Determination of an Application for an Environmental Permit under the Environmental Permitting (England & Wales) Regulations 2016

Decision document recording our decision-making process

The Permit Number is:	EPR/NP3005PR
The Applicant / Operator is:	VPI Immingham B Limited
The Installation is located at:	VPI Immingham OCGT Power Station Rosper Road South Killingholme Immingham DN40 3DZ

What this document is about

This is a decision document, which accompanies a permit.

It explains how we have considered the Applicant's Application, and why we have included the specific conditions in the permit we are issuing to the Applicant. It is our record of our decision-making process, to show how we have taken into account all relevant factors in reaching our position. Unless the document explains otherwise, we have accepted the Applicant's proposals.

We try to explain our decision as accurately, comprehensively and plainly as possible. Achieving all three objectives is not always easy, and we would welcome any feedback as to how we might improve our decision documents in future. A lot of technical terms and acronyms are inevitable in a document of this nature: we provide a glossary of acronyms near the front of the document, for ease of reference.

Preliminary information and use of terms

We gave the application the reference number EPR/NP3005PR/A001. We refer to the application as "the **Application**" in this document in order to be consistent.

The number we have given to the permit is EPR/NP3005PR/A001. We refer to the permit as "the **Permit**" in this document.

The Application was duly made on 25/04/19.

The Applicant is VPI Immingham B Limited. We refer to VPI Immingham B Limited as "the **Applicant**" in this document. Where we are talking about what would happen after the Permit is granted (if that is our final decision), we call VPI Immingham B Limited "the **Operator**".

VPI Immingham B Limited's proposed facility is located at VPI Immingham OCGT Power Station, Rosper Road, South Killingholme, Immingham, DN40 3DZ. We refer to this as "the **Installation**" in this document.

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
BAT-AEEL	BAT Associated Energy Efficiency Level
BAT-AEL	BAT Associated Emission Level
BREF	best available techniques reference document
CEM	continuous emissions monitor
DLN	Dry Low NOx burners
DLN-E	Dry Low NOx effective
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
MSUL/MSDL	Minimum start up load/minimum shut-down load
NOx	Oxides of nitrogen (NO plus NO_2 expressed as NO_2)
OCGT	open cycle gas turbine
Peaking	500-1,500 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. Our decision

We have decided to grant the Permit to the Applicant. This will allow it to operate the Installation, subject to the conditions in the Permit.

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

This Application is to operate an installation which is subject principally to the Industrial Emissions Directive (IED).

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

2. How we reached our decision

2.1 Receipt of Application

The Application was duly made on 25/04/19. This means we considered it was in the correct form and contained sufficient information for us to begin our determination but not that it necessarily contained all the information we would need to complete that determination: see below.

The Applicant made no claim for commercial confidentiality. We have not received any information in relation to the Application that appears to be confidential in relation to any party.

2.2 Consultation on the Application

We carried out consultation on the Application in accordance with the EPR and our statutory Public Participation Statement. We consider that this process satisfies, and frequently goes beyond the requirements of the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, which are directly incorporated into the IED, which applies to the Installation and the Application. We have also taken into account our obligations under the Local Democracy, Economic Development and Construction Act 2009 (particularly Section 23). This requires us, where we consider it appropriate, to take such steps as we consider appropriate to secure the involvement of representatives of interested persons in the exercise of our functions, by providing them with information, consulting them or involving them in any other way. In this case, our consultation already satisfies the Act's requirements.

We advertised the Application by a notice placed on our website, which contained all the information required by the IED, including telling people where and when they could see a copy of the Application. The advertising period was 20 working days between 21/08/19 and 19/09/19.

We made a copy of the Application and all other documents relevant to our determination (see below) available to view on our Citizenspace web based consultation portal and the public register. Anyone wishing to see these documents could also do so and arrange for copies to be made.

We sent copies of the Application to the following bodies, which includes those with whom we have "Working Together Agreements":

- Public Health England
- The Director of Public Health

- The Health and Safety Executive
- The Food Standards Agency
- National Grid
- North Lincolnshire – Environment Team
- North Lincolnshire – Planning

These are bodies whose expertise, democratic accountability and/or local knowledge make it appropriate for us to seek their views directly. Note under our Working Together Agreement with Natural England, we only inform Natural England of the results of our assessment of the impact of the installation on designated Habitats sites.

Further details along with a summary of consultation comments and our response to the representations we received can be found in Annex 2. We have taken all relevant representations into consideration in reaching our determination.

3. Chapter III of the Industrial Emissions Directive

Chapter III of the Industrial Emissions Directive (IED) 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 Large Combustion Plant (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 open cycle gas turbine (OCGT) on this site consists of an individual combustion unit with a total rated thermal input ≥50MW making it an LCP.

Combustion plant on the installation that do not form part of an LCP and so do not come under chapter III requirements, are still listed within the Section 1.1 A(1)(a) activity listed in Schedule 1 of the Environmental Permitting regulations. In this instance the standby diesel generator will be greater than 2MWth but less than 5MWth is also within the scope of the Medium Combustion Plant Directive (MCPD) and has been listed as an MCP in the permit. This will operate for less than 500 hours per year and therefore no limits have been specified.

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 best available techniques (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.

4. 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 672**. This LCP consists of one 767MWth OCGT which vents via a single stack. The unit burns natural gas.

The VPI Immingham OCGT Power Station is located in the vicinity of an existing VPI CHP Plant and east of the Lindsey Oil Refinery in North Killingholme, Lincolnshire. Immingham Dock is located approximately 1.5km to the southeast at its closest point. The Humber Ports facility is located approximately 500m north at its closest point and the Humber Refinery is located approximately 250m to the south. The nearest settlements are the villages of South and North Killingholme, located approximately 1.6km and 1.7km to the south west and west of the installation respectively. The town of Immingham and is located approximately 2km southeast of the installation. and the nearest residential property is a single property on Marsh Lane located approximately 325m to the east of the installation.

The OCGT technology selected for the VPI Immingham OCGT Power Station is a heavy frame gas turbine, meaning that the required plant capacity can be provided by a single unit (as opposed to multiple units, potentially requiring multiple emission stacks). The efficiency of the proposed units is expected to be in the region of 39%, which is in line with the BAT-AEELs for OCGT plant.

Given the nature of the installation's operation as a peaking plant, it will be required to be called on to produce electricity at short notice, and for short periods of time, and therefore the potentially long start-up times for CCGT plant are unsuitable for such duties.

The OCGT unit at VPI Immingham OCGT Power Station will be cooled through a closed loop cooling system with a fin fan cooler arrangement. The fans are external to any structure and use air as the cooling medium. A small amount of water will be retained in the closed loop system with periodic replacement and/or top up. Fin-fan coolers have no significant water consumption requirement and hence are suited to the site's operational profile and will not result in any effluent discharges.

An emergency generator will be required for the safe shut-down of the plant in the event of emergency shutdown or loss of power. The generator will be diesel fuelled, and the fuel would be stored in above ground storage tanks (AST) of less than $30m^3$ capacity. The generator unit would not be used to generate electricity to supply the national grid and, therefore, does not contribute to the generating capacity of the station.

A gas receiving station will be installed on the VPI Immingham OCGT Power Plant site. This is required to receive the natural gas from the gas connection pipeline from the existing VPI CHP Plant, and to treat and depressurise it in advance of using it as fuel in the installation. Treatment will include dehydration, filtering and odorising of the natural gas.

5. Net thermal input

The Applicant has stated that the Net Thermal Input of LCP 672 is 767MWth.

The Applicant has not provided sufficient information to demonstrate the 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.

6. Minimum start-up and minimum shut-down load

The applicant has not provided sufficient information to set the Minimum start up and minimum shut-down load (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 has also been completed to reflect this.

7. Large Combustion Plant Best Available techniques reference document conclusions

We have reviewed the permit application against the revised BAT Conclusions (BATc) 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 combustion 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 13 of this decision document. The BAT AELs for emissions of NOx and CO have been included in table S3.1 of the permit.

8. The Installation's environmental impact

Regulated activities can present different types of risk to the environment, these include 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). The key factors relevant to this determination are discussed in this and other sections of this document.

For an installation of this kind, the principal emissions are those to air.

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.

8.1 Assessment Methodology

8.1.1 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.

8.1.2 Use of Air Dispersion Modelling

For LCP applications, we usually 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 Environmental Quality Standards (EQS).

Where an EU EQS or National Air Quality Standard (NAQS) exists, the relevant standard is the EU EQS/NAQS. 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 Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs) or Special Protection Areas (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.

8.2 Assessment of Impact on Air Quality

The Applicant's assessment of the impact of air quality is set out in Environmental Permit Application

Appendix E – Air Assessment *Document Ref:* 60547702–ACM–PM–RP–EN–004_A dated 07/03/2019 of the Application. The assessment comprises:

- Dispersion modelling of emissions to air from the operation of the installation.
- A study of the impact of emissions on nearby sensitive 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 8.3.

The Applicant has assessed the Installation's potential emissions to air against the relevant air quality standards, and the potential impact upon local conservation sites and human health. These assessments predict the potential effects on local air quality from the Installation's stack emissions using the ADMS

(Atmospheric Dispersion Modelling System) 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 Humberside Airport which is 9.5km south west of the installation between 2012 and 2016. 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 Annex V of the IED or AELs outlined within the BAT Conclusions. These substances are:
    - Oxides of nitrogen (NO_x), expressed as NO_2
    - Carbon monoxide (CO)
- Second, they assumed that the Installation operates at a worst case of up to 2,250 hours in any given year.
- Third, the assessment of annual average emissions for the maximum of 2,250 hours operation has been carried out by factoring the annual emission rate by the proposed operation hours ((i.e. 2,250 / 8760) x 100 = 25.7%), and this has been used in the model.
- Fourth, assessment of short term impacts from the OCGT at IED limits, over the whole year to ensure meteorological conditions that lead to the worst case impacts are taken into consideration.

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

The Applicant used the values from the DEFRA background mapping system as background concentrations. Existing air quality conditions in the vicinity of the installation were evaluated through a review of local authority air quality management reports, Defra published data and other sources. The key pollutants of concern resulting from operation of the Installation are NOx, NO_2 and CO, therefore the assessment of baseline conditions considered these pollutants only.

