

## **VPI Immingham OCGT Project**

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### **The Immingham Open Cycle Gas Turbine Order**

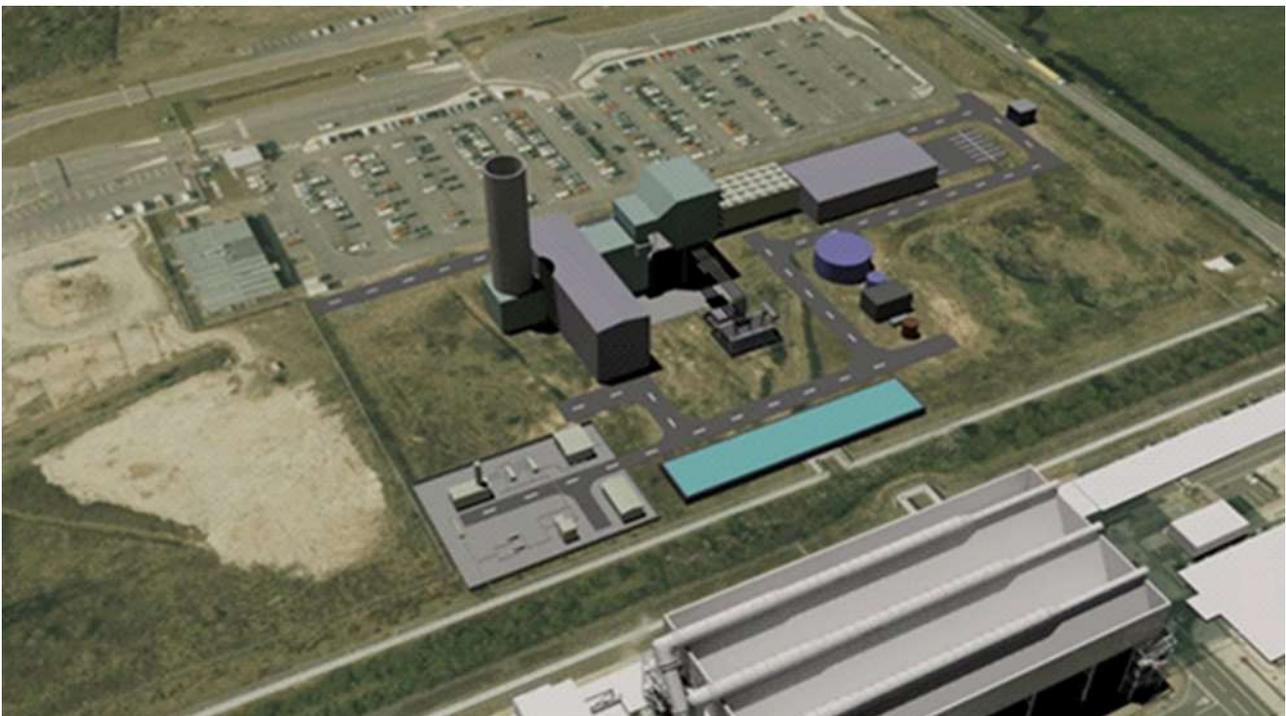
**Land to the north of and in the vicinity of the VPI Immingham Power Station, Rosper Road, South Killingholme, Lincolnshire, DN40 3DZ**

## **Combined Heat and Power Readiness Assessment**

**The Planning Act 2008**

**The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)(q)**

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**Applicant: VPI Immingham B Ltd**

**Date: April 2019**

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## DOCUMENT HISTORY

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## GLOSSARY

Abbreviation	Description
BAT	Best Available Techniques
CBA	Cost-benefit analysis
CCGT	Combined Cycle Gas Turbine
CHP	Combined Heat and Power
CHPQA	Combined Heat and Power CHP Quality Assurance
CHP-R	Combined Heat and Power -ready –
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
EA	Environment Agency
GT	Gas Turbine
HCA	Homes and Communities Agency
LEP	Local Enterprise Partnerships
MW	megawatts
MWth	megawatts thermal
NLC	North Lincolnshire Council
NSIP	Nationally Significant Infrastructure Project
OCGT	Open Cycle Gas Turbine.
PES	Primary energy saving
SoS	The Secretary of State –

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## 1.0 COMBINED HEAT AND POWER ASSESSMENT

### 1.1 Introduction

- 1.1.1 This Combined Heat and Power Assessment (Application Document Ref: 5.9) has been prepared on behalf of VPI Immingham B Ltd ('VPIB' or the 'Applicant'). It forms part of the application (the 'Application') for a Development Consent Order (a 'DCO') submitted to the Secretary of State (the 'SoS') for Business, Energy and Industrial Strategy under section 37 of the Planning Act 2008' (the 'PA 2008').
- 1.1.2 VPIB is seeking development consent for the construction, operation and maintenance of a new gas-fired electricity generating station with a gross output capacity of up to 299 megawatts ('MW'), including electrical and gas supply connections, and other associated development (the 'Proposed Development'). The Proposed Development is located primarily on land (the 'Site') to the north of the existing VPI Immingham Power Station, Rosper Road, South Killingholme, North Lincolnshire, DN40 3DZ.
- 1.1.3 A DCO is required for the Proposed Development as it falls within the definition and thresholds for a 'Nationally Significant Infrastructure Project' (a 'NSIP') under section 14(1)(a) and sections 15(1) and 15(2) of the PA 2008. The DCO, if made by the SoS, would be known as the Immingham Open Cycle Gas Turbine Order' (the 'Order').
- 1.1.4 Combined Heat and Power ('CHP') is the beneficial use of waste heat from the generation of electricity within a power station, typically in the form of steam or hot water, thereby increasing the thermal efficiency of the power station.

