Equinix (UK) Ltd

Environmental Permit Variation Application – Powergate (LD9) Data Centre: Supporting Information Document

03 October 2022

Project No.: 0630390

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03 October 2022

Equinix (UK) Ltd

Environmental Permit Variation Application – Powergate (LD9) Data Centre: Supporting Document

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Acronyms and Abbreviations

Name	Description
BAT	Best Available Technique
BREF	Best Available Techniques Reference document
Breach, breaching, breached	Used here when the predicted ambient concentration of a pollutant at a receptor will not comply with the air quality standard. For example, if the 1-hour mean NO2 standard is predicted to be exceeded 20 times at a receptor, a breach of the NO2 1-hour mean is therefore predicted as there would be more than the 18 allowed exceedances of this standard.
CO	Carbon monoxide
EA	Environment Agency
EMS	Environmental Management System
EP	Environmental Permit
EPR	Environmental Permitting Regulations
Exceed, exceedance, exceeded	Used here when a predicted concentration is above an air quality standard threshold. For example, a 1-hour mean NO_2 predicted environmental contribution of 220 µg/m^3 exceeds the 200 µg/m^3 air quality standard
kWe	Electrical power in kilowatts
HV	High Voltage
IED	Industrial Emissions Directive
ISO	International Standards Organisation
Km	Kilometre
L	Litre
m	Metre
MCP	Medium Combustion Plant
MCPD	Medium Combustion Plant Directive
MW_e	Megawatt electrical
MW_{th}	Megawatt thermal
NO_x	Oxides of nitrogen
PM_{10}	Particulate matter of diameter below of equal to 10 µm
PUE	Power Usage Effectiveness
SO_2	Sulphur Dioxide
t	Metric tonne
TGN	Technical Guidance Note
UPS	Uninterruptable Power Supply
WWTP	Waste Water Treatment Plant

Requirement	Topic	Location in Report
Form A Question 5c	Details of directors	Section 1.4
Form C2 Question 2b and Table 1	Changes to existing activities	Section 1.2
Form C2 Question 3d	Management System	Section 6.1
Form C2 Question 5a	Provide a plan for the Site	Figure 3.1
Form C2 Question 5c	Non-technical Summary	Non-technical Summary
Form C2 Question 6	Environmental Risk Assessment	Section 14
Form C3 Question 1 and Table 1a	Activities to vary	Section 1
Form C3 Question 2	Emissions to air	Section 4.2
Form C3 Question 2	Emissions to water	Section 4.3
Form C3 Question 2	Emissions to Sewer	Section 4.4
Form C3 Question 2	Emissions to land and groundwater	Section 4.5
Form C3 Question 3a	Operating Techniques	Section 5
From C3 Question 3b and Table 4	General Requirements	Section 10, Section 11
From C3 Question 3c and Table 5	Raw Materials	Section 8
Form C3 Question 4	Monitoring	Section 13
Form C3 Question 4b	Point Source Emissions	Section 13
Form C3 Question 6a	Energy Efficiency	Section 9.2
Form C3 Question 6b	Energy Usage	Section 9.1
Form C3 Question 6c	Climate change levy	Section 9.4
Form C3 Question 6d	The raw and other materials, other substances and water use	Section 8
Form C3 Question 6e	Avoid producing waste	Section 7

NON-TECHNICAL SUMMARY

Equinix (UK) Limited (Equinix) operates the LD9 data centre (the Powergate site) on the Powergate Business Park in north-west London under the Environmental Permit (EP) EPR/TP3500PB, last varied on 14 June 2021 (the existing EP). The data centre comprises two warehouse-style buildings (PG1 and PG2) containing data storage equipment and ancillary equipment designed to provide power in the event of the external power supply failing. The back-up power supply is from multiple diesel-fuelled generators for each data storage building.

The main commercial activity of the data centres is data storage, however, according to the Environmental Permitting (England and Wales) Regulations 2016 (as amended) the activity that requires a Permit is combustion of diesel in an appliance(s) with an aggregated thermal input of more than 50 megawatts (MWth). The individual generators are generally around 5-7 MW_{th}.

Equinix plans to install four additional 6.93 MW_{th} generators on the PG2 section of the Powergate site in mid-2023 within the new HV building which is being constructed this year (2022). A variation to the existing EP is therefore required to account for these additional generators. The existing EP relates to the operation of 29 standby emergency generators, whereas once the four new generators are installed, 33 emergency generators will be operational.

Environmental Resources Management Limited (ERM) has prepared this variation application on behalf of Equinix.

As per the existing EP (EP EPR/TP3500PB) diesel generators are considered to be the best available technique for the purpose of emergency generation for the data centre. A review of operating techniques and the potential effects on the environment is included in this application.

In the period since PG1 opened in 2008 and PG2 in 2012, there has been only a single event where backup generators have started in an emergency power supply capacity. With the exception of this single event, during which one generator operated for approx. 2 hours due to an issue with the site's uninterruptable power supply (UPS), all starts have been for maintenance and testing purposes, which is an integral part of Equinix's service commitment to their clients.

This variation application will not cause the operation to have any changed emissions to watercourses, groundwater, sewers or land. All four of the new generators are situated to the north of the PG2 part of the Site in a newly constructed HV building. The HV Building will house the four new generators at ground level with associated high voltage switch rooms above. Two new bulk tanks (43,000 litres each) will be installed in PG2, along with four new days tanks (1,000 litres each). These have the same bunding arrangements as the existing permitted bulk storage tanks.

As part of the variation application, the existing EP has been reviewed and the changes resulting from the four new generators identified. The application includes an updated air quality impact assessment and noise impact assessment, which consider the impact of the four new generators in combination with the 29 from the existing EP.

Air dispersion modelling was undertaken to assess the potential impact of the emissions to the air from the testing and emergency operation of the new and existing generators at the data centre. NO_2 and PM_{10} emissions associated with the testing regime of the generators at the data centre, including the four generators in the new HV building, are not predicted to result in a significant adverse impact on air quality at sensitive human receptors or local ecological receptors. An emergency operation of the generators at the data centre would be predicted to cause an exceedance of the hourly NO_2 air quality standard. However, given only one of the engines assessed has ever in practise been used to provide emergency power since the data centre was built, and considering that not all generators on site would be used in an emergency scenario, the likelihood of the predicted impacts from this modelled scenario occurring are considered unlikely to happen in reality.

A noise assessment has been undertaken as part of the permit variation application, which considers the likelihood of impact from site, with the addition of the new generators on noise sensitive receptors.

The assessment concludes that noise from the site is not anticipated to be significant or result in a significant change in the soundscape at the nearest noise sensitive receptors.

Equinix is an experienced operator of data centres, including back up engines, operating centres across the UK. Equinix will continue to operate its own ISO 14001 accredited Environmental Management System which covers the Powergate data centre.

1. ENVIRONMENTAL PERMIT TO BE VARIED

1.1 Reason for Application

Equinix (UK) Ltd (Equinix) operates a data centre on the Powergate Business Park, Volt Avenue, London, NW10 6PW (the Site) under the Environmental Permit (EP) EPR/TP3500PB/V002, last varied on 14th June 2021 (the 'existing EP'). The Powergate data centre comprises two warehouse-style buildings (PG1 and PG2) containing data storage equipment and ancillary equipment designed to provide power in the event of the external power supply failing. The back-up power supply is multiple diesel-fuelled generators for each data storage building comprising 29 standby emergency generators.

Equinix plans to install four additional 6.93 MW_{th} generators on the Powergate site in mid-2023, within the new 'HV' building which is being constructed this year (2022). A variation to the existing EP is therefore required to account for these additional generators. The existing EP relates to the operation of 29 standby emergency generators, whereas once the four new generators are installed, 33 emergency generators will be operational.

The variation application has been prepared by Environmental Resources Management Limited (ERM) on behalf of Equinix. The application includes this supporting document and associated appendices and sets out the requested changes to the existing EP. This supporting document provides detail on the changes resulting from the four new emergency generators and the information required as part of the application. It does not repeat all the information included within the original EP application (submitted in December 2020), however, where appropriate it cross-references to that original EP application and identifies where details have changed.

The variation application is based on the description of the data centre and its equipment and operations provided by Equinix; publicly available environmental data; and results of air dispersion modelling and noise assessments undertaken by ERM.

1.2 Listed Activities

In the existing EP, the permitted activity under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) is the combustion of diesel in an appliance(s) with an aggregated thermal input of more than 50 megawatts (MW_{th}). Additionally, the individual generators are Medium Combustion Plants (MCP) under the meaning of the Medium Combustion Plant Directive, Directive 2015/2193/EU (MCPD), being in the 1-50 MW_{th} size range and in fact generally around 5-7 MW_{th}.

Under this EP variation, the activity that requires an EP remains the combustion of diesel in an appliance(s) with an aggregated thermal input of more than 50 MW_{th}. The four new generators are also MCP, each having a thermal input of 6.93 MW_{th}.

The nature of the listed activity (AR1) in the Permit Table S1.1 remains unchanged. However, the overall thermal input capacity has increased due to the additional generators. Details are given in ***Table 1.1***.

Table 1.1: Listed Activities

Reference and Listed activity	Description	Limits
AR1 Section 1.1 Part A(1)(a) "Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts"	Operation of emergency standby generators burning diesel solely in order to provide electricity to the installation in the event of a failure of National Grid electricity supply. Existing EP: total thermal input c.171.2 MW_{th} EP variation application: total thermal input after variation c. 198.92 MWth	As per the existing EP, from receipt of raw material (diesel) to combustion in emergency standby generators for electricity production to exhaust of products of combustion to atmosphere to generation, storage and dispatch of wastes.

1.3 Directly Associated Activities

Under this EP variation, the nature of the directly associated activities (AR2 and AR3) in the EP Table S1.1 remain unchanged. However, the amount of raw materials (specifically diesel) stored has increased due to the additional generators. Details are given in ***Table 1.2***.

