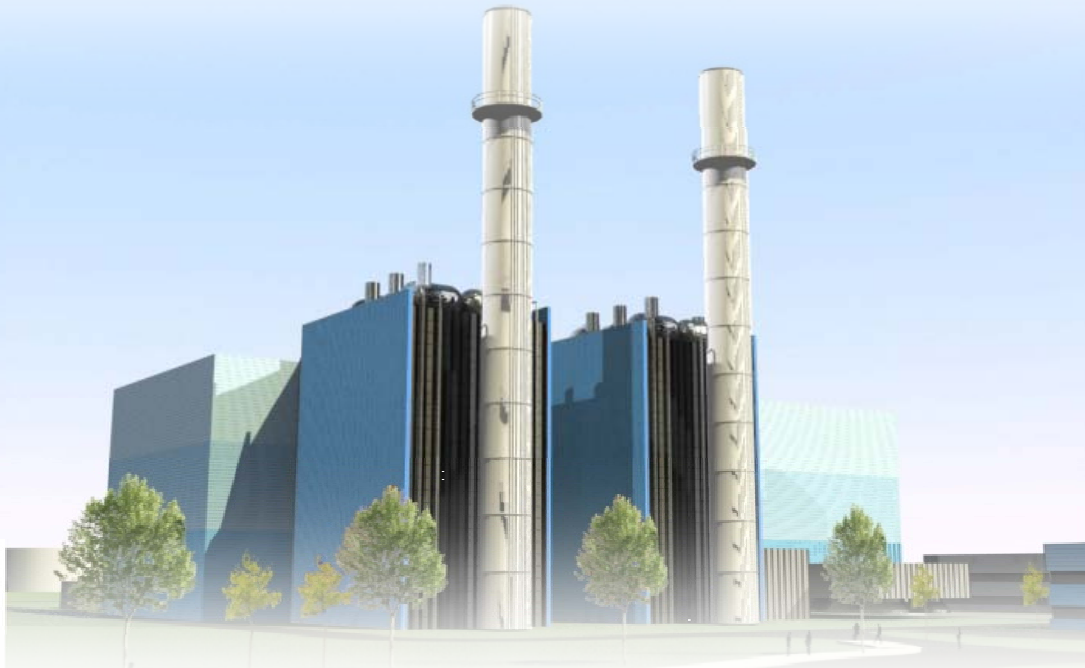




Gateway Energy Centre



ENVIRONMENTAL STATEMENT CHP Assessment

Prepared by



February 2010



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LIST OF ABBREVIATIONS

°C	degrees Celsius
AOD	Above Ordnance Datum
CCGT	Combined Cycle Gas Turbine
CCR	Carbon Capture Readiness
CECL	Coryton Energy Centre Limited
CHP	Combined Heat and Power
CHPA	Combined Heat and Power Association
CHPQA	Combined Heat and Power Quality Assurance
CO ₂	Carbon Dioxide
CPI	Confederation of Paper Industries
CRH	Cold Re-Heat
DE	distributed energy
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment Food and Rural Affairs
DH	Distributed Heat
DP	Dubai Ports
DTI	Department for Trade and Industry
EU ETS	European Union Emissions Trading Scheme
GEC	Gateway Energy Centre
GECL	Gateway Energy Centre Limited
GWe	gigawatts electric
HM	Her Majesty
IP	Intermediate Pressure
km	kilometres
kJ	kilojoules
kV	kilovolts
kW	kilowatts
kWh	Kilowatt hour
LG	London Gateway
LP	Low Pressure
m	metres
Mt	Megatonnes
MWe	megawatts electric
MWth	megawatts thermal
NHS	National Health Service
NPS	National Policy Statement
OS	Ordnance Survey
PB	Parsons Brinckerhoff Limited
t/h	tonnes per hour
UK	United Kingdom

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This document details the findings of a Combined Heat and Power (CHP) Assessment which has been undertaken by Parsons Brinckerhoff Limited (PB) on behalf of Gateway Energy Centre Limited (GECL) to support a Consent application for the proposed Gateway Energy Centre Combined Cycle Gas Turbine (CCGT) Power Plant to be known as Gateway Energy Centre or GEC.

GEC will be located on land within the London Gateway Port / London Gateway Logistics and Business Park development, collectively called the LG Development. The LG Development, promoted by DP World, is currently in the early stages of construction.

Once operational GEC will provide up to 900 megawatts electric (MWe) of electrical generation capacity. This will include the provision of up to 150 MWe to the LG Development, which is expected to meet its long term electricity requirements. In so doing the GEC will reduce transmission losses associated with the supply of electricity supply to the LG site, effectively improving plant and fuel efficiency.

As part of National Energy Policy, the UK Government is committed to promoting the installation of CHP wherever economical. GECL shares this vision and, as part of the process of preparing the Section 36 Consent application for GEC, has actively contacted organisations to establish appetite for CHP locally including the likes of The Energy Savings Trust, East of England Development Agency and local businesses. The delivery of a CHP scheme will help secure the UK's energy supply in a diverse and sustainable manner.

The responses from organisations to date have been encouraging. For example, there is the potential to supply the LG Development with heat in the form of hot water or steam for heating or refrigeration purposes.

The project also has the potential to provide heat to organisations in the area such as the Petroplus owned Coryton Oil Refinery, the Ford Motor Company at Dunton and Basildon Hospital. Following submission of the Section 36 application to the Department of Energy and Climate Change, GEC will hold further discussions with local organisations, including government agencies, with the aim of establishing further interest e.g. in a community heating scheme. If achieved, the result of this would be to improve GEC's overall plant efficiency whilst also reducing energy consumption by the users of the heat.

The design of GEC will incorporate features which, with suitable modifications, will allow for export of heat in the event that suitable users are identified.

SECTION 1

INTRODUCTION

1 INTRODUCTION

1.1 Overview

1.1.1 This document details the findings of a Combined Heat and Power (CHP) Assessment which has been undertaken by Parsons Brinckerhoff Limited (PB) on behalf of Gateway Energy Centre Limited (GECL) to support a Consent application for the proposed Gateway Energy Centre Combined Cycle Gas Turbine (CCGT) Power Plant to be known as Gateway Energy Centre or GEC.