### 1.2 VPI Immingham B Ltd

- 1.2.1 VPI Immingham LLP ('VPI LLP') owns and operates the existing VPI Immingham Power Station, one of the largest combined heat and power plants in Europe, capable of generating 1,240 MW (about 2.5% of UK peak electricity demand) and up to 930 tonnes of steam per hour (hereafter referred to as the 'Existing VPI CHP Plant'). The steam is used by nearby oil refineries to turn crude oil into products, such as gasoline. The land comprising the Existing VPI CHP Plant is hereafter referred to as the 'Existing VPI CHP Plant Site'.
- 1.2.2 VPI LLP is a wholly owned subsidiary of the Vitol Group ('Vitol'), founded in 1966 in Rotterdam, the Netherlands. Since then Vitol has grown significantly to become a major participant in world commodity markets and is now the world's largest independent energy trader. Its trading portfolio includes crude oil, oil products, liquid petroleum gas, liquid natural gas, natural gas, coal, electricity, agricultural products, metals and carbon emissions. Vitol trades with all the major national oil companies, the integrated oil majors and independent refiners and traders. For further information on VPI LLP and Vitol please visit:
- <https://www.vpi-i.com/>
- 1.2.3 VPIB has been formed as a separate entity for the purposes of developing and operating the Proposed Development.

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### 1.3 The Proposed Development

- 1.3.1 The Proposed Development comprises the construction and operation of an Open Cycle Gas Turbine ('OCGT') power station with a gross electrical output of up to 299 MW.
- 1.3.2 There are several elements of the Proposed Development which are potentially relevant to the provision of CHP, including:
- A single OCGT unit comprising a gas turbine, electrical generator, a stack and main transformer;
  - Auxiliary generator and liquid fuel tank for emergency electrical supplies;
  - Auxiliary cooling equipment/ system and cooling water supply; and
  - Various other supporting facilities, such as electrical, control, administration and welfare buildings, workshops and stores, access roads, car parking, drainage, fencing and landscaping.
- 1.3.3 In an OCGT, natural gas fuel is mixed and combusted with air from the compressor section of the gas turbine (GT) and the hot gases are expanded through the power turbine section of the GT which drives a generator to produce electricity for export to the National Grid electricity transmission system.
- 1.3.4 Gas turbines are widely used in the power industry as they have multiple advantages when compared to other power plants, such as their flexibility of operation, ease of use, relatively low weight and compactness. They are ideally suited to the planned operation of the power station as they can be started and shut down quickly, and operate flexibly across a range of loads.
- 1.3.5 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 which is recirculated in a closed loop system.

#### Hours of Operation

- 1.3.6 The Proposed Development would not run continuously, but would operate intermittently. It is most likely to run during periods of low electricity supply or high demand on the transmission network, or when required to provide technical services to support the National Grid.
- 1.3.7 The operation of the Proposed Development is expected to be weighted towards the winter period, for a few hours at a time. However, as the operation of the plant is driven by the dynamics of the energy market, the plant could run for longer periods, at any time of day, up to the maximum allowed under its Environmental Permit, which is envisaged to be up to 1,500 hours per year averaged over 5 years, and up to a maximum of 2,250 in any one calendar year.

### 1.4 The Site

- 1.4.1 The Site is primarily located on land immediately to the north of the Existing VPI CHP Plant Site. Immingham Dock is located approximately 1.5 kilometres ('km') to the south east of the Site at its closest point. The Humber ports facility is located approximately 500 metres ('m') north and the Humber Refinery is located approximately 500m to the south.

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- 1.4.2 The villages of South Killingholme and North Killingholme are located approximately 1.4 km and 1.6 km to the west of the Site respectively, and the town of Immingham is located approximately 1.8 km to the south east. The nearest residential property comprises a single house off Marsh Lane, located approximately 325 m to the east of the Site.
- 1.4.3 The Site is located entirely within the boundary of the administrative area of North Lincolnshire Council ('NLC'), a unitary authority. The different parts of the Site are illustrated in the Works Plans (Application Document Ref: 4.3).
- 1.4.4 The Site consists of a previously disturbed and undeveloped parcel of land of approximately 2 hectares (ha) lying between the existing Existing VPI CHP Plant Site to the south, and Rosper Road to the east. It also includes land within the operational envelope of the Existing VPI CHP Plant Site.
- 1.4.5 Immediately to the north of the Site are a private car park and a number of single storey structures associated with access to the Lindsey Oil Refinery. Immingham Dock is located approximately 1.5 km to the southeast at its closest point. The Humber ports facility is located approximately 500 m at its closest point and the Humber Refinery is located approximated 500 m to the south.
- 1.4.6 The Site is located in an area comprising a mix of industrial and agricultural activities. The land to the east of the Site and on the other side of Rosper Road comprises agricultural fields extending approximately 1 km toward the Humber Estuary before industrial activities associated with the storage and export of gas and oil and other port activities commence along the banks of the Estuary itself, approximately 1.4 km from the Site at its closest point. The land to the west of the Site has recently been granted planning permission by North Lincolnshire Council (planning reference PA/2018/918P) to an affiliated company of the Applicant for a <50 MW gas-fired power station.

## **1.5 The Purpose and Structure of this Document**

- 1.5.1 The purpose of this document is to comply with Section 4.6 of the '*Overarching National Policy Statement for Energy (EN-1)*' and Section 2.33 of the '*National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2)*', which require developers promoting thermal generating stations to consider the opportunities for the implementation of CHP.
- 1.5.2 The assessment demonstrates that the Applicant has explored the potential for the plant to operate in CHP mode, i.e. exporting heat to off-site users. In order to examine the CHP potential, the use of Best Available Techniques ('BAT') for the Proposed Development will be demonstrated by applying the three 'BAT Tests' outlined in the '*CHP Ready Guidance for Combustion and Energy from Waste Power Plants*' (2013, the '*CHP-R Guidance*').
- 1.5.3 Details of the above CHP guidance are presented in Section 2.1 of this document.
- 1.5.4 This remainder of this report is structured as follows:
- Section 2 describes the policy context;
  - Section 3 assesses the feasibility of heat extraction from the Proposed Development based on the current design;
  - Section 4 identifies potential heat users in the vicinity of the Site;

- Section 5 presents the assessment of the Proposed Development against the BAT tests described in the CHP-R Guidance; and
- Section 6 presents the conclusions of this CHP assessment.