Table 1.2: Directly Associated Activities

Reference	Directly associated activity description	Limits
AR2	Storage of raw materials including diesel.	From receipt of raw materials to use within the facility.
AR3	Surface water drainage.	Input to site drainage system until discharge to surface water drain via interceptors.

1.4 Details of Company Directors

As required by Application Form A, the directors for Equinix (UK) Ltd listed at Companies House at the time of this variation application are named below.

- Mr Eugenius Antonius Johannes Maria Bergen Henegouwen, Company Director, born [redacted]
- Mr Russell Alan Poole, Managing Director (UK & Nordics), born [redacted]
- Rene Maria Smit, Senior Director (Regional Finance, EMEA), born [redacted]

2. SITE DESCRIPTION

2.1 Site Location

As per the original EP application, the location of the Site remains on the Powergate Business Park in north-west London, close to Harlesden (NGR 521070,1827380). The Site boundary, identified in green in Schedule 7 of the existing EP (EPR/TP3500PB) has not changed.

2.2 Site Context

The context of the Site has not changed as a result of this EP variation and the general nature and location of potential receptors for Site emissions in the surrounding area is not believed to have changed. Detailed information on the Site context can be found in the original EP application Supporting Document (February 2019).

3. SITE ACTIVITY

3.1 Overall Site Activity

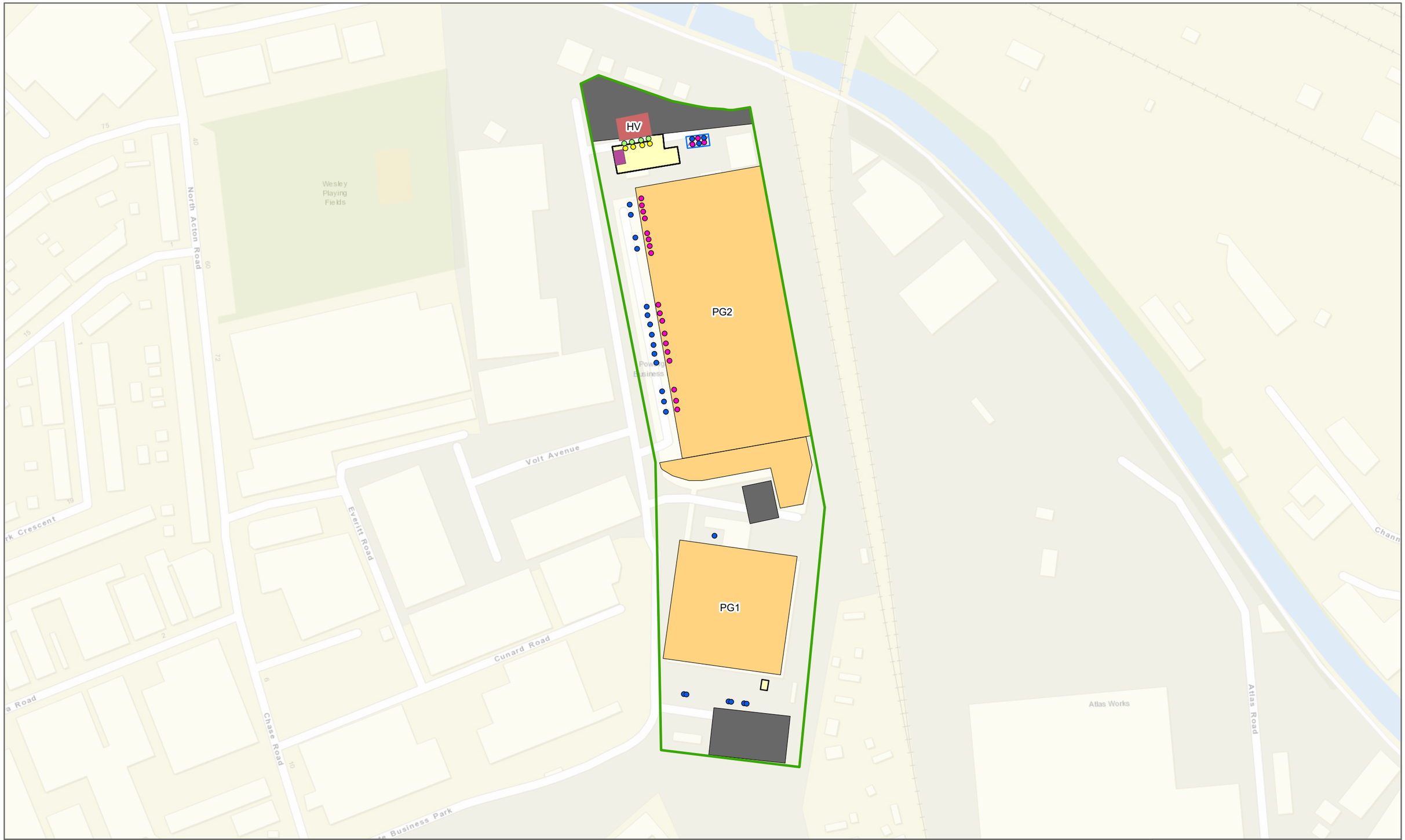
As per the existing EP, the overall commercial activity for the Site is data storage. The data centre comprises two warehouse-style buildings (PG1 and PG2) containing customer data storage equipment and ancillary equipment designed to provide power in the event of the external power supply failing.

This EP variation application focuses on combustion activities associated with the four new diesel emergency backup generators. All four of the new generators are to be located to the north of the PG2 part of the Site in a newly constructed HV building. The HV Building will house the four new generators at ground level with associated high voltage switch rooms above. The generators will be enclosed within the building and hidden from view with the building providing acoustic attenuation.

The variation brings the total number of generators on the site to 33. The activities related to the operation of the data centre itself (electronic equipment, cooling, etc.) are not subject to permitting and are not included here.

The data centre has the means of back-up power supply consisting of battery Uninterruptable Power Supplies (UPS) capable of maintaining data centre operations for several minutes before using the on-site generators for electrical power supply.

An updated site layout drawing for the Site, including the locations of the four new generators is provided as ***Figure 3.1***.



- New Day tanks
- Existing Day Tanks
- New Generator Locations
- Existing Generator Locations
- Site Boundary
- Existing Bulk Storage Area
- Car Park
- Data Centre
- HV Building
- New Bulk Tank Storage
- Acoustic Container

0 10 20 30 40 50
Meters

N

Figure 3.1
Site Layout
2, Powergate Business Park, Volt Ave
London NW10 6PW

SCALE: See Scale Bar	VERSION: A02
SIZE: A3	DRAWN: CB
PROJECT: 0630390	CHECKED: LB
DATE: 02/12/2020	APPROVED:

ERM

EQUINIX

PROJECTION: British National Grid

Path: \\UKSSMBNAF-a383.ops.erm55.com\UKSGISData01\London\0630390 - Equinix\MAPS\LD9 Maps\0630390 - Equinix LD9.aprx

3.2 Backup Generators

The four new generators will be for backup generation purposes only, i.e. for electrical generation in the event of a failure of the national grid electrical supply. They will, however, also be subject to regular testing – as described in ***Table 3.2.***

The data centre has two dual substation feeds in order that power supply has a good level of redundancy. The data centre is protected from short term brown-outs or black-outs by uninterruptable power supplies (UPS). These buffer limited fluctuations in electrical supply. If the UPS detects power failure or extended reduced power, some, or all of the generators within the data centre will start automatically to begin generating sufficient electricity to match the load required by the data centre. The UPS can supply power for approximately six minutes but ordinarily the generators would kick in well before this time elapses.

In the period since PG1 opened in 2008 and PG2 in 2012, there has been only a single event where backup generators have started in an emergency power supply capacity. With the exception of this single event, during which one generator operated for approx. 2 hours due to an issue with the site's uninterruptable power supply (UPS), all starts have been for maintenance and testing purposes, which is an integral part of Equinix's service commitment to their clients.

The type, number and capacity of new generators to be installed at the data centre is shown in ***Table 3.1.***

Table 3.1: New Generators to be Installed

Building	Permit ID numbers	Engine Model	Power Rating (MW_e)	Status	Number	Total MW_{th} input*
HV	PG2_22 PG2_23 PG2_24 PG2_25	MTU 20V4000G24F 6ETC	2.42	The four new engines, to be installed in 2023	4	27.72

**Note: As the generator manufacturers do not always provide thermal input data, an assumption of 35% efficiency has been applied to the electrical output power rating of each generator set. A power factor of 0.8 has already been applied to the generator power rating to adjust for the losses between the generator and alternator.*

3.3 Testing Regime

The generators are tested regularly to demonstrate they are capable of fulfilling the backup supply requirements. The overall testing regime remains as was set out in the original EP application with fortnightly start-up tests, quarterly building load tests and annual load bank tests. The grouping of generators in the testing regime has been updated to incorporate the four new generators and the start-up tests now take approximately 30-40 minutes longer overall. The updated testing regime is presented in ***Table 3.2***.

Scheduling of the test runs takes into account the potential for effect on local air quality and as a result the black building and full load tests are conducted on a weekend when a lower background burden on the local air quality is expected.

The building load test takes four days to complete. Within one-month Equinix schedules:

- PG1 groups 1-3 testing in weekend 1;
- No testing is scheduled for weekend 2 (which is allowed as a backup to weekend 1 if required); PG2 groups 1-5 in weekend 3; and

- No testing is scheduled for weekend 4 (which is allowed as a backup to weekend 3 if required).

Overall, only PG2 group 5 has changed as a result of this EP permit variation as it now includes the additional four new generators.

The annual full load test is completed over 5 weekends as follow Equinix schedules:

- PG1 groups 2&3 weekend one;
- PG1 group 1 weekend two; PG2 groups 1&2 weekend 3; PG2 groups 3&4 weekend 4; and
- PG2 group 5 weekend 5.

Overall, only PG2 group 5 has changed as a result of this EP permit variation as it now includes the additional four new generators.

