

29 November 2022

Your Reference

18399/APP/2022/411 (DC6 Data Centre)

Our Reference

60671881

London Borough of Hillingdon
c/o Dr Ana Grossinho
Air Quality Experts Global Ltd
[by email]

Copies to:
LB Hillingdon – V. Beale; A. Thornley
Virtus Data Centres – H. Kinsman; P. Betts
Savills – N. Green; P. Marks

Virtus DC6 – Air Quality Assessment Report – Addendum #2

Dear Ana,

1. Introduction

Thank you for your time yesterday to discuss this application which proposes a data centre at an existing site within Prologis Park, Hayes. This second Addendum should be read in conjunction with the previously submitted documents: “Virtus DC6 – Air Quality Assessment, Virtus Holdco Ltd, January 2022” and “Virtus DC6 – Air Quality Assessment Report – Addendum, 16 May 2022”.

In line with our discussions, this second Addendum focuses on updated damage cost calculations and describes the related supporting information and assumptions, including those related to emission mitigation.

2. Operational Regime

The Proposed Development includes 16 diesel-fuelled back-up power generators. The generators are envisaged to be run for testing, maintenance and to provide emergency back-up power during electrical grid failures.

The number of operating hours relating to testing and maintenance of the proposed generators are to be based on the information held by the applicant, and will align with the informative to be included within the environmental permit application for the installation.

In respect of operation of the generators during a power grid failure, it is highlighted that the electrical power supply to the Application Site originates from the Iver grid connection point, owned and run by National Grid. The only circumstance envisaged by the project engineers where the generators would be used for a period of time would be a power outage directly from Iver or further upstream from this substation. The local area is understood to currently have a grid reliability of 99.999605%, which would translate to approximately 2 minutes' worth of grid failure per year. Any outage would be a major impact for the entire area, as it would affect a large number of people and businesses over a wide area from Denham to Hayes to Slough. Given the scale of such an impact, it could be reasonably expected that such an outage would be addressed as a matter of top priority by National Grid, and therefore the back-up generating sets would run for as little time as possible. A conservative approach for the damage cost calculations has therefore been taken and emergency running (due to grid failure) has been estimated at 1 occurrence per year of 2 hours duration.

The estimated annual operating regime and the corresponding operating hours are listed in Table 1. The table includes a breakdown of expected emissions of oxides of nitrogen (NO_x) and particulate matter (PM_{2.5}). As the Applicant proposes the use of Selective Catalytic Reduction (SCR) NO_x abatement systems (refer to Section 3 below), both ‘raw unabated’ and ‘abated’ emissions are presented as applicable.

Table 1. Estimated Annual Operating Regime (per generator)

Parameter	Load Profile (%)	Duration	Frequency per year	Annual Operating Hours		
				Total	Non-abated	Abated (with SCR)
Testing						
Off-load testing	<10%	20 mins	12	4	4	0
Mains failure testing	75% - 100%	1 hour	2	2	0.666667	1.333333
Total Testing				6	4.666667	1.333333
Maintenance						
Minor	50%	30 mins	22	11	7.333333	3.666667
Major	50%	2 hours	5	10	1.666667	8.333333
Total Maintenance				21	9	12
Grid Failure	75% - 100%	1 hour	2	2	0.333333	1.666667
TOTAL OPERATING TIME				29	14	15

3. Generator Process Conditions and Emission Rates

The calculations have used information from the same manufacturer specification datasheet for a make / model of generator that could be used for the Proposed Development as was used for inputs to the dispersion modelling undertaken as part of the AQA. A copy of the specification datasheet has been enclosed with this email ("Enclosure 1"). Emission rates for NO_x and particulate matter for four different loads (10%, 50%, 75% and 100%) have been taken from the datasheet.

The majority of particulate matter produced by diesel engines is fine (<1µm in diameter)¹. Therefore, this assessment has assumed that all PM emissions from the generators (specified on the manufacturer's datasheet simply as "particulate matter") shall represent PM_{2.5} emissions.

Additionally, the Applicant proposes to install Selective Catalytic Reduction (SCR) systems for oxides of nitrogen (NO_x) abatement on each generator. These systems will reduce NO_x emissions from the 'raw unabated' rates shown in the datasheet – it is expected that NO_x emissions will be reduced by at least 86% once the SCR systems reach operating temperature (within 20 minutes of the generators starting). All emissions arising from the first 20 minutes of any operation have therefore been considered to be 'raw unabated'. A factor of 0.14 is therefore applied to the expected NO_x emissions associated with operation after an initial 20 minute period for each instance of operation.

For both the "Mains Failure Testing" and "Grid Failure" operating scenarios, the generators are expected to start running at 100% load for 20 minutes, before stabilising at 75% load thereafter.