1.1.2 The Consent application for GEC will comprise an application under Section 36 of the Electricity Act 1989 to the Department of Energy and Climate Change (DECC) to construct and operate a power station of greater than 50 MWe together with deemed planning permission under Section 90 of the Town and Country Planning Act 1990.

1.1.3 GEC will be located on land within the London Gateway Port / London Gateway Logistics and Business Park development, collectively called the LG Development. The LG Development, promoted by DP World, is currently in the early stages of construction.

1.1.4 Once operational GEC will provide up to 900 megawatts electric (MWe) of electrical generation capacity. This will include the provision of up to 150 MWe to the LG Development, which is expected to meet its long term requirements.

1.2 Combined Heat and Power and the Purpose of this Document

1.2.1 The draft Overarching National Policy Statement (NPS) for Energy EN-1 (NPS EN-1) states that:

“CHP is the generation of usable heat and electricity in a single process. A CHP Station may either supply steam direct to the customers or capture waste heat for low-pressure steam, hot water of space heating purposes after it has been used to drive electricity generating turbines. In conventional thermal generating stations, the heat that is raised to drive electricity generation is subsequently emitted to the environment as waste. Supplying steam direct to industrial customers or using waste heat...can reduce the overall amount of fuel needed to meet the equivalent energy requirements compared to separate generation of heat and power”

UK Government Policy

1.2.2 As part of National Energy Policy, the UK Government is committed to promoting the installation of CHP wherever economical and has set a target to achieve at least 10 GWe of installed CHP capacity by 2010.

1.2.3 Further to this, NPS EN-1 states that:

“In 2008, there was 5.6 GW of Good Quality CHP in the UK, providing over 7 per cent of electricity and saving an estimated 10.2 Mt CO₂ per annum”

and:

“There is a recognised cost-effective potential for a further 10 GW of Good Quality CHP, estimated to offer a further saving of 175 Mt CO₂ by 2015”.

1.2.4 To achieve these targets the Government has formulated a CHP Policy to support the provision of CHP generation wherever feasible.

1.2.5 The Government hopes that their CHP Policy will help achieve the National Energy Policy objectives of securing the UK's energy supply in a diverse and sustainable manner while allowing power to be generated at competitive prices. The greater energy utilisation associated with CHP installations will also assist the Government in achieving its obligations under the European Union Emissions Trading Scheme (EU ETS) and other targets and supporting legislation.

1.2.6 The Government acknowledges that opportunities to exploit CHP are not always technically practical and economically justifiable. Therefore, to promote (but not require) the use of CHP technology, the Government expects developers to submit information alongside their Consent application which demonstrates that they have seriously explored opportunities for CHP in developing their proposals. This CHP Assessment has been undertaken for the proposed GEC to provide this demonstration.

1.2.7 The requirements of a CHP Assessment (which has been prepared to accompany a Section 36 Consent application) are outlined in the Department of Trade and Industry's (DTI) (now DECC) document "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, December 2006" (the Guidance).

Guidance Requirements

1.2.8 The Guidance requires developers to explore opportunities to use CHP, including community heating, when developing proposals for new power stations and thus any proposals submitted to the DECC are expected to show that the developer has actively explored the opportunities for CHP use.

1.2.9 Where heat opportunities have been identified, developers are required to provide an audit trail and show how they have dealt with the opportunities in shaping their proposals.

1.2.10 In addition, the Guidance notes that future market conditions, outside the control of any project proponent, have the potential to give rise to variations to actual heat demand. Heat customers, identified during the development of project proposals, may take more or less heat than anticipated and new customers may emerge.

Potential Markets

1.2.11 NPS EN-1 states that:

"To be viable as a CHP Plant, a generating station needs to be located close to industrial or domestic customers with heat demands. This is likely to mean within a distance of up to 15 km"

1.2.12 The Guidance identifies a number of potential markets as being worthy of consideration in CHP Assessments undertaken by developers, either singly or in combination.

1.2.13 Industry, commerce and public services are all identified as being prospective users of CHP with the largest, most economic opportunities expected to be found in the industrial sectors where there are often large requirements for process heat.

1.2.14 However, opportunities are also identified in commerce (e.g., hotels, leisure centres, large corporate buildings) and public services (e.g., hospitals, universities, prisons, defence installations, administrative offices and ancillary college or hospital accommodation). There is also the potential for CHP where heat can be used in absorption chilling to deliver cooling in industry, commerce and the public sector.

1.2.15 The Guidance suggests that developers contact Trade Associations, Business Organisations and other interested parties to explore CHP opportunities in the key business sectors identified. The recommended and optional contacts in the Guidance include:

- DECC – Electricity Development Consents Team;
- DEFRA – Climate and Energy: Households and Markets (CHP Team);
- CHPQA (Quality Assurance for Combined Heat and Power);

- Government Office for the Regional Planning Bodies;
- Regional Development Agencies;
- CHPA (Combined Heat and Power Association);
- The Energy Saving Trust; and
- The Carbon Trust.

In addition, the following parties were contacted:

- NHS Estates / Strategic Health Authority;
- CPI (Confederation of Paper Industries);
- HM Prisons Service: Property Services Group;
- Petroplus; and
- London Gateway / DP World.

1.3 Proposal Assessment

- 1.3.1 The Government recognises that decisions on major new power station investments, including the location and anticipated load duty of the station (e.g., base load, mid-merit, peak-opping, support to local industry, etc), will primarily be driven by the market, taking into account fiscal and other incentives now on offer for CHP. Whilst some projects are developed as CHP from the outset, it is recognised that it is not always feasible to identify and accommodate CHP at a proposed site.
- 1.3.2 To show that developers have seriously considered the CHP options for a site, the Government expects that developers include within their CHP Assessments:
- An explanation of the choice of site location;
 - A description of the exploration carried out with prospective local heat customers;
 - The results of that exploration;
 - A list of organisations contacted;
 - A description of any existing local heat use;
 - The basis for the developer's conclusion that it is not economically feasible to exploit existing local heat markets (if this is the case);
 - A description of potential future heat requirements in the area; and
 - The provisions in the proposal for exploiting potential heat demand in the future.
- 1.3.3 These points have been addressed for GEC and are presented in this CHP Assessment.

