Environment Agency

Environmental Permit under the Environmental Permitting (England & Wales) Regulations 2010 (as amended)

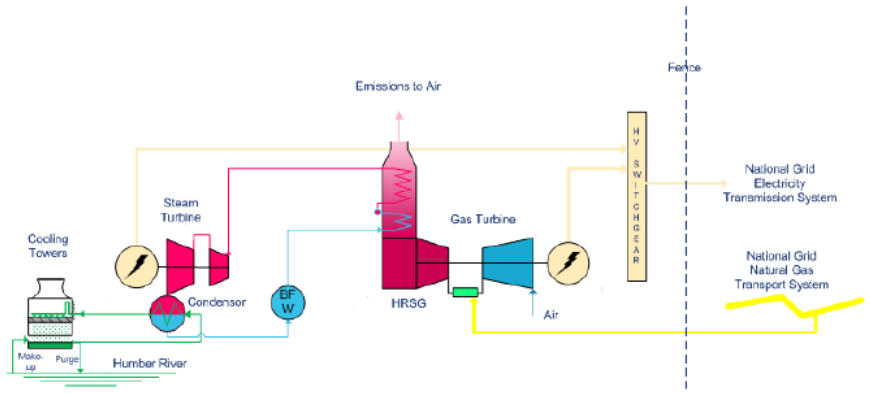
Decision document recording our decision-making process following an application for a bespoke permit

The permit number is: EPR/FP3838EB
The operator is: C.Gen Killingholme Limited.
The installation is: C.Gen Killingholme Power Plant.

We consider that in reaching our 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.

Description of the main features of the Installation

C.Gen Killingholme Power Plant will comprise of a gas-fired Combined Cycle Gas Turbine (CCGT) electricity generating station which will be fired on natural gas obtained from an existing local high pressure gas supply network, as well as cooling water supply infrastructure, low NOx burners, steam turbine and heat recovery steam generators (HRSG). The cooling system will comprise hybrid cooling towers using water from and water returned to the Humber Estuary.



The Main Stack serves the gas turbine and Heat Recovery Steam Generator (HRSG) within the Power island STU. Natural gas will be burnt in the combustion chamber of the gas turbine producing hot, high-pressure gases.

These gases will expand through the gas turbine to generate electricity. The hot, expanded gases are then used in the HRSG to generate steam, which is in turn then used in the steam turbine equipment to generate additional electricity. The spent steam will leave the steam turbine equipment passing to a condenser, which is cooled by water coming from the hybrid cooling towers. The resultant condensate will be returned to the HRSG for reuse.

Purpose of this document

This decision document:

- explains how the application has been determined
- provides a record of the decision-making process
- shows how all relevant factors have been taken into account
- Justifies the specific conditions in the permit other than those in our generic permit template.

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

Structure of this document

- Key issues
- Annex 1 the decision checklist
- Annex 2 the consultation, and web publicising responses
- Annex 3 Meeting the requirements of Chapter III and Annex V of the Industrial Emissions Directive (IED).

Key issues of the decision

Contents:

GLOSSARY

Baseload	means: (i) as a mode of operation, operating for >4000hrs per annum; and (ii) as a load, the maximum load under ISO conditions that can be sustained continuously, i.e. maximum continuous rating
BAT	best available techniques
BREF	best available techniques reference document
CCGT	combined cycle gas turbine
Derogation	as set out in Article 15(4) of the IED
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
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.

1. Chapter III of the IED

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

The aggregation rule is as follows:

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

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

Combustion plant on the installation that do not form part of an LCP and so do not come under chapter III requirements, will still aggregate to be part of the Section 1.1 A(1)(a) activity listed in Schedule 1 of the Environmental Permitting regulations if they have a rated thermal input of 1MW thermal input or over.

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

The permit contains conditions developed in consultation with industry having regard to the legal requirements of the Environmental Permitting Regulations (EPR) and other relevant legislation.

2. Large Combustion Plant Description and Number

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

LCP470,

The application includes a request to consider one natural gas CCGT configuration:

1. One generating unit totalling 470MWe

North Killingholme Power Plant with comprise of an LCP consisting of one 470MWe CCGT and one steam turbine in a single shaft configuration which will vent exhaust gases via the Main Stack at emission point A1. The unit will burn

natural gas and utilise diesel generators as back-up in the case of emergency shut downs.

The applicant has justified providing their potential layout for consideration which reflects the current gas turbine technology available in the marketplace that best suits their needs.

The configuration was provided with a relevant best available technique (BAT) justification, with the plant having an overall combined cycle efficiency of 58% at ISO conditions. The steam turbine will have an isentropic efficiency of approximately 90%, which are deemed acceptable.

3. Compliance Route

The Applicant has proposed to operate LCP470 under the ELV compliance route, complying with the emission limits set out in part 2 of annex V of the IED.

4. Net Thermal Input

The Applicant has stated that the Net Thermal Input of LCP470 is 800MWth under normal operating conditions.

One small auxiliary boiler of the order of 30 megawatts thermal ("MWth") may be installed to provide steam for the start-up of the Project and will operate intermittently for a limited number of hours per year. The boiler will provide steam, normally provided by the heat recovery steam generator, for deaeration of the feedwater / condensate before its introduction into the main boiler; to warm the steam piping and steam turbine gland system. An electric vacuum pump or steam injector will be used to establish the condenser vacuum during start-up of the main power station.

One emergency diesel-generators necessary to provide electricity to vital auxiliaries under black-out conditions with a generation capacity of up to 1.5 MWe and a net thermal input of 30MWth.

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 IC2, requiring them to provide this information within 12 months of the plant starting up.

5. Minimum Start Up Load and Minimum Shut-Down Load (MSUL/MSDL)

The gas turbine selected is the Mitsubishi Hitachi Power Systems M701F4. The Applicant states that the M701F4 can be reduced to 40% load, however the applicant has not provided sufficient information to set the MSUL/MSDL as

the plant has not been built yet. Consequently we have set improvement condition IC1, requiring them to provide this information within 12 months of the plant starting up. Table S1.5 in the permit has been completed to reflect this too.

6. The Installation's Environmental Impact

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

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

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

6.1 Assessment Methodology

6.1.1 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; and
- 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 PCs 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 PCs calculated are likely to be an overestimate of the actual maximum concentrations. More accurate calculation of PCs can be achieved by mathematical dispersion models, which take into account relevant parameters of the release and surrounding conditions, including local meteorology – these techniques are expensive but normally lead to a lower prediction of PC.

5.1.2 Use of Air Dispersion Modelling

For LCP applications, we normally require the applicant to submit a full air dispersion model as part of their application, for the key pollutants. Air dispersion modelling enables the PC 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 exists, the relevant standard is the EU EQS. Where an EU EQS does not exist, our guidance sets out a national EQS (also referred to as Environmental Assessment Level (EAL) which has been derived to provide a similar level of protection to human health and the environment as the EU EQS levels. In a very small number of cases, e.g. for emissions of lead, the national EQS is more stringent that the EU EQS. In such cases, we use the national EQS standard for our assessment.

