Hudson Energy Centre Specified Generator Permit Application

Non-Technical Summary

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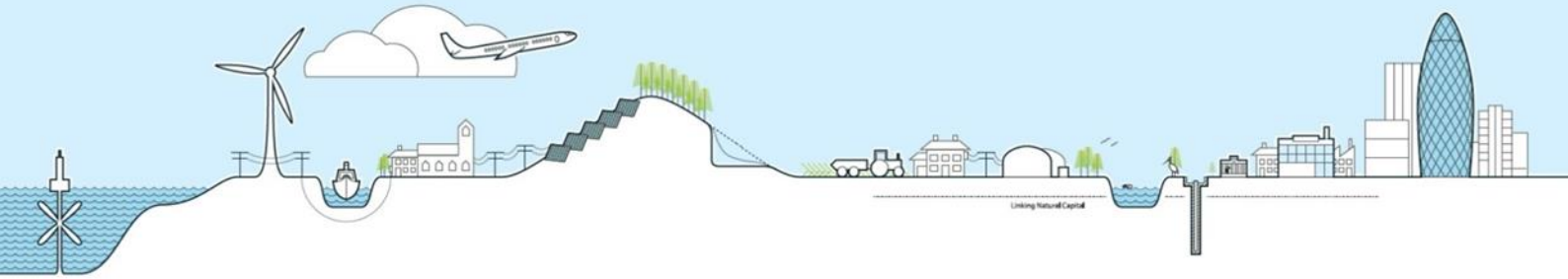
Prepared By

aardvark
environment matters



Project Quality Control Sheet

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Signature			
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Location: **2 Engineers Way, Wembley, Middlesex, HA9 0JS**

Grid Reference: **519607,185795**

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1 Introduction

This application is for a Specified Generator Environmental Permit for the installation at the Hudson Energy Centre on behalf of Wembley E03 Parking Limited.

An application for an Environmental Permit for this site is required under Schedule 25A Medium Combustion Plant and Schedule 25B (Specified Generator) under the Environmental Permitting (England and Wales) (Amendment) Regulations 2018[1]. The operation does not meet with any of the published Standard Permit Rules and therefore a bespoke permit is applied for.

1.1 Site Location

The Hudson Energy Centre is located approximately 200m north-east of Wembley Stadium at 2 Engineers Way, Wembley, Middlesex, HA9 0JS.

1.2 Operations Overview

The Hudson Energy Centre serves as a site-wide heat network which will provide thermal energy to approximately 5,200 dwellings and approximately 40,000m^2 of mixed-use space. Heating will be provided through a combination boilers and combined heat and power (CHP) reciprocating engines. The CHP engines will also generate electricity which will be used on-site or exported to the distribution network for use in the local area.

The facility comprises two CHP engines and three boilers all fuelled by natural gas. The CHP engines each have a net thermal input of 3.617MW$_{th}$ per generator and each boiler has a net rated thermal input of 9.30MW$_{th}$. The aggregated rated thermal input is 35.1MW$_{th}$.

The net rated thermal input is the lower heating value of the natural gas used as Maximum Continuous Rating (MCR) of the plant (that is, the maximum output from the plant that the plant is capable of generating if running continuously for a one year period).

The CHP engines are each expected to operate for up to 8,000 hours per year (around 91% of the time) to provide base load heat and electricity to the site.

Each boiler will operate for up to 1,333 hours per year. Boiler 3 is planned to be standby only and will only operate if either of the other boilers is not operating (i.e. it is not planned for more than two boilers to operation simultaneously).

The energy centre incorporates a Selective Catalytic Reduction (SCR) system to reduce the concentration of nitrogen dioxide in the exhaust gas stream. This includes the injection of a urea based solution into the exhaust gas stream, and the use of a catalyst to promote a chemical reaction to convert the nitrogen oxides into, principally, water and nitrogen. The combustion gases will be exhausted from individual, vertical stacks from each item of plant, all terminating at 90m above ground level.