1.3.4

Table 1 indicates the location of evidence in this CHP Assessment.

TABLE 1: CHECKLIST OF INFORMATION TO BE PROVIDED IN A CHP ASSESSMENT

<i>Evidence Required</i>	<i>Location in this CHP Assessment</i>
An explanation of the choice of site location	Section 2.1
A description of the exploration carried out with prospective local heat customers	Section 2.2 / Section 2.3
The results of the exploration carried out with prospective local heat customers	Appendix A
A list of organisations contacted	Section 2.2
A description of any existing local heat use	Section 2.3 / Section 3.2
The basis for developer's conclusions	Section 4
A description of potential future heat requirements in the area	Section 3.2
The provisions in the proposal for exploiting potential heat demand in the future	Section 3.3

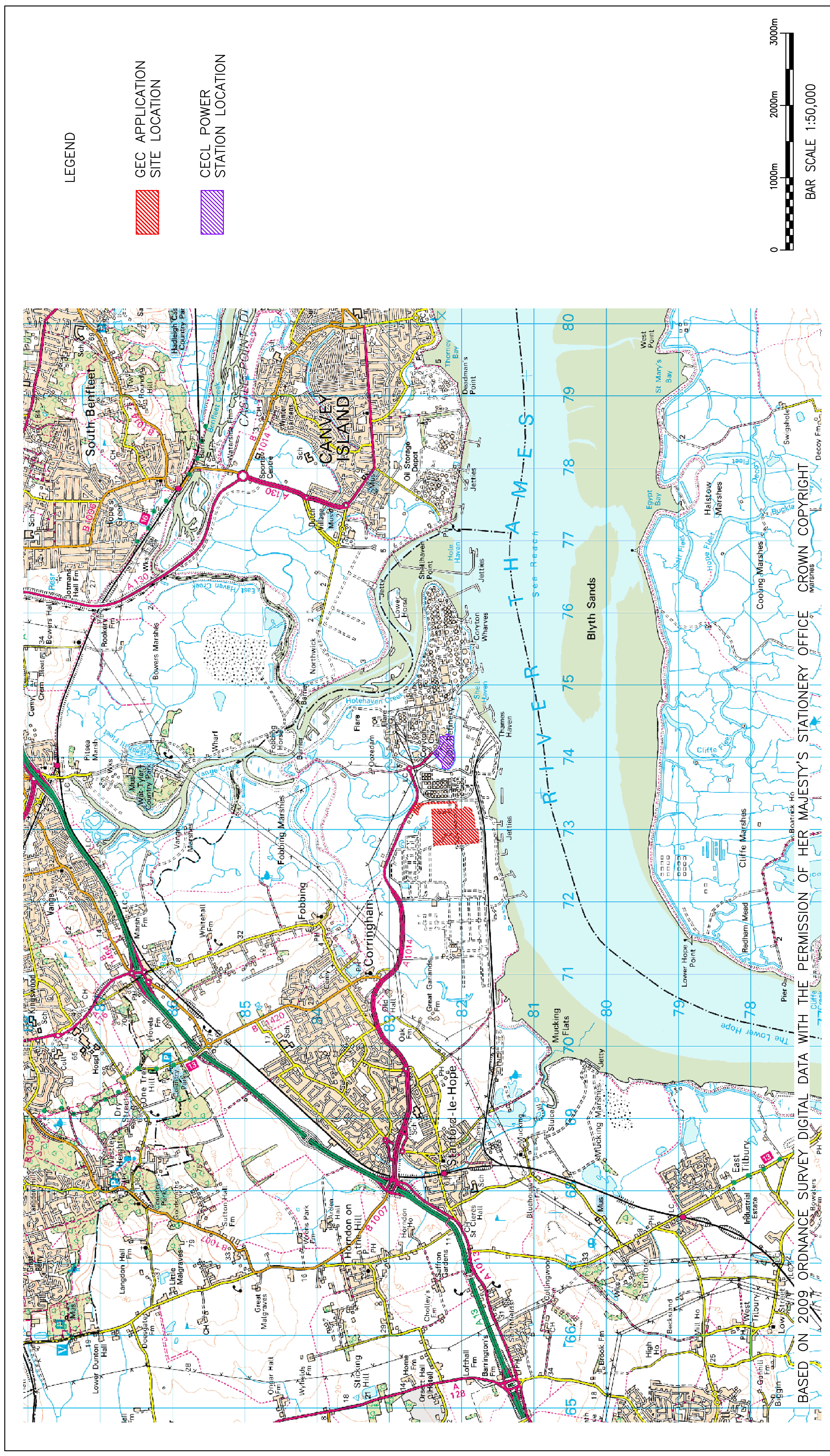
SECTION 2

CHP ASSESSMENT

2 **CHP ASSESSMENT**

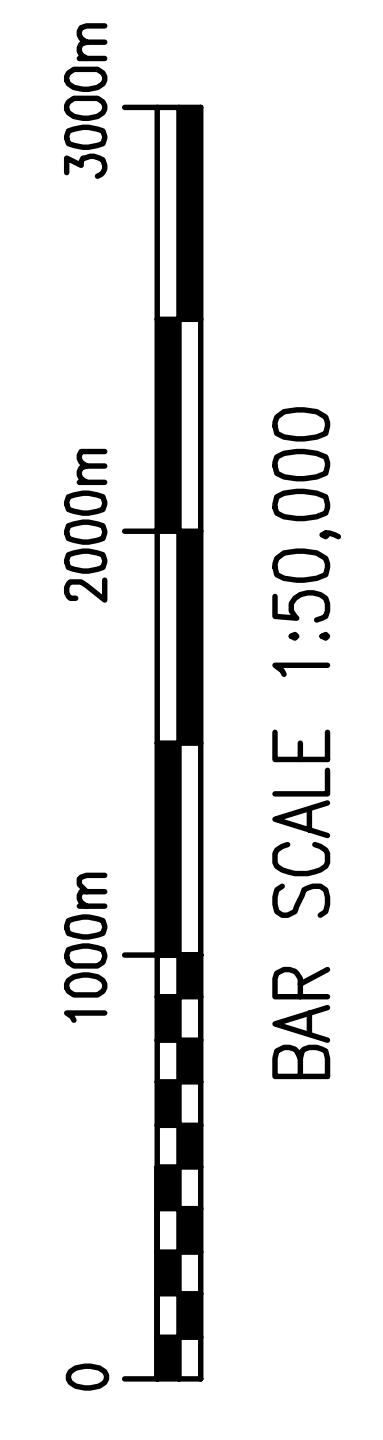
2.1 **The Site**

- 2.1.1 The GEC site, approximately 11.3 hectares (28 acres) in size, is situated on the north bank of the Thames Estuary and lies approximately 6 km east of the A13 Road. The A1014 dual carriageway (The Manorway) lies approximately 0.5 km to the north of the site and runs east to west to provide a link with the A13, which in turn links in with the M25 at Junction 30.
- 2.1.2 The nearest residential settlements are at Corringham and Fobbing which lie approximately 4 km to the west, Canvey Island which lies approximately 5 km to the east and Basildon approximately 7 km to the north.
- 2.1.3 The Ordnance Survey (OS) Grid Reference of the centre of the site is approximately 573209, 182165. The site location is shown in Figure 1.
- 2.1.4 To the east of the GEC site lies the existing 800 MWe CCGT Power Station owned and operated by Coryton Energy Company Limited (CECL Power Station), a subsidiary of the InterGen group, (700 m east) and the existing Coryton Oil Refinery (950 m east) owned and operated by Petroplus.
- 2.1.5 GEC will be located on land within the LG Development.
- 2.1.6 The LG Development will involve the redevelopment of the former Shell Oil Refinery site at Shell Haven near Corringham and Stanford-le-Hope (Essex) together with associated transport connections, reclamation of part of the foreshore of the River Thames Estuary, and dredging of higher parts of the navigation channel within the Estuary to accommodate the passage of container vessels.
- 2.1.7 Once complete the LG Development is expected to become the most advanced deep-sea container Port in the UK, capable of handling approximately three and a half million cargo containers annually. The Logistics and Business Park will serve the Port and offer some nine million square feet of advanced business space for distribution and manufacturing companies.



LEGEND

- GEC APPLICATION SITE LOCATION
- CECL POWER STATION LOCATION



BASED ON 2009 ORDNANCE SURVEY DIGITAL DATA WITH THE PERMISSION OF HER MAJESTY'S STATIONERY OFFICE CROWN COPYRIGHT

REV	DATE	DESCRIPTION	BY	CHKD	APPD	NOTES

<p>• CLIENT/PROJECT GATEWAY ENERGY CENTRE</p>	<p>• DATE 13/10/09</p> <p>• SCALE 1/50000</p> <p>• CAD REF</p>	<p>• DRAWN BY DD</p> <p>• PRODUCED BY DD</p> <p>• CHECKED EA</p> <p>• APPROVED EA</p>
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<p>• TITLE GEC APPLICATION SITE LOCATION</p>	<p>• DRAWING NUMBER FIGURE 1</p>
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Choice of Development Site

- 2.1.8 Following the consideration of a number of potential development sites, the GEC site was chosen as the preferred development site.
