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Non-Technical Summary – WE4588AB

Kao Harlow Campus

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1.0 INTRODUCTION

This Non-Technical Summary (NTS) has been prepared by HDR on behalf of the operator Harlow Operations Ltd (company number 09227383), currently trading as Kao Data Limited, hereafter referred to as 'Kao'.

This SCR has been prepared by HDR to support the application to a vary the existing Medium Combustion plant (MCP) Environmental Permit (EP):

Permit Ref: EPR / WE4588AB Issue date: 21/06/2022 Operator name: Harlow Operations Ltd Site name: Kao Data Campus Address: London Road, Harlow, CM17 9NA Grid reference: TL 471099

During the enhanced Environment Agency (EA) pre-application meeting during the permit application, the EA confirmed that a Substantial Variation is required to update the existing MCP permit into an installation permit under section 1.1 Part A(1) of schedule 1 of the Environmental Permitting Regulations. The plant >1MWth will also be MCP.

Kao, as the legal operator, is required to apply to the Environment Agency (EA) for a permit because the total net thermal input capacity of the site's combustion plant exceeds the 50MW thermal threshold stipulated in the legislation¹.

The existing permit covers the activities associated with the 5 no. Emergency Standby Generators (ESGs) at KLON-01 and the 3 no. ESGs at KLON-02. This NTS is to support the permit variation to add the activities associated with 11no. new ESGs at KLON-03, which is currently being constructed, with completion and handover expected around Q4 2026. The variation will also cover the addition of 2no. new ESGs at KLON-01 and 4no. new ESGs at KLON-02. The data centres will house various IT equipment that will require a constant stable electrical supply to operate effectively.

This document provides a non-technical introduction to the site and the application for a permit. For a detailed description of the data centre design, surrounding area and risk assessments please refer to the Best Available Techniques (BAT) Assessment, Environmental Risk Assessment (ERA) and Site Condition Report submitted with the application.

¹ The Environmental Permitting (England and Wales) Regulations 2016

2.0 SITE SUMMARY

The Harlow campus ('the site') has been operating as a data centre (DC) since 2018. The campus currently has x2 operational DCs, KLON-01 and KLON-02 with construction underway on a third DC, KLON-03. Whilst there are plans for a fourth building, KLON-04, these are still unknown and for this reason these changes are not included in this variation.

Under normal circumstances, electricity to the site is provided by the National Grid. Grid reliability is critical to a DC and as such the site currently has 8no. emergency standby generators (ESGs) to provide standby power in the event of an outage / failure in the grid supply. The ESGs are solely to support the campus in times of grid failure.

As per the table and site plan below, expansion works in 2025/26 will see 17no. additional ESGs installed in phases. The first phase of 4 no. ESGs are likely to be commissioned in Q3 2025, with the remaining 11 no. ESGs are to be commissioned in Q4 2026.

The generator model selected for the new ESGs associated with KLON-01 and KLON-02 is the same as existing generators: Rolls Royce DS2250 MTU16V4000G74F with an electrical output rating of 1.8 MWe. The model selected for KLON-03 is the Rolls Royce DS4000 MTU 20V4000G94LF with an electrical output rating of 3.2 MWe. Each ESG has a net thermal input rating of 4.61 MWth (KLON-01 and KLON-02) and 8.01 MWth (KLON-03), resulting in a combined site total of 152.29 MWth across the three DCs (see Table2.1).

The ESGs are capable of operating on diesel or biodiesel such as Hydrogenated Vegetable Oil (HVO). The ESGs will be located externally to the DC they serve, as seen in Figure 2.1. The permit boundary is outlined in green, and includes the ESGs and the Directly Associated Activities (DAA) which includes the fuel storage tanks, urea tanks, pipework and surface water drainage network.

Kao have made significant investment in fitting the ESGs with Selective Catalytic Reduction (SCR) to provide NOx abatement. The x4 new ESGs at KLON-02 and x11 new ESGs at KLON-03 are to be fitted with SCR which doses the exhaust gasses with urea to reduce NO_x emissions to 95mg/Nm³ at 15% O₂ or 500mg/Nm³ at 5% O₂.