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## 2.0 POLICY CONTEXT AND ASSESSMENT METHODOLOGY

### 2.1 National Policy Statements

- 2.1.1 CHP is the generation of electrical power and usable heat in a single process. This is also known as co-generation. CHP beneficially utilises a greater proportion of the fuel energy, reducing the energy wasted as low-grade heat when generating electrical or mechanical power.
- 2.1.2 The National Policy Statements (NPS) for energy infrastructure form the policy framework for applications for new generating stations of greater than 50 MW capacity in England and Wales. The NPS of most relevance to the Proposed Development (and this CHP Assessment) are the 'Overarching National Policy Statement on Energy (EN-1)' and the 'National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2)'.
- 2.1.3 Section 4.6 of EN-1 deals with the consideration of CHP. Paragraph 4.6.2 states that CHP is technically feasible for all types of thermal generating stations, including gas-fired, nuclear, energy from waste and biomass. Paragraph 4.6.3 goes on to state that the use of CHP reduces emissions and that the Government is therefore committed to promoting 'Good Quality CHP', which denotes CHP that has been certified as highly efficient under the CHP Quality Assurance ('CHPQA') programme.
- 2.1.4 Paragraph 4.6.5 of EN-1 recognises that, to be economically viable as a CHP plant, a generating station needs to be located close to industrial or domestic customers with heat demands. The distance will vary according to the size of the generating station and the nature of the heat demand.
- 2.1.5 Paragraph 4.6.6 of EN-1 highlights that under guidelines<sup>1</sup> issued by the Department for Energy and Climate Change ('DECC'<sup>2</sup>), any application to develop a thermal generating station under Section 36 of the Electricity Act 1989 must have either included CHP or contain evidence that possibilities for CHP had been fully explored to inform the consideration of the application by the SoS. The paragraph goes on to confirm that the same principle now applies to any thermal generating station that is the subject of an application for development consent under the PA 2008 and that the SoS should have regard to the DECC guidance, or any successor to it, when considering the CHP aspects of application for thermal generating stations.
- 2.1.6 Paragraph 4.6.7 of EN-1 states that:

*"In developing proposals for new thermal generating stations, developers should consider the opportunities for CHP from the very earliest point and it should be adopted as a criterion when considering potential locations for a project. Given how important liaison with potential customers for heat is, applicants should not only consult those potential customers they have identified themselves but also bodies*

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<sup>1</sup> Guidance on Background Information to Accompany Notifications under Section 14(1) of the Energy Act 1976 and Applications under Section 36 Of The Electricity Act 1989'

<sup>2</sup> In 2016, the functions of DECC were merged into the Department for Business, Energy and Industrial Strategy ('BEIS')

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*such as the Homes and Communities Agency (HCA), Local Enterprise Partnerships (LEPs) and Local Authorities and obtain their advice on opportunities for CHP. Further advice is contained in the 2006 DECC guidelines and applicants should also consider relevant information in regional and local energy and heat demand mapping."*

- 2.1.7 Paragraph 4.6.8 of EN-1 also states that to encourage proper consideration of CHP, substantial additional weight should be given by the SoS to applications incorporating CHP. If a proposal is for thermal generation without CHP, the applicant should:
- Explain why CHP is not economically or practically feasible;
  - Provide details of any future heat requirements in the area that the generating station could meet; and
  - Detail the provisions for ensuring any potential heat demand in the future can be exploited.
- 2.1.8 Paragraph 4.6.10 of EN-1 states that, if not satisfied with the evidence that has been provided, the SoS may wish to investigate this with one or more bodies such as the HCA, LEPs and Local Authorities.
- 2.1.9 According to paragraph 4.6.11 of EN-1, should the SoS identify a potential heat customer that has not been explored, the applicant should be requested to pursue this. If agreement cannot be reached with the potential customer, the applicant should provide evidence demonstrating why this was not possible.
- 2.1.10 Paragraph 4.6.12 of EN-1 states that the SoS may wish to impose requirements within any DCO to ensure that the generating station is 'CHP Ready' to facilitate the potential future export of heat, should demand be identified.
- 2.1.11 NPS EN-2 reiterates the requirements of EN-1, to either include CHP or present evidence in the application that the possibilities for CHP have been fully explored (paragraphs 2.3.2 - 3).

## **2.2 CHP Guidance**

- 2.2.1 The requirements for the assessment of the feasibility of CHP in relation to thermal generating stations are set out in the '*Guidance on Background Information to Accompany Notifications Under Section 14(1) of the Energy Act 1976 and Applications under Section 36 of the Electricity Act 1989*' (the 'CHP Guidance', Ref. 2-1).
- 2.2.2 Paragraph 8 of the CHP Guidance states that the Government expects developers to explore opportunities to use CHP fully, including community heating, when developing proposals for new thermal generating stations. However, it does recognise that in some cases CHP will not be an economic option.
- 2.2.3 Paragraph 12 of the Guidance lists what must be included with applications where CHP is not to be included. This includes:
- The basis for the developer's conclusion that it is not economically feasible to exploit existing regional heat markets;
  - A description of potential future heat requirements in the area; and

- The provisions in the proposed scheme for exploiting any potential heat demand in the future.

2.2.4 Paragraphs 13 - 17 provide guidance on exploring opportunities for local users to make use of heat. Developers should fully explore opportunities for existing and likely local users of heat across a range of sectors, including industry, housing and community users. They should also engage with Government agencies, have regard to heat mapping and contact regional and local bodies to identify potential heat users.

2.2.5 Paragraph 19 stresses that where heat opportunities have been identified, developers should carry out detailed studies on the economic feasibility of these. Paragraphs 20 - 22 provide further guidance on economic feasibility.

### **2.3 CHP-R Guidance**

2.3.1 In 2013, the Environment Agency ('EA') published detailed guidance on CHP-readiness assessments required for thermal generating stations, to be used by developers and EA officers as part of the Environmental Permitting regime.

2.3.2 The EA requires applications for Environmental Permits to demonstrate BAT is implemented at any new 'installation'. BAT applies to a number of operational criteria, including energy efficiency.