Details of the assessment of air quality impacts from the testing regime can be found in ***Section 11.***

Table 3.2: Testing Regime

Type of test / Frequency	Indicative Duration	Scheduling	Load
Fortnightly – start up test	5 minutes	■ Weekday ■ Daytime only ■ Takes approximately 180 minutes to run all of the generators	No load
Quarterly (three times year) – black building test	1 hour	■ Weekend ■ Daytime only ■ 1 hour per generator group ■ Generators are started in groups, however groups are not tested simultaneously, testing of groups does not overlap ■ Occurs over 2 weekends, and takes 4 days to complete the testing – within one month: - PG1 tested weekend 1 - nothing scheduled for weekend 2 to allow back-up time in case something goes wrong the first weekend - PG2 tested weekend 3 - Nothing scheduled for weekend 4 to allow back-up time in case something goes wrong the third weekend	60% maximum
Annually – load bank test	1 hour	■ Weekend ■ Daytime only ■ One engine after the other ■ 1-hour per generator; takes 4 days to complete this testing, approximately half the	100% load; i.e. load bank for full potential data centre load

		generators on one day, and the other half on the second day	

3.4 Fuel Storage

The description of the PG1 and PG2 day and bulk tanks remains as described in the original EP application (including Schedule 5 response). The variation application, however, includes two new 43,000 litres above ground bulk tanks in PG2 which brings the total number of 43,000 litre bulk tanks in PG2 to 12. There are also four new day tanks (c.1,000 litres capacity), one in the vicinity of each new generator, which are double skinned (self-bunded to 110% volume) and fitted with leak detection alarms.

As per the original EP application (including Schedule 5 response), the PG2 bulk fuel tanks are double skinned with a leak detection system, within a concrete bund (which is impermeable to oil and water as per Environment Agency guidance). The concrete bund is designed to capture tank leaks should these occur and to transfer fuel from the bund into an underground diesel holding tank that is capable of holding more than 110% of a single tank. The holding tank is segmented and visually examined regularly. Recovery arrangements are in place with a specialist subcontractor if necessary.

The PG2 bulk tanks are located outside but have means of removing rainwater from the bund that does not penetrate the bund wall. In the event of oil or oily water being present this is removed using a vacuum pump, and recycled or disposed using an appropriate waste disposal company if deemed appropriate.

The diesel filling procedure remains the same as the procedure set out for the existing EP and has been included in ***Appendix A***. Fuel is transferred from bulk tanks to day tanks via dedicated permanent pumping systems. They are “pipe-in-pipe” with leak detection systems. All the tanks are fitted with level detection systems (high-high, high-low and low-low) and are checked every month to confirm the correct level is kept in each. In case of a fire alarm, the pumping system is automatically shut down.

The maintenance and inspection procedures remain the same as set out in the original EP application (Schedule 5 response), i.e.:

- Daily: Visual inspection of fuel tank areas including bunds and holding tank.
- Monthly: Visual inspection of area and equipment; clean-up bunds; verify spill containment kits; verify level in tanks accuracy; confirm water content in tanks meets diesel requirements (automatic test or water detecting paste dip test).
- Six-monthly: as per monthly, with in addition a verification of any fuel polishing being required.
- Annually: as per monthly, with in addition a verification of the low and high fuel level alarms; sampling of the fuel for analysis in each tank; perform fuel polishing and verify effectiveness.

Equinix has emergency response procedures in place in the event of a release of oil or diesel, processes for the planning for such eventualities and checklists to audit the response in case such an event occurs. These remain the same as the procedures set out for the existing EP and have been reproduced in ***Appendix B***.

4. EMISSIONS

4.1 Introduction

There have been no changes in principle to the type of activities undertaken at the data centre. As per the existing EP, the principal emissions are to air from maintenance testing of the emergency back-up generators.

In the period since PG1 opened in 2008 and PG2 in 2012, there has been only a single event where backup generators have started in an emergency power supply capacity. With the exception of this single event, during which one generator operated for approx. 2 hours due to an issue with the site's uninterruptable power supply (UPS), all starts have been for maintenance and testing purposes, which is an integral part of Equinix's service commitment to their clients.

There are no material changes to waste generation, and no changes to emissions to water, sewer or ground.

4.2 Emissions to Air

4.2.1 Point Source Emissions to Air

The only notable point source emissions to air from the data centre are from the generators. Expected characteristics for the four new generators are listed in ***Table 4.1*** and the location of each emissions point at the Site is shown in ***Figure 4.1***.

Air dispersion modelling has been undertaken for these new sources in combination with existing sources. The air quality assessment considers the potential impact of the four new generators in combination with the 29 generators in the existing EP. More details can be found in ***Section 12*** and the air quality impact assessment report in ***Appendix C***.

Table 4.1: Point Source Emissions to Air

Building ID	Emission Point ID	Emission Source	Parameter	Quantity
PG1	PG1_01 to PG1_08: Generators already included in Permit EPR/TP3500PB/V002			
PG2	PG2_01 to PG2_14: Generators already included in Permit EPR/TP3500PB/V002			
	PG2_15 to PG2_21: Generators already included in Permit EPR/TP3500PB/V002			
HV	PG2_22 to PG2_25	MTU 20V4000G24F 6ETC	NO_x, SO_2, CO, Particulates	No limits set Backup generators only

4.2.2 Fugitive Emissions to Air

There is a potential for localised fugitive emissions to air of hydrocarbon vapour from the bulk diesel fuel storage tanks breathers.

4.2.3 Fluorinated gas (F-gas) legislation

As per the original EP application, the data centre uses F-gas and other regulated coolants within the operational portion of the data centre. This does not include processes under the activity that this permit is applied for i.e. combustion activities.

4.3 Emissions to Water

4.3.1 Point Source Emissions to Water

No changes to emissions to water are proposed in this variation application.

4.3.2 Fugitive Emissions to Water

No changes to fugitive emissions to water are proposed in this variation application.

4.4 Emissions to Sewer

4.4.1 Point Source Emissions to Sewer

No changes to emissions to sewer are proposed in this variation application.

4.5 Emissions to Land and Groundwater

4.5.1 Point Source Emissions to Land and Groundwater

No changes to emissions to land and groundwater are proposed in this variation application.

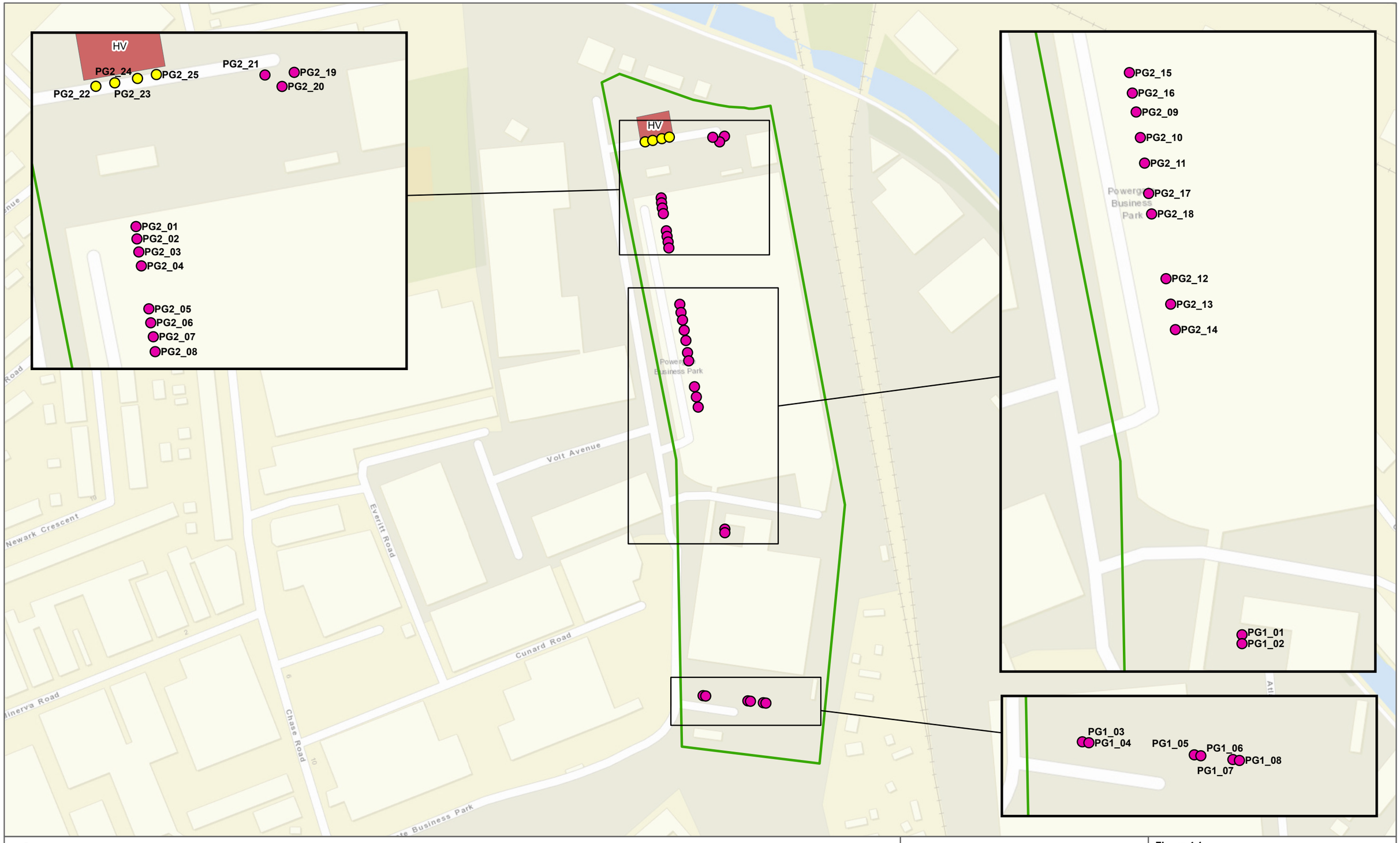
4.5.2 Fugitive Emissions to Land and Groundwater

There are no expected changes to fugitive emissions to land or groundwater as a result of the proposed updated activities described in this EP variation application

The main fugitive emission source to land and groundwater is that resulting from fuel storage areas. As detailed in section 3.4, two new bulk fuel storage tanks and four day tanks are being added to the Site as part of this variation. The maintenance and inspection procedures remain the same as set out in the original EP application (Schedule 5 response; and the diesel filling procedure remains the same as the procedure set out for the existing EP (which has been reproduced in ***Appendix A*** for ease).