At the time of writing, construction of KLON-03 is ongoing with commissioning of the ESGs due in Q4 of 2026.

Building	MCP type	Operating / planned	Thermal capacity / ESG (MWth)	No. ESGs	Total thermal capacity (MWth)	Install date
KLON-01	existing	Operating	4.48	3	13.45	2018
RLON-01	new	Operating	4.61	2	9.22	2022
KLON-02	new	Operating	4.61	3	13.84	2022
KLON-01	new	not installed	4.61	2	9.22	ТВС
KLON-02	new	not installed	4.61	4	18.45	commissioning planned for Q3 2025.
KLON-03	new	not installed	8.01	11	88.10	commissioning planned for Q4 2026.
Total after expansion				25	152.29	

Table2.1 Summary of MCP details



Figure 2.1 – Installation boundary and emission points.



Figure 2.2 - Plant layout for new ESGs.

Data centres have recently been classed as Critical National Infrastructure (CNI), as they underpin a large portion of the UK's economy. Data centres enable a wide range of digital activities including hosting various internet-based activities via servers in large "data halls" or warehouses.

Data centres rely on an uninterruptible supply of electricity to power various IT equipment. An interruption or break in this supply, even momentarily, would have catastrophic consequences on equipment and on the operator's reputation. As such, data centres employ ESGs to provide power, should the grid supply be unavailable.

Grid supplies are very reliable, however, in the unlikely event of an outage, the generators are designed to operate until the grid supply is restored. Outages are rare events and thus operation is normally limited to testing and maintenance, which is likely to be less than 50 hours per ESG or 0.006% of a year.

2.1 Site Context

The surrounding land use can be seen in Figure 2.3 below. Further details can be found in the Environmental Risk Assessment (ERA) and Site Condition Report submitted with the application for a permit.

The site is located in Harlow, in an industrial and commercial estate, surrounded by residential properties as well as a number of sports grounds and green leisure spaces. The A414 road is to the East of the site. The specific location is Kao Harlow Campus, London Road, Harlow, CM17 9NA, with National Grid Reference TL 471099.

The surrounding area has supported various industrial and potentially contaminative land uses, including works and laboratories, tanks and electrical substation. No sensitive land uses have been identified. Beyond the direct site boundaries, the closest ecological receptors are Epping Forest (SAC) and Lee Valley (SPA and Ramsar) which are approximately 5km from the site.

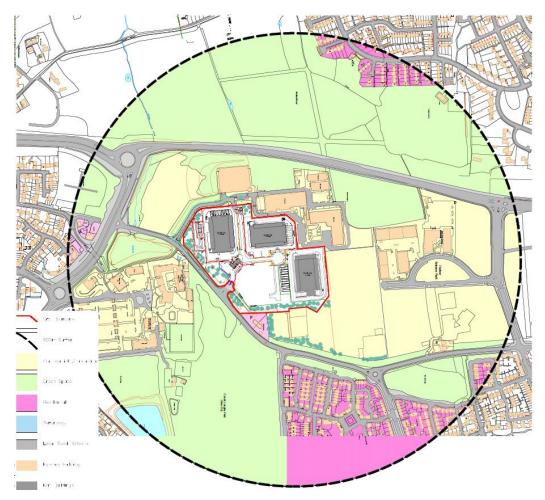


Figure 2.3 - Site Setting Plan

2.2 Site history

The historical land use has been detailed in the Site Condition Report (SCR) submitted with the application for a permit. One of the SCR appendices is a Phase 1 Environmental risk assessment which notes the following:

"The site remained predominantly undeveloped land until the early 1960s, when the Mark Hall Sports Ground was established in the north of the site, and a works in the south of the site comprising a large building (laboratories) with several smaller buildings, a car park and access road off London Road. The developed area subsequently expanded further to the west and south with additional buildings and car parking. London Road forming the eastern boundary of the site was established prior to 1873, and the A414 was constructed much later, around the time the site was developed"