The Applicant provided us with modelled output showing the concentration of key pollutants at a number of specified locations within the surrounding area. We used our Air Quality Screening tool to audit these outputs and confirm the likely predicted peak ground level concentrations for nitrogen dioxide as well as auditing predicted concentrations at the receptors.

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 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.

8.2.1 Assessment of Air Dispersion Modelling Outputs

The modelling predictions are summarised in the tables below.

The modelling predicted pollutant concentrations at discreet receptors

The table below shows the ground level concentrations at the maximum off site level and the most impacted receptor (Hazel Dene, Residential building 330m east of the site). Where emissions screen out as insignificant, the background pollutant levels are not considered within the assessment in accordance with our H1 screening process.

Pollutant	NAQS ($\mu g/m^3$)	Impact Location	PC ($\mu g/m^3$)	PC/ NAQS	PC < Insignificance Threshold?
NO_2 (1-hour mean, 99.79th %ile)	200	Max off-site	8.0	4%	Yes
		Max residential receptor	4.4	2%	Yes
NO_2 (Annual mean)	40	Max off-site	0.4	1%	Yes
		Max residential receptor	0.03	0.1%	Yes
CO (8-hour, daily running mean)	10,000	Max off-site	49.1	0.5%	Yes
CO (1-hour mean)	30,000	Max off-site	90.7	0.3%	Yes

8.2.2 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 short term PC is less than 10% of the EU EQS at sensitive receptors and so can be screened out as insignificant.

From the table above the annual maximum ground level emissions for NO_2 were not less than 1% of the EQS so we also considered the background NO_2 levels. When taking these into account there is adequate headroom between the PEC and EAL to indicate that it is unlikely that there will be an exceedance of an EQS. The PEC is 44% of the EQS.

Therefore we consider the Applicant's proposals for preventing and minimising the emissions of these substances is likely 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 (SO_2)

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 were not modelled by the Applicant. We agree with this approach.

(iv) Carbon monoxide (CO)

The above table shows that for CO emissions, 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.

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

Sites Considered

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

- Humber Estuary SPA, SAC, Ramsar (1.3Km)

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

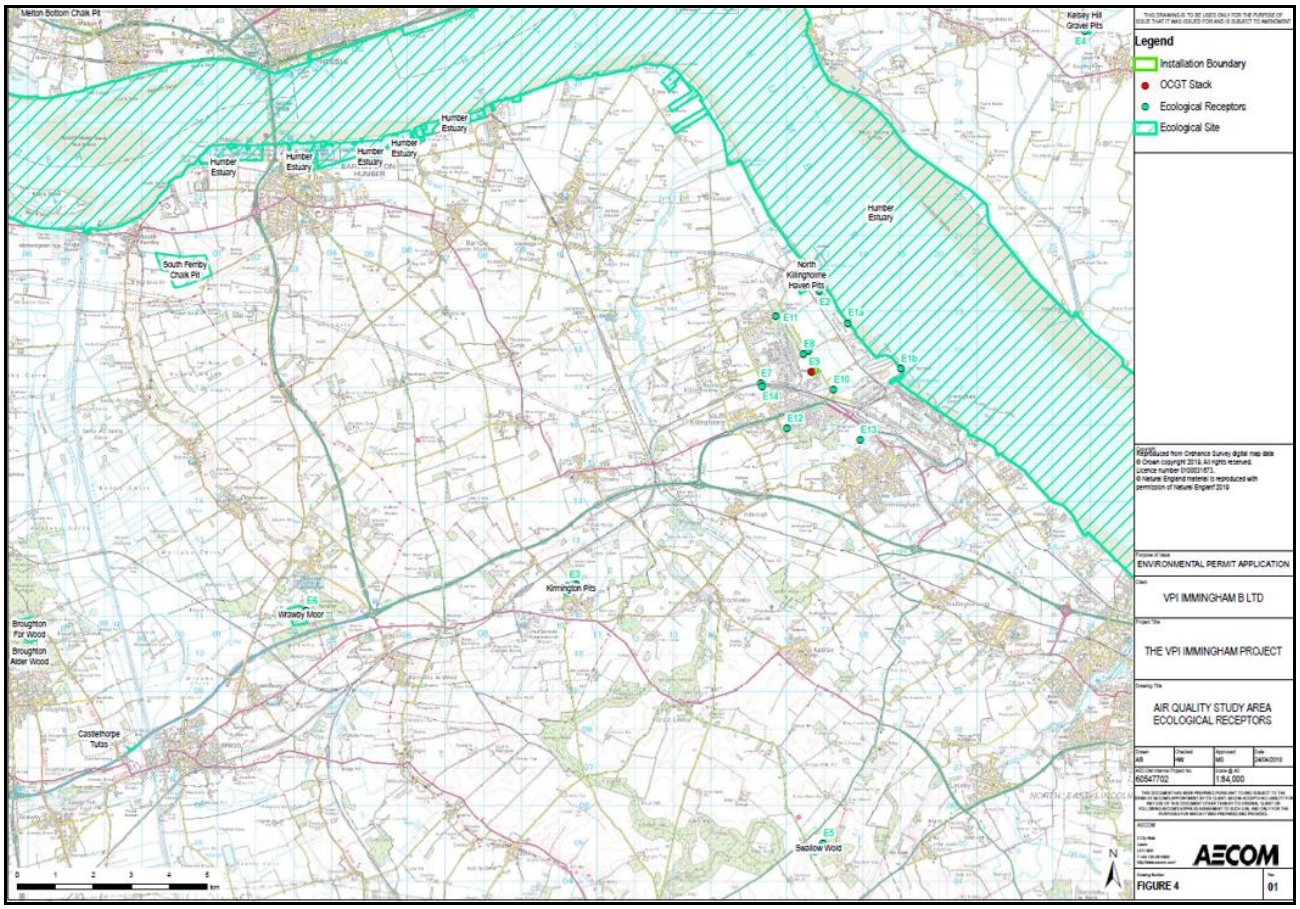
- North Killingholme Haven Pits (1.8Km)

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

- Eastfield Railway
- Burkinshaws Covert
- Station Road Fields
- Rosper Road Pools
- Chase Hill Wood
- Mayflower Wood Meadow
- Homestead Park Pond
- Eastfield Road Pit

These are shown in the figure below;

Ecological receptors



The modelling predicted pollutant concentrations at ecological receptors

The Applicant's modelling predicted pollutant concentrations at ecological receptors. The tables below show the ground level concentrations at the ecological receptors. Where emissions screen out as insignificant, the background pollutant levels are not considered within the assessment in accordance with our H1 screening process.

Maximum NO_x (24-hour) Predicted Concentrations - Ecological Impacts

Receptor		Receptor Type	Critical Level ($\mu g/m^3$)	Daily Mean NO_x PC ($\mu g/m^3$)	PC/ Critical Level	PC <Insignificance Threshold?
E1	Humber Estuary	SAC, SPA, Ramsar	75	7.4	10%	Yes
E2	North Killingholme Haven Pits	SSSI		3.7	5%	Yes
E3	Kirmington Pits	SSSI		1.0	1%	Yes
E4	Kelsey Hill Gravel Pits	SSSI		0.6	1%	Yes
E5	Swallow Wold	SSSI		0.4	1%	Yes
E6	Wrawby Moor	SSSI		0.5	1%	Yes
E7	Eastfield Railway	LWS		6.3	8%	Yes
E8	Burkinshaws Covert	LWS		3.7	5%	Yes
E9	Station Road Fields	LWS		8.2	11%	Yes
E10	Rosper Road Pools	LWS		3.1	4%	Yes
E11	Chase Hill Wood	LWS		3.1	4%	Yes
E12	Mayflower Wood Meadow	LWS		4.1	6%	Yes
E13	Homestead Park Pond	LWS/ SINC		1.2	2%	Yes
E14	Eastfield Road Pit	SINC		6.9	9%	Yes
Insignificance thresholds = <10% SSSI; <100% LWS						

Maximum Annual Mean NO_x Predicted Concentrations - Ecological Receptors

Receptor		Receptor Type	Critical Level ($\mu g/m^3$)	NO_x PC ($\mu g/m^3$)	PC/ Critical Level	PC <Insignificance Threshold?
E1	Humber Estuary	SAC, SPA, Ramsar	30	0.14	0.5%	Yes
E2	North Killingholme Haven Pits	SSSI		0.06	0.2%	Yes
E3	Kirmington Pits	SSSI		0.01	<0.1%	Yes
E4	Kelsey Hill Gravel Pits	SSSI		0.02	0.1%	Yes
E5	Swallow Wold	SSSI		0.005	<0.1%	Yes
E6	Wrawby Moor	SSSI		0.009	<0.1%	Yes
E7	Eastfield Railway	LWS		0.04	0.1%	Yes
E8	Burkinshaws Covert	LWS		0.03	0.1%	Yes
E9	Station Road Fields	LWS		0.06	0.2%	Yes
E10	Rosper Road Pools	LWS		0.01	<0.1%	Yes
E11	Chase Hill Wood	LWS		0.02	0.1%	Yes
E12	Mayflower Wood Meadow	LWS		0.02	<0.1%	Yes
E13	Homestead Park Pond	LWS/ SINC		0.006	<0.1%	Yes
E14	Eastfield Road Pit	SINC		0.04	0.1%	Yes
Insignificance thresholds = <1% SSSI; <100% LWS						

Nutrient Nitrogen Deposition (as kg N/Ha/year) at Statutory Designated Habitats

Receptor		Empirical Critical Load	Annual Mean PC	PC/ Critical Load (lower)
E1 Humber Estuary SPA, SAC and SSSI	Rich Fens[1]	15-30	0.0003	<0.1%
	Low and medium altitude hay meadows	20-30	0.01	<0.1%
	Pioneer, low-mid, mid-upper saltmarshes[1]	20-30	0.01	<0.1%
	Coastal stable dune grassland - acid type[2]	8-10	0.0003	<0.1%
	Coastal stable dune grassland - calcareous type[2]	10-15	0.0003	<0.1%
	Coastal shifting dunes[2]	10-20	0.0003	<0.1%
	Northern wet heath[1]	10-20	0.0003	<0.1%
E2 North Killingholme Haven Pits SSSI	Pioneer, low-mid, mid-upper saltmarshes	20-30	0.006	<0.1%
E3 Kirmington Pits SSSI	No information listed within APIS			
E4 Kelsey Hill Gravel Pits SSSI	No features listed within APIS			
E5 Swallow Wold SSSI	Calcareous grassland	15-25	0.0005	<0.1%
E6 Wrawby Wold SSSI	Acid grassland	10-15	0.001	<0.1%
	Broadleaved and mixed yew woodland	15-20	0.002	<0.1%

1 Assessed at NGR 502530, 423520 west of the Humber Bridge, as this is the closest point to the installation for this habitat type.