2.3.3 In accordance with the CHP-R Guidance, the EA requires developers to satisfy three BAT tests in relation to CHP. The first involves considering and identifying opportunities for the use of heat off-site. Where this is not technically or economically possible and there are no immediate opportunities, the second test involves ensuring that the plant is built to be 'CHP Ready'. The third test involves carrying out periodic reviews to see if the situation has changed and there are opportunities for heat use off-site.

2.3.4 Where development consent is granted for a new plant without CHP, the associated application for an Environmental Permit should build on the conclusions of the CHP Assessment and contain sufficient information to demonstrate the new plant will be built 'CHP ready' (for the chosen location and design). The EA requires that:

*"all applications for Environmental Permits for new installations regulated under the Environmental Permitting (England and Wales) Regulations 2010 demonstrate the use of BAT for a number of criteria, including energy efficiency. One of the principal ways in which energy efficiency can be improved is through the use of Combined Heat and Power (CHP). With respect to the use of CHP, there are three BAT tests which should be applied. These are as follows:*

#### **First BAT Test:**

*The Environment Agency considers that BAT for energy efficiency for new combustion power plant or Energy from Waste (EfW) 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.*

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*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).*

**Second BAT Test:**

*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 term 'CHP-R' in this context represents a plant which is initially configured to generate electrical power only but which is designed to be ready, with minimum modification, to supply heat in the future. The term 'minimum modification' represents an ability to supply heat in the future without significant modification of the original plant / equipment. Given the uncertainty of future heat loads, the initial electrical efficiency of a CHP-R plant (before any opportunities for the supply of heat are realised) should be no less than that of the equivalent non-CHP-R plant.*

**Third BAT Test:**

*Once an Environmental Permit has been issued for a new CHP-R plant, the applicant/ operator should carry out periodic reviews of opportunities for the supply of heat to realise CHP. Such opportunities may be created both by new heat loads being built in the vicinity of the plant, and/ or be due to changes in policy and financial incentives which improve the economic viability of a heat distribution network for the plant being CHP."*

2.3.5 The CHP-R Guidance reiterates the need for applications for development consent involving generating stations to be supported by a CHP Assessment in line with Section 4.6 of EN-1. The CHP-R Guidance states that a CHP Assessment should contain details on:

- An explanation of their choice of location, including the potential viability of the site for CHP;
- A report on the exploration carried out to identify and consider the economic feasibility of local heat opportunities and how to maximise the benefits from CHP;
- The results of that exploration; and
- A list of organisations contacted.

2.3.6 If the proposal is for generation without CHP:

- The basis for the developer's conclusion that it is not economically feasible to exploit existing regional heat markets;
- A description of potential future heat requirements in the area; and
- The provisions in the proposed scheme for exploiting any potential heat demand in the future.

2.3.7 The CHP-R Guidance states that:

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*"The primary focus of this CHP-R Guidance is on the demonstrations required in an application for an Environmental Permit for new plants under the Environmental Permitting (England and Wales) Regulations 2010. However, the principles contained within this CHP-R Guidance may also have implications on consent applications (i.e. Planning Permission (under the Town and Country Planning Act 1990) or a DCO (under the Planning Act 2008)) for the new plant. Indeed, the Environment Agency will be consulted on these applications, as well as applications for extensions of / variations to existing plants."*

- 2.3.8 The EA Document *"Guidelines for Developments requiring Planning Permission and Environmental Permits"* sets out the EA's role in the planning process and its approach to responding to applications for developments which will also require an Environmental Permit.
- 2.3.9 In particular, these Guidelines recognise that there may be some interdependencies between planning and permitting requirements. In the case of such interdependencies, the Guidelines recommend early engagement with the EA via their planning pre- application service.
- 2.3.10 Therefore, it is recommended that this CHP-R Guidance (and the requirements for CHP-R) is considered prior to making a consent application for a new plant, in particular because the first and second BAT tests may affect the layout, space requirements and building design for the implementation of CHP (or CHP-R).
- 2.3.11 Accordingly, the EA recommends that the requirement for new plants to be CHP or CHP-R is discussed at the earliest possible stage, ideally during planning pre-application. In any case, where a DCO is required the applicant will have to make similar demonstrations under both the planning and permitting applications in terms of suitability of the location for CHP, potential opportunities for heat supply and CHP-R.
- 2.3.12 When consulted by the Planning Authorities on relevant consent applications for new plants, the EA will highlight the need for the plant to be CHP or CHP-R and will make reference to the CHP-R Guidance.
- 2.3.13 The CHP-R guidance states that:

*"The Environment Agency will not object to applications for new plants where they are located in areas where there are no opportunities for heat supply. However, where relevant, the Environment Agency will highlight the lack of opportunities to the Planning Authorities and this may influence the Planning Authority in its consideration of the suitability of the proposed location."*

## **2.4 Note on the Implementation of the Energy Efficiency Directive**

- 2.4.1 In addition to the requirements of the CHP-R Guidance, the Energy Efficiency Directive has been implemented in the UK initially through the Environmental Permitting (England and Wales) (Amendment) Regulations 2015. Since March 2015, these Regulations have required operators of certain combustion installations to carry out a cost-benefit analysis ('CBA') where opportunities for 'Good Quality CHP' schemes (or high efficiency co-generation) are identified. These schemes are those which achieve at least a 10 per cent saving in primary energy consumption ('primary energy saving' or 'PES').

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## 2.5 Assessment Methodology

2.5.1 This CHP assessment has been undertaken in accordance with the methodology prescribed by the CHP-R Guidance, the stages of which are summarised below:

- Identify whether the plant is required to be CHP or CHP-ready;
- Identify if there are opportunities for the supply of heat from the plant;
- Where opportunities are identified, select the most appropriate heat loads for further consideration;
- Determine the 'CHP envelope' to confirm if the plant is capable of serving the selected heat loads;
- Identify the impacts to operation of the plant of the supply of heat to the serviceable loads;
- Identify the provisions required (e.g. on-site space) to supply heat to the serviceable loads; and
- Undertake a CBA for the serviceable loads.