- 2.1.9 There are many advantages to this GEC site that make it an ideal location for power generation. These include, amongst others:
- The close proximity of the 400 kV National Grid transmission system;
 - A transmission connection date of around 2014;
 - The close proximity of the National Grid Gas National Transmission System;
 - Availability of sufficient land, including that to be used for the development of a CCGT Power Station and that to be reserved for the retrofitting of a carbon capture plant in the future;
 - Transport infrastructure which will accommodate construction traffic;
 - The close proximity of the LG Development to allow GEC to meet its expected long-term power requirements of up to 150 MWe;
 - Appropriate visual context due to the industrial nature of the immediate area including the existing CECL Power Station and the Coryton Oil Refinery, and the proposed setting on the site of the LG Development;
 - The close proximity of GEC to areas of highest national power demand;
 - Availability of technical support (if required) from the existing CECL Power Station;
 - Compatibility with Planning Policies and Local Development Plans; and
 - Opportunities to link beneficially with local industry.

2.2 Consultees

- 2.2.1 In accordance with the Guidance, PB has contacted organisations identified as being able to assist in the identification of potential CHP users.
- 2.2.2 Organisations contacted as part of this CHP Assessment included:
- DECC – Electricity Developments Consents Team;
 - DEFRA – Climate and Energy: Households and Markets;
 - CHPQA (Quality Assurance for Combined Heat and Power);
 - Government Office for the East of England;
 - East of England Development Agency;
 - CHPA (Combined Heat and Power Association);
 - The Energy Saving Trust;
 - The Carbon Trust
 - East of England Strategic Health Authority;
 - CPI (Confederation of Paper Industries);
 - HM Prisons Service: Property Services Group
 - Petroplus; and
 - London Gateway / DP World.

2.3 Consultee Responses

2.3.1 Of the 13 consultees contacted, 4 replied by letter and 2 replied by e-mail. Where responses were not forthcoming, consultees were contacted by telephone and 3 further responses were obtained. Overall 9 replies were obtained.

2.3.2 A summary of the consultees responses and advice is given in Appendix A, together with the resulting outcomes and action taken.

2.3.3 The following provides a summary of the potential CHP opportunities that were identified:

- London Gateway / DP World

Identified two potential LG Logistics and Business Park opportunities: one requiring steam; and, one proposing to operate a cold-store. However, neither opportunity has advanced to the stage where detailed information is available for use in this CHP Assessment.

Potential scenarios are modelled in Section 3 of this CHP Assessment.

- Petroplus

Identified that CHP opportunities were available. However, were unable to provide any details for modelling within this CHP Assessment. Discussions are likely to continue with Petroplus in this regard as the GEC development progresses.

- CHPQA

Recommended examination of the On-line Industrial Heat Map at <http://www.industrialheatmap.com/>

Potential scenarios obtained from the On-line Industrial Heat Map are modelled in Section 3 of this CHP Assessment.

- CHPA

Recommended examination of on-line London Heat Map at <http://www.londonheatmap.org.uk/>

The GEC site location is outside the coverage range of the London Heat Map.