The land areas within the overall development are at different stages of design, build and completion. The Energy Centre forms part of a District Heat Network for a proportion of the Wembley Park Regeneration scheme. The grid coordinates for the stack emission points are provided below:

[1] 2018 No. 0000, Environmental Protection, England and Wales, The Environmental Permitting (England and Wales) (Amendment) Regulations 2018

No.	Grid References (X and Y coordinate)
CHP 1	X- 519602; Y-185789
CHP 2	X- 519601; Y- 185788
Boiler 1	X- 519602; Y- 185787
Boiler 2	X- 519604; Y- 185788
Boiler 3	X- 519603; Y- 185788

Table 1: Stack emission grid coordinates

2 Environmental Permit Application

2.1 Requirement to hold an environmental permit

An environmental permit application is required for the energy centre, as the combustion equipment is designated as New Medium Combustion Plant, and the two CHPs, as electricity generating equipment, collectively form a Specified Generator.

2.1.1 Medium Combustion Plant Directive

The Medium Combustion Plant Directive (MCPD) requires all new combustion plant with a net rated thermal input of 1 – 50MW_{th} to hold an environmental permit, and applies emission limits values which the plant must adhere to depending on the combustion technology and fuel. Medium Combustion Plant (MCP) permits apply an emission limit value (ELV) on the concentration of nitrogen oxides (a combination of nitrogen oxide and nitrogen dioxide) emitted to the atmosphere from the combustion activity, and establish procedures for the monitoring of the regulated emissions to ensure ongoing compliance, by way of condition on the permit.

2.1.2 Specified Generators

The Specified Generator Permit requirements were introduced alongside the MCPD but only apply to combustion activities used for the purpose of generating electricity. Therefore, in relation to this application, only the CHP engines (and not the boilers) are part of the Specified Generator. As both CHPs are based upon the same site and have the same operator, under the terms of the Environmental Permitting Regulations they are considered as a single Specified Generator.

2.1.3 Permit Conditions

Similarly to the MCPD, the Specified Generator Permit requires operators to monitor emissions and adhere to an emission limit value (ELV) for nitrogen oxides.

However, in this case the Specified Generator permit requirements fall within those already established by the MCPD. Therefore the stricter standards of the Medium Combustion Plant will apply.

Accordingly the permit will condition the site to adhere to the following conditions:-

- The emission of nitrogen oxides from the CHP engines will not exceed 95mg/Nm^3([2])
- The emission of nitrogen oxides from the boilers will not exceed 100mg/Nm^3[(3)]

Emissions of nitrogen dioxide and carbon monoxide must be monitored and reported to the Environment Agency every three years, and within 4 months of (the earlier of) date of first operation or date of permit issue.

Further to above permit requirements, CHP plants and boilers in London are required to meet the Greater London Authority Sustainable Design and Construction Supplementary Planning Guidance

[2] Reference Condition 273.15K Temperature, 101.3kPa Pressure and 15% O_2 content

[3] Reference Condition 273.15K Temperature, 101.3kPa Pressure and 3% O_2 content

(SPG) (GLA, 2014) emission limits. Gas-fired boiler plants must achieve an emission limit of <40 mg/kWh, which approximates to an emission of 44.0 mg/Nm^3 at 3% O_2.

2.2 Environmental Permit Application

2.2.1 Permit Application Documents

The full application includes the following documents:

- Hudson Energy Centre Non-Technical Summary
- Environmental Permit Application Forms – Parts A, B2.5 and F1
- Air Quality Assessment (ref. J3936) and associated model files, completed by Air Quality Consultants Ltd.[4]

A complex bespoke permit application has been prepared as the operation does not fit within any of the standard permit rules sets published by the Environment Agency. The operation is deemed to fall outside of the operational boundaries that are included in the Specified Generator Screening Tool, as the site is located within an Air Quality Management Area (AQMA). Therefore, a detailed air quality assessment has been prepared and this has been submitted alongside this application and is accompanied by the associated modelling files.