2 Assessed at NGR 531560, 407810 and 539680, 410570 closest Dunes at Cleethorpes or Spurn Head respectively.

Acid Deposition (as keq/Ha/year) at Statutory Designated Habitats

Receptor Name		Empirical Critical Load (keq N/Ha/yr)	Empirical Critical Load (keq S/Ha/yr)	Total Baseline (N:S keq/Ha/yr)	PC of N to Acid Deposition 1	PC/ Critical Load
E1 Humber Estuary SPA, SAC and SSSI	Acid Grassland	0.223-0.643	0.420	1.07:0.32	0.0006	<0.1%
	Calcareous grassland	0.856-4.856	4.000	1.07:0.32	0.0006	<0.1%
	Dwarf Shrub and Heath	0.499-1.312	0.420	1.07:0.32	0.00002	<0.1%
E2 North Killingholme Haven Pits SSSI	Not sensitive to acid deposition					
E3 Kirmington Pits SSSI	No information listed within APIS					
E4 Kelsey Hill Gravel Pits SSSI	No features listed within APIS					
E5 Swallow Wold SSSI	Calcareous grassland	0.856-4.856	4.000	1.34:0.27	0.00003	<0.1%
E6 Wrawby Wold SSSI	Acid grassland	0.366-0.536	0.170	1.81:0.31	0.00005	<0.1%
	Broadleaved and mixed yew woodland	0.285-1.333	0.748	3.04:0.35	0.00009	<0.1%

The tables above show that the PCs are below the critical levels or loads and can be considered insignificant in that the process contribution is <1% of the long term critical load/critical level and <10% of the short term critical load/critical level. These are:

- NO_2 annual mean, NO_2 daily mean, nitrogen deposition and acidification.

Conclusion

We are satisfied that the Installation will not have a likely significant effect at the habitats sites, will not damage the special features of the SSSIs and will cause no significant pollution of the LWS. No further assessment of impact on conservation sites is required.

8.4 IN-COMBINATION EFFECTS WITH THE PROPOSED ADJACENT GAS ENGINE DEVELOPMENT

Gas Engine Modelled Parameters

In 2018 Planning Permission was granted to VPI for the construction of a Gas Engine Peaking Plant on land adjacent to the west of the VPI Immingham OCGT Power Station.

Although this site will be subject to a separate Environmental Permit application in due course, as part of the pre-application discussions for this installation we requested that an “in-combination” assessment was carried out, taking onto consideration the impacts from both the OCGT and the Gas Engines.

At the time the Planning Application for the Gas Engines was submitted, a number of different technology options were assessed for the site. As the final technology has still not been decided, the in-combination assessment presented here takes into consideration the option that resulted in the worst-case impacts reported in the Planning Application.

Conservative assumptions have been made for operational parameters of the gas engines including:

- Continuous operation of 33 x 1.5MW gas engines for short-term impacts when annual operating hours are likely to be around 1,200 per unit per year;
- Annual impacts have been assessed assuming 1,200 hours per year;
- Assumption that the Gas Engine and the OCGT plants will be operational at the same time; and
- Conservative emission rates based on Medium Combustion Plant Directive (MCPD) ELVs.

Predicted pollutant concentrations at discreet receptors as a result of an in-combination impact with the proposed Gas Engine Development

The table below shows the predicted ground level concentrations at the most impacted receptor from emissions from both the Gas Engine Development and the VPI Immingham OCGT Powerstation in combination. Where emissions screen out as insignificant, the background pollutant levels are not considered within the assessment in accordance with our H1 screening process.

The table below shows the maximum ground level concentrations from emissions from both the Gas Engine Development and the VPI Immingham OCGT Powerstation in combination.

Maximum Predicted Ground Level Concentrations – Human Health Impacts

Pollutant	NAQS $\mu g/m^3$	Impact location	PC $\mu g/m^3$	PC/ NAQS	PC <Insig Threshold ?	AC $\mu g/m^3$	PEC/ NAQS or headroom	PEC <Insig Threshold?
NO_2 (1-hour mean, 99.79th %ile)	200	Max residential receptor	29.2	15%	No	34.0	18%	Yes
NO_2 (Annual mean)	40	Max residential receptor	0.4	1.1%	No	17.0	44%	Yes
CO (8-hour, daily running mean)	10,000	Max off-site	2,218	22%	No	226	23%	No
CO (1-hour mean)	30,000	Max off-site	2,346	8%	Yes	-	-	-

The short term in-combination impacts are dominated by the emissions from the proposed Gas Engine site, due to the much lower stack heights associated with the individual gas engine units.

From the table above the following emission 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 EQS/EAL. This is:

- CO.

From the table above the annual maximum ground level emissions for NO_2 were over 1% of the EQS at 1.1% so we also considered the background NO_2 levels. When taking these into account there is adequate headroom between the PEC and EAL to indicate that it is unlikely that there will be an exceedance of an EQS. The PEC is 44% of the EQS.

When considered with the existing background concentrations for NO_2 and CO there is adequate headroom between the PEC and EQS to indicate that it is unlikely that there will be an exceedance of an EQS at any human health receptors when the Gas Engines and VPI Immingham OCGT Power Station are assessed as operating together.

Predicted pollutant concentrations at ecological receptors as a result of an in-combination impact with the proposed Gas Engine Development

Maximum NO_x (24-hour) Predicted Concentrations - Ecological Impacts

Receptor		Receptor Type	Critical Level µg/m^3	Daily Mean NO_x PC µg/m^3	PC/ Critical Level	PC < Insig Threshold?	AC µg/m^3	PEC/ Critical Load
E1	Humber Estuary	SAC, SPA, Ramsar	75	14.5	19%	No	44.9	79%
E2	North Killingholme Haven Pits	SSSI		9.7	13%	No	36.6	62%
E3	Kirmington Pits	SSSI		2.2	3%	Yes	-	-
E4	Kelsey Hill Gravel Pits	SSSI		2.0	3%	Yes	-	-
E5	Swallow Wold	SSSI		1.6	2%	Yes	-	-
E6	Wrawby Moor	SSSI		1.6	2%	Yes	-	-
E7	Eastfield Railway	LWS		20.0	27%	Yes	-	-
E8	Burkinshaws Covert	LWS		66.5	89%	Yes	-	-
E9	Station Road Fields	LWS		50.9	68%	Yes	-	-
E10	Rosper Road Pools	LWS		28.1	38%	Yes	-	-
E11	Chase Hill Wood	LWS		10.3	14%	Yes	-	-
E12	Mayflower Wood Meadow	LWS		16.1	21%	Yes	-	-
E13	Homestead Park Pond	LWS/ SINC		6.0	8%	Yes	-	-
E14	Eastfield Road Pit	SINC		20.9	28%	Yes	-	-
Insignificance thresholds = <10% SSSI; <100% LWS								

The maximum daily mean NOx concentrations at the majority of the identified receptors still remain below the thresholds for insignificance. Only the Humber Estuary and North Killingholme Pits receptors are predicted to exceed the insignificance thresholds. However when background concentrations are taken into consideration, the PECs indicate that it is unlikely that the Critical Level will be exceeded, especially taking into account that the assessment assumes 24-hour operation of plant, which is unlikely to operate for more than 6 hours in any one day.

Maximum Annual Mean NOx Predicted Concentrations - Ecological Receptors

Receptor		Receptor Type	Critical Level (µg/m3)	NOx PC (µg/m3)	PC/ Critical Level	PC < Insig Threshold?	AC µg/m^3	PEC/ Critical Load
E1	Humber Estuary	SAC, SPA, Ramsar	30	0.48	1.6%	No	30.0	101%
E2	North Killingholme Haven Pits	SSSI		0.28	0.9%	Yes		
E3	Kirmington Pits	SSSI		0.02	0.1%	Yes		
E4	Kelsey Hill Gravel Pits	SSSI		0.04	0.1%	Yes		
E5	Swallow Wold	SSSI		0.01	<0.1%	Yes		
E6	Wrawby Moor	SSSI		0.01	<0.1%	Yes		
E7	Eastfield Railway	LWS		0.21	0.7%	Yes		
E8	Burkinshaws Covert	LWS		0.75	2.5%	Yes		
E9	Station Road Fields	LWS		1.28	4.3%	Yes		
E10	Rosper Road Pools	LWS		0.30	1.0%	Yes		
E11	Chase Hill Wood	LWS		0.08	0.3%	Yes		
E12	Mayflower Wood Meadow	LWS		0.14	0.5%	Yes		
E13	Homestead Park Pond	LWS/ SINC		0.04	0.1%	Yes		
E14	Eastfield Road Pit	SINC		0.22	0.7%	Yes		
Insignificance thresholds = <1% SSSI; <100% LWS								

The maximum annual average process contribution of NOx from the installation is predicted to be 1.6% of the annual mean Critical Level at the worst-affected statutory designated, the Humber Estuary. Due to the high background concentration, already representing 100% of the critical load without any predicted process contributions, it is predicted that the annual average Critical Level will be exceeded. The only habitat present at the location of worst case impact is mudflats, which are considered to be of low sensitivity to atmospheric nitrogen.

Nutrient Nitrogen Deposition (as kg N/Ha/year) at Statutory Designated Habitats

Receptor		Empirical Critical Load	Annual mean PC	PC/ Critical Load (lower)
E1 Humber Estuary SPA, SAC and SSSI	Rich Fens[1]	15-30	0.0003	<0.1%
	Low and medium altitude hay meadows	20-30	0.04	0.2%
	Pioneer, low-mid, mid-upper saltmarshes[1]	20-30	0.04	0.2%
	Coastal stable dune grassland - acid type[2]	8-10	0.0003	<0.1%
	Coastal stable dune grassland - calcareous type[2]	10-15	0.0003	<0.1%
	Coastal shifting dunes[2]	10-20	0.0003	<0.1%
	Northern wet heath[1]	10-20	0.0003	<0.1%
E2 North Killingholme Haven Pits SSSI	Pioneer, low-mid, mid-upper saltmarshes	20-30	0.03	0.1%
E3 Kirmington Pits SSSI	No information listed within APIS			
E4 Kelsey Hill Gravel Pits SSSI	No features listed within APIS			
E5 Swallow Wold SSSI	Calcareous grassland	15-25	0.001	<0.1%
E6 Wrawby Wold SSSI	Acid grassland	10-15	0.001	<0.1%
	Broadleaved and mixed yew woodland	15-20	0.003	0.2%

1 Assessed at NGR 502530, 423520 west of the Humber Bridge, as this is the closest point to the installation for this habitat type.