3.0 ENVIRONMENTAL PERMIT APPLICATION

3.1 Permit Type and regulated activities

The activities onsite require a bespoke installation permit under Schedule 1, Part A (1) (a) of the Environmental Permitting Regulations: "*burning of any fuel in an appliance with a rated thermal input of 50 megawatts or more.*"

The three data centres will use Emergency Standby Generators or 'ESGs' to provide emergency power in the event of a grid electrical failure. These ESGs will be located external to the DC they serve. At final fit-out, KLON-01 and KLON-02 will each have a total of 7 no ESGs and KLON-03 will have a total of 11 ESGs. The models selected for the new ESGs are the Rolls Royce DS2250 MTU 16V4000G74F and DS4000 MTU 20V4000G94LF, which will have an electrical output rating of 1.8 MWe and 3.2 MWe each respectively. This equates to an aggregated total net thermal input rating of approximately 152.29 MWth.

All of the ESGs due to be commissioned are over 1MWth and are therefore classed as 'Medium Combustion Plant' (MCP) and Specified Generators. These ESGs are 'limited hour MCPs' as they are purely standby plant that will operate less than 500 hours per year and there is no capacity agreement in place. The operation of the ESGs is likely to be limited to monthly/annual maintenance and testing.

The Directly Associated Activities (DAA) include the fuel storage tanks, urea tanks that service the SCR system, associated pipework and the surface water drainage network.

3.2 Application contents

This application has been prepared in accordance with the EA's informal BAT guidance document: '*data centre FAQ Headline Approach v21*' (November 2022).

The following documents have been submitted to the EA as part of the application for a permit variation. We have provided a high level non-technical summary of each of these in the following sections. Please refer to the latest version of these documents for further information.

- Application forms Part A, C2, C3, F1 and Directors' Details
- Best Available Techniques Assessment (BAT)
- Non-technical Summary (this document)
- Site Condition Report (SCR)
- Environmental Risk Assessment (ERA)
 - Air Quality Assessment (AQA)
 - Noise Impact Assessment (NIA)
- Thermal Schedule
- Supporting information including site plans, drawings, generator datasheets, etc.

3.3 Site Condition Report

An updated Site Condition Report (or 'Site Baseline Report') has been submitted along with the application for a permit.

Extensive baseline soil and groundwater sampling and site investigations were completed in 2014, 2016 and 2021 as part of planning requirements. Following the proposed construction of KLON-03, further environmental risk assessment was undertaken in 2025.

The Site Condition Report is intended to provide the EA with a description of the baseline conditions at permit issue.

The Site Condition Report is intended to provide the EA with a description of the baseline conditions at permit issue and it has been prepared in accordance with the EA's H5 Guidance Note² with details on the following:

- Site background
- Condition of the land at permit issue
- Geology
- Hydrogeology & Hydrology
- Previous land use
- Pollution history
- Evidence of historical contamination
- Permitted activities.

3.4 Environmental Risk Assessment

An updated ERA has been provided in support of this application using the EA's "Risk assessment for your environmental permit" guidance³. This provides an update on the potential risks the site poses as a result of the aforementioned expansion works.

The purpose of the ERA is to identify the potentially significant risks to human health and the environment from permitted activities, as well as the controls in place to help mitigate these risks to an acceptable level.

The potential risks identified as part of the ERA are outlined below:

- Controlled releases to air
- Accidents
- Odour
- Noise and Vibration
- Fugitive emissions (from uncontrolled sources)
- Visible emissions
- Global warming potential

Detailed standalone risk assessments have been completed to assess the risk of air quality and noise impacts from the operation of the ESGs. These are summarised below.

3.4.1 Air Quality Assessment

Emissions to air will occur from the operation of the generators. Due to the Data Centre's high levels of resiliency, it is expected that operation will be limited to maintenance and testing only, with no capacity agreement / 'elective operation'.