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## 3.0 CHP ASSESSMENT

### 3.1 CHP and Peaking Plants

#### Technical Feasibility

- 3.1.1 The OCGT process is, essentially, adiabatic where no heat transfer occurs within the system. The heat generated by the combustion of fuel (natural gas) is converted to work by the combustion product gases expanding across the gas turbine that, in turn, drives a generator that converts the work into electrical energy. As such, there is little waste heat generated by the process, with the exception of the residual heat contained within the flue gas emitted from the stack. The Proposed Development will incorporate fin-fan coolers to provide a minor cooling duty for lubricating oils and plant auxiliaries however this heat is not of a suitable scale or source for the export of heat off-site.
- 3.1.2 This is different to combined cycle gas turbine (CCGT) plants which can be configured to provide CHP through the extraction from the steam/ water cycle. Unlike CCGT plants, the Proposed Development will not require or generate steam as part of the process for generating electricity.
- 3.1.3 The only potential source of the recovery of useful heat from an OCGT, such as the Proposed Development, would be from the flue gases, which are typically emitted at temperatures of 400 to 600°C. In order to recover this heat, the Proposed Development would need to include steam-raising equipment and additional heat exchangers in order to deliver heat/ steam to any potential user (including district heating networks) at the flowrate and condition (i.e. temperature and pressure) that that user would require. However, the Proposed Development needs to be designed and operated to be as flexible as it can be, so as to meet market demand. CCGTs with steam cycles cannot operate as flexibly or start up as quickly as OCGTs and the installation of a heat recovery system on the flue gas is contrary to the intended purpose of the Proposed Development.

#### Operating Regime

- 3.1.4 As discussed in Section 1.3, the operating regime of the Proposed Development will vary depending on the demand from the National Grid; and is likely to be lower than the maximum capacity of the plant. It is anticipated that the operation of the Proposed Development is expected to be weighted towards the winter period, for a few hours at a time. However, as the operation of the plant is driven by the dynamics of the energy market, the plant could run for longer periods, at any time of day, up to the maximum allowed under its Environmental Permit, which is envisaged to be up to 1,500 hours per year averaged over 5 years, and up to a maximum of 2,250 hours in any one calendar year.
- 3.1.5 A primary requirement of a viable and effective CHP scheme is that it should be able to service the heat demand of any user connected to (and reliant on) the scheme. As such, there are two significant technical issues to the Proposed Development implementing CHP:
- The limited and intermittent operation of the Proposed Development may not coincide with when heat is required by an off-taker (e.g. industrial heat demands are likely to be continuous or required on a set schedule ); and

- There is no steam cycle associated with the Proposed Development and installing one would compromise the intended purpose of the Proposed Development.

3.1.6 In order to address the above issues and enable the Proposed Development to operate as a CHP facility, backup boilers would have to be installed to provide continuous or scheduled heat or steam to third party users when the Proposed Development is not generating electricity. The supply of heat in this way would simply replace one heat/steam system (off-site) with another (on-site). In addition, the boiler system would need to be held in a 'warm' state (requiring the use of additional fuel) such that it can provide heat/steam as soon as the OCGT shuts down.

3.1.7 The use of backup boiler equipment would therefore not be able to deliver any reduction in primary energy usage (or associated carbon emissions) economically.

3.1.8 The CHP-R Guidance acknowledges the above constraints:

*"...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 and anaerobic digestion plants) the provision of CHP would not be compatible with original operating regimes/intentions."*

#### **Financial Feasibility**

3.1.9 The profile for the generation of electricity from the Proposed Development cannot be guaranteed to coincide with the required heat demand profile of any potential consumer. Without certainty of supply, it is unlikely to be feasible for the Applicant to enter into a supply contract for the supply of heat/ steam.

## 4.0 IDENTIFICATION OF POTENTIAL HEAT USERS

### 4.1 Introduction

4.1.1 A review of the potential heat demand within a 15 km radius of the Proposed Development has been undertaken to assess potential known or consented future developments that may require heat and to identify any existing major heat consumers; i.e. to identify potential heat loads. The potential heat loads have been identified using a review of publicly available datasets on fuel use in the region - the UK CHP Development Map and available OS data, satellite imagery and aerial photographs from Google Earth.

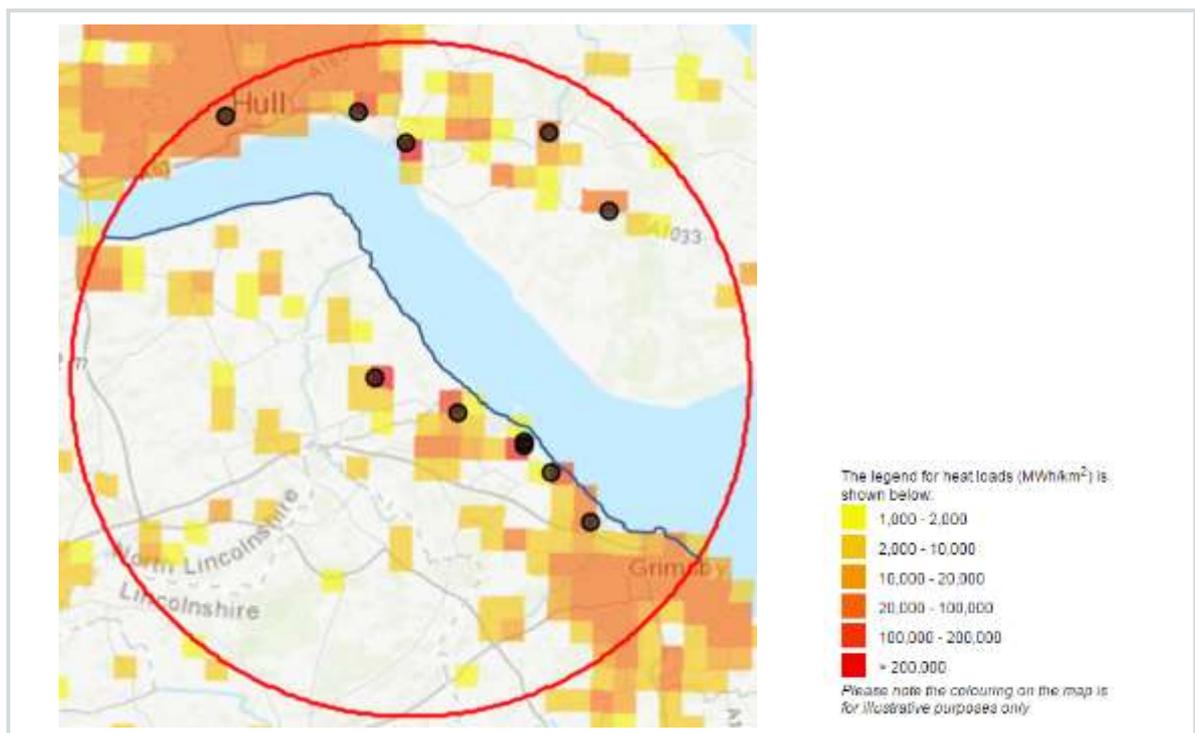
4.1.2 The CHP-R Guidance requires that the heat loads used in a CHP-R assessment be agreed with the EA. At this stage, due to the incompatibility of the provision of CHP with the proposed operating regime, no detailed consultation with the EA has taken place to date, but discussions with the EA will take place as part of the Environmental Permit application process.