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

PCs are considered **Insignificant** if:

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

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

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

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

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

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

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

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

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

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

6.2 Assessment of Impact on Air Quality

The Applicant's assessment of the impact of air quality is set out in section 6 "Air quality" of the Environmental Statement. The assessment comprises:

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

This section of the decision document deals primarily with the dispersion modelling of emissions to air from the installation and its impact on local air quality. The impact on conservation sites is considered within section 6.

The Applicant has assessed the Installation's potential emissions to air against the relevant air quality standards, and the potential impact upon local conservation and habitat sites and human health. These assessments predict the potential effects on local air quality from the Installation's stack emissions using the ADMS 5 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 between 2006 and 2010. The applicant chose this station as it is considered that this data will be representative of the conditions experienced at the Installation given the relative proximity of the Airport (c.10 km).

The impact of the terrain surrounding the site upon plume dispersion was not considered in the dispersion modelling, as ground levels do not rise above 10m AOD within 1km of the Installation. This is an appropriate assumption with respect to the terrain around the site.

The applicant initially modelled the impact of emissions from both IGCC and CCGT operation, however as they have withdrawn their Application to operate as an IGCC, we only address the impacts of CCGT operation emissions below, using their re-submitted Air Quality Modelling – Update report dated April 2016.

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. These substances are:
    - Oxides of nitrogen (NO_x), expressed as NO_2
    - Carbon monoxide (CO)
- Second, they assumed that the Installation will operate at full load for 365 day per year (i.e. the maximum possible operation of the Installation).

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

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

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

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

6.2.1 Assessment of Air Dispersion Modelling Outputs

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

Whilst we have used the Applicant's modelling predictions in the table below, we have made our own simple verification calculation of the percentage process contribution and predicted environmental concentration. These are the numbers shown in the tables below and so may be very slightly different to those shown in the Application. Any such minor discrepancies do not materially impact on our conclusions.

Pollutant	EQS / EAL		Process Contribution (PC)	
	µg/m³		µg/m³	% of EAL
NO_2	40	1	0.23	0.6
	200	2	3.4	1.7
CO	10000	3	30.5	0.31

1 Annual Mean
2 99.79th %ile of 1-hour means
3 Maximum daily running 8-hour mean

The short term NO_2 figures based on 19th highest hourly result.

From the table above the emissions of both NO_2 and CO can be screened out as insignificant in that the process contribution is < 1% of the long term EQS/EAL and <10% of the short term EAQ/EAL.

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

6.2.2 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 $\mu g/m^3$.

Our guidance suggests that the NO_x to NO_2 conversion percentage should be a minimum of 70% for the long term and 35% in the short term unless alternative values are fully justified. The consultant has used a form of the Janssen equation. This equation assumes an empirical relationship between NOx conversion to NO_2 and background ozone based on observations made elsewhere in power station plumes. As part of our own checks we used a NO_x to NO_2 conversion rate of 70% for annual and 35% for short term. Our checks enabled us to agree with the consultant's conclusion that there is unlikely to be a breach of any EQS at local human receptors or within the AQMA.

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

(ii) Dust

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

(iii) Sulphur Dioxide

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

(iv) Emissions to Air of CO,

The above table shows that CO emissions 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.

6.2.3 Auxiliary Boiler and Diesel Engines

The Applicant is proposing one small 30 MWth auxiliary boiler to provide steam for the start-up of the Installation and will operate intermittently for a limited number of hours per year. The boiler will provide steam, normally provided by the heat recovery steam generator, for deaeration of the feedwater/condensate before its introduction into the main boiler; to warm the steam piping and steam turbine gland system. The auxiliary boiler system will be gas-fired and incorporate a small stack of the order of 8m high. The proposed operating regime will result in approximately 12-15 start-ups and shutdowns per annum. Therefore the operation of the auxiliary boiler would be limited to a few hours of operation at intermittent intervals system and is likely to only operate for approximately 35 to 40 hours per annum. The boiler is small in comparison to the 800MWth input of the CCGT plant, but the impacts still need to be assessed.

The Installation will also include a small emergency diesel generator of up to 1.5MWe output to provide emergency back-up and enable the plant to be shut down in a safe manner in the event of loss of electricity. It is expected that this generator will only ever be operated for routine testing procedures of around 30 minutes at weekly intervals.

The Applicant has modelled the impacts of emissions from both the auxiliary boiler and the diesel generator:

For operation of the diesel generator set, no exceedances of the relevant short-term AQS Objectives for SO_2 (15-minute and 1-hour mean) are predicted, with maximum process contributions of 66.4 µg/m^3 (13.9% of EQS) and 53.6 µg/m^3 (15.3% of EQS) , respectively. The Applicant states that whilst these results are

greater than 10 per cent of the relevant objectives, they are well within these objectives and are not considered to be significant. We carried out our own check modelling of the impacts of SO_2 emissions from the auxiliary boiler and diesel generator (including the operation of the flare as this was still an option at the time), and concluded that even operating 365 days a year a breach of an SO_2 EQS was highly unlikely to occur if the flare operated less 1 hour at a time. As the flare will not operate at all now, we agree with the operator that emissions from the auxiliary boiler and diesel engines will not be significant and extremely unlikely to cause a breach of the SO_2 EQS's

For NOx emissions from the auxiliary boiler, no exceedances of the hourly average AQS are predicted with a maximum process contribution of 114.0 µg/m^3, which is 57% of the EQS. This figure is greater than 10 per cent of the relevant AQS; however the PEC is 186.9 µg/m^3 which is less than the 200 µg/m3 AQS. Given that the proposed operating regime for the auxiliary boiler will be to assist the anticipated 12-15 start-ups per annum, the Applicant concludes that potential impacts of operation of the auxiliary boiler are considered to be not significant.

For the diesel generator, exceedances of the short-term AQS Objective for NOx are predicted at the Installation boundary, with a maximum process contribution of 400 µg/m3 which is double the EQS. However, modelling has predicted that, for operation of the generator set at 100 per cent load operating for 365 days of the year, that there would only be 400 exceedances of the AQS Objective. Given the proposed operating regime of the generator set (i.e. emergency use only in the event of a loss of electricity to the Project, or at weekly intervals for testing purposes) the number of potential exceedances (per year) can be estimated to be a worst case 11 exceedances, which is within the 18 permitted by the AQS Regulations.

As a result of the above, the Applicant concludes that the impact of the auxiliary boiler and the diesel generator sets are, therefore, considered to not be significant. We have carried out our own modelling assessment of the impacts of the emissions from the auxiliary boilers and diesel engines, using a realistic operational time of 52 hours per year, and we agree with Applicant's conclusions.

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

6.3.1 Sites Considered

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

- Humber Estuary SAC, SPA and Ramsar

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

- Humber Estuary SSSI
- North Killingholme Haven Pits SSSI

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

- Local Wildlife Site: Scrub Lane Field 1
- Local Wildlife Site: Swinster Lane Field
- Local Wildlife Site: East Halton Dismantled Railway
- Local Wildlife Site: Scrub Lane East Field
- Local Wildlife Site: Halton Marsh Clay Pits
- Local Wildlife Site: Scrub Lane Field 2
- Local Wildlife Site: Chase Hill Wood
- Local Wildlife Site: Station Road Field
- Local Wildlife Site: Burkinshaw's Covert

6.3.2 Habitats Assessment

The tables below present the modelling predictions provided by the Applicant in tables (15, 16, 18 & 19) of the "Updated Air Dispersion Modelling Study dated February 2014".