Equinix has emergency response procedures in place in the event of a release of oil or diesel, processes for the planning for such eventualities and checklists to audit the response in case such an event occurs. These are provided in ***Appendix B***.

The Site Condition Report has been updated to reflect the change in description of the activities (i.e. the four new generators); however the site condition and baseline description remains as provided in the original EP application. Details of the existing condition of the Site can be found in the Site Condition Report, presented in ***Appendix F***.



- New Emission Points to Air
- Existing Emission Points to Air
- Site Boundary
- HV Building

0 20 40 60 80 100 Metres

N

Figure 4.1
EP Variation – Air Emission Point Locations
2, Powergate Business Park, Volt Ave
London NW10 6PW

SCALE: 1:5000	VERSION: A02
SIZE: A3	DRAWN: CB
PROJECT: 0630390	CHECKED: LB
DATE: 21/09/2022	APPROVED:

ERM

EQUINIX

PROJECTION: British National Grid

Path: \\UKSSMBNAF-a383.ops.erm55.com\UKSGISData01\London\0630390 - Equinix\MAPS\LD9 Maps\0630390 - Equinix LD9.aprx

5. OPERATING TECHNIQUES

5.1 Applicable Technical Standards

Notwithstanding the UK's departure from the European Union, the European Commission's relevant Best Available Techniques (BAT) Reference Documents (BREFs), against which the EA continues to regulate, have been reviewed as part of this variation. The EA's Technical Guidance Notes (TGN) and relevant sector and industry guidance have also been considered. The following have been considered:

- Environment Agency's Data Centre FAQ Headline Approach, May 2020 presented in ***Table 5.1***;
- Medium Combustion Plant Directive and the Government's Medium Combustion Plant Directive, Specified Generator Regulations page (https://www.gov.uk/guidance/medium-combustion-plant-andspecified-generators-environmental-permits) ***Table 5.2***;
- Best Available Techniques (BAT) Reference Document for Large Combustion plants, 2017 presented in ***Table 5.3*** (for general measures appropriate to data centres, as the data centre does not contain any Large Combustion Plants (LCP) under the meaning of Chapter III of the Industrial Emissions Directive (2010/75/EU)).

5.2 Operating Techniques Review Tables

Each of the above documents is presented in tabular form on the following pages and have been re-reviewed in the context of the EP variation application. Best Available Techniques that are not considered applicable are greyed out.

Table 5.1: Data Centre FAQ Headline Approach, 2020

	EA Summary Requirement	Equinix Response
1	We accept that oil fired diesel generators are presently the default technology for standby generators in data centres. However the permit application still requires a BAT discussion detailing the choice of engine, the particular configuration and plant sizing meeting the standby arrangement (e.g. 2n).	The Equinix Powergate data centre works to a 2n standby arrangement, where n is the load requirement of the data centre. The four new engines, purchased in 2022 are TA Luft 2g equivalent and the existing 29 permitted engines are a mix of 2G and 3G standard emissions. The engines in place reflect local and global investment and acquisition decisions by Equinix and were selected at the time of purchase to provide the appropriate power capacity, reliability and serviceability for the function they are required for, namely emergency generation. Equinix is committed to the purchase of 2G engines for any future replacement engines or future expansion. As required by Improvement Condition 3 of the existing EP, Equinix will be completing a feasibility study into the installation of 2G engines for the engines currently not at this specification. As per Improvement Condition 1, Equinix is also committed to a feasibility study into retro-fitting abatement measures. Air emissions dispersion modelling (see ***Section 11***), indicates that the effect of expected emissions on air quality by comparison with human health protective standards from the testing regime should be acceptable and that the likelihood of the hourly air quality standard for NO_2 being breached is significantly less than 1%.
2	Standby engine capacities are added together in MW_{th} input at the quoted standby rating, being usually 110% of the continuous rating (if >=50MW_{th} the site then needs an EA 1.1A Combustion Activity EPR permit)	The Site installed capacity is in excess of 50 MW_{th} howsoever calculated.
3	If precise MW_{th} figures are unavailable and spec sheets or face-plates are unclear, the calculation for MW_{th} derived from MVA output is based on: power factor 0.8 and an assumed poor conversion efficiency of 0.35 for MW_{th} to MW_e e.g. 3MVA = (3*0.8)/0.35 = 6.86MW_{th}.	See ***Table 3.1.*** This methodology has been followed. The MW_e outputs quoted are assumed to include power factor correction from MVA. MW_{th} figures are not generally available from generator manufacturers.
4	The sum of generator plant capacities is based only on MW_{th} inputs of all plant regardless of the standby configuration. MW_{elec} output constraints such as realistic customer load or other practical output limiting factors do not constitute a limit to the MW_{th} input as defined in the EA's guide RGN02.	As noted above, the installed capacity is well over 50 MW_{th}, irrespective of calculation methods.
5	Proximity of data centres with a company campus, adjacent, neighbouring or close-by buildings in urban locations (e.g. within a common trading estate but only separated by a road width or notional distance) may constitute a single site for determining the boundary of the installation as 'same site – same operator' as per RGN02 – see the details in the text.	Not applicable for the Powergate Site, which is a single data centre.

6	Permits will include a maximum 500 hour 'emergency/standby operational limit' for any or all the plant producing on-site power under the limits of the combustion activity; and thereby emission limit values ELVs to air (and thus engine emissions monitoring) are not required within the permit.	This threshold will not be exceeded. The same limit applies as per the existing EP.
7	Emergency hours' operation includes those unplanned hours required to come off grid to make emergency repair of electrical infrastructure associated but occurring only within the data centre itself.	This is likely to occur very rarely given the dual substation supply at the Site for each building. In the period since PG1 opened in 2008 and PG2 in 2012, there has been only a single event where backup generators have started in an emergency power supply capacity. With the exception of this single event, during which one generator operated for approx. 2 hours due to an issue with the site's uninterruptable power supply (UPS), all starts have been for maintenance and testing purposes, which is an integral part of Equinix's service commitment to their clients.
8	Each individual generator with its own discharge stack, can be maintained, tested and used in a planned way for up to 500 hours per calendar year each without ELVs (and hence no monitoring) under IED/MCPD. Though clearly the EA expects planned testing and generator operations to be organised to minimise occasions and durations (subject to client requirements). Ideally a target should seek to keep individual generator testing to below 50 hours/annum each as required for MCPD specified generator exclusion.	Scheduled individual generator run times will be well under 50 hours per year. During fortnightly testing each is fired for approximately 5 minutes, and operated for only around an hour during quarterly and annual tests.
9	In summary 7, & 8 means the whole or part site can only operate as emergency plant up to 500 hours as an absolute limit for grid backup issues; but that individual plant (at any load) with its own stack (or a stack with multiple plant) with justification can be operated for up to 500 hours (ideally <50) each as part of its non-emergency role under maintenance and testing.	Noted. This threshold will not be exceeded.
10	For the purposes of determining operating hours, data centre diesel generators are regarded as having a minimal start-up or shut-down times. Operational hours start on the first fuel ignition.	This has been assumed in the air quality assessment found in ***Appendix C***.
11	Data Centre permits (unless they apply and justify it in a permit application) will expressly have a limit on the activity to exclude voluntary 'elective power operation' such as demand side response (i.e. on-site use) or grid operating reserve (STOR) (i.e. off-site export of electricity) and Frequency Control by Demand Management (FCDM) for grid support. This is primarily to differentiate data centres from 'diesel arrays or MCPD specified generators' that voluntarily operate within the balancing market, and	No voluntary elective power operation for on-site use, STOR or FCDM is proposed.

	importantly a clear way to demonstrate minimisation of emissions to air as 'Emergency plant'.	
12	The default engine specification as a minimum for new plant to minimise the impacts of emissions to air (NOx) is 2g TA-Luft (or equivalent standard). A detailed cost benefit analysis (CBA) is otherwise needed justifying worse emission such as 4g TA-Luft plant or for example a justification under FCDM.	The Equinix Powergate data centre works to a 2n standby arrangement, where n is the load requirement of the data centre. The four new engines, to be installed in 2023 are TA Luft 2g equivalent and the existing 29 permitted engines are a mix of 2G and 3G standard emissions. The engines in place reflect local and global investment and acquisition decisions by Equinix and were selected at the time of purchase to provide the appropriate power capacity, reliability and serviceability for the function they are required for, namely emergency generation. Air emissions dispersion modelling (see ***Section 11***), indicates that the effect of expected emissions on air quality by comparison with human health protective standards from the testing regime should be acceptable and that the likelihood of the hourly air quality standard for NO_2 being breached is significantly less than 1%.
13	CBA for improved exhaust emissions, dispersion and mitigations from the plant is expected for the maintenance/testing and the emergency standby roles. We would be looking for improvements particularly if Local Air Quality (LAQ) modelling (under H1) indicates anything other than an insignificant contribution to short term local air quality for the 'planned' maintenance emissions of the plant.	EA guidance on dispersion modelling assessment (2019) can be found on https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment An updated air quality dispersion model has been prepared by ERM to assess the potential impact of the operation of additional generators on local air quality. The air quality assessment considers the impact of the four new generators in combination with the generators existing permit. Summary findings are included as ***Section 11*** of this document and the detailed report is presented in ***Appendix C***.
14	Retrofit abatement techniques for existing installations for engine emissions such as selective non-catalytic or catalytic reduction (SNCR or SCR) would not normally be expected for standby plant to mitigate the emissions for standby/emergency operation. BAT might include improved flue gas dispersion (e.g. stack modifications, increased height) or improved low NOx engine management controls or possibly fuel choice.	See responses to Questions 1 and 12 for currently planned interventions.
15	Operations and management procedures should reflect the outcomes of the air quality modelling by minimising the duration of testing, phasing engines into subgroups, avoiding whole site tests and planning off-grid maintenance days and most importantly times/days to avoid adding to "at risk" high ambient pollutant background levels.	The black building and full load tests are planned for weekends when the NOx contribution from the local road network on the Powergate Business Park and the road network in general is expected to be lower than week days. See ***Section 3.3***. These tests represent part of Equinix's commercial offering to guarantee maximum uptime to clients.
16	When AQ modelling the emissions from the engines, the certified technical standard provided by the manufacturer should be used (i.e. likely worst case emissions). However any 'fit for purpose' monitoring of the actual	Likely worst-case emissions have been used for modelling.