### 4.2 CHP Opportunities

4.2.1 The CHP Guidance required that CHP Assessments examine the information available on the Online Industrial Heat Map to identify potential CHP opportunities. Since the publication of the CHP Guidance, the Online Industrial Heat Map has been replaced with the UK CHP Development Map.

4.2.2 The results from the examination of the UK CHP Development Map, covering a search area of 15 km centred on the Proposed Development, are shown in Figure 4.1. The black dots shown in Figure 4.1 are specific large heat loads identified by the UK CHP Development Map.

**Figure 4.1: Results from the Examination of the UK CHP Development Map**



4.2.3 The breakdown of the results from the examination of the UK CHP Development Map across the full 15 km radius is shown in Table 4.1.

**Table 4.1: Results from the Examination of the UK CHP Development Map**

Sector	% share of total load identified	Estimated average instantaneous demand load Identified (MWth)
Communications and Transport	0.0	0
Commercial Offices	0.1	1
Domestic	13.7	284
Education	0.2	5
Government Buildings	0.1	2
Hotels	0.1	2
Large Industrial	10.2	211
Health	0.2	4
Other	0.7	14
Small Industrial	1.3	27
Retail	0.1	2
Sport and Leisure	0.0	0
Warehouses	0.1	1
District Heating	73.3	1,517

4.2.4 The River Humber represents a significant constraint to the development of any heat/steam supply and return infrastructure to the north of the Proposed Development Site. Therefore the CHP Search Area (outlined in blue in Figure 4.1) has been defined to only include locations south of the River Humber. The breakdown of the results from the examination of the UK CHP Development Map across the CHP Search Area is shown in Table 4.2.

**Table 4.2: CHP Search Area - UK CHP Development Map**

Sector	% share of total load identified	Estimated average instantaneous demand load identified (MWth)
Communications and Transport	0.0	0
Commercial Offices	0.0	1
Domestic	7.6	133
Education	0.1	2
Government Buildings	0.0	0
Hotels	0.0	0
Large Industrial	4.5	78
Health	0.0	0
Other	0.8	14
Small Industrial	0.4	8
Retail	0.0	1
Sport and Leisure	0.0	0
Warehouses	0.0	0
District Heating	86.4	1,517

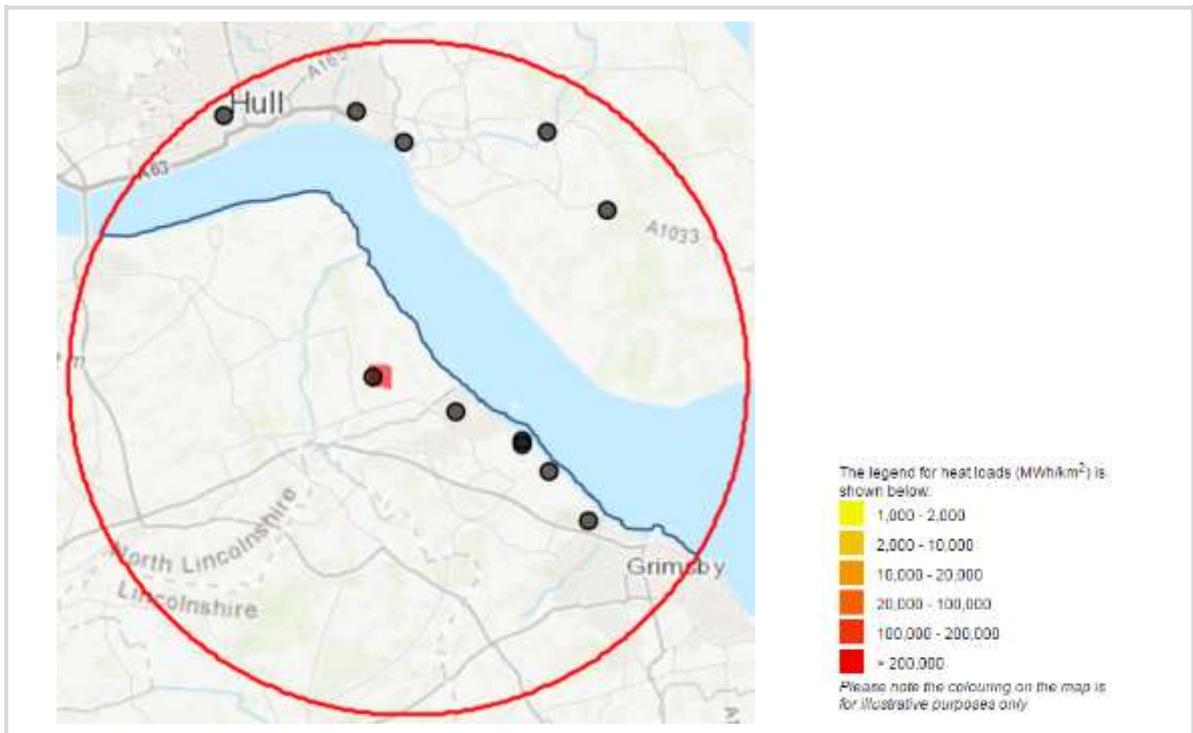
4.2.5 From Table 4.2 it can be seen that the largest potential heat loads within the CHP search area relate to:

- District Heating;
- Domestic; and
- Large Industrial.