Humber Estuary SAC, SPA and Ramsar (North receptor)						
Pollutant	EQS / EAL (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of EQS / EAL	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % EQS / EAL
Direct Impacts[1]						
NO_x Annual	30	26.04	0.88	2.9%	26.92	89.7%
NO_x Daily Mean	75	52.08	8.09	10.8%	60.17	80.2%
Deposition Impacts[1]						
N Deposition (kg N/ha/yr)	20-30	-	0.126	0.6%	-	-
Acidification - Nitrogen Dep (Keq/ha/yr)	N/A					

Humber Estuary SAC, SPA and Ramsar (South Receptor)						
Pollutant	EQS / EAL (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of EQS / EAL	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % EQS / EAL
Direct Impacts[1]						
NO_x Annual	30	28.52	0.51	1.7%	29.03	96.8%
NO_x Daily Mean	75	57.04	6.36	8.5%	63.4	84.5%
Deposition Impacts[1]						
N Deposition (kg N/ha/yr)	20-30	-	0.74	0.4	-	-
Acidification - Nitrogen Dep (Keq/ha/yr)	N/A					

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

The Applicant's Habitats assessment was reviewed by the Environment Agency's technical specialists for modelling, air quality, conservation and ecology technical services.

The Humber Estuary SAC/SPA/Ramsar covers a large area and therefore should be covered by multiple receptors. The applicant's choice of just receptors does not adequately cover the SAC; therefore in our check modelling we considered additional receptors.

We agree with the consultant's conclusion that the affect from nutrient nitrogen deposition will be insignificant when using a critical load stated in table 19 of the consultant's report. Using a value for the most sensitive habitat at the Humber Estuary SAC (8 keq/ha/yr) is still unlikely to lead to a PC greater than 1%.

Our review of the background data indicates that the NOx values used by the Applicant in the report might be too low. The value of 28.3µg/m^3 from the APIS website (search by location tool) is substantially lower than 33.3µg/m^3 obtained from the Killingholme industrial urban automatic monitoring site (4km away from the Humber), indicatively the background NO_x may already exceed the critical level of 30 µg/m^3. We agree with the Applicant that the contribution to the NO_x critical level is likely to be greater than 1% at the Humber Estuary SAC. However, as stated above the nearest automatic monitoring station indicates that the background is already exceeded in the general area and therefore we have undertaken an appropriate assessment and consultation with Natural England.

The applicant did not model the impacts of acid deposition, as they stated that it is not sensitive. There is a potential for a PC that is greater than 1% for acid

deposition if compared against the critical load of 0.6Keq/ha/year for dune features, which may be present within the SAC locally. Therefore we have reviewed this further in consultation with Natural England to check the local habitat features. After undertaking further investigation we can conclude that the background Cle are unlikely to have been exceeded for NOx (which means also that the PEC <100% Cle) and the PC to the acidity CLo to any potential Dune systems would now be <1% and also insignificant which means we can firmly conclude 'no likely significant effect'.

6.3.3 Conclusion

6.3.3.1 Alone assessment

The long-term impact modelling of aerial NOx emissions from the proposed facility is >1% of the site specific atmospheric NOx environmental benchmark of 30µg/m3 for both modelled locations of the site, and the predicted environmental contribution (PEC) is additionally >70% of the relevant site Cle of 30µg/m3 at 89.73% (North Receptor) and 96.76% (South Receptor) respectively this is <100% of the relevant critical Level and therefore we can conclude that no significant effect.

APIS does not consider the effects of atmospheric NOX on an individual site basis or habitat type and applies the 30µg/m3 level as broad habitat.

6..3.3.2 In-combination assessment

The risk from this proposal is from Long Term emissions to air of atmospheric NOx only. We have considered the in-combination effects from other existing sites within the surrounding locality by considering the background pollution levels and by the above assessment of EA and non-EA regulated sources.

Based on the best information available to us, we do not believe any in-combination effects to be significant. It appears that the background atmospheric NOx DEFRA/APIS levels may be significantly reduced due to the decommissioning of the existing Killingholme Power Station on 1st March 2016, originally considered a significant contributor of atmospheric NOX to the

SAC/SPA/Ramsar with a process contribution of 1.78µug/m3 or 5.9% of a Cle 30µg/m3.

6.3.3.3 Overall Conclusion

Following our review and assessment, we have concluded no adverse effect on the site integrity of Humber Estuary SAC/SPA/Ramsar either alone or in combination from the proposal.

This is in light of the following main points:

- The methodology used in the applicants modelling to determine the impact on air quality uses a number of worst case assumptions. These include the following:

  a) It is assumed that the plant will continually operate at the maximum emission limits (50mg/m3) allowed under the Industrial Emissions Directive and that this occurs on the worst day of meteorological data from the 5 years of data that was used in the modelling. In reality, this will not be the case and actual emissions will be less than the limits.

  b) The maximum ground level concentrations are considered in each case. These concentrations occur in small areas; in general the concentrations will be much lower over wider areas of the conservation sites.

- The decommissioning of Killinghome power Station in March 2016 will have the effect of reducing existing reported background atmospheric NOx DEFRA/Apis levels at the SAC/SPA/Ramsar by some 5.9%. This figure is derived from examination of the atmospheric dispersion modelling undertaken when the original power station was permitted.

- There will be uncertainty associated with background concentration data, however there is potential for significant decreases in NOx background levels with time as indicated by DEFRA and APIS projections (Year adjustment factors 2011- 2030) for NOX background levels.

- APIS confirms an average of 25.9ug/m3 for NOx across the SAC/SPA/Ramsar (Range is Min 13.86 to Max 43.08). Examination of DEFRA background maps for the nearest 1km grid squares to the applicants modelled receptors (Within zone of PC significance >1%) estimates levels of 25.3ug/m3 and 24.1ug/m3 respectively. The applicant has used a value of 28.3ug/m3 as background. A search by location only on APIS provides ‘Maximum’ level of 33.4m3/m3 however this is the Maximum Level and not representative of the average or minimum. For the most sensitive receptor ‘fixed coastal dunes’ an estimated current background level of 26.23ug/m3 is shown on APIS for the location. Based on above figures (DEFRA and APIS) we conclude

that the applicant's figure 28.3ug/m3 as a background is conservative and suitable for determination purposes.

- Average concentrations of background NOx are currently below the site-relevant Critical Level values given for both SPA/SAC features on the Air Pollution Information System (www.apis.ac.uk). This system is considered to be a reliable and best available source for the purposes of undertaking habitats assessments.

- Environment Agency check modelling confirms relatively small NOx process contributions at or below 2% of the Critical level of 30µg/m3 for the proposal.