	emissions from installed plant will be considered as evidence of the likely real impacts as part of the permitting decision process.	
17	The groundwater monitoring of fuel storage tanks and distribution pipework using GW boreholes is risk based for the site condition report (SCR) and IED 5-yearly monitoring. Should GW monitoring be required for underground tanks and/or the SCR, the boreholes should be positioned for whole site surveillance (for the SCR) rather than as a very local control immediately around the buried fuel oil tanks (i.e. not be just an addition to double skinned tanks already protected by leak detection and hence ignoring distribution pipework etc.).	As per the original EP application (including Schedule 5 response), the PG2 bulk fuel tanks are double skinned with a leak detection system, within a concrete bund (which is impermeable to oil and water as per Environment Agency guidance). The concrete bund is designed to capture tank leaks should these occur and to transfer fuel from the bund into an underground diesel holding tank that is capable of holding more than 110% of a single tank. The holding tank is segmented and visually examined regularly. Recovery arrangements are in place with a specialist subcontractor if necessary. Since the underground holding tank is maintained empty, the risk to groundwater is considered low thus no groundwater monitoring is proposed.
18	10-yearly soil sampling under IED is normally not needed but still needs some justification.	As identified in the original EP application, soil sampling took place. Due to the nature of operations and the preventative measures in place, Equinix does not propose to undertake further soil sampling.
19	The permit application must assess and provide evidence of actual reliability data for the local electricity grid distribution (including data centre internal electrical design) for the EA to judge the realistic likelihood of the plant needing to operate for prolonged periods in an emergency mode (especially if emissions model so as to exceed short term air quality standards).	In the period since PG1 opened in 2008 and PG2 in 2012, there has been only a single event where backup generators have started in an emergency power supply capacity. With the exception of this single event, during which one generator operated for approx. 2 hours due to an issue with the site's uninterruptable power supply (UPS), all starts have been for maintenance and testing purposes, which is an integral part of Equinix's service commitment to their clients.
20	Optimising grid reliability within the site as part of general BAT to minimise emergency operating hours is required – evaluation is needed within the permit application on the Tier reliability standard under ISO27001 and Uptime.	Equinix does not subscribe to Uptime Institute Tier Levels per se but the Equinix equivalent tier level rating the Powergate Site is Tier 3. The Site is certified to ISO27001:2013.
21	Reporting of standby engine operational run hours and discussion of any electrical outages (planned or grid failures regardless of duration) required annually.	Equinix notes that this is the expectation for annual reporting to the EA, as per the existing EP, and proposes to continue on that basis.
22	Assuming AQ modelling, based on operating scenarios, indicates a local air quality risk then notification to the EA of unplanned (and pre-notification of planned) continuous grid outage exceeding 18 hours LAQM (or the otherwise assessed short term interval from modelling) is likely required under a permit schedule 5 notification.	Equinix proposes to continue to operate to existing EP EPR/TP3500PB notification requirements.
23	The notification requirement stated in the permit should also indicate the actual number of generators that need to be operating above which the local air quality is at risk e.g. 'notification of continuous emergency operation exceeding 18hours with 5 or more engines operating together is required' (i.e. model shows 4 or less engines unlikely to breach LAQ)	As above, Equinix proposes to continue to operate to existing EP EPR/TP3500PB notification requirements.

24	Assuming AQ modelling, based on emergency outage operating scenarios, indicates a very significant risk to local air quality and identified receptors, the EA will ask the operator to have a written action plan to manage the issue for prolonged emergency running of the plant (including sensitive receptors list and mitigations, assessments and impacts evaluation against modelled risk conditions i.e. occurrence at periods of most concern in the year, possibly ambient air monitoring surveillance at very sensitive receptors). An AQ outage action plan is also likely required for sites which might operate in conjunction with other neighbouring large sites during an outage i.e. data centre hubs.	An AQMP has been prepared for the Powergate site and will be updated to factor in the additional generators that are proposed in this variation.
25	Due to the emphasis of the permit on electrical (and cooling) systems it is noted that the EA considers the F-Gas regulations as falling under the remit of the EPR permit (for notifications and management) where F-gases (or potentially any polluting potential substance) are used directly under the combustion aspects of the permitted activity (e.g. switchgear). It is important to notify the EA of any significant releases. Other uses of F-gases e.g. for server room cooling are not strictly under the EA permit but are regulated by the EA generally so it may still be prudent to make the EA aware of your F-gas releases.	See ***Section 4.2.3***. F-gases are used exclusively for server room cooling, an activity that does not form part of the permitted activities for the site.
26	The permit application should detail the likely quantities of waste engine oil generated annually – EWC 13 02 waste oils following servicing for example. Although unlikely to be huge, the Pollution inventory has a reporting threshold of 1 tonne for non-hazardous waste but technically no lower thresholds for hazardous waste oil.	Currently waste lubricating oil is removed by sub-contractors who perform servicing and maintenance of the generators at Powergate. The zero threshold is noted and these data will be collected from the subcontractor as part of the annual EA reporting process. In 2021/22, only small quantities of oil were removed for testing and no bulk replacement took place. Given the lack of routine operation which would cause degradation of the lubricating oil, this situation is expected to be typical of a given year. An external company is brought in on site annually to test the stored diesel fuel. They test a variety of parameters, including clarity, adenosine triphosphate, water content and particle count. If required the fuel is then cleaned on site by the same company (fuel polishing). Samples are taken after the polishing to ensure that the quality of the cleaned fuel is acceptable.
27	The permit application is for the combustion plant and associated environmental concerns and not for the Data Centre itself. The applicant should be aware that the permitting process and application is accessible to the public so should have regard to ‘Commercial in Confidence’ and Critical National Infrastructure. In the first instance discuss particular concerns directly with the EA and/or exclude such priority information from the application but indicate that such is ‘available on request’.	Noted.

Table 5.2: Medium Combustion Plant and Specified Generator Regulations Guidance, updated 25 September 2019

Key Definitions and Scope		Comments
Excluded Generators	Excluded Generators are generators that are exempt from Schedule 2 5B of the Permitting Regulations. Excluded generators are not included when determining capacity of the permitted specified generator site. Excluded generators are those that meet the following condition – Are part of an IED installation under Chapter II or III. BAT applies to these installations so air quality is protected. It should be noted that a generator which is a Part B (1.1 or 5.1) or permitted Waste Facility (Small Waste Incineration Plant, SWIP) is not excluded. Have a defined nuclear safety role under a nuclear site licence issued by the Office for Nuclear Regulation. Emergency 'backup generators' (see definition below) that are not tested for more than 50 hours a year. Data centres that use an on-site emergency backup generator when the transmission frequency is unstable are excluded. Are operated offshore Generators installed on a gas storage or unloading platform (as defined in Regulation 2 of the Offshore Combustion Installations (Pollution Prevention and Control) Regulations 2013.	The four new generators, as per the 29 permitted generators are emergency 'backup generators' that individually are not tested for more than 50 hours a year. As per the case of the existing EP, the four new generators are not 'specified generators' under Schedule 25B of the Environmental Permitting (England and Wales) Regulations 2016 (as amended), as emergency generators only used to provide power at a site during an emergency are excluded.
Backup Generator	Means a generator that is operated for the sole purpose of providing power at a site during an onsite emergency from the 1 January 2019. Balancing Services, and Demand Side Response operations, whether procured or not, such as Triad Avoidance or Fast Frequency Response are not on site emergencies and a generator that provides these services is not excluded.	The four new generators, as per the 29 permitted generators are emergency 'backup generators' that individually are not tested for more than 50 hours a year.
Emergency Operation	There is no restriction on the total operating hours in the event of an onsite emergency. However operators should make best endeavours to reduce the period and frequency of emergencies. Similarly there is no restriction on the hours of operation by 'black start' backup generators.	In the period since PG1 opened in 2008 and PG2 in 2012, there has been only a single event where backup generators have started in an emergency power supply capacity. With the exception of this single event, which was due to an issue with the site's uninterruptable power supply (UPS), all starts have been for maintenance and testing purposes, which is an integral part of Equinix's service commitment to their clients.

Testing Backup Generators	Operators must not carry out more than 50 hours testing a year for each backup generator. Operators must get agreement in writing from your regulator if you want to increase this limit. The regulator can exclude commissioning time within the written agreement. For each backup generator, operators must record the number of hours you test during the year. This is to demonstrate that you meet the exclusion criteria. If the limit of 50 hours testing a year is exceeded without written agreement the regulator will take appropriate enforcement action.	The updated testing regime is described in ***Section 3.3***. As per the existing EP the new four generators are individually tested for less than 50 hours per year. Equinix will record, for each generator/ the data-centre as applicable: ■ Number of test/maintenance running hours per year; ■ Number of emergency generation events and running hours – per year; and ■ Quantity and type of backup generation fuel used over the period.
Best practices in testing Backup generators	Operators should aim to minimise the environmental impact from emissions to air wherever feasible when testing emergency backup generators. The regulators considers the following are best practice: With multiple backup engines, testing should be staggered. The period and frequency of testing should be kept to the minimum sufficient to demonstrate the reliability at the appropriate load. Testing should be scheduled to periods when ambient background NOx can be expected to be low i.e. not during peak traffic periods. It is considered appropriate to utilise the electricity generated during testing for onsite use. Good practice when installing backup generators include the careful placement away from sensitive receptors, exhaust flues terminating vertically without obstructions to increase dispersion and not below residents windows or venting onto car parks etc.	The updated testing regime is described in ***Section 3.3*** black building and full load tests are conducted on a weekend when a lower background burden on the local air quality is expected, the fortnightly tests are conducted weekdays. The generators are tested for less than 50 hours per year.