2.3 Air Quality Assessment

Air quality modelling has been undertaken by Air Quality Consultants Ltd (AQC) in accordance with the relevant guidance provided by the Environment Agency. It includes assessment of the impacts of both local human and ecological receptors, with particular focus on nitrogen dioxide (NO_2) as this is the principal pollutant of concern to human health from natural-gas fuelled generators and is the pollutant upon which the MCPD and Specified Generator Permitting requirements focus on. The main air pollutants of concern with respect to ecological receptors are nitrogen oxides, nitrogen deposition and acid deposition. In addition, since the CHP plant will operate with Selective Catalytic Reduction (SCR) technology, consideration of ammonia (NH_3) emissions is also required.

The air quality assessment includes a dispersion model, which predicts the spread of the emission plume from the exhaust stacks over the surrounding area, based upon a range of contributory factors including emission properties, operating timescales, prevailing meteorological conditions, the height of the stack, and the local topography.

The concentration of the main polluting substances in the ambient air at relevant receptors can then be estimated, and compared to the air quality standards set out in the relevant legislation and/or regulatory guidance. Receptors can be human or ecological features which could be sensitive to the chemical compounds within the emission plume. Identification of the relevant receptors is a key part of the emission modelling. Further consideration of the pertinent receptors in this case is provided below.

[4] Air Quality Consultants, Air Quality Assessment for Specified Generator Permit: Hudson Energy Centre, Wembley, December 2019

2.3.1 Receptors

Table 2 below provides details of the receptors of note in the air quality modelling for this application. Receptors are categorised into two groups; human and ecological: Human receptors are those which are members of the public may be present; and ecological receptors are those benefitting from a designation to protect an ecological consideration.

The air quality assessment differentiates between roadside receptors and non-roadside receptors, as roadside receptors are anticipated to be subject to localised higher background levels due to the exhaust emissions from vehicles. Also of importance to this application is the height of surrounding buildings, as many of the surrounding residential receptors are substantially above ground level. These are modelled as "specific receptors" in this application. The nearest non-roadside as well as roadside human health receptors is located within 2 Engineers Way development. The ground-floor properties are categorised as a roadside receptor, whilst the top floor residences closest to emission points, are non-roadside receptors, due to their height above ground-level.

The modelling work conducted by AQC has identified one Site of Special Scientific Interest (SSSIs) within a 2km radius of the energy centre.

Receptor / Feature	Description	Distance from Stack
Nearest roadside human receptor	Residential property at ground-floor level within 2 Engineers Way development	90m
Nearest non-roadside human receptor	Residential property at top floor level within 2 Engineers Way development	~5m
Nearest SAC, SPA, Ramsar site or SSSI	Brent Reservoir SSSI	1,660m

Table 2: Distance to Receptors

2.3.2 Air Quality Standards

2.3.2.1 Human Health Air Quality Standards

The Air Quality Standards (AQS) which are relevant for human health impacts are set out in Table 3 and are accompanied by acceptable exceedance criteria. There are derived from the Ambient Air Directive (AAD).

Pollutant	Averaging Period	AQS (µg/m^3)	Acceptable Exceedance Criteria
NO_2	Annual Mean	40	Zero exceedances
	1-hour	200	Not to be exceeded more than 18 one hour periods per year.

Table 3: Human Health Air Quality Standards

2.3.2.2 Ecological Receptors Air Quality Standards

Table 4 sets out the relevant critical levels and critical loads for the designated ecological sites in the study area. Unlike the values for human health assessment, these are not derived directly from the Ambient Air Directive or UK Air Quality Strategy (AQS) Objectives. These are derived from the Air Pollution Information System (APIS) for the tolerable thresholds for each pollutant for the relevant habitat type.