- The Energy Saving Trust

Provided actual gas consumption data (based on 2007 annual consumption figures) for domestic and industrial customers within the Thurrock Local Authority area, with specific reference to 'Middle Layer Super Output Areas': Thurrock 001; Thurrock 002; Thurrock 003; and, Thurrock 005.

These areas are within 3 km radius of GEC site location.

The data is based on actual meter readings. It is expected that 95 per cent of metered gas consumption will be due to heat demand (both space heating and water heating).

Based on these assumptions, an estimate of local district heat demand of 22 MW is obtained. This is discussed further in Section 3 of this CHP Assessment.

SECTION 3

POTENTIAL USERS

3 POTENTIAL USERS

3.1 Introduction

3.1.1 Possible users of heat for incorporation into a CHP scheme include the following applications:

- Offices for heating or cooling;
- Factories, including those for paper, board mills, sugar refining, pharmaceutical, food processing, pet food processing, breweries;
- Leisure facilities and sports halls;
- Swimming pools;
- Glass houses for horticulture;
- Refrigeration stores;
- Fish farming, such as trout or eels; and
- Homes for heating.

3.1.2 In general, CHP schemes offer benefits when the heat load is large and constant throughout the year. This is typically the case with oil refineries or chemical works, which depend upon continuous processes and use large amounts of heat energy, usually as steam.

3.1.3 CHP schemes are less attractive in cases where the heat demand is seasonal or intermittent. As the climate in the UK gives a relatively short winter heating season, compared to Scandinavian or Eastern European countries, there is a general absence of significant district heating schemes in the UK. Community heating schemes in the UK are rare and have generally been associated with new build public funded high rise housing where the heating loads can be readily combined and the heat distribution piping is compact.

3.1.4 In the UK, if a satisfactory heat load exists, the potential benefits of CHP schemes can be realised with electricity being generated in direct proportion to the heat load. The size of a CHP scheme is determined by the local heat load which can be supplied at a common point.

3.1.5 For this reason the majority of CHP schemes in the UK are small (less than 5 MWe). These small units can offer very high fuel utilisation when fully supplying the heat load. However during periods when the heat load is low or absent, the electrical efficiency of these units is rather low compared to power stations.

3.1.6 In addition, experience indicates that it is unusual for a CHP scheme to be viable if the heat consumers are located far from the heat source. Whilst NPS EN-1 states a distance of 15 km, it is considered that normally the heat users would need to be within 1 to 2 km of the source.

3.2 Identified Potential Users

CHP User – LG Development

3.2.1 As mentioned previously, GEC will be located on a site in the south east of the LG Development. It is currently proposed that GEC will provide up to 150 MWe to the LG Development.

3.2.2 Additionally there is also the possibility for GEC to incorporate a CHP scheme to either supply the LG Development with heat in the form of steam or hot water for heating or refrigeration purposes.

3.2.3 Whilst, as discussed above, the actual requirements of the opportunities identified at the LG Development are not available at the time of writing this CHP Assessment, PB has undertaken studies investigating the impact of the provision of CHP to the LG Development site on the performance of GEC. The studies used Thermoflow Proprietary Software to calculate the base load performance of GEC based on the supply of steam at 10 MWth at 5 bar a taken from the Cold Re-Heat (CRH) (LG Development CHP Requirements).

3.2.4 Table 2 provides a summary of the modelling undertaken at design ambient conditions¹ based on the assumed LG Development CHP Requirements. It should be noted that for these CHP options considered, a connection can be incorporated in the design of GEC without significant changes to the layout / requirements for additional space / land.

TABLE 2: EFFECT OF LG DEVELOPMENT CHP REQUIREMENTS ON PERFORMANCE OF GEC (NOT CONSIDERING SUPPLEMENTARY FIRING)

	<i>Power Only No CHP (MWe)</i>	<i>Power Only CHP (MWe)</i>
CCGT Vendor A	845	842
CCGT Vendor B	876	873
CCGT Vendor C	922	920
CCGT Vendor D	846	843
Summary / Average	872.3	869.5

3.2.5 Table 2 indicates that delivering the assumed LG Development CHP Requirements would result in an approximate loss of 2.8 MWe from the overall electricity production of GEC.

3.2.6 In addition to the above modelling, supplementary firing has been considered to provide the Thermal Heat required for the assumed LG Development CHP Requirements. Supplementary firing is often used in CHP applications to provide the necessary flexibility. Similar to the above, Table 3 provides a summary of the studies undertaken for supplementary firing at design ambient conditions based on the assumed LG Development CHP Requirements.

TABLE 3: EFFECT OF LG DEVELOPMENT CHP REQUIREMENTS ON PERFORMANCE OF GEC (CONSIDERING SUPPLEMENTARY FIRING)

	<i>Power and Supplementary Firing No CHP (MWe)</i>	<i>Power and Supplementary Firing CHP (MWe)</i>
CCGT Vendor A	935	932
CCGT Vendor B	966	963
CCGT Vendor C	1012	1010
CCGT Vendor D	936	933
Summary / Average	962.3	959.5

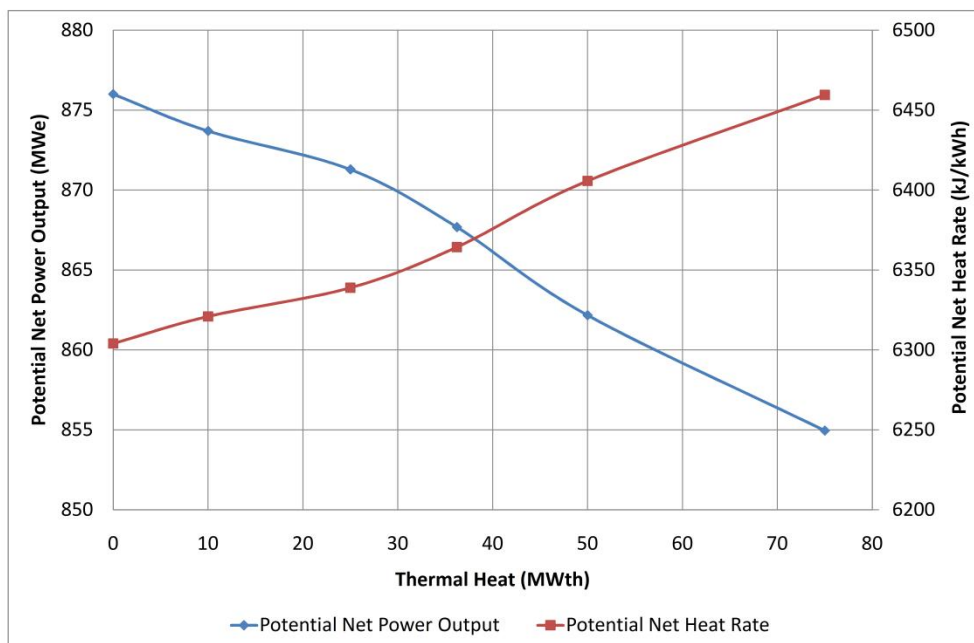
3.2.7 Table 3 indicates that delivering the LG Development CHP Requirements would also result in an approximate loss of 2.8 MWe from the overall electricity production of GEC.