- The Predominant habitats at both SPA/Ramsar sites are indicated to be marine tidal rivers, estuaries, mud flats and lagoons (Littoral sediments) 94%, these habitat types are shown not to be affected by atmospheric NOx (APIS). Intertidal so inundated twice daily, habitats not NOx sensitive etc.
- Proposal is considered to represent Best Available Technique (BAT)

Having considered that the PPP would be likely to have a significant effect on Humber Estuary SAC/SPA/Ramsar and that the PPP was not directly connected with or necessary to the management of the site for nature conservation, an appropriate assessment has been undertaken of the implications of the proposal in view of the site's conservation objectives.

Natural England/CCW were consulted under Regulation 61(3) on 16th December 2016 and their representations, to which the Environment Agency has had regard. The conclusions of this appropriate assessment are in accordance with the advice and recommendations of Natural England/CCW.

"The site's nature conservation objectives have been taken into account, including consideration of the citation for the site and information supplied by Natural England/CCW. The likely effects of the proposal on the international nature conservation interests for which the site was classified or designated may be summarised as Log Term impacts of atmospheric NOx

The assessment has concluded that:
- The plan or project as proposed **can** be shown to have no adverse effect on the integrity of the site.

6.3.4 SSSI Assessment

The Humber Estuary SSSI and North Killingholme Haven Pits SSSI, both form part of the Humber Estuary SPA and Ramsar and so the assessment of impacts for these sites is covered in section 6.3.2 above.

6.3.5 Assessment of other conservation sites

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

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

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

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

The tables (15, 16, 18 & 19) in the "Updated Air Dispersion Modelling Study dated February 2014", show that the PC's are well below the critical levels or loads. We are satisfied that the Installation will not cause significant pollution at the sites. The Applicant is required to prevent, minimise and control emissions using BAT, this is considered further in Section 7.

6.4 **Emissions to Water**

6.4.1 Thermal discharge to the River Humber & Humber Estuary

Following our review of the assessment on thermal recirculation submitted by the applicant we do not have any concerns relating to the temperature/thermal discharge aspects, or of the plume modelling for the relocated E.ON and Centrica discharges. We would expect all the thermal plumes to be

insignificant and relatively small with the potential for any effects to be very localised.

6.4.2 Water discharge to River Humber & Humber Estuary

The applicant states that based on the methodology presented in the EA Horizontal Guidance Note H1 Annex (d): Surface Water Discharges (basic), estimates of river flow speeds were used in conjunction with the EA Initial Dilution Spreadsheet in order to allow for the calculation of process contributions to the concentrations of the various EQS pollutants.

The initial dilution ("ID") is a function of ambient current velocity, water depth and effluent discharge, as such, a range of factors for the ID of the combined effluent discharge are expected over the tidal cycle.

The worst (lowest) initial dilution will be experienced during low tide (slack water) whilst the best (highest) initial dilution will be at the point between high tide and low tide when the river current is at its greatest.

The applicant concludes that all process contributions will be <4 per cent of the relevant EQS and are therefore considered not to be significant based on the screening criteria from the above H1 Guidance Note.

Having reviewed the original environmental permit application and full supporting submission, including Section 13; the Water Quality and Resources Chapter of the Environmental Statement we identified some information gaps and requested further via schedule 5 regarding the discharges to water.

In response to our questions set out within our Schedule 5 and the further information submitted by the applicant in February 2017 and April 2017 including an updated H1 assessment and Initial Dilution Spreadsheet we, the Environment Agency, believe that a limit for chlorine of 0.5 mg/l (or 500 µg/l) for the North Killingholme water discharge is appropriate. The MAC EQS for chlorine is 10 µg/l and they are planning to discharge 500µg/l requiring a dilution of 50 times to get to EQS. From our review of the initial dilution calculations, the mean initial dilution is just under 60 with a minimum of 2 at low tide (slack water) and a maximum of over 150 at mid-tide (between high and low tide) springs. Given the initial dilution calculations and 0.5mg/l limit that neighbouring Killingholme A and B both have set within them, we believe that this limit is reasonable and justified for the water discharge of the new North Killingholme station.

6.5 Noise Impacts

The application contained a noise impact assessment which identified local noise-sensitive receptors, potential sources of noise at the proposed plant and noise attenuation measures. Measurements were taken of the prevailing ambient noise levels to produce a baseline noise survey and an assessment was carried out in accordance with BS 4142:2014 to compare the predicted plant rating noise levels with the established background levels.

The application included a BS4142 assessment of noise which concludes that for both day and night there will be a less than marginal significance impact from the site at the sensitive receptors based on a number of assumptions:.

- The plant will be running continuously.
- The measurement time is very short and the applicant has not demonstrated that it is representative
- That the adjacent C.RO Ports Killingholme Ltd (CPK) plant operates continuously, including the weekends, therefore there is no expected variation between the weekday and weekend background noise.
- The sound power levels for each source are modelled at 500Hz based on a single sound power derived by combining the octave spectrums
- Only the most dominant noise sources have been modelled within CADNA as presented in Appendix E
- Onsite HGV movements have not been included, however the consultant has suggested it is “negligible” during the operation of the plant.

The application also considered an assessment on the impact of noise at habitat sites following an assessment that the consultant stated was agreed with Natural England, predicting that the specific noise level will not affect species at the North Killingholme Haven Pits SSSI. The approach followed varies from the method adopted by the Environment Agency. However, our review indicates that complaints are unlikely at receptors as a result of the proposed thermal generating station operating as a Combined Cycle Gas Turbine (CCGT) Station.

7. Application of Best Available Techniques

7.1 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 is the choice of combustion technology.
- We consider in particular control measures for the emissions which were not screened out as insignificant in the previous section on minimising the installation's environmental impact. In this case, NO_2 and CO can be screened out as insignificant for impacts to human health, however NOx emissions cannot be screened out for impacts to the ecological receptors and so we address NOx control measures below.
- We consider energy efficiency, and options for Combined Heat and Power,
- 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. However BAT Conclusions and a revised BREF for LCP have not yet been drafted or published, so the existing BREF and Chapter III of the IED remain relevant.

Even if the Chapter III limits are appropriate, 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, say, Chapter III limits 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.

7.2 Consideration of Combustion Plant

The operator has chosen to operate a CCGT plant which we consider to be BAT.

We have set pre-operational condition PO2 to ensure that the operator will undertake a full detailed review of the Environmental Permit application against the final plans for the installation, prior to construction, to:

1. Ensure that the final proposals will meet the requirements for BAT; and
2. The application still accurately reflects the final design and operating proposals.

7.3 Consideration of emission control measures

We have reviewed the techniques used by the operator and compared these with the relevant guidance notes.

Operating Techniques for NON-insignificant emissions

Emissions of oxides of nitrogen cannot be screened out as insignificant. The Environment Agency has therefore assessed whether the proposed techniques are BAT.

NOx control:

The gas turbine will incorporate Dry low nitrogen oxide (DLN) burners for the combustion of natural gas. The DLN burners reduce the peak flame temperature, which is a proven method for primary pollution control that does not require additional secondary control measures, such as SCR.