Site	Maximum 24-hour Mean NOx	Annual Mean			
		NOx	Nutrient Nitrogen Deposition	Acid Deposition	Ammonia
Brent Reservoir SSSI	75 µg/m^3	30 µg/m^3	5 kgN/ha/yr	N/a	1 µg/m^3
Fryent Park LNR			10 kgN/ha/yr	2.068 keq/ha/yr	

Table 4: Designated Ecological Sites Air Quality Standards

2.3.3 Background Conditions

The background conditions at each of the receptors is taken from the background annual mean NO_2 concentrations in the study area taken from Defra's published maps for 2019 and are shown in Figure 1 below. It also shows the annual mean NO_2 concentrations in the study area as measured by the London Borough of Brent in 2017, which is the most recent year for which the Council has published a full set of measurements.

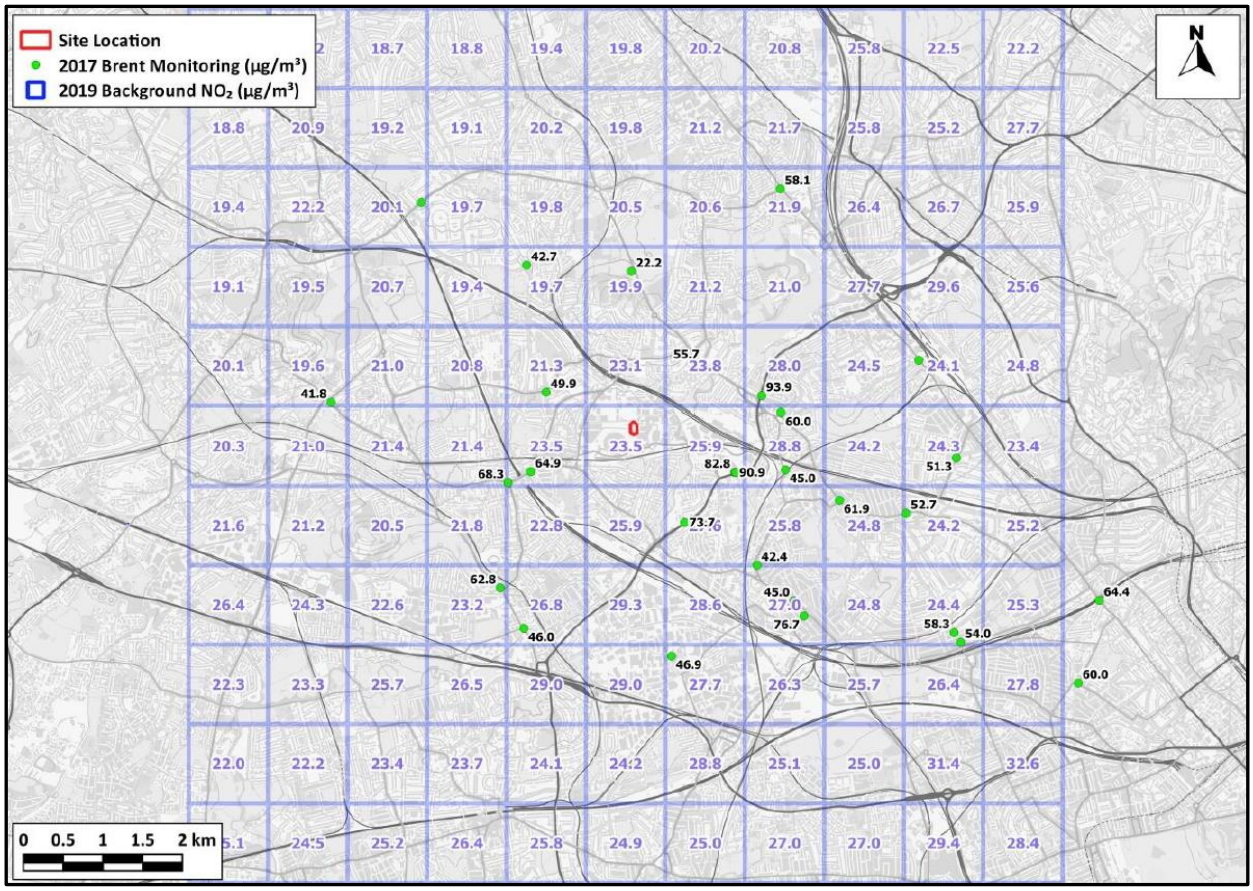

Figure 1: Defra's Predicted and Measured NO_2 Background Concentrations

2.3.4 Modelling Methodology

In this assessment a dispersion model has been used to predict the potential air quality impacts at the location of the above detailed receptors. The concentration of an air pollutant at a given place is a function of a number of variables, including the emission release parameters, the distance of the receptor from the source, and the atmospheric conditions.

The emission release parameters include variables such as fuel consumption, exhaust flow rate, temperature stack diameter and stack. The stacks have been entered into the model as five individual point sources, and then combined into two sources (type of source, location, height, flow rate etc.).

The atmospheric conditions include meteorological conditions (wind speed, direction, temperature etc.), atmospheric chemical reactions, terrain effects, buildings and surface roughness. Hourly sequential meteorological data from RAF Northolt in Ruislip has been used to inform on prevailing weather conditions likely to be present for the energy centre location.

The study area encompasses a range of land types, each with different surface roughness which will impact on air flow and the dispersal of the plume from the energy centre. Variable surface roughness has been used to represent the spatial variation of the surface roughness over each land type. Local terrain has been included within the model based on OS Terrain 50 data.

The assessment progresses in a step by step basis, in accordance with the Environment Agency guidance, to screen out impacts when it can be demonstrated that they do not present a risk against the Air Quality Standards (set out in Table 3 and 4).

