the operator to demonstrate that the application contained a worst case scenario air impact assessment in line with plant final design emission parameters. PO2 to determine whether further noise mitigation is warranted in practice. PO3 to agree MWth as a percentage of power output and/or operational parameters under which ELVs apply
Improvement programme	Based on the information in the Application, we consider that we need to

Aspect considered	Decision
	impose an improvement programme. We have imposed an improvement programme: IC01 As the plant has not been built yet to define and provide a written justification of the “minimum start up load” and “minimum shut-down load. IC02 to confirm the net rated thermal input supported by operational and design data. IC03 to demonstrate implementation of the EMS. IC04 to demonstrate environmental performance of the plant as installed against the design parameters set out in the Application. IC05 to demonstrate the noise emissions in practice are in line with the predictions in the Application. IC06 due to the way the site operates we have asked them to propose an achievable emission limit value (ELV) for carbon monoxide expressed as an annual mean of validated hourly averages.
Emission limits	ELVs and equivalent parameters or technical measures based on BAT have been set for the following substances. Nitrogen Dioxide Carbon Monoxide Sulphur dioxide An improvement condition has been set requiring the operator to define and agree an appropriate emission limit value for carbon monoxide within 4 months within the completion of commissioning. This was set because the data for this parameter was not available at the time of permit determination
Monitoring	We have decided that monitoring should be added for the following parameters, using the methods detailed and to the frequencies specified: • continuous emissions monitoring for LCP650 – oxides of nitrogen and carbon monoxide; and • 6 monthly for LCP650 – sulphur dioxide These monitoring requirements have been imposed in order to meet requirements of Annex V of the IED and the AELs specified in the Large Combustion Plant BAT Conclusions document. We made these decisions in accordance with the SGN Combustion Activities (EPR1.01) and the monitoring methods are in accordance with the Monitoring of Stack Emissions to Air Technical Guidance Note (M2). 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. We have added reporting in the Permit for the following parameters: • every 3 months for LCP650 – oxides of nitrogen and carbon monoxide; and • every 6 months for LCP650 – sulphur dioxide

Aspect considered	Decision
	The reporting requirements in the Permit have been specified in order to comply with the requirements of the Industrial Emissions Directive. We made these decisions in accordance with the *JEP Electricity Supply Industry – IED Compliance Protocol for Utility Boilers and Gas Turbines. February 2015.*
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. The decision was taken in accordance with the guidance on operator competence and how to develop a management system for environmental permits.
Relevant convictions	The Case Management System been checked to ensure that all relevant convictions have been declared. No convictions were found.
Financial competence	There is no known reason to consider that the Operator will not be financially able to comply with the Permit conditions.
Growth Duty	
Section 108 Deregulation Act 2015 – Growth duty	We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this Permit. Paragraph 1.3 of the guidance says: "The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation." We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections. We consider the requirements and standards we have set in this Permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the Operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.

Consultation

The following summarises the responses to consultation with other organisations, our notice on GOV.UK for the public, and the way in which we have considered these in the determination process.

Responses from organisations listed in the consultation section

Response received from
Public Health England
Brief summary of issues raised
• Recommend Environmental Permit should contain conditions to ensure that nitrogen dioxide and carbon monoxide from the combustion activities on site do not impact upon public health. • The applicant has provided little detail on how accidents will be dealt with. The Environment Agency may wish to ensure that the applicant has an accident management plan that identifies all the potential hazards and risks in relation to all of the proposed operations, including fires, and has in place necessary control and mitigation measures. • No significant concerns regarding risk to health of the local population from this proposed activity, providing that the applicant takes all appropriate measures to prevent or control pollution, in accordance with the relevant sector technical guidance or industry best practice. • Recommend that the Environment Agency also consult - The Local authority - Director of Public Health
Summary of actions taken or show how this has been covered
• The Applicant has assessed the impact of nitrogen dioxide and carbon monoxide on human health in the air dispersion modelling and have concluded that there will be no impact. We have assessed the Applicant's air quality modelling and limited the concentration of emissions within the air emissions table in the Permit to those modelled in order to prevent the site emitting at levels with the potential to impact on public health. • The Operator submitted an Environmental Statement which outlined their assessment and approach to accident management. We have reviewed this document and we are satisfied with the proposals outlined. • To ensure the implementation of appropriate measures we have assessed the proposals outlined by the Applicant and incorporated them into the Permit operating techniques • We have consulted the relevant local authorities in line with our working together agreements which include the two bodies stated.

Response received from
Midsuffolk District Council – Environmental Health
Brief summary of issues raised
The mitigation measures within the Development Control Order are sufficient to protect local amenity and should be considered alongside any permit issued.
Summary of actions taken or show how this has been covered
We have assessed the Operator's proposals in line with the requirements of our guidance and have inserted conditions into the Permit which will ensure local amenity is protected in line with the scope of the Environmental Permitting Regulations.