Therefore, the use of DLN burners is sufficient to control the emissions of NOx to 50 mg/Nm^3 which is the BAT AEL for the combustion of natural gas for gas turbines, and the IED annex V limit.

The proposed techniques/ emission levels for priorities for control are in line with the benchmark levels contained in the Combustion Activities Technical Guidance Note (EPR 1.01) and we consider them to represent appropriate techniques for the facility. The permit conditions ensure compliance with relevant BREFs, the "Summary of the UK wish list LCP BREF review May 2011" document and the ELVs deliver compliance with BAT-AELs.

Operating Techniques for insignificant emissions

Emissions of carbon monoxide have been previously screened out as insignificant, and so the Environment Agency agrees that the Applicant's proposed techniques are BAT for the installation.

The BAT AELs for CO for new plant given in the "Summary of the UK wish list LCP BREF review May 2011" is 100mg/m^3, this is the limit in IED annex V also. The Operator has proposed 90mg/m^3 for CO, and so we consider this to be BAT for the monthly mean ELV.

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

7.4 Energy efficiency

7.4.1 Use of energy within the Installation

Having considered the information submitted in the Application, we are satisfied that appropriate measures will be in place to ensure that energy is used efficiently within the Installation.

The Applicant is using a CCGT and state in the "application for a new bespoke environmental permit November 2013" document that its efficiency will be greater than 55%. In their revised environmental permit application dated July 2015 the applicant states that the overall combined cycle efficiency is 58% at ISO conditions. The UK submission to the LCP BREF review, gives an expected electrical efficiency for a new CCGT plant as 55 to 59%, so the figure provided is considered BAT.

7.4.2 Choice of Cooling System

The Applicant is proposing to use hybrid cooling towers. Whilst once-through cooling provides greatest efficiency it also requires water abstraction and discharge in large volumes. The Applicant has justified their choice of cooling system within the submission for an Environmental Permit which has been reviewed by the Environment Agency.

Once-through cooling requires large cooling infrastructure to deal with the amount of water required. The applicant has stated that once-through cooling would have a typical water requirement of the order of 15 m^3/s (1.3 million m3/day). If once-through cooling were to be adopted there would need to be a submerged culvert or tunnel into the River Humber that could either terminate at a shore pumping station or extend to the Operations Area by way of a culvert or tunnel. The first alternative is difficult to achieve since the availability of land close to the river bank is restricted due to the operations of adjacent port facilities, the need for protection of the integrity of the flood defences and the river bank public footpath. The second alternative would involve longer and more complex expensive tunnels but would minimise the disruption. However, the abstraction of this volume of water could also potentially have a higher ecological impact on aquatic life in the River Humber due to entrainment / impingement as well as the effect of localised water temperature increases.

With the potential heat rejected to the river water there would need to be a separation distance between the intake and the outfall. The dissipation of the heat would need to be modelled to ensure that the thermal plume was both of minimal risk to recirculation and also had an acceptable minimal environmental effect on the river ecosystem. The River Humber and many of its tributaries are Salmonid rivers for which there is a temperature limit of 1.5°C above the river temperature, at the edge of the mixing zone, for discharged cooling water. This criterion may not be achievable during high river water temperature events in the summer time, which may affect either ecology or plant availability. Given

the potential sensitivity of the Humber Estuary SAC / SPA it is not considered feasible to utilise once-through cooling at the location.

Sector Guidance note “How to comply with your environmental permit Additional guidance for: Combustion Activities (EPR 1.01)” states that “In terms of the overall energy efficiency of an installation, the use of once-through systems is an appropriate measure. It may be acceptable to use water from a river or an estuary for once-through cooling, provided that: fish can still migrate through the extended heat plume in the receiving water … heat load does not interfere with other users of the receiving surface water.” Consequently given the fact that in the summer the mixing zone limits may not be achievable, and there is the potential to interfere with other users of the estuary, we agree with the operator that once through cooling is not BAT for this Installation.

In the case of hybrid cooling towers, the applicant has stated that the water evaporation rate amounts to approximately 0.9 per cent to 1.1 per cent of the circulation rate. The evaporation taking place in the cooling tower is dependent upon the ability of the air passing through the tower to hold moisture and hence the humidity of the ambient air entering the tower. The humidity is represented by the wet bulb temperature of the air and the cooling towers are designed on the basis of a “wet bulb approach”, since cooling the water to the wet bulb temperature is the theoretical minimum temperature that can be achieved by evaporative cooling. Achieving close to the wet bulb requires large, expensive cooling towers and most cooling towers are designed to an approach of 8 to 10°C. The water evaporated from the cooling tower water circuit must be replaced by fresh make-up water. The continued addition of new water and evaporation of water vapour leads to an increase in the dissolved salts in the circulating water. In order to avoid scaling of condensers and heat exchangers, the concentration of the salts must be regulated by purging some of the circulating water from the system.

The volumes of cooling water passing through the condensing system would remain more or less the same as for once-through cooling. However, instead of being returned to its source, the cooling water is passed to the cooling tower for cooling prior to recirculation to the condenser and heat exchangers. Hybrid cooling towers are composed of a wet section and a dry section. Hot water leaving the condenser is passed to the top of the towers and flows through an air cooled heat exchanger that performs approximately 20 per cent of the cooling duty of the towers, depending upon ambient conditions. The water leaves the heat exchangers and is sprayed down the wet section of the towers where the remaining heat is lost through evaporation. A significant environmental advantage of this hybrid system is that the air leaving the cooling towers is under-saturated with water, meaning that for the majority of the time no vapour plume is visible.

Therefore, it is considered that the utilisation of hybrid cooling towers represents BAT because of the balance between operating efficiency penalties, the potential environmental impacts and the operation of neighbouring facilities in the area and will therefore be used for North Killingholme Power Project.

Water abstraction requirements have been calculated 43,200m^3/day. An abstraction licence for this has not yet been granted, for use of water from the Humber Estuary.

In terms of discharge from the installation it is anticipated that cooling water purge will equate to 0.3m^3/s (up to 24,000m^3/s per day), boiler blow-down resulting in 0.2m^3/s or of the order of 185m^3/day and the water treatment plant producing 35m^3/day discharge.

The Environment Agency accepts that the use of the hybrid cooling system in this scenario can be considered BAT for this site.

7.4.3 Proposed Cooling system and BAT assessment

As discussed above, at North Killingholme Power Plant there is sufficient water supply for the preferred method of cooling towers. The applicant has stated that hybrid cooling towers are favoured to mechanical cooling towers as they consume about 10% less water and produce less visible water droplet plumes, which reduces the risk of fogging at ground level.

Using air as the cooling medium eliminates the need for the construction of a water intake / outlet infrastructure. This represents the most simple infrastructure and environmental option. However, this solution is very expensive, has the largest footprint, and has an important negative influence on the overall plant efficiency. There are plant efficiency impacts associated with the increased reliance on ambient air to provide part (or all) of the cooling duty. As such, once-through cooling represents the most efficient cooling medium, followed by the use of hybrid cooling towers, with air-cooled condensers representing the least energy efficient option for the Generating Station, which would reduce the net electrical output by around 2 per cent of the maximum continuous rating.