2 Assessed at NGR 531560, 407810 and 539680, 410570 closest Dunes at Cleethorpes or Spurn Head respectively.

Acid Deposition (as keq/Ha/year) at Statutory Designated Habitats

Receptor Name		Empirical Critical Load (keq N/Ha/yr)	Empirical Critical Load (keq S/Ha/yr)	Total Baseline (N:S keq/Ha/yr)	PC of N to Acid Deposition	PC/ Critical Load
E1 Humber Estuary SPA, SAC and SSSI	Acid Grassland	0.223-0.643	0.420	1.07:0.32	0.003	<0.1%
	Calcareous grassland	0.856-4.856	4.000	1.07:0.32	0.003	<0.1%
	Dwarf Shrub and Heath	0.499-1.312	0.420	1.07:0.32	0.00002	<0.1%
E2 North Killingholme Haven Pits SSSI	Not sensitive to acid deposition					
E3 Kirmington Pits SSSI	No information listed within APIS					
E4 Kelsey Hill Gravel Pits SSSI	No features listed within APIS					
E5 Swallow Wold SSSI	Calcareous grassland	0.856-4.856	4.000	1.34:0.27	0.00007	<0.1%
E6 Wrawby Wold SSSI	Acid grassland	0.366-0.536	0.170	1.81:0.31	0.00009	<0.1%
	Broadleaved and mixed yew woodland	0.285-1.333	0.748	3.04:0.35	0.0002	<0.1%

The maximum PCs of nutrient nitrogen deposition and acid deposition from the installation at any identified receptor remains below 0.2% of the lower Critical Load at all receptors when the emissions from the Gas Engines and the VPI Immingham OCGT Power Station are considered in-combination, and is therefore below the threshold for insignificance at all habitat types. The predicted impacts of nutrient nitrogen and acid deposition at the identified statutory ecological receptors, when the Gas Engines and the VPI Immingham OCGT Power Station are assessed as operating together, is considered to be insignificant.

Conclusion

We are satisfied that the Gas Engines and the VPI Immingham OCGT Power Station operating together will not have a likely significant effect at the habitats sites, will not damage the special features of the SSSIs and will cause no significant pollution of the LWS. No further assessment of impact on conservation sites is required.

8.5 Emissions to Water

There are no discharges to surface water of process effluent. The small volume of effluent that is produced from cleaning of the turbine blade is tankered off site for treatment.

Only surface water run off will be discharged but the drainage plan was not available at this stage and provision of this has been included as a pre operational condition. The site will be covered by hardstanding and an oil interceptor will be in place on site. Diesel and chemicals on site will be bunded.

8.6 Noise Impacts

The following measures were proposed to minimise noise impacts:

- noise from the process will be minimised by the selection of appropriate plant,
- building cladding,
- louvres
- and silencers/attenuators.

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. Noise monitoring has been undertaken on behalf of VPI since 2005 and, as result, there is a dataset of background and ambient sound levels at the nearest receptor measured over a period of 13 years. The baseline noise survey was used in an assessment carried out in accordance with BS4142:2014 to compare the predicted plant rating noise levels with the established background levels. The operational noise modelling has been undertaken on the basis of the worst-case layout scenario assuming that the installation will operate continually at full load, 24 hours a day; it should be noted this is an absolute ‘worst case’ assumption for the purposes of the noise assessment and is highly unlikely to occur in practice, considering the ‘peaking’ nature of the installation. An acoustic character correction of +3dB has been applied due to the intermittent operation of the installation.

The table below shows how the predicted rating level compares to the background levels at the receptors near to the Installation. It was agreed in consultation with North Lincolnshire Council (NLC) that there is only one noise sensitive receptor (NSR) with the potential to be significantly impacted by the installation, we agree with this conclusion. This is identified as Hazel Dene on Marsh Road, a residential property approximately 325m southeast of the installation. The Existing VPI CHP Plant has been required to undertake regular (annual) noise monitoring at three locations around the site including Hazel Dene. Impacts at receptors further away will be lower. Impacts during the daytime and evening will be below the current background level.

Receptor: NSR – Hazel Dene	Installation's Operational Scenario
Specific sound level, Ls (LAeq,Tr), dB	47
Acoustic feature correction, dB	+3
Rating level (LAr,Tr), dB	50
Representative background sound level, (LA90,T), dB	49
Excess of rating level over background sound level, (LAr,Tr - LA90,T), dB	+1
Magnitude of impact	Very low
Classification of effect	Negligible

The assessment predicts that the night-time excess between corrected rating level for the installation and the representative background is 1dB, which is within +5dB of the background noise levels; which signifies very low impact at the NSR. This assessment is based upon night-time background sound levels; the daytime background sound levels will be higher so the impacts and effects will be even lower.

We audited the Applicant's assessment. Although we agreed with the conclusion that adverse or significant adverse impacts are unlikely at nearby receptors we have included a pre operational condition specifying that the applicant is required to carry out an additional feasibility study to establish whether additional mitigation measures can be incorporated into the design. This is based on the technology selection and the lack of information provided to demonstrate whether other mitigation options that could be available have been considered.

Based upon the information in the application 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 if pre-operational condition PO3 is completed satisfactorily.

9. Application of Best Available Techniques

9.1 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;
- We consider energy efficiency, and options for Combined Heat and Power, and the compliance with the Energy Efficiency Directive;
- We consider the cooling system proposed.

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. The BAT Conclusions and a revised BREF for LCP were published in July 2017 so BAT Associated Emission Levels (AELs) are specified alongside Chapter III limits from the IED within the permit.

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 based on Chapter III ELVs or BAT AELs are therefore "worst-case" scenarios.

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

9.2 Consideration of Combustion Plant

The operator has chosen to operate an OCGT plant.

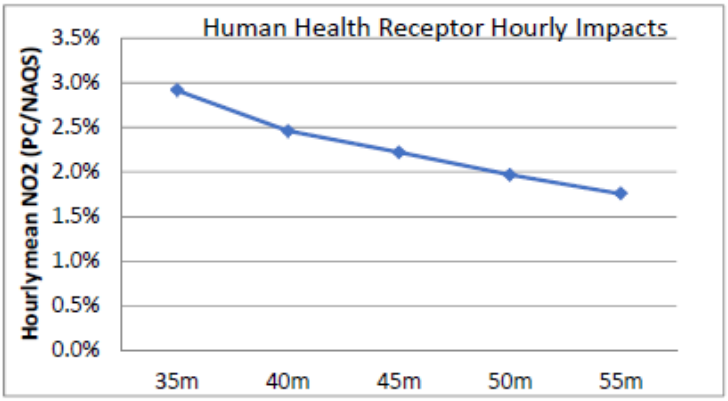
Open cycle gas turbines operate without a heat recovery steam generator (HRSG) and therefore have a lower efficiency when compared with a Combined Cycle Gas Turbine (CCGT). The exhaust gases are emitted to atmosphere without any energy recovery.

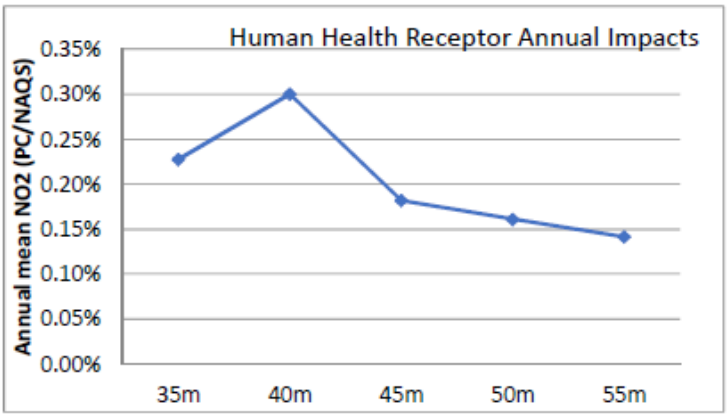
Operation of gas turbines in open cycle is not considered a best available technique due to reduced energy efficiency and the potential increase of pollutants released to air in comparison to operating gas turbines in combined cycle mode. However, operating in open cycle enables a quick start up time in order to provide energy to the National Grid to maintain electrical generation for emergency use compared with a CCGT. With no steam turbine generating equipment, OCGTs can start faster and ramp quicker since there are no constraints on 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.

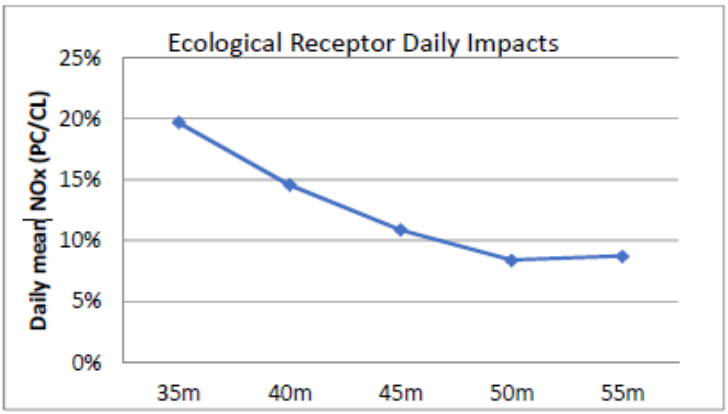
During open cycle operation the turbines will only burn natural gas and the main pollutant of concern will be NO_2. The Operator is restricted to operation in open cycle mode for 1,500 hours in any one year over a five year period with a maximum of 2,250 hours in any one year. The assessment has modelled the impact of emissions conservatively for operation of the turbine for 2,250 hours in one year.