¹ Ambient Temperature 10°C; Barometric Pressure 1.013 bar a; Ambient Relative Humidity 80 per cent; Cooling Technology used is Air Cooled Condensers (ACCs); and, GEC Site Level is 4 m Above Ordnance Datum (AOD).

3.2.8 Further to the above modelling, the studies also provided an indicative guide to the impact that a larger CHP requirement would have on the Potential Net Power Output and the Potential Net Heat Rate. This considered taking steam from various sources (mainly the Low Pressure (LP) System and Intermediate Pressure (IP) System) depending on the Thermal Heat CHP Requirements.

3.2.9 The results of this modelling are summarised in Insert 1 below.

INSERT 1: IMPACT OF CHP ON PLANT PERFORMANCE



3.2.10 Insert 1 demonstrates that the effect of increasing the Thermal Heat required for CHP results in a decrease in Potential Net Power Output. Therefore, based on Insert 1 it can be seen that without Thermal Heat extraction, the Potential Net Power Output from GEC would be approximately 876 MWe. With a Thermal Heat extraction of approximately 75 MWth, the Potential Net Power Output from GEC would decrease to approximately 855 MWe.

CHP User – Identified from the Industrial Heat Map

3.2.11 As required by the Guidance and as per the recommendations from the various Consultee replies, the Online Industrial Heat Map has been examined for potential opportunities in the area of the GEC site. The results of this examination are presented in Appendix B.

3.2.12 Using the parameters in Table 4 and Table 5, the effect of incorporating CHP schemes to the CHP opportunities identified by the Online Industrial Heat Map to GEC has been estimated.

TABLE 4: CHP USER (FORD MOTOR COMPANY - DUNTON) PARAMETERS AND EFFECTS

CHP User	Details
Ford Motor Company - Dunton	<ul style="list-style-type: none"> Heat demand – 5.6 MWth Steam requirement – 8.8 t/h

3.2.13 The loss of electrical output from GEC would be 1.5 MWe. This loss would represent the main operational cost of providing the heat.

TABLE 5: CHP USER (BASILDON HOSPITAL) PARAMETERS AND EFFECTS

<i>CHP User</i>	<i>Details</i>
Basildon Hospital	<ul style="list-style-type: none"> Heat demand – 3.6 MWth Steam requirement – 5.7 t/h

3.2.14 The loss of electrical output from GEC would be 1.2 MWe. This loss would represent the main operational cost of providing the heat.

CHP User – Local Community Heating Programme

3.2.15 The opportunity to incorporate a local community heating programme has also been included in this CHP Assessment. This opportunity has been identified by The Energy Saving Trust. However, it should be noted that there are no confirmed plans for the purposes of this CHP Assessment.

3.2.16 Estimates of typical heat load requirements for large community heating programmes have been assumed. For a development with circa 5000 homes, a distributed energy (DE) and distributed heat (DH) system would hold the most potential for delivering the required the energy demands. For a development this large, it would be expected that the electrical load would peak at around 14 MWe and the heat load would peak at around 25 MW. This would cover the estimate of the local district heat demand (approximately 22 MW) obtained from the information provided by The Energy Saving Trust.

3.2.17 As the peak heat load represents an extreme and rare winter condition, a community heating programme would generally be sized at 30 per cent of the peak heat load, with local heat stores / back-up gas fired condensing boilers to service the peak demands. It is considered therefore that a community heating scheme of approximately 7.5 MW of heat load is more appropriate.

3.2.18 Typical infrastructure required for a district heating scheme would involve a hot water delivery and a return pipe. Temperatures are typically of the order of 90°C delivery and 50°C return, however the temperature of the supply of water (or steam) can be changed at the source (that is at GEC) to suit the eventual end-user requirements.

3.2.19 Using the parameters in Table 6, the effect of installing a community heating programme to GEC has been estimated.

TABLE 6: CHP USER (LOCAL COMMUNITY HEATING PROGRAMME) PARAMETERS AND EFFECTS

<i>CHP User</i>	<i>Details</i>
Local Community Heating Programme	<ul style="list-style-type: none"> Estimated average heat demand* – 7500 kW Minimum steam requirement – 12 t/h Maximum heat demand – 25 000 kW Maximum steam requirement – 39 t/h

* Based on 30 per cent of the peak heat load.

3.2.20 The loss of electrical output from GEC would range between 1.8 to 4.8 MW, depending on the actual heat load supplied. This loss would represent the main operational cost of providing the heat.

Potential Future CHP Users

- 3.2.21 Further users could also be identified or indeed forthcoming in the event that GEC is consented and moves towards the detailed design stage. Given the size and nature of GEC, successful consenting may be required before a user may show a serious interest in the use of heat in the area.
- 3.2.22 GECL will engage in ongoing consultation with local businesses / industries and other interested parties in an attempt to identify any possible future CHP opportunities at the earliest stage.