Furthermore, with respect to the potential for impact on habitats and ecological receptors, it is has been argued by the applicant that hybrid cooling towers would be less impactful than once through cooling.

Therefore, the applicant intends to install a closed circuit evaporative cooling method in the form of low plume hybrid cooling towers.

7.4.4 Combined Heat and Power

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

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

the outset (i.e. when a plant is first consented, constructed and commissioned).

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

The assessment of existing and future CHP opportunities for the Project and the analysis of CHP-R are presented in the report 'Combined Heat and Power Assessment' (Parsons Brinckerhoff, March 2013) .

The CHP Assessment has identified potential heat / steam users in the vicinity of the Project. For each identified potential user, analysis of the particular requirements (including: load and the required heat / steam properties) has been undertaken and the results are presented in the report.

The Installation will be designed and built to be CHP ready. The CHP assessment considered two potential Scenarios: Process CHP ready; and, Domestic CHP ready. It also considers the heat available for export when operating in CCGT mode and the potential to operate in IGCC mode. IGCC is still a relevant factor in assessing CHP readiness as it is IGCC mode that incorporates carbon capture which may be required during the lifetime of the plant.

Heat and power envelopes showing the possible operating ranges for the Project using either intermediate pressure (IP) steam or low pressure (LP) steam are given in Insert 2 (for the Project in CCGT power plant mode) and Insert 3 (for the Project in IGCC power plant mode fuelled by syngas produced by the gasification of coal with carbon capture), within the CHP Assessment. This covers the plant running at baseload (100% load) down to minimum stable load.

Table 3 in the CHP Assessment shows that even the worst case operating envelope – running as CCGT at minimum stable load, 53MW of IP steam is available for export. If this is fully utilised the plant efficiency would increase to around 58%.

At the other end of the operating envelope, running at base load in CCGT mode there will be 167MW of IP steam available for export. If this is fully utilised the plant efficiency would increase to 71%.

The results from the consultation undertaken as part of CHP Assessment indicates that, whilst there are a range of potential CHP opportunities there is limited CHP interest in the CHP search Area. This CHP Assessment was carried out in 2013, and so we have set pre-operating condition PO3, to review the viability of Combined Heat and Power prior to the operation of the plant

Our CHP-R guidance also states that opportunities to maximise the potential for heat recovery should be considered at the early planning stage, when sites are being identified. In our role as a statutory consultee on the Development Consent application, we ensured that the issue of energy utilisation was brought to the planning authority's attention. We made comments about this to planning inspectorate (the planning authority) in our role as a statutory consultee for the Development Consent application.

We consider that, within the constraints of the location of the Installation explained above, the Installation will recover heat as far as practicable, and therefore that the requirements of Article 6(6) are met.

We have set permit condition 1.2.2 to require the operator review the viability of Combined Heat and Power (CHP) implementation at least every 4 years, or in response to any of the specific factors listed in the condition

(i) Permit conditions concerning energy efficiency

Pre-operational condition PO3 requires the Operator to carry out a comprehensive review of the available heat recovery options prior to commissioning, in order to ensure that waste heat from the plant is recovered as far as possible.

Condition 1.2.2 has been included in the Permit, which requires the Operator to review the viability of CHP at least every 4 years, or in response to changes that might make CHP viable.

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

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

8. Emission limits

8.1 CCGT

The operator has proposed limits in line with part 2 annex V of the IED and emission benchmarks (BAT) given in Combustion Activities Technical Guidance Note (EPR 1.01). In fact, in table 2 of section 4.2.4 of the supplementary emissions information to the application, a slightly lower CO limit 90mg/m^3 than the 100mg/m^3 limit required is proposed. As discussed in section 6 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, as summarised below.

Parameter	Proposed mg/m3	Reference Period	Annex V mg/m3	Permit limit mg/m3
NO_x	None	95%ile of hourly averages	100	100
	None	24 hourly averages	55	55
	50	Monthly averages	50	50
CO	None	95%ile of hourly averages	200	200
	None	24 hourly averages	110	110
	90	Monthly averages	90	90

"Low Load" Gas Turbine Emission Limits: set when the load varies between MSUL/MSDL and base load during the daily reference period:

IED Annex V ELVs for GTs apply when the load is >70%. The Applicant has stated that the GT will normally operate between 80 and 100 per cent load, but will be capable of operating at a range of part load conditions down to the MSUL/MSDL. They state in the application that the emissions will be controlled to the above proposed limits of 90 mg/m^3 for CO and 50mg/m^3 NOx. They have further stated in their July 2015 request for information response, that the proposed GT (the Mitsubishi Hitachi Power Systems M701F4) can be reduced to 40% load. The Applicant states that they will be able to reach down to approximately 50% combined cycle load, whilst remaining compliant with the Industrial Emissions Directive. Consequently we have set separate emission limits in the permit for MSUL/MSDL to base load too, however we have set them as just daily limits using the IED daily limits. The Applicant will be able to run at or below 50% load, as long as the daily average limit is not breached, if not then they will have to maintain their operating range above 50%. As discussed in section 6, they have provided air dispersion modelling data demonstrating that these emissions will not cause significant pollution.

8.2 Auxiliary Boiler and emergency diesel plant

Both the auxiliary boiler and emergency diesel generators, are likely to be operated after Dec 20th 2018, and so will be considered new plant and subject to the requirements of the Medium Combustion Plant Directive. However the MCPD states that regulators may exempt new medium combustion plants which do not operate more than 500 operating hours per year, as a rolling average over a period of three years, from compliance with the emission limit values set out in the MCPD. As both the boiler and diesel generators will only operate for a few hours a year, we consider that the setting of emission limits or monitoring of emissions is not necessary, and may risk the operation of these

plant simply for monitoring purposes, which would have an unnecessary environmental impact.

BAT Emission limits for the auxiliary boiler, could also be set using the DEFRA Process Guidance Note 1/03 (12) Statutory Guidance for Boilers and Furnaces 20-50MW thermal input dated June 2012. However, for the reasons above we have not set emission limits or monitoring for the auxiliary boiler.

9. 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. Dust emissions for natural gas fired boilers will, likewise, be reported on the basis of emission factors without continuous or periodic monitoring. 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 for oxides of nitrogen and carbon monoxide apply to CCGTs when the load is >70%. This has been interpreted as 70% of the rated output load. The rated output load used here is the same as that used for calculating the percentage load when specifying the end of start-up and beginning of shut-down.

Standards:
Standards for assessment of the monitoring location and for measurement of oxygen, water vapour, temperature and pressure have been added to the permit template for clarity.
A row has been included in table S3.1 which requires the operator to confirm compliance with BS EN 15259 in respect of monitoring location and stack gas velocity profile in the event there is a significant operational change (such as a change of fuel type) to the LCP. For a new plant, such as this, in pre-operational commissioning the same requirement applies

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.

Annex 1: decision checklist
This document should be read in conjunction with the application, supporting information, site condition report assessment document and permit.