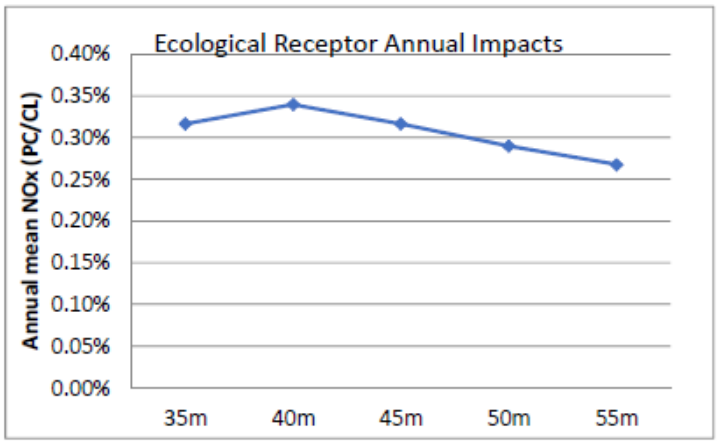
A Short Term Operating Reserve (STOR) contract requires the power station to generate power on demand within specific time windows to support the energy supply requirement of the National Grid. These typically occur six days per week for two periods per day of between approximately 5-6 hours. Generally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

Stack height sensitivity testing indicated that a stack height of 45m would be required to achieve adequate dispersion of emissions, with the maximum ground level concentrations within the receptor grid as insignificant – see graphs below. We accept that this indicates BAT for stack height.









9.3 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 oxides of nitrogen are either considered insignificant (at discrete receptors) or are considered to have adequate headroom between the PEC and EQS to indicate that an exceedance of the EQS is unlikely (maximum grid and in combination assessment).

We consider that the emission limits included in the installation permit reflect the BAT for the sector.

9.4 Energy efficiency

9.4.1 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.

9.4.2 Use of energy within the Installation

The primary considerations of energy efficiency for this site relates to the initial selection of combustion plant as set out in section 9.2 above.

9.4.3 Combined Heat and Power Ready

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.

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

Whilst it is considered that CHP is technically feasible for all types of new plants, it is recognised that in some cases (such as peaking plant) the provision of CHP would not be compatible with original operating regimes / intentions. In this case the Applicant has stated that the OCGT was chosen as the most suitable technology choice for peaking plant based on a BAT assessment and that the chosen technology involves no steam cycle that would enable an offtake for CHP developments. 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.

9.4.4 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.

9.4.5 Compliance with energy BAT AEELs set out in BAT Conclusions

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

Table 23 of the LCP BAT Conclusions specifies that the BAT-AEELs for this type of plant are not applicable to plant operating less than 1500 hours per year. We have therefore not assessed this operational aspect of the plant. We have however included a process monitoring requirement in table S3.3 of the permit. This is required to demonstrate that efficiency levels are maintained following any significant overhauls of equipment in order to fulfil the requirement of BAT Conclusion 2.

9.4.4 Choice of Cooling System

The current practice for operation of GTs is to exhaust the combustion gases via the Heat Recovery Steam Generator (HRSG), but cooling is required. The proposed 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 which are limited to 1,500 hours per year as a rolling average.

10. 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 IC06 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 IC01.

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 IC05 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/m3
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	To be confirmed under improvement condition IC05

11. Monitoring & Reporting

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. For gas turbines we have not required 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.

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.

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.

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.

12. 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	2.3.6 Schedule 1 Table S1.5
Ann V Pt 1(1)	All emission limit values shall be calculated at a temperature of 273K, 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 engines.	Schedule 6, Interpretation
Ann V Pt 1	Emission limit values	3.1.2 Schedule 3, Table S3.1
Ann V Pt 1	For plants operating less than 500 hours per year, record the used operating hours	N/A
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 – plant runs on natural gas only
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 Part 3(8,9,10)	Monitoring methods	3.5, 3.6
Ann V Pt 4	Monthly, daily, 95%ile hourly emission limit value compliance	3.5.1 Schedule 3, Table S3.1

IED Article Reference	IED requirement	Permit condition
Ann V Pt7	Refinery multi-fuel firing SO_2 derogation	3.5.1 Schedule 3, Table S3.1

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

BAT Conclusion requirement topic	**Permit condition(s)**	**Permit table(s)**
Environmental Management System	1.1.1	S1.2
BAT AELs	3.1	S3.1
Monitoring	3.5 and 3.6	S3.1
Energy efficiency	1.2	S3.3
Noise	3.4	-
Other operating techniques	1.2	S1.2

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

NA Not Applicable

CC Currently Compliant

FC Compliant in the future (within 4 years of publication of BAT conclusions) 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
General			
1	**In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features:** i. commitment of the management, including senior management; ii. definition of an environmental policy that includes the continuous improvement of the installation by the management; iii. planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment; iv. implementation of procedures (a) Structure and responsibility (b) Training (c) Communication (d) Employee involvement (e) Documentation (f) Efficient process control (g) Maintenance programmes (h) Emergency preparedness and response (i) Safeguarding compliance with environmental legislation v. checking performance and taking corrective action, paying particular attention to: (a) monitoring and measurement (see also the Reference Document on the General Principles of Monitoring) (b) corrective and preventive action (c) maintenance of records (d) independent (where practicable) internal and external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; vi. review of the EMS and its continuing suitability, adequacy and effectiveness by senior management; vii. following the development of cleaner technologies; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life; ix. application of sectoral benchmarking on a regular basis. Etc - see BAT Conclusions	**FC**	**i to vi. General EMS Aspects** The VPI Immingham OCGT Power Station will be operated by VPIB under an Environmental Management System (EMS) which will be developed in compliance with the requirements of ISO14001. The EMS will comprise of an environmental policy and management documents which will be applicable to the installation. Following commencement of operations at the site, certification of the EMS will be sought. The installation's procedures will provide the contact details for the applicable responsible personnel on site, and their roles and responsibilities. **v. Performance Monitoring and Corrective Actions** a. Monitoring and Measurement: Emissions to Air: All emissions to air from the VPI Immingham OCGT Power Station will be monitored, as specified within the LCP BRef and

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	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.		the Environmental Permit (EP) for the installation. Emissions to Water: All emissions to controlled waters from the installation will be monitored as required by the LCP BRef and the Environmental Permit (EP) for the installation. Maintenance Plan: All plant and equipment at the installation will be regularly maintained. Maintenance works at the installation will be scheduled using appropriate systems, and will be undertaken regularly by qualified maintenance contractors. a) Corrective and Preventative Actions: The operator will have appropriate procedures in place for monitoring plant operation and various performance parameters, and actions to be taken if any abnormal operational scenarios are identified. b) Records: The EMS will clearly define the requirements for maintaining and storing records. c) Auditing: The EMS will be subject to regular

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
			review and update (as required) by the operator. **vi. Management Review of EMS** Regular Management Review meetings will be undertaken at the installation covering all aspects of site operations, including the EMS. **vii. Development of Cleaner Technologies** It is considered that for the operation of the installation as a peaking plant, the selected technology i.e. OCGT operated using natural gas represents BAT. The operator will regularly review the implementation of cleaner technologies, if available. **viii. Consideration of Decommissioning Impacts** The operator will develop a decommissioning plan for the installation during detailed design stage that will include an assessment of impacts from decommissioning of the plant and equipment at the installation. **ix. Sectoral Benchmarking** The installation is being designed with consideration to the application of BAT for its operation. The installation will be designed and

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			operated in line with the LCP BRef. **x. Fuel Quality Control** The installation will be fuelled by natural gas supplied by the National Transmission System (NTS). The installation will include a gas receiving area, gas treatment control facilities, gas reception building and gas pipeline to a new Gas Reception Facility. This will ensure that the quality of fuel is appropriate for the operation of the installation. **xi. Other than Normal Operating Conditions (OTNOC) Management Plan** See response to BATc 10 and 11. **xii. Waste Management Plan** The installation will have appropriate procedures in place outlining the management of waste generated on site. This will include the appropriate storage and subsequent treatment/ recycling/ disposal of the waste. **xiii. Management of Uncontrolled or Unplanned Emissions** Site Protection: The installation will have a procedure in place as a good practice measure for describing the site protection and monitoring procedures in place at the site. The

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>procedure will describe the programme for the installation to monitor the effectiveness of the pollution prevention infrastructure to prevent and/ or reduce any release of polluting substances to ground or groundwater</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>The total fuel used by the OCGT power station will be recorded and reported routinely, in line with regulatory requirements. Periodic operational performance tests will be undertaken in accordance with applicable BS EN standards.</td></tr>
<tr><td>3</td><td>BAT is to monitor key process parameters relevant for emissions to air and water including those given below.
<table>
<tr><th>Stream</th><th>Parameter(s)</th><th>Monitoring</th></tr>
<tr><td rowspan="3">Flue-gas</td><td>Flow</td><td>Periodic or continuous determination</td></tr>
<tr><td>Oxygen content, temperature, and pressure</td><td rowspan="2">Periodic or continuous measurement</td></tr>
<tr><td>Water vapour content (3)</td></tr>
<tr><td>Waste water from flue-gas treatment</td><td>Flow, pH, and temperature</td><td>Continuous measurement</td></tr>
</table></td><td>FC</td><td>The flue gases from the installation will be monitored using MCERTS certified Continuous Emissions Monitoring system (CEMs) in accordance with applicable EN standards, as required by the LCP BRef. Due to the nature of the fuel proposed to be used on site, and the capability of the OCGT unit to meet BAT-AELs without the requirement of secondary abatement, no flue gas treatment is expected to be undertaken on site; hence there will be no waste water from flue-gas treatment systems.</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</th><th>Fuel/Process/Type of</th><th>Combustio</th><th>Standard(s) (</th><th>Minimum</th><th>Monitorin</th></tr>
</table></td><td>FC</td><td>The flue gases from the installation will be monitored using MCERTS certified Continuous Emissions Monitoring systems (CEMs) in</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

/Parameter	combustion plant	n plant total rated thermal input	[4]	monitoring frequency [5]	g associated with
NH_3	— When SCR and/or SNCR is used	All sizes	Generic EN standards	Continuous [6] [7]	BAT 7
NO_X	— Coal and/or lignite including waste co-incineration — Solid biomass and/or peat including waste co-incineration — HFO- and/or gas-oil-fired boilers and engines — Gas-oil-fired gas turbines — Natural-gas-fired boilers, engines, and turbines — Iron and steel process gases — Process fuels from the chemical industry — IGCC plants	All sizes	Generic EN standards	Continuous [6] [8]	BAT 20 BAT 24 BAT 28 BAT 32 BAT 37 BAT 41 BAT 42 BAT 43 BAT 47 BAT 48 BAT 56 BAT 64 BAT 65 BAT 73
	— Combustion plants on offshore platforms	All sizes	EN 14792	Once every year [9]	BAT 53

accordance with EN standards.