An updated Air Quality Assessment (AQA) was completed in support of the permit application to model the predicted impacts of operating the generators, with their associated SCR, on short-term and long-term air quality. A summary of the findings is as follows:

Scenario 1: Monthly Maintenance Testing + Annual test

- Current testing schedule is to run generators individually for 1hr at 30% load per month, with an annual 2hrs at 75% test.
- Testing will occur during daytime hours, between 9:00AM and 5:00PM, when atmospheric conditions are more conducive to greater plume dispersion.
- Note, the model results are overestimations and present a "worse case" scenario, as the generators have been grouped for modelling purposes and the load set at 100%, which exceeds the standard testing and maintenance regime.

Scenario 2: Black Building Test

² Environmental permitting: H5 Site condition report - GOV.UK (www.gov.uk)

³<u>Risk assessments for your environmental permit - GOV.UK (www.gov.uk)</u>

- Current testing schedule on site is to run generators concurrently per building for approx. 30 minutes at 30% load annually to replicate a black building scenario.
- Testing will occur during daytime hours, between 9:00AM and 5:00PM, when atmospheric conditions are more conducive to greater plume dispersion.
- Note, the model results are overestimations and present a "worse case" scenario, as the generators have been grouped for modelling purposes and the load set at 50%, which exceeds the standard testing and maintenance regime.

Scenario 3: Emergency Outage

- Modelled to assume all engines would operate continuously for 72 hours.
- Note, the model results are overestimations and present a "worse case" scenario, as not all generators will be required to run during an outage (due to capacity resiliency), and not at full load.

The conclusion of the assessment is as follows, with further details, in the AQIA:

"This dispersion modelling analysis indicates that maximum ambient air concentrations of NO2, PM10, PM2.5, SO2, and CO at publicly accessible receptor locations will not result in an exceedance of the applicable AQS. Moreover, the analysis indicates that peak NO2 air concentrations and nitrogen deposition rates in ecologically sensitive areas are **insignificant** and within acceptable levels.

An emergency power outage scenario was also modelled, assuming all engines would operate continuously for 72 hours. Although the model results for this scenario indicate a potential peak 1-hour concentration for NO2 that is greater than the allowable threshold, a statistical analysis was prepared to indicate how improbable such occurrence is, considering the **very low probability** that a power outage incident will coincide with least dispersive meteorological conditions for the Harlow area and Kao Data Center campus location."

Given the above, the site's ESGs are unlikely to have a significant impact on surrounding receptors and therefore represent the BAT.

3.4.2 Noise Assessment

An updated Noise Impact Assessment (NIA) has been completed in addition to the noise survey undertook on site in 2021 and this has been submitted as part of the application to vary the existing environmental permit ('Noise Impact Assessment'). This report assesses the likely impact from the operation of the new ESGs and the associated equipment that serves the data halls, including the chillers, etc. The impact assessment concluded the following:

"The assessment of predicted noise levels from the generators indicates that during maintenance and black building testing, most receptors experience noise levels below the background levels, resulting in a **low likelihood of significant adverse impacts**."

Further information can be found in the 'Noise Impact Assessment' submitted as part of this variation application.

3.5 BAT Assessment

An updated BAT assessment has been submitted with the application which focuses on an assessment of the 17no. new ESGs being installed in KLON-01, KLON-02 and KLON-03.

This has been structured using the EAs informal BAT guidance document; 'Data Centre FAQ Headline Approach v21' (November 2022). The assessment report seeks to provide evidence of BAT or justification where the requirements have not been met.

The following sections provide a non-technical summary of the BAT assessment which concluded that the installation is considered to meet the above BAT requirements.