Table 5.3: Best Available Techniques (BAT) Reference Document for Large Combustion Plants, 2017

Section	Subsection	BAT	BAT Text	Requirements	Comment
General BAT Conclusions	Environmental Management System EMS	BAT1	In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates the features presented in the BREF.	See BREF for detailed requirements	There is no change to the EMS as a result of this EP variation application. An ISO14001 accredited environmental management system (EMS) is in operation for their Powergate data centre, latest review date 5 June 2020. See ***Section 6*** and ***Appendix D*** for further information
	Monitoring	BAT2	BAT is to determine the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the gasification, IGCC and/or combustion units by carrying out a performance test at full load (1), according to EN standards, after the commissioning of the unit and after each modification that could significantly affect the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the unit. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	(1) In the case of CHP units, if for technical reasons the performance test cannot be carried out with the unit operated at full load for the heat supply, the test can be supplemented or substituted by a calculation using full load parameters	As the four new and 29 permitted generators are considered individually to be medium combustion plant and for the purpose of emergency generation, they are only required to comply with the MCPD requirements for monitoring instead of LCP BREF.
	Monitoring process parameters for emissions to air and water	BAT3		■ Fuel gas - Flow - Oxygen content, temperature and pressure - Water vapour content ■ Waste water from flue-gas treatment	Normal operating conditions for the data centre is grid supply of electricity. As Other than Normal Operating Conditions (OTNOC) conditions occur only in an emergency situation, there is no opportunity to schedule monitoring. To monitor during testing regimes would extend the running period of engines, thus worsening any air quality impact they may have.

					Not required to monitor as MCP. See BAT2 above, i.e. is required to comply with MCPD requirements only. No waste water to monitor.
	Monitoring of emissions to air	BAT4	BAT is to monitor emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	■ NH3 ■ NO2 ■ N2O ■ CO ■ SO2 ■ SO3 ■ Gaseous chlorides ■ HF ■ Dust ■ Metals and metalloids ■ Hg ■ TVOC ■ Formaldehyde ■ CH4 ■ PCDD/F	NOx, CO, SO2 and dust potentially applicable Normal operating conditions for the data centre is grid supply of electricity. As OTNOC conditions occur only in an emergency situation, there is no opportunity to schedule monitoring. To monitor during testing regimes would extend the running period of the engines, thus worsening any adverse air quality impact they may have.
	Monitoring emissions to water from flue-gas treatment	BAT5			
	General environmental and	BAT6	In order to improve the general environmental performance of combustion plants and to reduce	Techniques Fuel blending and mixing	Equinix has an extensive preventative maintenance regime, which includes maintenance and good design of the

	combustion performance		emissions to air of CO and unburnt substances, BAT is to ensure optimised combustion and to use an appropriate combination of the techniques given below.	Maintenance of the combustion system Advanced control system Good design of the combustion equipment Fuel choice	combustion equipment to deliver the requirement of an emergency back-up generator. This has not changed as a result of this EP variation application. Refer to ***Table 5.1*** response to items 7, 15 and 26.
	General environmental and combustion performance	BAT7	In order to reduce emissions of ammonia to air from the use of selective catalytic reduction (SCR) and/or selective non-catalytic reduction (SNCR) for the abatement of NO_x emissions, BAT is to optimise the design and/or operation of SCR and/or SNCR (e.g. optimised reagent to NO_x ratio, homogeneous reagent distribution and optimum size of the reagent drops).		Not applicable. No use of selective catalytic or non-catalytic reductions.
		BAT8	In order to prevent or reduce emissions to air during normal operating conditions, BAT is to ensure, by appropriate design, operation and maintenance, that the emission abatement systems are used at optimal capacity and availability.	(No requirements specified)	Emissions reduction for the data centre includes the scheduling of the black building test and full load tests on weekends i.e. not during periods of poor air quality associated with weekday traffic. Details of the testing regime can be found in ***Section 3.3***.
		BAT9	In order to improve the general environmental performance of combustion and/or gasification plants and to reduce emissions to air, BAT is to include the following elements in the quality assurance/quality control programmes for all the fuels used, as part of the environmental management system (see BAT 1):	i. Initial full characterisation of the fuel used including at least the parameters listed below and in accordance with EN standards. ISO, national or other international standards may be used provided they ensure the provision of data of an equivalent scientific quality; ii. Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications. The frequency of testing and the parameters	Fuel supply is ultra-low-sulphur diesel from commercial supply. Usage is extremely low due to normal operational for the data centres being powered by grid supply. As a result, the fuel selected is optimal for the use intended, i.e. emergency supply.

				chosen from the table below are based on the variability of the fuel and an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed); iii. Subsequent adjustment of the plant settings as and when needed and practicable (e.g. integration of the fuel characterisation and control in the advanced control system (see description in Section 10.8.1)).	
		BAT10	In order to reduce emissions to air and/or to water during other than normal operating conditions (OTNOC), BAT is to set up and implement a management plan as part of the environmental management system (see BAT 1), commensurate with the relevance of potential pollutant releases, that includes the following elements:	■ Appropriate design of the systems considered relevant in causing OTNOC that may have an impact on emissions to air, water and/or soil (e.g. low-load design concepts for reducing the minimum start-up and shutdown loads for stable generation in gas turbines) ■ Set-up and implementation of a specific preventive maintenance plan for these relevant systems; ■ Review and recording of emissions caused by OTNOC and associated circumstances and implementation of corrective actions if necessary; ■ Periodic assessment of the overall emissions during OTNOC (e.g. frequency of events, duration, emissions quantification/estimation) and implementation of corrective actions if necessary	Normal operating condition for the data centres is grid supply of electricity. Tests within the testing regime which have the potential to significantly affect local air quality (black building test and load bank test) are scheduled on weekends, i.e. not during periods of typically poor air quality associated with weekday traffic. In the event of emergency generation being required, the number of running hours will be recorded and reported to the EA.

		BAT11	BAT is to appropriately monitor emissions to air and/or to water during OTNOC	The monitoring can be carried out by direct measurement of emissions or by monitoring of surrogate parameters if this proves to be of equal or better scientific quality than the direct measurement of emissions. Emissions during start-up and shutdown (SU/SD) may be assessed based on a detailed emission measurement carried out for a typical SU/SD procedure at least once every year, and using the results of this measurement to estimate the emissions for each and every SU/SD throughout the year.	Normal operating conditions for the data centres is grid supply of electricity. As Other than Normal Operating Conditions (OTNOC) conditions occur in an emergency situation, there is no opportunity to schedule monitoring of emergency operations. Monitoring of the testing regime is as per BAT2 above, i.e. is required to comply with MCPD requirements only.
	Energy Efficiency	BAT12	In order to increase the energy efficiency of combustion, gasification and/or IGCC units operated ≥ 1 500 h/yr, BAT is to use an appropriate combination of the techniques given below	*Techniques* ■ Combustion optimisation ■ Optimisation of the working medium conditions ■ Optimisation of the steam cycle ■ Minimisation of energy consumption ■ Preheating of combustion air ■ Fuel preheating ■ Advanced control system ■ Feed-water preheating using recovered heat ■ Heat recovery by cogeneration (CHP) ■ CHP readiness ■ Flue-gas condenser ■ Heat accumulation	Not applicable. The engine/generator sets provide backup generation only and do not run for >1500 hr/yr.

				■ Wet stack ■ Cooling tower discharge ■ Fuel pre-drying ■ Minimisation of heat losses ■ Advanced materials ■ Stream turbine upgrades ■ Supercritical and ultra-supercritical steam conditions	
	Water usage and emissions to water	BAT13-15			No routine water usage and no emissions to water
	Waste Management	BAT16	In order to reduce the quantity of waste sent for disposal from the combustion and/or gasification process and abatement techniques, BAT is to organise operations so as to maximise, in order of priority and taking into account life-cycle thinking: (a) waste prevention, e.g. maximise the proportion of residues which arise as by-products; (b) waste preparation for reuse, e.g. according to the specific requested quality criteria; (c) waste recycling; (d) other waste recovery (e.g. energy recovery)	Techniques: Generation of gypsum as a by product Recycling or recovery of residues in the construction sector Energy recovery by using waste in the fuel mix Preparation of spent catalyst for reuse	Waste produced by the permitted activity is managed by subcontractors. If left over a long period of time the fuel in the tanks degrades. Once a year a subcontractor comes to site and accesses each bulk tank analysing the quality of the fuel. Depending on the results, they will undertake fuel 'polishing' improving its quality, taking any waste diesel off-site with them Mineral lube oil is also brought and taken off site by the subcontractor changing the oil.
	Noise Emissions Flaring	BAT17	In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below.	*Techniques* ■ Operational measures	The updated testing regime in total for the whole data centre is less than 100 hours in the year.