BAT Concn. Number	Summary of BAT Conclusion requirement						Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	N_2O	— Coal and/or lignite in circulating fluidised bed boilers — Solid biomass and/or peat in circulating fluidised bed boilers	All sizes	EN 21258	Once every year (10)	BAT 20 BAT 24		
	CO	— Coal and/or lignite including waste co-incineration — Solid biomass and/or peat including waste co-incineration — HFO- and/or gas-oil-fired boilers and engines — Gas-oil-fired gas turbines — Natural-gas-fired boilers, engines, and turbines — Iron and steel process gases — Process fuels from the chemical industry — IGCC plants	All sizes	Generic EN standards	Continuous (6) (8)	BAT 20 BAT 24 BAT 28 BAT 33 BAT 38 BAT 44 BAT 49 BAT 56 BAT 64 BAT 65 BAT 73		
		— Combustion plants on offshore platforms	All sizes	EN 15058	Once every year (9)	BAT 54		

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
	SO_2	— Coal and/or lignite incl waste co-incineration — Solid biomass and/or peat incl waste co-incineration — HFO- and/or gas-oil-fired boilers — HFO- and/or gas-oil-fired engines — Gas-oil-fired gas turbines — Iron and steel process gases — Process fuels from the chemical industry in boilers — IGCC plants	All sizes	Generic EN standards and EN 14791	Continuous (6) (11) (12)	BAT 21 BAT 25 BAT 29 BAT 34 BAT 39 BAT 50 BAT 57 BAT 66 BAT 67 BAT 74		
	SO_3	— When SCR is used	All sizes	No EN standard available	Once every year	—		
	Gaseous chlorides, expressed as HCl	— Coal and/or lignite — Process fuels from the chemical industry in boilers	All sizes	EN 1911	Once every three months (6) (13) (14)	BAT 21 BAT 57		
		— Solid biomass and/or peat	All sizes	Generic EN standards	Continuous (15) (16)	BAT 25		
		— Waste co-incineration	All sizes	Generic EN standards	Continuous (6) (16)	BAT 66 BAT 67		

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
	HF	— Coal and/or lignite — Process fuels from the chemical industry in boilers	All sizes	No EN standard available	Once every three months (6) (13) (14)	BAT 21 BAT 57		
		— Solid biomass and/or peat	All sizes	No EN standard available	Once every year	BAT 25		
		— Waste co-incineration	All sizes	Generic EN standards	Continuous (6) (16)	BAT 66 BAT 67		
	Dust	— Coal and/or lignite — Solid biomass and/or peat — HFO- and/or gas-oil-fired boilers — Iron and steel process gases — Process fuels from the chemical industry in boilers — IGCC plants — HFO- and/or gas-oil-fired engines — Gas-oil-fired gas turbines	All sizes	Generic EN standards and EN 13284-1 and EN 13284-2	Continuous (6) (17)	BAT 22 BAT 26 BAT 30 BAT 35 BAT 39 BAT 51 BAT 58 BAT 75		
		— Waste co-incineration	All sizes	Generic EN standards and EN 13284-2	Continuous	BAT 68 BAT 69		
	Metals and	— Coal and/or lignite	All sizes	EN 14385	Once every year (18)	BAT 22		

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
	metalloids except mercury (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Se, Tl, V, Zn)	— Solid biomass and/or peat — HFO- and/or gas-oil-fired boilers and engines				BAT 26 BAT 30		
		— Waste co-incineration	< 300 MW_{th}	EN 14385	Once every six months (13)	BAT 68 BAT 69		
			≥ 300 MW_{th}	EN 14385	Once every three months (19) (13)			
		— IGCC plants	≥ 100 MW_{th}	EN 14385	Once every year (18)	BAT 75		
	Hg	— Coal and/or lignite including waste co-incineration	< 300 MW_{th}	EN 13211	Once every three months (13) (20)	BAT 23		
			≥ 300 MW_{th}	Generic EN standards and EN 14884	Continuous (16) (21)			
		— Solid biomass and/or peat	All sizes	EN 13211	Once every year (22)	BAT 27		
		— Waste co-incineration with solid biomass and/or peat	All sizes	EN 13211	Once every three months (13)	BAT 70		
		— IGCC plants	≥ 100 MW_{th}	EN 13211	Once every year (23)	BAT 75		
	TVOC	— HFO- and/or gas-oil-fired engines — Process fuels from chemical industry in boilers	All sizes	EN 12619	Once every six months (13)	BAT 33 BAT 59		
		— Waste co-incineration with coal, lignite, solid biomass and/or peat	All sizes	Generic EN standards	Continuous	BAT 71		

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

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

5	BAT is to monitor emissions to water from flue-gas treatment with at least the frequency given in BAT 5 and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	**N/A**	No flue gas treatment is proposed to be undertaken at the installation. This BATc is therefore not applicable.
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)** The plant will procure a contractual agreement to receive natural gas from the NTS, which will include the requirement for the supplied gas to comply with specified quality criteria. Additional fuel blending is therefore not considered to be required at the installation. **b)** All plant and equipment at the installation will be regularly maintained. Maintenance works at the installation will be scheduled as required due to the intermittent nature of the operation; all maintenance work will be carried out by qualified maintenance contractors.

	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	

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
	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		**c)** Operation of the OCGT unit will be controlled by trained site operators using an automated control system to control the operation of the plant And also record data on the plant performance which can be used by the operations team to identify potential issues. The OCGT unit will have Dry Low NO_x burners in place to ensure minimum emissions of NO_x, compliant with the emission limit values (ELVs) specified in the Industrial Emissions Directive (IED). Periodic review of the plant and equipment will be undertaken to ensure appropriate and optimised operation of the plant. **d)** The installation is being designed to comply with BAT, including the selection of combustion technology. The installation will be constructed in accordance to the applicable standards. The plant will operate in line with the designed electrical efficiency and be compliant with specified BATAEELs. **e)** The plant comprises an OCGT plant, which will be operated using natural gas. Natural gas is a relatively clean fuel compared to other fuels such as coal and diesel.

BAT Concn. Number	Summary of BAT Conclusion requirement	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
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.	**N/A**	The required NO_x emission limits can be achieved without the requirement for SCR abatement; therefore installation of SCR plant is not considered to be required for the installation. This BATc is therefore not applicable.
8	In order to prevent or reduce emissions to air during normal operating conditions, BAT is to ensure, by appropriate design, operation and maintenance, that the emission abatement systems are used at optimal capacity and availability.	**FC**	The installation is being designed to comply with BAT. The control system at the installation will continuously monitor the plant performance with periodic assessment of overall efficiency being undertaken to ensure that the plant is operating in line with the designed electrical efficiency. The data collated from the CEMS will be used to demonstrate that the emissions from the plant are within the permitted levels. The installation will be operated using an automated control system to continuously monitor the operation of the plant and equipment at the site. Any non-conformance or deviation in normal operating parameters will be identified by the control system to allow operators to take action to avoid inefficient operation and potential permit non compliances or significant

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
			environmental impacts. The data on plant performance, incidents, and potential incidents will be recorded and retained as per regulatory requirements. The OCGT unit has Dry Low NO_x burners in place to ensure minimum emissions of NO_x, and compliance with IED ELVs. Periodic maintenance and overhauls of the plant and equipment will be undertaken to ensure optimised operation of the plant. All plant and equipment at the installation will be regularly maintained. Maintenance works at the will be undertaken by qualified maintenance contractors carry out maintenance works regularly at the 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)). ***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	**FC**	The operator will procure a contractual agreement to receive natural gas from the NTS including a requirement for the received gas to comply with specified quality criteria. Additional treatment of the fuel is therefore not proposed to be undertaken by the installation. The quality of the incoming gas will be monitored by the NTS provider to confirm that it meets the agreed supply criteria – this would typically be by way of gas chromatograph analysis. Performance tests including thermal efficiency tests will be undertaken at the installation regularly.

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>specification and/or guarantee.
<table>
<tr><th>Fuel(s)</th><th>Substances/Parameters subject to characterisation</th></tr>
<tr><td rowspan="2">Biomass/peat</td><td>— LHV
— moisture</td></tr>
<tr><td>— Ash
— C, Cl, F, N, S, K, Na
— Metals and metalloids (As, Cd, Cr, Cu, Hg, Pb, Zn)</td></tr>
<tr><td rowspan="3">Coal/lignite</td><td>— LHV
— Moisture
— Volatiles, ash, fixed carbon, C, H, N, O, S</td></tr>
<tr><td>— Br, Cl, F</td></tr>
<tr><td>— Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)</td></tr>
<tr><td>HFO</td><td>— Ash
— C, S, N, Ni, V</td></tr>
<tr><td>Gas oil</td><td>— Ash
— N, C, S</td></tr>
<tr><td>Natural gas</td><td>— LHV
— CH_4, C_2H_6, C_3, C_4+, CO_2, N_2, Wobbe index</td></tr>
<tr><td>Process fuels from the chemical industry (27)</td><td>— Br, C, Cl, F, H, N, O, S
— Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)</td></tr>
</table></td><td></td><td></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
	Iron and steel process gases: — LHV, CH_4 (for COG), C_XH_Y (for COG), CO_2, H_2, N_2, total sulphur, dust, Wobbe index Waste [28]: — LHV; — Moisture; — Volatiles, ash, Br, C, Cl, F, H, N, O, S; — Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)		
10	In order to reduce emissions to air and/or to water during other than normal operating conditions (OTNOC), BAT is to set up and implement a management plan as part of the environmental management system (see BAT 1), commensurate with the relevance of potential pollutant releases, that includes the following elements: — appropriate design of the systems considered relevant in causing OTNOC that may have an impact on emissions to air, water and/or soil (e.g. low-load design concepts for reducing the minimum start-up and shutdown loads for stable generation in gas turbines), — set-up and implementation of a specific preventive maintenance plan for these relevant systems, — review and recording of emissions caused by OTNOC and associated circumstances and implementation of corrective actions if necessary, — periodic assessment of the overall emissions during OTNOC (e.g. frequency of events, duration, emissions quantification/estimation) and implementation of corrective actions if necessary.	**FC**	The installation and associated control systems will be designed to minimise the potential for OTNOC events to occur. The installation will be operated using an automated control system to continuously monitor the operation of the plant and equipment at the site. Any non-conformance or deviation in normal operating parameters will be identified by the control system to allow operators to take action to avoid OTNOC events. Site operators will be trained to monitor plant operation and take appropriate action in the event of a potential OTNOC event being identified. Start-up and shutdown procedures will be developed for the installation prior to commissioning, to minimise the time during which the plant is operating at non-optimal conditions. All plant and equipment at the site