Aspect considered	Justification / Detail	Criteria met Yes
Receipt of submission		
Confidential information	A claim for commercial or industrial confidentiality has not been made.	✓
Identifying confidential information	We have not identified any information provided as part of the application that we consider to be confidential. The decision was taken in accordance with our guidance on commercial confidentiality.	✓
Consultation		
Scope of consultation	The consultation requirements were identified and implemented. The decision was taken in accordance with RGN 6 High Profile Sites, our Public Participation Statement and our Working Together Agreements. For this application we consulted the following bodies: ➢ Environmental Health Departments and District Councils ➢ Public Health England ➢ Directors of Public Health ➢ Natural England ➢ Health and Safety Executive ➢ MMO ➢ National Grid.	✓
Responses to consultation	The web publicising, and consultation responses (Annex 2) were taken into account in the decision. The decision was taken in accordance with our guidance.	✓
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 EPR RGN 1 Understanding the meaning of operator.	✓
European Directives		
Applicable directives	All applicable European directives have been considered in the determination of the application. The requirements of Chapter III and Annex V of the IED relating to large combustion plant have been implemented in this permit.	✓

Aspect considered	Justification / Detail	Criteria met Yes
	Refer to the Item 1) in the Key Issues Section and to Annex 3 of this document for further details.	
The site		
Extent of the site of the facility	The operator has provided plans which we consider are satisfactory, showing the extent of the site of the facility including discharge and emission points. A plan is included in the permit and the operator is required to carry on the permitted activities within the site boundary.	✓
Site condition report	The operator has provided a description of the condition of the site. We consider this description is satisfactory. The decision was taken in accordance with our guidance. Further details and discussion are provided within the Site Condition Report Evaluation Template (SCRET) for EPR/FP3838EB/A001.	✓
Biodiversity, Heritage, Landscape and Nature Conservation	The application is within the relevant distance criteria of several designated sites, sites of nature conservation and protected species. A full assessment of the application and its potential to affect the site and species has been carried out as part of the permitting process. We consider that the application will not affect the features of the sites. We have formally consulted on the application. The decision was taken in accordance with our guidance. Please refer to Section 6 in the Key Issues Section of this document for further details and the completed Appendix 12.	✓
Environmental Risk Assessment and operating techniques		
EIA	In determining the application we have considered the Environmental Statement. We have also considered the planning permission and the Development Consent Order granted by the Planning Inspectorate. The installation was subject to a Development Consent Order (DCO) which was granted by the Secretary of State (SoS) on 11 September 2014 with a Correction Order effective from 27 October 2015. Therefore, the SoS is satisfied that the need for this development has been established.	✓
Environmental risk	We have reviewed the operator's assessment of the environmental risk from the facility. The operator's risk assessment is satisfactory.	✓

Aspect considered	Justification / Detail	Criteria met
		Yes
	Point Source Emissions to Air See Section 6.2 of the key issues section of this document, for emissions to air. Point source emissions to water: See Section 6.5 of the key issues section of this document, for emissions to water. Fugitive emissions to land and water: The H1 and environmental risk assessments cover fugitive emissions to water and groundwater. The key risks being leaks from or failures of storage tanks, leaks from tanker offloading and failure of pipework or drains. The Environment Agency have reviewed the operators preventative measures (see operating techniques section below) and consider that fugitive emissions will not pose a significant risk to the environment. Fugitive emissions to air: Steam from the HRSG, auxiliary boiler, deaerator vents, pressure relief valves, blow down vents and steam turbine seals have the potential to create steam. However, it is considered unlikely that the steam will reach offsite due to the separation distances thus preventing steam being released off of the site. Visible plumes should not be a significant issue for the site, as Hybrid cooling towers will be used. These towers are composed of a wet section and a dry section. Hot water leaving the condenser is passed to the top of the towers and flows through an air cooled heat exchanger. The water leaves the heat exchangers and is sprayed down the wet section of the towers where the remaining heat is lost through evaporation. A significant environmental advantage of this hybrid system is that the air leaving the cooling towers is under-saturated with water, meaning that for the majority of the time no vapour plume is visible. Natural gas combustion is inherently a non-odorous process. Natural gas venting from pipework and ammonia degassing from boiler water in the deaerator are potential sources of odour. Only trace amounts of ammonia will potentially be released and no associated odour is anticipated outside the immediate vicinity of the deaerator plant. Noise:	

Aspect considered	Justification / Detail	Criteria met Yes
	See Section 6.7 of the key issues section of this document, for noise impacts assessment <u>Accident risks:</u> There are potential accident risks and hazards associated with the Installation. The Accident Management Plan will form a key part of both the EMS and the Site Emergency Plan and will be communicated to all employees, managers and contractors who work at the site and tested using regular drills or exercises. A preventative accident regime will consider a wide range of potential hazard scenarios resulting from both normal and abnormal operating conditions. The provision of an AMP has been set within into Improvement Condition IC 3.	
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. For details see section 7 of the key issues section of this document.	✓
The permit conditions		
Use of conditions other than those from the template	Based on the information in the application, we consider that we do not need to impose conditions other than those in the installation permit template.	✓
Pre-operational conditions	Based on the information in the application, we consider that we need to impose pre-operational conditions as follows: ➢ Prior to fuel being burned on the Installation for the first time, the Operator will notify the Environment Agency, ➢ Prior to the commencement of the build, the Applicant is required to confirm in writing the full plant configuration. ➢ Prior to commissioning the operator must review their Combined Heat and Power Assessment against the latest Environment Agency guidance and submit for approval to the Agency. ➢ Confirm compliance with BS EN 15259 in respect of monitoring location and stack gas velocity profile for emission point A1 ➢ A site closure plan will be submitted to the Environment	✓

Aspect considered	Justification / Detail	Criteria met
		Yes
Improvement conditions	Based on the information on the application, we consider that we need to impose an improvement condition. We have imposed an improvement condition to ensure that: ➢ definitions of the minimum start-up load (MSUL) and the minimum shut-down load (MSDL) parameters are set ➢ provision of net rated thermal input values for LCP470. ➢ an EMS is in place within six months of operation ➢ a post commissioning report is submitted	✓
Incorporating the application	We have specified that the applicant must operate the permit in accordance with descriptions in the application, including all additional information received as part of the determination process. These descriptions are specified in the Operating Techniques table in the permit.	✓
Emission limits	We have decided that emission and process limits should be set for the parameters listed in the permit and have incorporated them into Tables S3.1 & S3.2. See section 8 of this document for further details.	✓
Monitoring	We have decided that monitoring should be carried out for the parameters listed in the permit, using the methods detailed and to the frequencies specified. 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. See section 9 of the keys issues section of this document for further details.	✓
Reporting	We have specified reporting in the permit. Sulphur dioxide emissions will be reported on fuel sulphur content since only trace quantities of sulphur are present in UK natural gas. Dust emissions will not be reported as the fuel gas and inlet air is filtered resulting in lower dust content. We made these decisions in accordance with the requirements of Annex V of the IED. See section 9 of the keys issues section of this document for further details.	✓

Aspect considered	Justification / Detail	Criteria met Yes
Operator Competence		
Environment management system	There is no known reason to consider that the operator will not have the management systems to enable it to comply with the permit conditions. The decision was taken in accordance with RGN 5 on Operator Competence. The applicant is planning to have a management system in place which complies with ISO14001 within 6 months of commissioning the facility.	✓
Relevant convictions	The National Enforcement Database has been checked to ensure that all relevant convictions have been declared. No relevant convictions were found. The operator satisfies the criteria in RGN 5 on Operator Competence.	✓
Financial provision	There is no known reason to consider that the operator will not be financially able to comply with the permit conditions. The decision was taken in accordance with RGN 5 on Operator Competence.	✓
Growth Duty		
Section 108 Deregulation Act 2015 – Growth duty	We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit. Paragraph 1.3 of the guidance says: "The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation." We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections. We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector	✓

Aspect considered	Justification / Detail	Criteria met
		Yes
	and have been set to achieve the required legislative standards.	