### District Heating

4.2.6 In terms of the domestic heat loads within the CHP search area, the results from the UK CHP Development Map are shown in Figure 4.2.

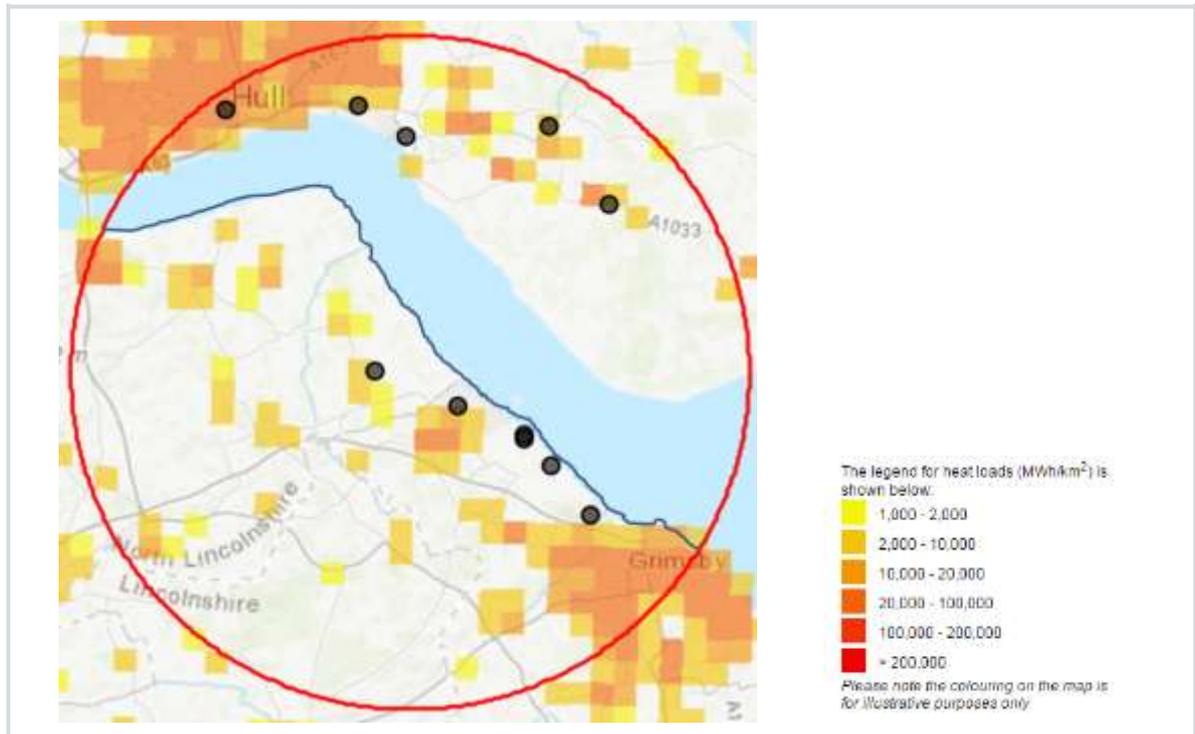
**Figure 4.2: District Heating Loads**



### Domestic

4.2.7 In terms of the domestic heat loads within the CHP search area, the results from the UK CHP Development Map are shown in Figure 4.3.