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
			will undergo regular maintained including those system provided to minimise the potential for OTNOC conditions to occur. Maintenance works at the installation will be undertaken by qualified maintenance contractors. All plant operators will be appropriately trained regarding the correct response to OTNOC events. Additionally, the installation will also have emergency response procedures for the management of spills, firewater, and the blocking of discharge outlet to the internal drainage board (IDB) drains.
11	BAT is to appropriately monitor emissions to air and/or to water during OTNOC. ***Description*** The monitoring can be carried out by direct measurement of emissions or by monitoring of surrogate parameters if this proves to be of equal or better scientific quality than the direct measurement of emissions. Emissions during start-up and shutdown (SU/SD) may be assessed based on a detailed emission measurement carried out for a typical SU/SD procedure at least once every year, and using the results of this measurement to estimate the emissions for each and every SU/SD throughout the year.	**FC**	The flue gases from the installation will be monitored using MCERTS certified Continuous Emissions Monitoring systems (CEMs) in accordance with EN standards. All emissions will be monitored prior to being discharged.
12	In order to increase the energy efficiency of combustion, gasification and/or IGCC units operated ≥ 1 500 h/yr, BAT is to use an appropriate combination of the techniques given in BAT 12.	**N/A**	The VPI Immingham OCGT Power Station is designed to operate as a peaking plant and as such the installation will operate for up to 1,500 hours as a rolling average over 5 years, with maximum operations in any one year not exceeding 2,250 hours. Continual operation for over 1,500 hours per annum is not proposed, therefore this BATc does not apply.

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td></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>FC</td><td>Only limited cooling is required for this type of plant and this would be achieved through a closed loop system utilising fin-fan coolers which require a small supply of water. Therefore, the degree of recycling achievable at the installation is limited.

The installation does not produce any ash from the combustion process; therefore the techniques for dry bottom ash handling are not applicable to the installation.</td></tr>
<tr><td>14</td><td>In order to prevent the contamination of uncontaminated waste water and to reduce emissions to water, BAT is to segregate waste water streams and to treat them separately, depending on the pollutant content.
Description
Waste water streams that are typically segregated and treated include surface run-off water, cooling water, and waste water from flue-gas treatment.
Applicability
The applicability may be restricted in the case of existing plants due to the configuration of the drainage systems.</td><td>FC</td><td>The key wastewater generated at the installation is uncontaminated surface water/storm water runoff, which will be discharged to the IDB drains located to the east and south of the site.

The installation will also generate process wastewater which will be drained to the retention pond, via oil/water interceptors to ensure that the water contained in the retention pond is not contaminated. The retention pond will be designed to</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
			comply with sustainable urban discharge system (SuDS) with impermeable lining, and all discharges will be analysed and controlled to greenfield discharge rates. Any oil collected within the oil/water interceptors will be taken off site for suitable treatment/disposal. In addition to the surface water run-off, the installation will be discharging treated sewage to the IDB drains; these discharges will be analysed prior to discharge to ensure compliance with the requirements of the Permit.
15	In order to reduce emissions to water from flue-gas treatment, BAT is to use an appropriate combination of the techniques given in BAT 15, and to use secondary techniques as close as possible to the source in order to avoid dilution.	**N/A**	Not applicable as no flue gas treatment.
16	In order to reduce the quantity of waste sent for disposal from the combustion and/or gasification process and abatement techniques, BAT is to organise operations so as to maximise, in order of priority and taking into account life-cycle thinking: (a) waste prevention, e.g. maximise the proportion of residues which arise as by-products; (b) waste preparation for reuse, e.g. according to the specific requested quality criteria; (c) waste recycling;	**FC**	The installation will have procedures in place outlining identification of waste streams and how they must be handled, including segregation and storage within designated waste storage areas on site. Waste hierarchy principles will be applied for the management of any waste produced on site. Due to the inherent nature of the site operations and fuel used, the installation is expected to produce minor quantities of waste, primarily from maintenance. Where possible,

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>(d) other waste recovery (e.g. energy recovery),

by implementing an appropriate combination of techniques such as:

<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Generation of gypsum as a by-product</td><td>Quality optimisation of the calcium-based reaction residues generated by the wet FGD so that they can be used as a substitute for mined gypsum (e.g. as raw material in the plasterboard industry). The quality of limestone used in the wet FGD influences the purity of the gypsum produced</td><td>Generally applicable within the constraints associated with the required gypsum quality, the health requirements associated to each specific use, and by the market conditions</td></tr>
<tr><td>b.</td><td>Recycling or recovery of residues in the construction sector</td><td>Recycling or recovery of residues (e.g. from semi-dry desulphurisation processes, fly ash, bottom ash) as a construction material (e.g. in road building, to replace sand in concrete production, or in the cement industry)</td><td>Generally applicable within the constraints associated with the required material quality (e.g. physical properties, content of harmful substances) associated to each specific use, and by the market conditions</td></tr>
<tr><td>c.</td><td>Energy recovery by using waste in the fuel mix</td><td>The residual energy content of carbon-rich ash and sludges generated by the combustion of coal, lignite, heavy fuel oil, peat or biomass can be recovered for example by mixing with the fuel</td><td>Generally applicable where plants can accept waste in the fuel mix and are technically able to feed the fuels into the combustion chamber</td></tr>
<tr><td>d.</td><td>Preparation of spent catalyst for reuse</td><td>Preparation of catalyst for reuse (e.g. up to four times for SCR catalysts) restores some or all of the original performance, extending the service life of the catalyst to several decades. Preparation of spent catalyst for reuse is</td><td>The applicability may be limited by the mechanical condition of the catalyst and the required performance with respect to controlling NO_X and NH_3 emissions</td></tr>
</table>
</td><td></td><td>the waste generated on site will be sent off for recycling, with any hazardous waste streams sent off site for appropriate treatment and/or disposal.</td></tr>
</table>

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td><table><tr><td></td><td></td><td>integrated in a catalyst management scheme</td><td></td></tr></table></td><td></td><td></td></tr>
<tr><td>17</td><td>In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below.<table><tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr><tr><td>a.</td><td>Operational measures</td><td>These include:
— improved inspection and maintenance of equipment
— closing of doors and windows of enclosed areas, if possible
— equipment operated by experienced staff
— avoidance of noisy activities at night, if possible
— provisions for noise control during maintenance activities</td><td>Generally applicable</td></tr><tr><td>b.</td><td>Low-noise equipment</td><td>This potentially includes compressors, pumps and disks</td><td>Generally applicable when the equipment is new or replaced</td></tr><tr><td>c.</td><td>Noise attenuation</td><td>Noise propagation can be reduced by inserting obstacles between the emitter and the receiver.</td><td>Generally applicable to new plants. In the case of existing plants, the</td></tr></table></td><td>FC</td><td>a) The installation will have a maintenance schedule in place to ensure optimum operation of all plant and equipment. The frequency of regular maintenance of the installation is expected to be relatively low due to the intermittent nature of operation of the installation as a peaking plant. The gas turbine and all associated noise generating equipment will be situated within an enclosure.

The installation will operate as a peaking plant, with operations limited to 1,500 hours a year on a 5 year rolling average with a maximum in any year of 2,250 hours, therefore minimising noise emissions.

The noise assessment undertaken demonstrates that even assuming the installation will operate for 24 hours a day, the impact of the noise emissions on the noise sensitive receptors will be negligible.

b) The noise assessment undertaken for the installation reviewed the impact of the operation and concluded that the impact of noise emissions from the installation on the noise sensitive receptors in the vicinity of the installation will be negligible. The plant and equipment proposed for</td></tr>
</table>

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td></td><td>Appropriate obstacles include protection walls, embankments and buildings</td><td>insertion of obstacles may be restricted by lack of space</td></tr>
<tr><td>d.</td><td>Noise-control equipment</td><td>This includes:
— noise-reducers
— equipment insulation
— enclosure of noisy equipment
— soundproofing of buildings</td><td>The applicability may be restricted by lack of space</td></tr>
<tr><td>e.</td><td>Appropriate location of equipment and buildings</td><td>Noise levels can be reduced by increasing the distance between the emitter and the receiver and by using buildings as noise screens</td><td>Generally applicable to new plant</td></tr>
</table>
</td><td></td><td>use at the installation is therefore considered to represent low noise equipment.

c) - e) The gas turbine and associated noise generating equipment will be enclosed.</td></tr>
<tr><td colspan="4">Combustion of gaseous fuels</td></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="4">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>
</table>
</td><td>N/A</td><td>The installation will not operate for >1,500 hours per year. This BATc is therefore not considered to be applicable to the installation.

However the BAT-AEEL for a new OCGT plant is 36–41.5%. With a thermal efficiency of 39%, the VPI Immingham OCGT Power Station is considered to be compliant with the required BAT-AEEL.</td></tr>
</table>

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<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></td><td></td></tr>
<tr><td>41</td><td>In order to prevent or reduce NO_X emissions to air from the combustion of natural gas in boilers, BAT is to use one or a combination of the techniques given in BAT 41.</td><td>N/A</td><td>The installation is an OCGT plant and does not comprise operation of boilers. This BATc is therefore not considered applicable.</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 rowspan="2">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>The applicability may be limited in the case of turbines where a retrofit package is not available or when</td></tr>
</table>
</td><td>FC</td><td>a) Operation of the OCGT plant will be controlled by trained site operators using an automated control system, which will be used to control the operation of the plant and also record data on the plant performance, which could be used by the operations team to identify potential issues.

The OCGT has Dry Low NOx burners in place to ensure minimum emissions of NOx compliant with the IED ELVs.