Annex 2: Consultation and web publicising responses

Summary of responses to consultation, and web publication and the way in which we have taken these into account in the determination process.

Response received from
Hull City Council
Brief summary of issues raised
The notification of existing combustion activities within the local area including A1 and A2 and Part B permits.
Summary of actions taken or show how this has been covered
We have considered the facilities identified in combination with the proposed site and the potential for impact on the environment.

Response received from
Natural England
Brief summary of issues raised
Natural England have agreed with our approach to the assessment of emissions from emissions and potential to affect, designated sites, protected and sensitive species and habitats. We the Environment Agency, have shared our approach and proposals to ensure a full and appropriate assessment of emissions and potential impact is undertaken by the applicant and Natural England have agreed in writing with our approach and conclusions from it.
Summary of actions taken or show how this has been covered
Full consultation throughout the process has been undertaken with Natural England. A Stage 3 appropriate assessment has additionally been made of which Natural England agree with our methodology, conclusions and approach.

Response received from
Anglian Water Services
Brief summary of issues raised
No issues raised.
Summary of actions taken or show how this has been covered
The Environment Agency, have re-iterated to the operator that should processing change and there is found a need to discharge wastes to the public foul or surface water sewers, that they must, before commencing to discharge, gain the formal acceptance of Anglian Water by way of a Trade Effluent Consent.

Response received from
Humberside Fire & Rescue Service
Brief summary of issues raised
No response received.
Summary of actions taken or show how this has been covered
No actions necessary.

Response received from
Marine Management Organisation
Brief summary of issues raised
A bespoke response was received by the Environment Agency. The Marine Management Organisation (MMO) stated that they fed into the Development Consent Order (DCO) process and conditions within the deemed marine licence (DML). As long as the Environment Agency is content the permit application submitted falls within the parameters of the DCO and DML then MMO have no further comments to make. Furthermore, a standard response was submitted to the Environment Agency and also considered during the determination.
Summary of actions taken or show how this has been covered
We have considered what falls within the remit of the new bespoke environmental permitting process. A full assessment and consideration of discharges to the Humber Estuary have been undertaken and appropriate limits set within the permit to ensure no significant impact to the environment through discharges to water.

Response received from
Public Health England
Brief summary of issues raised
A request that the Environment Agency should verify that the Air Quality Standard will not be breached- for NOx specifically. The 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
A full and detailed assessment of emissions to air has been undertaken together with a review of the relevant sector guidance and BREF documentation to ensure that operator employs Best Available Techniques. We are satisfied that emissions to air have been fully assessed against appropriate standards and will not cause significant harm to the environment.

Response received from
National Grid – Plant Protection Team

Brief summary of issues raised
No issues raised and no formal response received.
Summary of actions taken or show how this has been covered
No action necessary.

Response received from
Lincolnshire Fire & Rescue Service
Brief summary of issues raised
No formal response received.
Summary of actions taken or show how this has been covered
No action necessary.

Response received from
Harbour Authority: Associated British Ports, North East Lincolnshire
Brief summary of issues raised
No formal response received.
Summary of actions taken or show how this has been covered
No action necessary.

Response received from
Health & Safety Executive
Brief summary of issues raised
No formal response received.
Summary of actions taken or show how this has been covered
No action necessary.

Response received from
Hull & Goole Port Authority
Brief summary of issues raised
The EA will have responsibility as the Regulator of the proposed installation. From the plans, the cargo unloading operation will take place at the wharf and the jetty, and control of emissions to air will be within the gasification STU permit. Thus, this Authority will have no direct enforcement powers in respect of what would otherwise be an EPR Part B installation for unloading and storage of coal products. I therefore trust that the permit conditions will be robust and enforced as necessary, so as to prevent fugitive emissions from the installation and in support of the long-standing initiative by all local regulators to improve air quality in the Immingham area.

Summary of actions taken or show how this has been covered
No action necessary as CCGT operation only. IGCC element of the application has been withdrawn.

Response received from
Food Standards Agency
Brief summary of issues raised
No formal response received.
Summary of actions taken or show how this has been covered
No action necessary.

Response received from
North Lincolnshire Council
Brief summary of issues raised
No objections raised.
Summary of actions taken or show how this has been covered
No action necessary.

Response received from
Brief summary of issues raised
No objections raised with the proviso that all emissions are monitored as appropriate and do not exceed maximum quantity limits.
Summary of actions taken or show how this has been covered
Emissions to air and water have been fully considered including in combination with other industry and local emissions. Appropriate monitoring and emission limits have been set within the environmental permit. No further action necessary.

Response received from
Environmental Protection Team – North Lincolnshire Council
Brief summary of issues raised
No objections raised.
Summary of actions taken or show how this has been covered
No action necessary.

11. Meeting the requirements of the IED

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

IED Article Reference	IED requirement	Permit condition
30(6)	If there is an interruption in the supply of gas, an alternative fuel may be used and the permit emission limits deferred for a period of up to 10 days, except where there is an overriding need to maintain energy supplies. The EA shall be notified immediately.	N/A
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
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
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
41(a)	Determination of start-up and shut-down periods	2.3.5 Schedule 1 Table S1.5
Ann V Pt 1(1)	All emission limit values shall be calculated at a temperature of 273,15 K, a pressure of 101,3 kPa and after correction for the water vapour content of the waste gases and at a standardised O2 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	N/A (new plant)
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
AnnV Pt 3(1)	Continuous monitoring for >100MWth for specified substances	3.5, 3.6 Schedule 3, Table S3.1
AnnV Pt 3(2, 3, 5)	Monitoring derogations	3.5.1 Schedule 3, Table S3.1
AnnV Pt3(4)	Measurement of total mercury	N/A

IED Article Reference	IED requirement	Permit condition
AnnV 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
AnnV Pt3(7)	Monitoring requirements	3.5.1 Schedule 3, Table S3.1
AnnV Part 3(8,9,10)	Monitoring methods	3.5, 3.6
AnnV Pt 4	Monthly, daily, 95%ile hourly emission limit value compliance	3.5.1 Schedule 3, Table S3.1
AnnV Pt7	Refinery multi-fuel firing SO_2 derogation	N/A