Representations from community and other organisations

Response received from
Brome and Oakley Parish Council
Brief summary of issues raised
Ambient Monitoring - Concern that ambient monitoring locations are not appropriate. Dispersion Modelling - Concern that the in-combination effects of existing sites have not been taken into account in the applicant's assessment Stack Height - Suggestion that increased stack height would reduce the impact of air emissions
Summary of actions taken or show how this has been covered
1. The sites listed on pages 9-10 of the air quality report are the ecological sites considered, and the Applicant states in their report that their selection for inclusion is based on the screening distances for ecological sites given in Environment Agency guidance. The Applicant omitted one local wildlife sites which we identified as being within the 2 km screening distance from the dispersion site for local nature sites. We have included this additional ecological site in our checks. To assess impact on human health the consultant has considered the point of maximum concentration based on receptor grids of different resolutions, as opposed to using discrete receptor locations. This a conservative approach as the concentration of pollutants will be lower than this at all other locations. We have audited the Operator's report and we are satisfied with the conclusions. 2. In regard to the combined impact of emissions from the proposed site and the existing neighbouring Eye Power site, any existing sources will be included in background levels of pollutants. As the predicted emission Process Contributions (PC's) from the proposed plant are 'insignificant' in line with our air quality screening guidance we do not require the applicant to consider impacts from the site in combination with background levels. The proposed OCGT will be fuelled on natural gas, so there would not be any emission of Dioxins or Furans. We have audited the Applicant's report and they have considered emissions of NOx and CO as required. We are satisfied the impact from the site will be insignificant and therefore will not act in combination with other sites. 3. In regards to increasing the stack height to reduce impacts at receptors the predicted long-term and short-term concentrations of the pollutants are 'insignificant' at human health and ecological receptors based on a stack height of 25 m. From an environmental permitting point of view we cannot request that the applicant increases their stack height as they have demonstrated that the impact of pollutant emissions from the site will be 'insignificant' when considered against the relevant environmental standards.

Response received from
Public response
Brief summary of issues raised
Definition of Plant Capacity and Running Hours - Concern raised that the installation may exceed the 299MW limit at which CHP and carbon capture readiness is required. Emissions - Concern that there may be a visible plume Dispersion Modelling - Concern over the validity of the applicant's modelling and impact assessment. Noise - Concern over the validity of the applicant's noise impact assessment.
Summary of actions taken or show how this has been covered
• The plant maximum capacity has been referenced in the Permit's S1.1 activities table with the description set as a 299MWe electrical output. We have also inserted an improvement condition into the Permit which requires the Applicant to use operation testing data to demonstrate the Installation actually achieves the quoted net rated thermal input which can be used to establish the actual electrical output. • The plant is restricted to a maximum of 1,500 operating hours per year. "Operational hours" are defined in the Permit as whole hours commencing from the first unit ending start up and ending when the last unit commences shut down. The Large Combustion Plant BAT conclusions further state "operational hours" is the time that the plant is "discharging emissions to air". This does not include start up and shutdown periods (see comments on start up and shutdown below). • Start up and shutdown periods are excluded from Industrial Emissions Directive IED compliance and BAT for normal operation in line with the Commission Implementing Decision 2012 249/EU on determining start up and shut down periods for the purposes of the Industrial Emissions Directive. This document looks at providing stability of plant operation while minimising the start up and shut down periods. We have inserted improvement condition IC01 into the Permit in in line with this to define and justify the minimum start up and shut down loads. • Visible plume - As the proposed combustion plant is a dry system using gas as a fuel, does not reply on a water based cooling system and does not utilise CHP visible vapour is, therefore, not considered to be a significant risk. In regards to visible pollutants we are satisfied the use of gas will not result in a significantly visible plume. • Concerns are raised over the surface roughness length used by the consultant in their modelling and consideration of nearby buildings and wind turbines. We have checked sensitivity to a range of surface roughness lengths as part of our check modelling, including a length of 0.5 which is indicated as being representative of parkland and open suburbia within the ADMS software. We also checked sensitivity when the wind turbines and additional on-site and off-site buildings are included in our model. None of these factors was found to affect the consultant's conclusions. • Concerns are raised relating to two other sources of pollution within close proximity of the proposed stack. These are existing sources so background pollutant levels will already include the contribution from these sources. We would not expect these additional sources to be modelled within the consultant's assessment. To include them in the dispersion modelling would lead to 'double counting'. The consultant considered background concentrations in their assessment, but as their Process Contributions were 'insignificant' we do not require that they consider Predicted Environmental Concentrations as part of their detailed modelling assessment. • Noise - We have audited the Applicant's noise modelling and assessment. We agree with the conclusions that significant adverse impacts are unlikely at nearby receptors. This was

concluded on the basis that the Installation is constructed to the design and mitigation measures (see key issues section) as outlined in the Application.
The proposed noise management measures are incorporated into the Permit as operating techniques in table S1.2 of the Permit. We have also set improvement condition (IC05) so that the noise assessment is repeated once the plant is operating and to propose further measures if required.
Based upon the information in the Application, the additional information submitted in response to a schedule 5 request and further assessment will be undertake during operation under the Permit improvement conditions, we are satisfied that the sound rating is appropriate in comparison to existing background measurements the appropriate measures will be in place to prevent or where that is not practicable to minimise noise and vibration and to prevent pollution from noise and vibration outside the site.