Periodic technology review will be undertaken at the installation to ensure appropriate and optimised</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
				water/steam addition systems are installed		operation of the plant. **b) – c)** Water/steam addition for NOx control is not expected to be applied at the plant as Dry Low NOx burners are used for NOx control. **d)** Not applicable as this is limited by the turbine design. Operational efficiency characteristics of the plant vary according to the load. **e)** The plant implements DLNs, therefore LNBs are not required. **f)** The installation will comply with the BAT-AELs without application of secondary mitigation measures such as SCR; implementation of SCR at the installation is therefore not considered to be required. Footnote 3 table 24 – yearly NOx The BAT –AEL for NOx for the installation will be < 50mg/Nm³ as a daily average (or average over the sampling period)； the OCGT units will be designed to comply with it. As the OCGTs will have DLN combustors, the BAT-AEL will only apply once the DLN is effective (Note 2). The effective DLN range will be confirmed during detailed design and advised to the EA as part of a commissioning report, IC04 has been set requiring the submission of the report.
		d.	Low-load design concept	Adaptation of the process control and related equipment to maintain good combustion efficiency when the demand in energy varies, e.g. by improving the inlet airflow control capability or by splitting the combustion process into decoupled combustion stages	The applicability may be limited by the gas turbine design	
		e.	Low-NO_X burners (LNB)	See description in Section 8.3	Generally applicable to supplementary firing for heat recovery steam generators (HRSGs) in the case of combined-cycle gas turbine (CCGT) combustion plants	
		f.	Selective catalytic reduction (SCR)		Not applicable in the case of combustion plants operated < 500 h/yr. Not generally applicable to existing combustion plants of < 100 MW_{th}. Retrofitting existing combustion plants may be constrained by the availability of sufficient space. There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1,500 h/yr	

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td></td><td></td><td>The installation is therefore considered to be compliant with the BATc.</td></tr>
<tr><td>43</td><td>In order to prevent or reduce NO_X emissions to air from the combustion of natural gas in engines, BAT is to use one or a combination of the techniques given in BAT 43.</td><td>N/A</td><td>Not applicable as the plant is not a natural gas fired engine.</td></tr>
<tr><td>44</td><td>In order to prevent or reduce CO emissions to air from the combustion of natural gas, BAT is to ensure optimised combustion and/or to use oxidation catalysts.
Description - See descriptions in Section 8.3.
BAT-associated emission levels (BAT-AELs) for NO_X emissions to air from the combustion of natural gas in gas turbines
<table>
<tr><th rowspan="2">Type of combustion plant</th><th rowspan="2">Combustion plant total rated thermal input (MW_{th})</th><th colspan="2">BAT-AELs (mg/Nm^3) (142) (143)</th></tr>
<tr><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>
<tr><td>Existing OCGT (excluding turbines for mechanical drive applications) — All but plants operated < 500 h/yr</td><td>≥ 50</td><td>15–50</td><td>25–55 (148)</td></tr>
<tr><td colspan="4">Combined-cycle gas turbines (CCGTs) (146) (149)</td></tr>
<tr><td>New CCGT</td><td>≥ 50</td><td>10–30</td><td>15–40</td></tr>
<tr><td>Existing CCGT with a net total fuel utilisation of < 75 %</td><td>≥ 600</td><td>10–40</td><td>18–50</td></tr>
<tr><td>Existing CCGT with a net total fuel utilisation of ≥ 75 %</td><td>≥ 600</td><td>10–50</td><td>18–55 (150)</td></tr>
<tr><td>Existing CCGT with a net total fuel utilisation of < 75 %</td><td>50–600</td><td>10–45</td><td>35–55</td></tr>
<tr><td>Existing CCGT with a net total fuel utilisation of ≥ 75 %</td><td>50–600</td><td>25–50 (151)</td><td>35–55 (152)</td></tr>
<tr><td colspan="4">Open- and combined-cycle gas turbines</td></tr>
</table></td><td>FC</td><td>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 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 IC06 requires the operator to define an output load or operational parameters and provide a written</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

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

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

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

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

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

Type of combustion plant	BAT-AELs (mg/Nm^3)			
	Yearly average (157)		Daily average or average over the sampling period	
	New plant	Existing plant (158)	New plant	Existing plant (159)
Boiler	10–60	50–100	30–85	85–110

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 IC07.

See section 10 – Emissions for further information.

<table>
<tr><th>BAT Concn. Number</th><th>Summary of BAT Conclusion requirement</th><th>Status NA/ CC / FC / NC</th><th>Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement</th></tr>
<tr><td></td><td>
<table>
<tr><td>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></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.
Description
See descriptions in Section 8.3. Oxidation catalysts are not effective at reducing the emissions of saturated hydrocarbons containing less than four carbon atoms.
BAT-associated emission levels (BAT-AELs) for formaldehyde and CH_4 emissions to air from the combustion of natural gas in a spark-ignited lean-burn gas engine
<table>
<tr><th rowspan="3">Combustion plant total rated thermal input (MW_{th})</th><th colspan="3">BAT-AELs (mg/Nm^3)</th></tr>
<tr><th>Formaldehyde</th><th colspan="2">CH_4</th></tr>
<tr><th colspan="3">Average over the sampling period</th></tr>
<tr><th>New or existing plant</th><th>New plant</th><th>Existing plant</th></tr>
<tr><td>≥ 50</td><td>5–15 (162)</td><td>215–500 (163)</td><td>215–560 (162) (163)</td></tr>
</table>
</td><td>N/A</td><td>Not applicable as the plant is not a spark ignited lean burn gas engine.</td></tr>
</table>

Annex 1 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.
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', Appendix 1 of RGN 2 'Interpretation of Schedule 1', guidance on waste recovery plans and permits. 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 at this stage. The decision was taken in accordance with our guidance on site condition reports and baseline reporting under the Industrial Emissions Directive. VPI Immingham OCGT Power Station is to be built on land covering an area of approximately 2ha lying between the Existing VPI CHP Plant to the south, and Rosper Road to the east. Immediately to the north of the installation is a private car park and a number of single storey structures associated with access to the Lindsey Oil Refinery; this is owned and operated by Total, as is the Oil Refinery. According to historical maps, the site of the installation was previously used for agricultural purposes, with no significant change in the site until 1951 when maps identify the presence of drainage systems. Railway sidings are identified at the site in 1974. No permitted activities were identified to have been undertaken at the site. The environmental sensitivity of the site is considered to be as follows: · Groundwater – Moderate sensitivity - Underlying Secondary Aquifer within the superficial glacial deposits, the underlying bedrock is classified as a Principal Aquifer - with low vulnerability, due to the over laying low-permeability

Aspect considered	Decision
	superficial deposits; · Surface water – Moderate sensitivity – River Humber, located circa 1.3km directly to the east, there are a number of drains and tributaries of the River Humber in close proximity to the installation; · Land use – Low sensitivity – the installation is surrounded by industrial and agricultural land and no significant land uses have been identified. An intrusive ground investigation was conducted on an area of land including the OCGT Power Station Site in April 2018. The ground investigation comprised six boreholes, eight window samples and the excavation of thirteen machine and hand dug trial pits and trenches. A total of 26 soil samples were taken and analysed for a range of parameters including metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH) and asbestos. Fourteen dual-purpose groundwater/ground gas wells were installed, from which a total of seven groundwater samples were obtained on subsequent monitoring visits, and in situ monitoring of ground gas was also undertaken. The findings of the investigation are presented in SOCOTEC' Factual Report in Appendix 11C (ES Volume III, Application Document Ref. 6.4), and AECOM's Phase 2 Geotechnical and Geo-environmental Interpretative Report in Appendix 11D (ES Volume III). The report highlights that concentrations within the soil samples were present below a commercial generic assessment criteria (GAC) and of the determinants tested in groundwater samples only selenium exceeded the Drinking Water Standards (DWS), while zinc, sulphates and chloride exceeded the Coastal EQS. It is considered these represent a level of minimal risk, below which it can be presumed that there is insignificant risk to any receptors. The assessment showed that the low-permeability superficial deposits are likely to limit transmission from surface to deeper groundwater within the principal aquifer. The low leaching nature of the ground underneath the site and in the vicinity is considered to ameliorate the potential impact from both on and off-site operations. The OCGT unit and associated infrastructure will be installed on concrete hardstanding with controlled drains, using a limited type and quantity of potentially contaminating raw materials, the likelihood of the new operations adversely affecting the surrounding environment is considered to be minimal. Therefore, based on the review of existing ground conditions and proposed installation operations, it is considered that the proposed activities do not pose a significant risk to the environment.
Biodiversity, heritage, landscape and nature conservation	The application is within the relevant distance criteria of a site of heritage, landscape or nature conservation, and/or protected species or habitat. We have 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. We have completed a Habitats Regulation assessment and sent it to Natural England for information only. This decision was taken in accordance with our guidance. **See section 8 above for further information.**

Aspect considered	Decision
Environmental risk assessment	
Environmental impact assessment	In determining the application we have considered the Environmental Statement.
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 8 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 oxides of nitrogen 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. The following conditions were imposed; • PO1 submission of a written commissioning plan. • PO2 submission of a finalised drainage plan. • PO3 carry out a feasibility study on the provision of additional mitigation of noise emissions from the installation.
Improvement programme	Based on the information on the application, we consider that we need to impose an improvement programme. Improvement conditions IC01 – IC07 have been set as detailed in previous sections of this document.
Emission limits	ELVs and equivalent parameters or technical measures based on BAT have been set for the following substances: Oxides of nitrogen (NOx) Carbon monoxide **See section 10 above for further information.**
Monitoring	We have decided that monitoring should be added for the following

Aspect considered	Decision
	parameters, using the methods detailed and to the frequencies specified: • continuous emissions monitoring for LCP 672 – oxides of nitrogen and carbon monoxide; and • 6 monthly for LCP 672 – 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 LCP 672 – oxides of nitrogen and carbon monoxide; and • every 6 months for LCP 672 – sulphur dioxide 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. We have set IC03 requiring the submission of a written report to the on the implementation of its Environmental Management System and the progress made in the certification of the system by an external body or if appropriate submit a schedule by which the EMS will be certified.
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

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

Annex 2 Consultation

Advertising and Consultation on the Application

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
Based on the information contained in the application supplied to us, Public Health England has no significant concerns regarding the risk to the health of the local population from the installation. This consultation response is based on the assumption that the permit holder shall take all appropriate measures to prevent or control pollution, in accordance with the relevant sector guidance and industry best practice.
Summary of actions taken or show how this has been covered
We have reviewed the permit application against the revised BAT Conclusions (BATc) for the large combustion plant sector published on 31st July 2017. We are satisfied that suitable controls in line with BAT will be in place and that there will be no significant impact on human health or the environment.

No other responses were received.