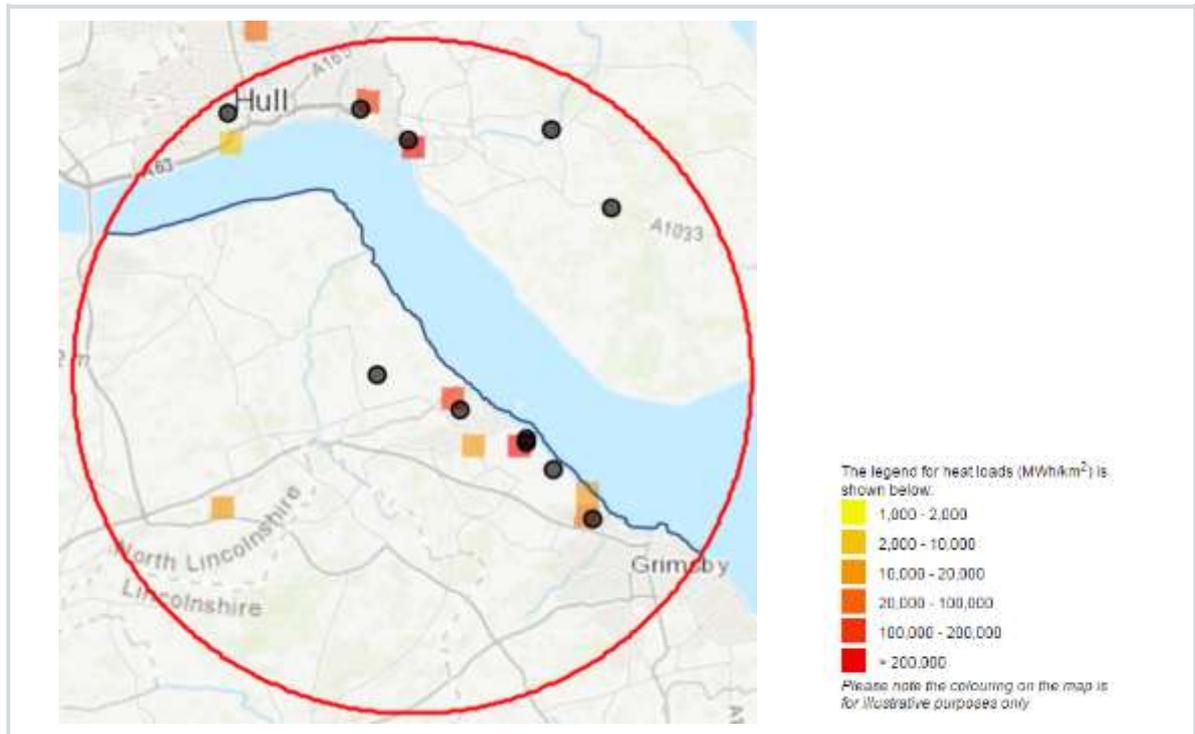
**Figure 4.3: Domestic Heat Loads**



### Large Industrial

4.2.8 In terms of the large industrial heat loads within the CHP Search Area, the results from the specific examination of the UK CHP Development Map are shown in Figure 4.4.

**Figure 4.4: Large Industrial Heat Loads**



4.2.9 Although several potential heat loads have been identified, these are not considered to represent viable CHP opportunities for the reasons set out previously in particular no steam or water production and the short term and sporadic operating regime of the Proposed Development and the distance from the Site.

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## 5.0 BAT ASSESSMENT

### 5.1 Introduction

- 5.1.1 The CHP-R Guidance states that the EA requires applications for Environmental Permits to demonstrate BAT for a number of criteria, including energy efficiency. Aside from the selection of efficient turbines, one of the principal ways of improving energy efficiency is through the use of CHP. The EA therefore requires developers to satisfy three BAT tests in relation to CHP. The first involves considering and identifying opportunities for the use of heat off-site. Where this is not technically or economically possible and there are no immediate opportunities, the second test involves ensuring that the plant is built to be 'CHP Ready'. The third test involves carrying out periodic reviews to see if the situation has changed and there are opportunities for heat use off site.
- 5.1.2 The EA CHP Guidance BAT Requirements have been fulfilled for the Proposed Development as outlined in this section.

### 5.2 First BAT Test

- 5.2.1 The Proposed Development will not be operated as a CHP plant at the outset of commercial operation.
- 5.2.2 The intended operating regime (that will be limited by the Environmental Permit for the Proposed Development) is not compatible with the provision of CHP, a position which is identified in the CHP-R Guidance:

*"...it is recognised that in some cases (such as peaking plant [...]) the provision of CHP would not be compatible with original operating regimes/ intentions."*

### 5.3 Second BAT Test

- 5.3.1 The profile for the generation of electricity from the Proposed Development cannot be guaranteed to coincide with the required heat demand profile of any potential consumer. Without certainty of supply, it is unlikely to be feasible for the Applicant to enter into a supply contract for the supply of heat/ steam.
- 5.3.2 Therefore, and given that the supply of heat (as CHP) from the Proposed Development is not compatible with its operating regime, the Proposed Development is not required to be CHP-ready.

### 5.4 Third BAT Test

- 5.4.1 In order for the above position to change, the Proposed Development would need to change its operating regime (such as the conversion to the provision of baseload power or through the addition of combined cycle equipment) in the future.
- 5.4.2 As stated in Section 1.3.1, the Environmental Permit for the Proposed Development will likely limit the operation to a 5-year rolling average of 1,500 hours per year (with a maximum of 2,250 hours per year). Therefore any proposed future change to the operating regime of the Proposed Development would require an application to be made to the EA in order to vary the Environmental Permit. Such an application would need to re-examine the potential for the implementation of CHP by the Proposed Development

and be based on the prevailing conditions (e.g. local heat demand, regulatory requirements, etc.) at that time.

- 5.4.3 The Applicant acknowledges that, should it wish to alter the operating regime of the Proposed Development by increasing the intended hours per year of operation, additional land may be required in order to facilitate this and that EA agreement to the extension of the operating hours may rest on the Applicant being able to demonstrate that it has control of such land (for the purposes of demonstrating CHP-R at that time).

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## 6.0 CONCLUSIONS

- 6.1.1 In line with the requirements of NPS EN-1 and EN-2 and the CHP-R Guidance, this CHP Assessment has been undertaken to support the application for a DCO and meet the BAT requirements of the CHP-Ready Guidance.
- 6.1.2 This CHP assessment demonstrates that the Proposed Development meets the BAT tests outlined in the CHP-R Guidance.
- 6.1.3 The CHP Assessment has indicated that there are a number of theoretical identified heat users within a 15 km radius of the Proposed Development although the applicable CHP Search Area considered in the CHP assessment is less given the significant physical constraint to implementation presented by the River Humber.
- 6.1.4 The provision of CHP is not compatible with the proposed short term and intermittent 'peaking' nature of operation of the Proposed Development and the lack of any hot water or steam generation to provide a medium for usable heat. CHP is therefore not proposed to be installed from the outset. This is considered to be BAT for peaking plant such as the Proposed Development.
- 6.1.5 To allow any future CHP opportunities to be realised, the operating regime of the Proposed Development would need to change. The Environmental Permit for the Proposed Development will likely limit the operation to a 5-year rolling average of up to than 1,500 hours per year, with a maximum of 2,250 hours per year. Therefore any proposed future change to the operating regime of the Proposed Development would require an application to be made to the EA in order to vary the Environmental Permit.
- 6.1.6 The Applicant acknowledges that, should it wish to alter the operating regime of the Proposed Development by increasing the intended hours per year of operation, additional land may be required in order to facilitate this and that EA agreement to the extension of the operating hours may rest on the Applicant being able to demonstrate that it has control of such land (for the purposes of demonstrating CHP-R at that time).
- 6.1.7 The Applicant does not propose to explicitly review the potential for the implementation of CHP at the Proposed Development, given that it is not compatible with the proposed operating regime. However, the Applicant and the Proposed Development will be required to operate in full accordance with any relevant condition of the Environmental Permit for the Proposed Development.