Process conditions are to be listed in Table 2, along with the calculated emission rates per unit and or any combined flues.

¹ ECOpaint Inc (2002), Diesel Net Technology Guide: Diesel Exhaust Particle Size. Available at: Diesel Exhaust Particle Size (dieselnet.com).

Table 2. Generator Process Conditions

Parameter	Unit	10% load	50% load	75% load	100% load
Internal Diameter	m		3.27		
Stack Height	m		14.45		
Exhaust temp. (from generator exhaust)	°C	356.3	567.6	500.3	492.7
Exhaust temp. (as discharged, mixed with cooling air)	°C	28.6	54.0	72.1	85.2
Stack Area	m ²		8.40		
Efflux Velocity (as discharged, mixed with cooling air)	m/s	5.42	5.98	6.48	6.82
Actual Volumetric Release (from generator exhaust)	m ³ /s	1.86	4.87	7.68	9.31
Actual Volumetric Release (as discharged, mixed with cooling air)	m ³ /s	45.53	50.25	54.43	57.26
Pollutant Concentration - NO _x * (from generator exhaust)	mg/Nm ³	4,010.3	1,729.1	1,394.1	1,745.8
NO _x emission rate – per unit**	g/hour	5,238	7,213	8,583	13,600
Pollutant Concentration – PM* (from generator exhaust)	mg/Nm ³	11.7	28.5	23.8	20.1
PM emission rate – per unit**	g/hour	18.0	146.8	176.9	190.9
With SCR					
NO _x emission rate – per unit	g/hour	5,238***	1,010	1,202	1,904

Notes:

* Pollutant Concentration in mg/Nm³ corrected for standard conditions = 5% O₂, normal temperature and pressure (0°C (273 K), 101.3 kPa).

** Emission rate for one generator unit.

*** No reduction in NO_x emissions due to the SCR system has been considered for the 10% load operating case, as there could be insufficient system temperature under this light load to guarantee the reduction.

4. Predicted Annual Emissions

The estimated operating hours have been multiplied by the applicable emission rates (abated or unabated), based on the applicable load, to derive the pollutant emissions in units of mass per year per diesel backup generator. These have then been multiplied by the total number of generators (16) to provide the total annual emissions for the site.

The calculated annual emissions in tonnes/year for NO_x and PM_{2.5} are presented in Table 3.

Table 3. Annual Emissions Summary

Parameter	Unit	Total Value
Annual NO _x emissions (with reduction from SCR as described above)	tonnes/year	1.843
Annual PM _{2.5} emissions	tonnes/year	0.062

5. Updated Damage Cost Assessment

An environmental damage cost calculation was included in the air quality assessment (and updated in the first Addendum) to estimate the equivalent monetary 'damage cost' value of development-related emissions. Following receipt of LBH's feedback since submission of those documents, the damage cost calculations have again been updated, taking account of the latest damage cost guidance and tools² and information described in the preceding sections.

The calculations consider NO_x and PM_{2.5} emissions associated with the first 30 years of operation of the Proposed Development, as has been recently discussed and agreed. The assessment considered a start year

² Defra (2021), Air quality appraisal: damage cost guidance. Available at: <https://www.gov.uk/government/publications/assess-the-impact-of-air-quality/air-quality-appraisal-damage-cost-guidance>.

and price base year of 2022 and used the “Part A Category 3” NO_x and PM_{2.5} damage cost values from the Defra toolkit.

The summary results of the updated assessment are presented in Table 4. A copy of our calculation spreadsheet is enclosed with this email (“Enclosure 2”) for ease of review.

Table 4. 30-year Damage Cost Estimate of Development-Related Emissions

Source	Pollutant	Annual Emissions (tonnes/year)	Estimated Damage Costs (30 years)		
			Low Sensitivity	Central	High Sensitivity
16 diesel generators (Part A Category 3)	NO _x	1.843	£30,317	£308,653	£1,162,025
	PM _{2.5}	0.062	£35,021	£164,857	£484,738
TOTAL				£473,510	£1,646,763

6. Mitigation Measures

Measures for reducing emissions from the activity of the 16 diesel backup generators have been incorporated in the damage cost calculations as described in the preceding sections of this Addendum.

The total 30-year environmental damage cost has been calculated to be £473,510 at the central present value. This value – also referred to as “Damage Cost 1” – shall be paid to LBH as a financial contribution (£106), to address air quality impacts arising from the Proposed Development.

In conclusion, I hope that this Addendum is helpful to you in your evaluation of the Proposed Development, however please feel free to contact me should you wish to clarify anything.

Yours sincerely,



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Enclosures (attached to email):

- Enclosure 1 – Generator manufacturer specification datasheet
- Enclosure 2 – Emissions and damage cost calculation spreadsheet