The emissions are first modelled as a Process Contribution (PC) from the site, which is compared against a percentage of the relevant short-term and long-term air AQS.

Where both the PC is below 10% of the short-term (24 hour) AQS and 1% of the long-term AQS, the impact at a given receptor may be assessed as insignificant, and no further assessment is required.

Where the PC exceeds 10% of the short-term (24 hour) AQS or 1% of the long-term AQS, the assessment must advance to the next stage.

This is to consider the PC in addition to the background concentration to determine the Predicted Environmental Concentration (PEC) of the pollutant in ambient air conditions. If the PEC is determined to exceed an Air Quality Standard as a result of the addition of the PC this may represent an unacceptable impact.

2.3.5 Modelled Process Contributions

The model has been run assuming constant operation and has been based on the worst-case operational scenarios with respect to potential air quality impacts. Annual mean Process Contributions (PCs) have then been reduced to account for the fact that each CHP plant will not operate for more than 8,000 hours per year, and that each boiler will not operate for more than 1,333 hours per year. The table below shows the emission concentrations for the CHP generators when they are operating with SCR. No SCR technology is required for the boilers to meet the specified emission concentrations.

Point Source	Modelled Release Emission Parameters		
	CHP 1 and 2	Boiler 1 and 2	Boiler 3
NOx Emission Rate (mg/Nm^3) (at 15% O_2)[5]	18.6	13.0	14.9

Table 5: Modelled Release Emissions Parameters

2.3.6 Results for Ground Level Human Health Receptors

The modelled results indicate the maximum annual mean NO_2 PC at any location across the modelled grid of ground-level (1.5m above ground level) receptors is 0.10µg/m3, equivalent to 0.2% of the long term AQS. The maximum 1-hour mean NO_2 PC at any location across the modelled grid of receptors is 6.7µg/m^3, equivalent to 3.4% of the short term AQS. There are, therefore, no locations where the screening criterion is exceeded at ground level.

2.3.7 Results for Specific Receptors

The modelled results indicate the annual mean PC is less than 1% of the AQS and can, therefore, be considered insignificant. The short-term PC, however, exceeds 10% of the AQS, thus it is necessary to consider the Predicted Environmental Concentration (PEC). The short-term PEC is just 36.1% of the AQS, thus it is clear that the AQS will not be exceeded as a result of the emissions from the energy centre.