3.5.1 Technology selected to provide emergency power

ESGs operating on Diesel/HVO have been selected to provide emergency power to the installation in the event of grid failure on account of the following:

- Proven as a reliable technology.
- Cold start capability
- Space requirements
- Fuel suitability.
- Lifetime of stored fuel

3.5.2 Generator Operation

The ESGs are solely used as standby plant for emergency power provision in the event of grid failure. There is no capacity agreement in place or plans to operate the generators for generating revenue. As such, operation of the generators is likely to be limited to monthly maintenance and testing. Therefore, the generators are classed as 'limited hour MCPs' and are therefore exempt from meeting the BAT emissions limit values (ELVs) for new MCPs / specified generators.

The intended operation of the ESGs is as follows (see Table 3.1 - Summary of generator testing regime). This reflects the air quality modelling assessment which accompanies the application for a permit.

In the unlikely event of a loss of grid power to the building, all 25 generators will start and then drop off according to requirement. The redundancy arrangement for each group in KLON-01 and 02 is N+1, KLON-03 is N+2, where 'N' is the number of generators required to carry the maximum electrical load.

Туре	Building	Approach	No and Duration	total / gen / year
Monthly ⁴	KLON01	This will be at current site load which is approx. 30%. All gens start and run for 60mins. This is normally completed Weekdays, 9-5pm.	x11 tests for 1	
Monthly KLON02 KLON03		This will be an offload test, i.e. 0% load. All gens start and	hour each	11 hours
		run for 60mins. Normally completed Weekdays, 9-5pm, KLON02 one week, KLON03 next week		
Annual test	All 3 data centres	Each generator tested for 2 hours individually using a 75%load bank	x1 test for 2 hours	2 hours
Annual test	All 3 data centres	Simulated mains failure / 'black building test' for each building e.g. KLON01 one week, KLON02 next week. All gens start and run for 30mins. During daytime working hours, between 9-5pm.	x1 test for 30mins / 0.5hrs	0.5 hrs
Total hours of operation per generator				

Table 3.1 - Summary of generator testing regime

3.5.3 Generator emissions performance

The generators that have been selected are emissions optimised and achieve the Tier II US EPA standard. For the size and output, the engines selected are best in class for NO_x emissions.

⁴ Based on x11 monthly tests as the annual test replaces the monthly test

The SCR system will be fitted to the generator exhaust system to help reduce NO_x emissions before they enter the atmosphere. The SCR system has been designed and sized so that it can outperform even gas generators on NO_x emissions.

The SCR system will rely on a source of Ammonia fed from individual Urea tanks located inside the generator container. These are likely to be integrally bunded to contain a minimum of 110% volume of the inner tank.

3.5.4 Generator flue design

Each of the x5 existing KLON01 ESGs has x2 horizontal flues that terminate at a height of approx. 5.5m. As part of the design process, the decision was taken by Kao to reorientate these and raise them to building height of approx.15.5m as this will significantly improve dispersion to bring them in line with BAT requirements for new MCPs.

Each of the x7 KLON02 ESGs and x11 KLON03 ESGs will have its own dedicated flue that will terminate vertically at approx. 15.5m as shown below.

Following the above changes to KLON01, all ESG flues will be uncapped / impeded by flaps or cowls, terminate vertically at approx. 15.5m. The design of the flues is therefore considered to be BAT for this application.

3.5.5 Grid electrical supply

Under normal circumstances, electricity to the site will be provided by UK Power Distribution. The electrical infrastructure is such that there is one dedicated customer substation on-site (London Road) with three 33kV feeds, A, B, and C connected to the UK Power Networks (UKPN) at Harlow West. Customer A and B feeds extend from the substation to each of the building on the campus. Both feeds can support 100% load, allowing for one to be down in case of maintenance or failure.

A site wide failure is considered extremely rare as it would require a catastrophic regional failure on the grid, or at the supplying power station, and would likely impact not only the site but the surrounding area. As a result, the grid connection is considered to be highly reliable as demonstrated in the grid reliability letter provided with the application (calculated as 99.999981% for period 2022/23).