				■ Low-noise equipment ■ Noise attenuation ■ Noise-control equipment ■ Appropriate location of equipment and buildings	Extended running will occur only in an emergency situation. The four new generators are situated on the PG2 part of the Site in a newly constructed HV building. The HV Building will house the four new generators at ground level with associated high voltage switch rooms above.
BAT conclusions for the combustion of solid fuels	BAT conclusions for the combustion of coal and/or lignite	BAT18-23			Not applicable
	BAT Conclusions for the combustion of solid biomass and/or peat	BAT24-27			Not applicable
BAT conclusions for the combustion of liquid fuels	HFO- and/or gas-oil-fired boilers	BAT28-30			Not applicable
	HFO- and/or gas-oil-fired engines Energy efficiency	BAT31	In order to increase the energy efficiency of HFO and/or gas oil combustion in reciprocating engines, BAT is to use an appropriate combination of the techniques given in BAT 12 and below.	*Techniques* ■ Combined cycle	The purpose of the diesel generators is for emergency supply only. There is no opportunity for combined cycle operation.
	HFO- and/or gas-oil-fired engines NO_x, CO and volatile organic compound	BAT32	In order to prevent or reduce NO_x emissions to air from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to use one or a combination of the techniques given below.	*Techniques* ■ Low-NOx combustion concept in diesel engines ■ Exhaust-gas recirculation (EGR) ■ Water/steam addition	The Equinix Powergate data centre works to a 2n standby arrangement, where in is the load requirement of the data centre. The four new engines, purchased in 2022 are 2G standard emission and the existing 29 permitted engines are a mix of 2G and 3G standard emissions. The

	emissions to air			■ Selective catalytic reduction (SCR)	engines in place reflect local and global investment and acquisition decisions by Equinix and were selected at the time of purchase to provide the appropriate power capacity, reliability and serviceability for the function they are required for, namely emergency generation.
		BAT33	In order to prevent or reduce emissions of CO and volatile organic compounds to air from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to use one or both of the techniques given below.	*Techniques* ■ Combustion optimism ■ Oxidation catalysts	The purpose of the diesel generators is for emergency supply only. Combustion is optimised for this purpose. The four new engines, as per the existing 29 engines, are considered individually to be medium combustion plant and for the purposes of emergency generation, they are not required to comply with emissions limits in the MCPD.
	HFO- and/or gas-oil-fired engines SO_x, HCl and HF emissions to air	BAT34	In order to prevent or reduce SOX, HCl and HF emissions to air from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to use one or a combination of the techniques given below.	*Techniques* ■ Fuel choice ■ Duct sorbent injection (DSI) ■ Wet flue-gas desulphurisation (wet FGD)	Ultra-low-sulphur fuels as a primary source. Ultra-low-sulphur diesel is specified for purchase. Actual annual purchase is very low (one delivery of c. 40,000 every two-three years). The four new engines, as per the existing 29 engines, are considered individually to be medium combustion plant and for the purposes of emergency generation, they are not required to comply with emissions limits in the MCPD.
	HFO- and/or gas-oil-fired engines Dust and particulate bound metal emissions to air	BAT35	In order to prevent or reduce dust and particulate-bound metal emissions from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to use one or a combination of the techniques given below.	*Techniques* ■ Fuel choice ■ Electrostatic precipitator (ESP) ■ Bag filter	The four new engines, as per the existing 29 engines, are considered individually to be medium combustion plant and for the purposes of emergency generation, they are not required to comply with emissions limits in the MCPD.

	Gas-oil-fired gas turbines	BAT36-39			Not applicable
10.4 BAT conclusions for the combustion of gaseous fuel		BAT40-54			Not applicable
10.5 BAT conclusions for multi-fuel-fired plants		BAT55-59			Not applicable
10.6 BAT conclusions for the co-incineration of waste		BAT60-75			Not applicable

6. ENVIRONMENTAL MANAGEMENT SYSTEMS

6.1 ISO 14001

As identified in the original EP application, Equinix operates an ISO 14001 accredited environmental management system (EMS) for the Site. Equinix successfully recertified its ISO14001, ISO50001 & ISO45001 on 12th December 2020 and is awaiting its new certificate. The current ISO 14001 certificate was provided as part of the original EP application (see ***Appendix D***). The EMS will be reviewed and updated to include the additional four generators.

6.2 Summary of Equinix Environmental Management System

The following is a summary of the contents of the Equinix EMS. Further detail on any aspect is available on request.

1. Purpose
2. Scope of Document
3. Management Systems Elements
    - 3.1. Health Safety and Environment Policy
    - 3.2. Health Safety and Environment Organisation and Roles and Responsibilities
    - 3.3. Health Safety and Environmental Communications
    - 3.4. Compliance with Legislation
    - 3.5. Scope of the Health Safety and Environment Management System
    - 3.6. Health Safety and Environment Objectives
    - 3.7. Health Safety and Environment Training
    - 3.8. Employee Health Safety and Environment Competence
    - 3.9. Monitoring
    - 3.10. Record Management
    - 3.11. Visitors
4. Health and Safety Section
5. Occupational Health
6. Environmental Management Section
    - 6.1. Significant Environmental Aspects
    - 6.2. Environmental Incident Reporting
    - 6.3. Environmental Spill Response Process
    - 6.4. Environmental Emergency Preparedness
    - 6.5. Water Quality and Legionella Management
    - 6.6. Waste (incl. licences and permits, waste documentation and List of wastes codes)
    - 6.7. Hazardous Waste (incl. fluorescent light tubes, lead batters, printer cartridges and toner, WEEE, chemicals and hazardous materials
    - 6.8. Site Environmental Issues
    - 6.9 Energy Management

7. WASTE MANAGEMENT

7.1 Waste Generation

Minimal additional waste is expected to be generated as a result of this EP permit variation. Waste generated from the permitted activities is waste lubricating oil and diesel fuel waste.

As per the original EP application and latest variation (and Schedule 5 response), waste oil is only generated in limited amounts during the maintenance of the diesel engines of the generators. The maintenance is undertaken by an external subcontractor who collects and disposes of the waste oil generated.

An external company is brought on site annually to test the stored diesel fuel. They test a variety of parameters and if required the fuel is then cleaned on site using the site's fuel polishing system fitted on each fuel bulk tank. Minimal waste is generated through this cleaning process, which is managed through the external company.

7.2 Waste Minimisation

Waste minimisation measures are already in place, as per the original EP application and will continue to apply to the varied activities.

7.3 Waste Storage

The management of waste storage is as previously applied for and determined as per the existing EP. Waste oil is not stored on site or disposed of by Equinix.

8. RAW MATERIALS

The Site uses the raw materials detailed in ***Table 8.1***. Typical consumption values are given, as all raw material usage is intermittent. There is no change to the consumption of water, mineral lube oil and biocides as part of this permit variation.

Table 8.1: Raw Materials Usage

Substance	Approximate Annual Consumption	Typical Storage Capacity	Use	Risk
Water	No change as a result of this EP variation			
Diesel	In 2021, 73.5 tonnes of diesel was purchased for the LD9 data centre.	PG1 has a 22,000 litre and a 33,463 litre bulk tank PG2 has 12 x 43,000 litre bulk tanks Each generator has its own day tank (c. 1,000 litres capacity)	Generator fuel	Flammable liquid and vapour, Toxic to aquatic life with long lasting effects
Mineral Lube Oil	The new engines will result in additional consumption of mineral lube oil but the overall increase in usage is not expected to be material.			
Biocides	No change as a result of this EP variation			

9. ENERGY

9.1 Energy Usage

The data centre at the Site is supplied by the national grid during normal operation. The load expected varies depending on the customers using the data centre. The supply of energy from the national grid will continue to be the normal source of energy. Backup generation will be increased to match the requirements of the data centre up to a factor of 2n, where n is the load requirement of the data centre. ***Table 3.1*** provides detailed of the increase in backup generation capacity as a result of this permit variation.

9.2 Energy Efficiency

As per the information in the original EP application, Equinix uses the power usage effectiveness (PUE) metric to measure the energy efficiency of a data centre's infrastructure under normal operating conditions.

$$PUE = \frac{total\ energy\ entering\ the\ data\ centre}{energy\ used\ by\ IT\ equipment\ inside\ the\ data\ centre}$$

Each of the data centres has a PUE target set against a base year of 2019 to accomplish a 5% improvement in energy efficiency over a 3-year period.

9.3 Energy Management System

There is no expected change in the Energy Management System as a result of the operational changes described in this EP variation application. Equinix operates an ISO 50001 accredited energy management system for their Powergate Business Park data centre, at the latest review date of 5 June 2020. The four generators are to be included in the management system. Equinix is awaiting for its updated ISO 50001 certificate following recertification on 12th December 2020; however the current version is presented in ***Appendix D***.

9.4 Climate Change Agreement

There is no expected change to the Climate Change Agreement (CCA) as a result of the changes made to this operation under this variation application.

Equinix (UK) Ltd's CCA is included in ***Appendix E***. Equinix's performance in Target Periods One and Two can be examined in the following First and Second Target Reports:

- First Target Report:

  https://www.techuk.org/images/programmes/DataCentres/CCA_First_Target_Report_FOR_PRINT.pdf

- Second Target Report:

  https://www.techuk.org/images/CCA_Second_Target_Report_04.pdf

10. NOISE

An assessment of the potential for impact on noise sensitive receptors from the four new generators in terms of noise has been undertaken and is presented in ***Appendix I***. The assessment concludes that noise from the site is not anticipated to be significant or result in a significant change in the soundscape at the nearest noise sensitive receptors.

The assessment includes an updated noise modelling study by ERM that has been carried out to simulate the potential changes resulting from the four new emergency generators at the site in combination with the operation of the 29 generators presented in the existing EP.

The assessment is based on background noise data from a noise study by Applied Acoustic Design ref. 07069/001/mb dated 2nd November 2007.

11. AIR QUALITY

The full Air Dispersion Modelling Report can be found in ***Appendix C***. A summary of the findings is presented below.

11.1 Summary of Air Dispersion Modelling Findings

The air quality assessment that was submitted as part of the original EP application has been reviewed and updated to reflect the addition of the four new HV generators (which will operate in combination with the permitted 29 generators) and to accommodate changes in the testing regime. The assessment methodology, baseline data, meteorology data, remain largely as reported in the original air quality assessment that was reviewed and approved as part of the existing EP, however some refinements pertaining to the statistical analysis have been made.

The testing scenarios modelled have also been amended as part of the EP variation application to reflect changes to include the four new generators.

The information provided follows Environment Agency guidelines for the requirements for dispersion modelling and guidelines for assessing the impacts of emissions from engines which are infrequently used. The Environment Agency requires evidence that emissions from the installation should not result in the air quality standards being exceeded, or that the probability of exceeding is unlikely. Such evidence is provided in the Air Dispersion Modelling Report.