3.3 Proposed Design of GEC Incorporating CHP Modifications

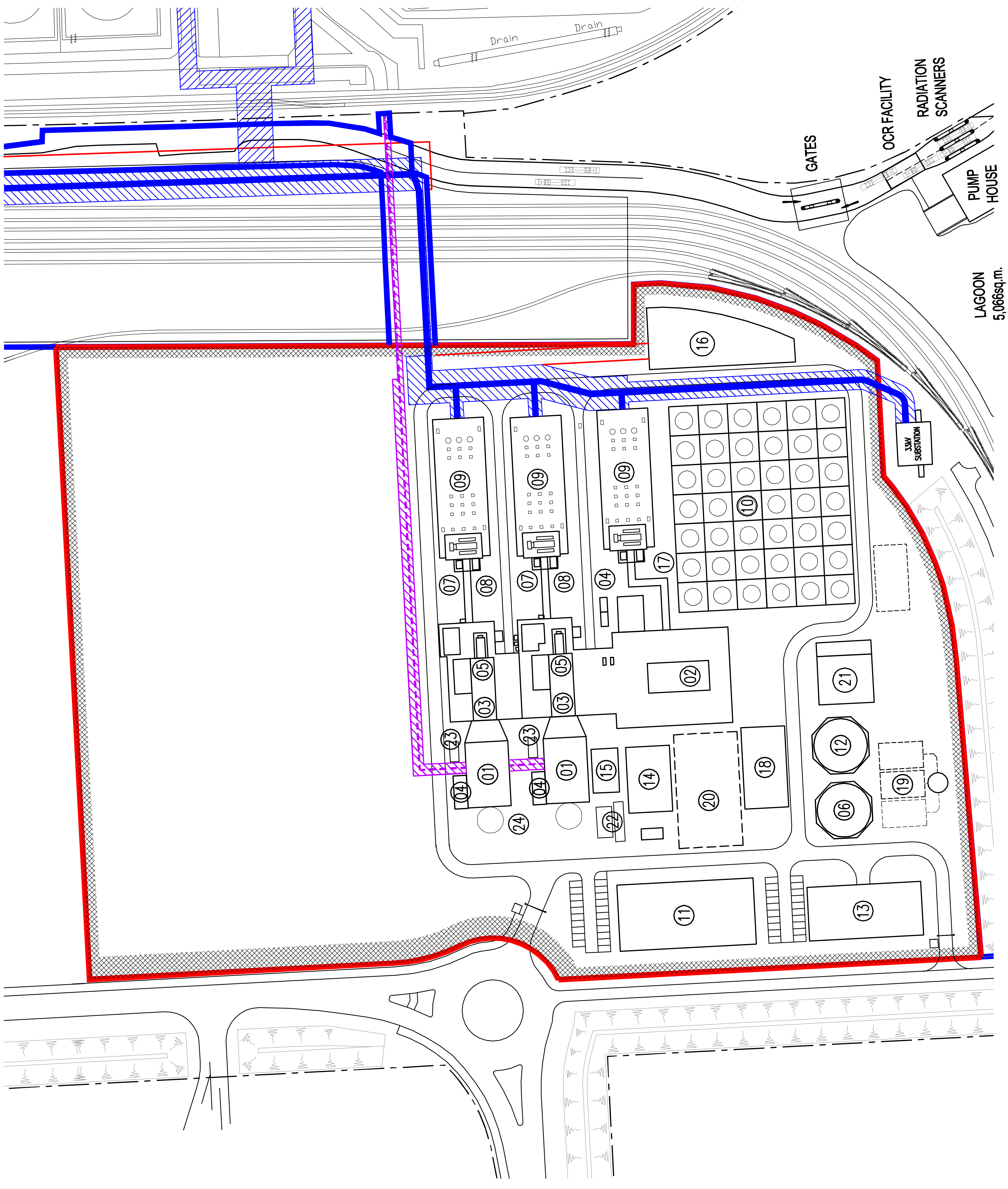
- 3.3.1 To allow for future CHP development, the GEC design will incorporate suitable modifications which will allow for exports of heat in the event that a suitable user is identified.
- 3.3.2 For the smallest heat loads (between approximately 2 to 5 MW) the most likely solution would be to use steam extraction to heat a hot water heating system. Such a system could be supplied by the auxiliary boiler when GEC is shut down, such as for periods of annual maintenance.
- 3.3.3 For larger industrial process heat loads (up to approximately 30 MW) and district heating schemes a possible solution would involve extracting steam from the steam turbine. Suggested modifications for this solution would include two flange connections to extract CRH, or LP / IP steam at modest extra cost, providing the steam conditions are suitable for the user. Cross connections would be required to assure constant availability of steam during unit outages. For any more significant heat extraction for full scale CHP, a bespoke design would be required for equipment downstream of the gas turbine.
- 3.3.4 Depending on the reliability of the steam host, there may also be a need for GEC to be designed such that it is 'CHP Ready'. The design of GEC may therefore allow for the inclusion of standby auxiliary boilers to ensure there could be a steam supply available at all times.
- 3.3.5 Figure 2 illustrates the provisions which have been made in the design of GEC such that it is 'CHP Ready'. These provisions have included space for three standby auxiliary boilers to accommodate any significant CHP requirements, thus securing a reliable steam supply for any times when GEC is not available. Additionally, there is space for additional water tank capacity and a sufficiently oversized water treatment plant in the case where a significant open loop CHP scheme (where the steam / water used is not returned) is identified. However, it can normally be expected that when steam or hot water is supplied off-site to other users, the condensate or cold water would be returned to the GEC site in a closed cycle. Therefore, there would be flow and return pipes required. All piping would be well insulated and clad to minimise heat losses.

KEY

-  STEAM/HOT WATER EASEMENT
-  POWER EXPORT EASEMENT

LEGEND

- 01 HEAT RECOVERY STEAM GENERATOR
- 02 STEAM TURBINE AREA
- 03 GAS TURBINE AREA
- 04 CO2 LOW PRESSURE STATION
- 05 GAS TURBINE INLET FILTER
- 06 DEMINERALIZED WATER STORAGE TANK
- 07 CTG MAIN TRANSFORMERS
- 08 STATION SERVICE TRANSFORMER
- 09 SWITCHYARD
- 10 AIR COOLED CONDENSER
- 11 WAREHOUSE/MAINT./ADMIN
- 12 WATER/ FIREWATER STORAGE TANK
- 13 WATER TREATMENT BUILDING
- 14 FIN FAN COOLERS
- 15 AUXILIARY BOILER
- 16 GAS CONDITIONING FACILITY
- 17 STG MAIN TRANSFORMER
- 18 CONTROL BUILDING
- 19 AUXILIARY BOILER FOR FUTURE CHP
- 20 POSSIBLE LAYDOWN/OPEN
- 21 GAS COMPRESSOR
- 22 AMMONIA OFFLOADING/STORAGE
- 23 AMMONIA INJECTION SKID
- 24 STACK