2.3.8 Results for Designated Ecological Sites

The modelled results indicate the maximum PCs at the designated ecological sites are all less than the screening criterion; there is no need to present PECs. The operation of the SCR technology has the potential to be a source of NH_3 through the dosing of reagents in order to reduce the NO_x emissions. Therefore nitrogen and acid deposition on sensitive ecological habitats were also modelled.

The modelled results indicate that so long as the long-term NH_3 emission rate is less than 12.0 mg/Nm^3 (at 15% O_2), the assessment has demonstrated that the maximum PCs will be less than 1% of the long-term AQS.

2.3.9 Summary of Air Quality Impacts

The outcomes from the modelling and assessment demonstrate that:

- There is no risk that the annual mean NO_2 AQS will be exceeded as a result of the facility, as the PCs, both at any location on the modelled grid and at any discrete receptor, are less than 1% of the AQS.
- There is no risk that the 1-hour mean NO_2 AQS will be exceeded as a result of the facility. The maximum 1-hour mean PEC at a relevant receptor is 36.1% of the AQS.

[5] Boiler emissions reported at 13.0mg/Nm^3 and 14.9mg/Nm^3 at a 15% O_2 reference condition are equivalent to 39.4mg/Nm^3 and 44.9mg/Nm^3 at a 3% O_2 reference condition

- The PCs will be less than 1% of the long-term AQS and less than 10% of the short-term AQS at Brent Reservoir SSSI, and less than 100% of the two Standards at the Fryent Country Park LNR. The EA guidance is thus that these PCs are not significant.
- It is concluded that the air quality impacts of the facility will be not significant.

3 Supporting Information

3.1 Part B2.5 Supporting Information

The following table is supplied in accordance with the information required by Part B2.5 Appendix 1 for a Medium Combustion Plant, and Appendix 2 for a Specified Generator.

3.1.1 MCP Checklist

MCP Specific Identifier	CHP1	CHP 2	Boiler 1	Boiler 2	Boiler 3
12-digit grid reference	519602	519601	519602	519604	519603
Rated thermal input (MW) of the MCP	3.62	3.62	9.30	9.30	9.30
Type of MCP	Gas engine (spark ignition)	Gas engine (spark ignition)	Gas engine (spark ignition)	Gas engine (spark ignition)	Gas engine (spark ignition)
Date when the MCP was first put into operation	20/07/2019	20/07/2019	20/07/2019	20/07/2019	20/07/2019
Sector of activity of the MCP or the facility in which it is applied (NACE code)	D35.1.1	D35.1.1	D35.1.1	D35.1.1	D35.1.1
Expected number of annual operating hours of the MCP and average load in use	8,000 (90% average load)	8,000 (90% average load)	1,333 (90% average load)	1,333 (90% average load)	1,333 (90% average load)
Where the option of exemption under Article 6(8) is used the operator (as identified on Form A) should sign a declaration here that the MCP will not be operated more than the number of hours referred to in this paragraph	N/a	N/a	N/a	N/a	N/a

3.1.2 Generator Checklist

Specific Identifier	CHP1	CHP 2
Rated thermal input of generator in MW thermal	3.62	3.62
Total rated thermal input of all generators on site in MW thermal	7.24	
Grid reference of the location of the SG	519602, 185789	519601, 185788
Commissioning date (MM/YYYY)	07/2019	07/2019
Fuel	Natural Gas	Natural Gas
Stack height (m)	90	90
Technology (engine/turbine)	Gas engine (spark ignition)	Gas engine (spark ignition)
Annual hours	8,000	8,000
Annual load (%)	90.00	90.00
Distance to nearest human receptor (m)	5	5
Distance to nearest ecological receptor (m)	1,660.00	1660.00
Background NO_2 ($\mu g/m^3$)	80.00	80.00
AQMA?	Brent AQMA	Brent AQMA