3.5.6 Emissions monitoring plan

An Emissions monitoring plan is to be developed once the site is operational in conjunction with the EA guidance. To facilitate flue gas testing, Monitoring ports are to be pre-installed on the generator flues to facilitate NOx and CO monitoring in accordance with web guide 'Monitoring stack emissions: low risk MCPs and specified generators' Published 16 February 2021 (formerly known as TGN M5)⁵.

3.5.7 Fuel storage

The current plans are for all the ESGs to operate on diesel or HVO with enough onsite storage to provide 48 hours of electricity when running at 100% continuous rated load. All ESGs have bulk fuel tanks or 'belly tanks' which site beneath the generator they serve. The fuel storage arrangements are as follows:

⁵ <u>https://www.gov.uk/government/publications/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-emissions-low-risk-mcps-and-specified-generators/monitoring-stack-e</u>

Building	Туре	No.	Capacity (litres) ⁶	Location
KLON01	Bulk tank	7	27,000	Adjacent to KLON01 building, under the generator it serves. Balancing lines between tanks, which allow the tank fuel to be shared between tanks
KLON02	Bulk tank	7	28,989	Adjacent to KLON02 building, under the generator it serves
KLON03	Bulk tank	11	47,939	Adjacent to KLON03 building, under the generator it serves
	Total capacity			

All belly tanks across all three DCs are double skinned and integrally bunded to 100%, fitted with overspill alarms, bund alarms, float switches and leak detection alarms, and located above ground over good quality hardstanding. More details can be found in the BAT Assessment.

3.5.8 Drainage

The drainage system is split into separate foul and surface water networks and this network serves all 3 DCs.

The permitted activities will not generate large volumes of trade effluent that would require EA consent to discharge. Discharges are likely to be limited to surface run-off which is unlikely to contain significant levels of contaminated liquid e.g. fuel / oils.

Uncontaminated surface run off from the roof and external yard/ generator area will drain to the surface water drainage system at emission point 'SW1' as shown in Figure 2.1.As per the drainage plan, a petrol interceptor is in place to act as tertiary containment.

The point source emissions to surface water from the entire campus is shown as 'SW1' in the drainage plan, found alongside this application. This is an existing emissions point that resides within the boundary of the current environmental permit (ref: WE4588AB).

3.5.9 Waste

Small quantities of wastes are generated from routine generator maintenance activities or in the event of a spillage/leakage. This is likely to be low given the standby nature of the generators and procedures in place to reduce the risk of spills and leaks spillage/leaks.

Procedures for licenced and responsible collection of waste oils and other hazardous wastes are already in place and may require an update as the new ESGs are installed. In accordance with the sites' ISO14001:2015 certification, waste generated is to be managed in line with the waste hierarchy, using licenced waste management providers and relevant Duty of Care information retained.

3.5.10 Operating procedures

Various procedures are already in place at the site to help ensure compliance with the Environmental Permit as well as other requirements of legislation for the protection of the environment and human health. Once KLON-03 is operational, procedures will be reviewed, amended and implemented to this installation.

Relevant and responsible staff are to receive appropriate training and awareness on these procedures, and this will be documented through the operator's management systems. This will help ensure compliance with the Environmental Permit as well as other requirements of legislation for the protection of the environment and human health. Procedures are / will be as follows:

⁶ Values provided are brimful capacity

- Spill response procedure
- Refuelling procedure
- Grid failure procedure (Air Quality Management Plan or 'AQMP').

3.5.11 Management systems

Kao is certified in accordance with:

- ISO 9001:2015 Quality Management System
- ISO 14001:2015 Environmental Management System
- ISO 22301:2019 Security and Resilience Business Continuity Management Systems
- ISO 27001:2013 Information Security Management System
- ISO 45001:2018 Occupational Health and Safety Management
- ISO 50001:2018 Energy Management

4.0 CONCLUSION

We consider this to be comprehensive submission that meets the requirements of all relevant EA guidance documentation.

The overall conclusion is that there is unlikely to be a significant impact on human health or the environment from the additional 24no. new generators that are being added as part of this permit variation.