Based on the assessment performed, the testing regime for the generators at the data centre is not expected to result in a significant adverse impact on air quality at sensitive potential human receptors by comparison with human health protective standards. Whilst the assessment predicts that there is a marginal increase in the potential in principle for the total number of hours exceeding the hourly NO_2 standard to be greater than the 18 allowed, a statistical assessment suggests that the chance of this happening in practice is highly unlikely ($4.3x10^{-33}$ %); far below the 1% tolerable probability threshold.

With regard to potential effects at ecological receptors, the assessment suggests that he generator testing regime of the Site will not have any significant effects relative to the annual mean NO_2 standard; and will not have any significant effects relative to the 24-hour mean or annual mean NO_x, nitrogen deposition and acid deposition standards for the surrounding protected conservation areas.

An emergency power generation scenario assuming all the Site's generators run at the same time at 60% load for an assumed duration of one hour was also assessed. In this case, an exceedance of the hourly NO_2 standard is predicted to occur. Only one engine has ever in practice been used to provide emergency power since the datacentre was built; 2008 for PG1 and 2012 for PG2. The scenario is also conservative as not all the engines would actually be used for emergency power generation as the Site is designed with a 2n arrangement (where the n is the number of generators required to meet the data centre load). This modelled scenario and exceedance of the hourly air quality standard is therefore considered quite unlikely to happen. Emergency power generation would not be expected to result in exceedances of the annual mean NO_2 standard for human health or the annual mean NO_x, nutrient nitrogen deposition or acid deposition standards for the protected conservation areas in the vicinity of the Site.

The modelling also suggests the expanded Site operation should not result in a breach the air quality standard for PM_{10}. Sulphur dioxide emissions were not assessed as the Site uses ultra-low-sulphur diesel.

12. SITE CONDITION REPORT

The site condition of the data centre is not known to have changed since the original EP application was submitted. There has been no change to the site boundary and no ground pollution incidents have been reported. No additional baseline data/site investigation has been undertaken for this application and none is considered necessary. The Site Condition Report (SCR) has been updated with details of the additional fuel storage at the data centre associated with the additional generators.

The updated SCR can be found in ***Appendix F***.

13. MONITORING

13.1 Emissions to Air

The existing EP requires that Equinix provide an annual report of the activities set out in Schedule 4 Table S4.2. An emissions inventory is also required to be completed annually. No change is proposed as a result of this EP variation application in the way Equinix collects and reports this data.

The Environment Agency requires the following metrics in relation to the backup generation activity at the Site's data centre:

- Number of test/maintenance running hours per year;
- Number of emergency generation events and running hours – per year; and
- Quantity and type of backup generation fuel used over the period.

The annual report and emissions inventory will incorporate details for the four new generators as well as the currently permitted 29 generators.

It is anticipated that monitoring for NO_x and CO, in line with web guide 'Monitoring stack emissions: low risk MCPs and specified generators,' published 16 February 2021 will be required for the four new generators. The monitoring frequency is expected to be every 1,500 hours of operation or once every five years (whichever comes first). The flues for the four new generators have been designed so that suitable sampling points are incorporated to facilitate such monitoring.

14. ENVIRONMENTAL RISK ASSESSMENT

14.1 Identify and Consider Risks from the Site

The environmental risk assessment of the original EP application has been reviewed and updated to include the four new generators and additional fuel storage. This has included review of sources, pathways and receptors. The overall assessment of risk is the combination of probability and consequence. It is considered that the addition of a further four generators and associated fuels storage will result in only a small additional risk. The risk assessment is presented in ***Table 14.1***.

Separately, the EA's H1 tool has been updated for the four new generators. The database file is supplied with this application via OneDrive as Equinix LD9 Permit Variation 03.10.22. Detailed modelling of the emissions to air is described in Section 11 of this document.

14.2 Climate Change Risk Assessment

A climate change risk assessment was completed as part of the previous EP. This is supplied in ***Appendix G***.

Table 14.1: Environmental Risk Assessment

Hazard	Operational Scenario	Receptor	Pathway	Risk Management Techniques	Probability of Exposure	Consequence	Overall Risk
Emission to air *(NO_x, CO, particulates)*	Testing	See detailed air quality modelling ***Section 11***	Dispersion through the air	Testing regime scheduled for minimum practicable impact – see detailed air quality modelling in ***Section 11*** and ***Appendix C***	High	Low	Low
	Emergency operation	See detailed air quality modelling ***Section 11***	Dispersion through the air	■ The site has an uninterruptable power supply (UPS) units, the design is for 6 minutes autonomy at the end of battery life; during a utility failure it is expected that generators will start and take the load within 1 minute of the failure occurring ■ Emergency running within 1 minute of blackouts ■ Site has not experienced blackouts that require emergency running since it commenced operation in 2008	Very Low	Medium	Low
	In case of fire	See detailed air quality modelling ***Section 11***	Dispersion through the air	Each generator container or room has a fire alarm panel (flame detection) interfaced to the site wide fire alarm system. A fusible link interfaced with fire alarm system and drop valves on both the fuel transfer and feed line to the generator are also provided to terminate the flow of fuel to the engine. When the fusible link melts, it isolates the fuel feed to the engine which shuts the generator down in the event of the fire which triggers the fire alarm. The generator containers are designed to withstand the fire.	Very Low	Medium	Low
Emission to water of bulk fuel	Accidental release of diesel to ground surface	Grand Union Canal	Overland flow	The site is hard surfaces and kerbed around the edges. The likelihood of a spill large enough to overwhelm the kerbing is very low, not least as bulk fuel storage is in multiple tanks with secondary containment. Multiple catastrophic failures are highly unlikely.	Very Low	Medium. Site clean-up and possible remediation required	Low
Emission to sewer (*Cooling water blowdown)*	Maintenance	Waste water treatment plant (WWTP)	Combined sewer	Emission is by arrangement with the sewerage undertaker	Very low	None (planned)	Very low

Hazard	Operational Scenario	Receptor	Pathway	Risk Management Techniques	Probability of Exposure	Consequence	Overall Risk
Emission to sewer *(Bulk fuel)*	Accidental	WWTP	Combined sewer following a direct spill onto land through catastrophic failure of tank / pipework / overfill, bund and site surfacing	The description of the PG1 day and bulk tanks remains as described in the original EP application (including Schedule 5 response). The PG2 bulk tanks, including the two new ones being added as part of this variation, are double skinned with a leak detection system. The tanks are located within a concrete bund (which is impermeable to oil and water as per Environment Agency guidance). The concrete bund is designed to capture tank leaks should these occur and to transfer fuel from the bund into an underground diesel holding tank that is capable of holding more than 110% of a single tank. The holding tank is segmented and visually examined regularly. Recovery arrangements are in place with a specialist subcontractor if necessary. The PG2 bulk tanks are located outside but have means of removing rainwater from the bund that does not penetrate the bund wall. In the event of oil or oily water being present this is removed using a vacuum pump, and recycled or disposed using an appropriate waste disposal company if deemed appropriate. The areas in which the bulk and day tanks are located are subject to a daily site housekeeping walk around to look for issues. The diesel filling procedure is defined and set out in ***Appendix A*.** The generators are all stood on pour concrete floors. The Sites consist of hardstanding in generally good condition both inside and outside of the building. The site drainage system is detailed in ***Appendix H*** Equinix has emergency response procedures in place in the event of a release of oil or diesel, processes for the planning for such eventualities and checklists to audit the	Low	Medium. WWTP may need to quarantine the affected flow	Low

Hazard	Operational Scenario	Receptor	Pathway	Risk Management Techniques	Probability of Exposure	Consequence	Overall Risk
				response in case such an event occurs. These are provided in ***Appendix B***.			
Emission to land *(Bulk fuel)*	Accidental	Land within the installation boundary (hard standing is kerbed and losses to ground surface are expected to enter sewer rather than run off site).	Direct spill onto land through catastrophic failure of tank / pipework / overfill, bund and site surfacing	See response for Emission to water and sewer (bulk fuel)	Low	Medium. Site clean up and possible remediation required	Medium - Low
Emission to groundwater *(Bulk fuel)*	Accidental	The site is more 1.5km from the nearest aquifer (Secondary A) and more than 6km from a source protection zone	Infiltration through land surface following direct spill as above	See response for Emission to water and Sewer (bulk fuel)	Very low	Medium. Site clean up and possible remediation required	Low
Odour	No known scenarios						
Noise and Vibration	Generator testing / emergency operation	Local businesses / residential receptors	Airborne	■ Testing regime scheduled for daytime hours ■ Emergency running likelihood is very low and unlikely to be of extended duration (see emissions to air) See also ***Section 10*** of this document.	Very low	Medium – nearest residences are c. 50m. Nearest businesses are c. 50m	Low

Hazard	Operational Scenario	Receptor	Pathway	Risk Management Techniques	Probability of Exposure	Consequence	Overall Risk
Litter / pests	Normal operation	Neighbouring industrial and commercial units	Windblown	■ Housekeeping is given a high priority as company policy ■ Waste generating activities occur within the data centre building and are not external ■ Waste generated by the data centres is not putrescible			
Visible emissions *(Black smoke on start-up)*	Generator testing / emergency operation	Neighbouring industrial and commercial units	Airborne / visual	■ Minimisation of planned testing ■ Low likelihood of emergency running (see emission to air)	Medium	Low – short duration visible emission	Low
Surface water flooding from a weather event	All operational scenarios	Site operations restricted	Direct effect	■ Surface water drainage to combined sewer ■ Site operations are principally internal	Low – not in a fluvial flood plan	Low – operational impact	Low

APPENDIX A DIESEL FILLING PROCEDURE

APPENDIX B EMERGENCY RESPONSE PROCEDURE

APPENDIX C AIR QUALITY IMPACT ASSESSMENT

APPENDIX D ISO 14001 AND ISO 50001 CERTIFICATE

APPENDIX E CLIMATE CHANGE AGREEMENT

APPENDIX F UPDATED SITE CONDITION REPORT JULY 2022

APPENDIX G CLIMATE CHANGE RISK ASSESSMENT

APPENDIX H DRAINAGE PLAN

APPENDIX I NOISE IMPACT ASSESSMENT AND MANAGEMENT PLAN

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