REV	DATE	DESCRIPTION	BY	CHKD	APPD	NOTES

CLIENT/PROJECT	GATEWAY ENERGY CENTRE
DATE	04/02/10
SCALE	1:2000 @ A3
CAD REF	
DRAWN BY	DD
PRODUCED BY	DD
CHECKED	GM
APPROVED	



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TITLE
**GEC INDICATIVE DESIGN
 INCORPORATING CHP
 FEATURES**

SECTION 4

CONCLUSIONS

4 CONCLUSIONS

- 4.1.1 A CHP Assessment has been undertaken by PB on behalf of GECL to support a consent application for GEC.
- 4.1.2 GEC will be located on land within the London Gateway Port / London Gateway Logistics and Business Park development, collectively called the LG Development. The LG Development, promoted by DP World, is currently in the early stages of construction.
- 4.1.3 Once operational GEC will provide up to 900 megawatts electric (MWe) of electrical generation capacity. This will include the provision of up to 150 MWe to the LG Development, which is expected to meet its long term requirements.
- 4.1.4 In Europe, CHP schemes are generally viable only where a substantial and reasonably constant heat load exists close to the electrical generation site.
- 4.1.5 At this stage in the development process, after the appropriate investigations, the CHP Assessment has identified a number of potential heat users in the area who might be able to take advantage of the construction of GEC.
- 4.1.6 GECL will engage in ongoing consultations with the identified potential heat users, in addition to local businesses / industries and other interested parties, in an attempt to identify any CHP opportunities at the earliest stage in the development of GEC with the aim of incorporating CHP requirements into the final design.
- 4.1.7 Further users could also be identified or indeed be forthcoming in the event that GEC is consented and moves towards the detailed design stage. Given the size and nature of GEC, successful consenting may be required before a user may show a serious interest in the use of heat in the area.
- 4.1.8 To allow for future CHP development, the design of GEC will incorporate features which, with suitable modifications, will allow for exports of heat in the event that further suitable users are identified. As a result, consultation will continue between GECL and local businesses / industries and other interested parties in an attempt to identify any future CHP opportunities.

APPENDIX A

SUMMARY OF RESPONSES RECEIVED

SUMMARY OF RESPONSES RECEIVED

Consultee	Advice	Outcome/Action Taken
LG Development / DP World	<p>Identified two potential LG Logistics and Business Park opportunities.</p> <p>One requiring steam and one proposing to operate a cold-store.</p> <p>However, neither opportunity has advanced to the stage where detailed information is available.</p>	<p>Modelling undertaken based on potential estimated steam requirements. See Section 3.</p> <p>Discussions to continue throughout the development of GEC with the aim of incorporating any requirements into the final design for GEC.</p>
Petroplus	<p>Identified that potential CHP opportunities were available. However, were unable to provide any details for modelling in this CHP Assessment.</p> <p>Ongoing discussions are likely to continue as the GEC development progresses.</p>	No further action taken.
CHPQA	<p>Examine the on-line Industrial Heat Map at http://www.industrialheatmap.com/</p>	<p>Results of examination can be seen in Appendix B.</p> <p>Modelling undertaken based on potential estimated steam requirements. See Section 3.</p>
Government Office for the East of England (Go East)	<p>At present can identify no potential existing CHP opportunities.</p> <p>However, identify that the LG Development promoted by DP World may hold potential future CHP opportunities.</p>	Consultation has taken place regarding the LG Development with DP World.
CHPA	<p>Examine the on-line London heat map at http://www.londonheatmap.org.uk</p>	<p>The GEC site location is outside the coverage range of the London Heat Map.</p> <p>No further action taken.</p>
The Energy Saving Trust	<p>Provided actual gas consumption data (based on 2007 annual consumption figures) for domestic and industrial customers within Thurrock Local Authority area, via:</p> <p>http://www.decc.gov.uk/en/content/cms/statistics/regional/mlsoa_2007/mlsoa_2007.a.spx</p>	<p>The website identified the 'Middle Layer Super Output Areas which were within 3 km of the Gec site. These were "Thurrock 001"; "Thurrock 002"; "Thurrock 003"; and, "Thurrock 005"</p> <p>http://www.neighbourhood.statistics.gov.uk/dissemination/LeadDownNav.do?a=7&b=276845&c=thurrock&d=13&e=7&q=405874&i=1001x1003x1004&m=0&r=1&s=1265632652506&enc=1&sampleAreald=280471</p> <p>The data is based on actual meter readings. It is expected that 95 per cent of metered gas consumption will be due to heat demand (both space heating and water heating).</p> <p>Based on these assumptions, an estimate of local district heat demand in the vicinity of GEC of 22 MW is obtained.</p> <p>Modelling undertaken based on potential</p>

**APPENDIX A
SUMMARY OF RESPONSES RECEIVED**



Consultee	Advice	Outcome/Action Taken
		estimated steam requirements. See Section 3.
The Carbon Trust	At present can identify no potential CHP opportunities.	No further action taken.
Confederation of Paper Industries	At present can identify no potential CHP opportunity.	No further action taken.
East of England Strategic Health Authority	At present can identify no potential CHP opportunities. Further advise that there are no potential CHP opportunities in the foreseeable future.	No further action taken.

APPENDIX B

INDUSTRIAL HEAT MAP RESULTS

APPENDIX B
INDUSTRIAL HEAT MAP RESULTS



INDUSTRIAL HEAT MAP RESULTS

Gateway Energy Centre	SS17 9LP	573209	182165			
Description	Postcode	X	Y	Distance to Site (km)	CHP	Heat Load (MWth)
Data for Post Code SS17 9LP						
No data exists						
Data for Post Code SS17						
BP Oil UK Ltd (Petroplus)	SS17 9LL	574400	182300	1.20	Yes	0
Data for Post Code SS						
Ford Motor Company - Dunton	SS15 6EE	566713	189665	9.92		5.6
Basildon Hospital	SS16 5NL	569900	187100	5.94		3.6