ARUP

Amazon Data Services UK Limited

Linmere Island Data Centre Environmental Permit Application

Summary Technical Report

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1. Introduction

1.1 Overview

Ove Arup & Partners Ltd (Arup) has been commissioned by Amazon Data Services UK Limited (henceforth known as 'the Operator') to prepare a Summary Technical Report (STR) to accompany a bespoke application for an Environmental Permit (EP) for a data centre.

The EP is for Linmere Island Data Centre – Emergency Back-Up Generation Facility only (not including the whole data centre).

The application is made by Amazon Data Services UK Limited which is the legal entity that will be responsible for operating the generating installation.

1.2 The Operator

The Operator currently runs own built data centres in-line with The Environmental Permitting (England and Wales) Regulations 2016. The Operator also has additional operational data centres in England and Wales however, these are co-located sites and are operated by third-parties who hold the Environmental Permits.

1.3 The Site

The site is located in Houghton Regis, Bedfordshire, UK, approximately 7km north-west of Luton town centre and accessed from the A5505 Woodside Link off the M1 (hereafter referred to as 'the site').

The site bounded by the Dunstable Northern Bypass to the north; the A5505 Woodside Link to the east; B5790 to the south; and Sundon Road to the west. The intersections of the A5505 with the B5790 and the B5790 with Sundon Road are roundabouts. The surrounding area is characterised by a mix of warehouse and industrial uses that are currently under development / recently built. There is a public park to the west, a supermarket and residential developments to the south, and a Lidl Distribution Centre to the east. The wider area forms part a wider network of sites that comprise a strategic mixed-use development for the area, known as 'HRN1' (Horton Regis North 1).

A lime stabilised earth bund occupies the north side of the site, adjacent to the Dunstable Northern Bypass. The remainder of the site comprises fields, trees, the remains of an orchard associated with the demolished Charlton Cross Farm Buildings, and a former car park. The site is classified as greenfield and was agricultural land until circa 2015, after which it is assumed to have been used as a construction compound for development in the wider area. The data centre will be manned on a 24-hour basis.

2. Legislative Framework

The following regulations and guidance to the assessment and has been taken into consideration in developing the approach to the assessment:

1. The Environmental Permitting (England and Wales) Regulations 2016, SI2016/1154.
2. EU, 2010 Directive 2010/75/EU of the European Parliament and the Council on industrial emissions.
3. EU, 2015. Directive (EU) 2015/2193 on the limitation of emissions of certain pollutants into the air from medium combustion plant.
4. The Control of Pollution (Oil Storage) (England) Regulations 2001
5. Best available techniques: environmental permits[1]
6. Risk assessments for specific activities: environmental permits[2].
7. Environment Agency Data Centre FAQ Headline Approach[3].
8. Reference Document - Best Available Techniques on Emissions from Storage 2016[4].
9. CIRIA, 2014. Containment systems for the prevention of pollution (C736F)[5]

2.1 On-site activities

The Site will comprise 42 standby backup diesel generators for emergency use, four of which are secondary back-ups ('catcher') and two are smaller ('house') generators to cover non-critical loads (e.g., office lights, office fire system) during an emergency. All will be run individually for maintenance tests and will exhaust through individual flues. The generators will not be used for any other purpose other than to provide emergency power to the data centre in the event of a national grid power outage, and for maintenance and testing. It is the intent that the generators will run on more sustainable Hydrogenated Vegetable Oil (HVO) if it can be sourced in the local area, however diesel may also be used if unavailable. In addition, there will also be one generator with a thermal input capacity of 0.39MWth present in the substation.

Each generator has an individual flue terminating at 25m above ground, the locations of which are provided in the Installation Permit Boundary Drawing (302321-ARP-XX-XX-DR-Z-0001) and Emissions Point Drawing (302321-ARP-XX-XX-DR-Z-0001) contained in Appendix 03– 04 Site Plan. The generator located in the substation has the capacity below 1MWth and has therefore not been included in the assessment. This generator will be located within the Substation building within a dedicated room. The storage tank will be filled via an external fuel filling cabinet.

Fuel will be delivered to the site using fuel tankers. There will be two 40,000L litres top up tanks (one for each data centre hall) which the fuel tankers will dispense fuel to. The fuel will then be distributed from the top up tank to individual generator belly tanks where it will be stored until use. A separate fuel storage tank serving the substation generator. The capacity of the generator belly tanks will be 16,000 litres and the capacity of the substation fuel storage tank is 349 litres. All fuel storage will be integrally bunded tanks with 110% capacity. All tanks will comply with the Oil Storage Regulations (SI 2001/2954, The Control of Pollution (Oil Storage) (England) Regulations 2001).

[1] https://www.gov.uk/guidance/best-available-techniques-environmental-permits

[2] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit

[3] EA, 2022, Data Centre FAQ Headline Approach – Release to Industry version 21 15/11/22.

[4] EC, 2014 Reference Document – Best Available techniques on Emissions from Storage. Available at https://eippcb.jrc.ec.europa.eu/sites/default/files/2022-03/efs_bref_0706_0.pdf. Accessed June 2024.

[5] CIRIA 2014. Containment systems for the prevention of pollution. Secondary, tertiary and other measures for industrial and commercial premises. Available at https://www.ciria.org/ItemDetail?iProductCode=C736F&Category=FREEPUBS. Accessed June 2024.

Combustion activities are regulated under The Environmental Permitting (England and Wales) Regulations 2016 (EPR). The regulations enact both the Industrial Emission Directive (IED) and the Medium Combustion Plant Directive (MCPD) in England and operators undertaking any of the activities identified under these regulations require an environmental permit to carry out these activities.

The data centre will be operated on power from the national grid however, in the event of a grid failure back up power will be provided by backup diesel generators, with a total installed thermal capacity onsite will be approximately 324.6 MWth. The generators will be operated to provide power at a site during an emergency only, as well as routine testing in-line with manufacturers maintenance requirements.

They will not be used to provide a balancing service or for demand side response operations such as triad avoidance or fast frequency response. No electricity generated from the site will be exported off-site or fed back into the National Grid.

Combustion plant that have an aggregated capacity of greater than 50 MWth are listed in Annex I of the IED and must therefore be permitted to operate in line with Chapter II of the IED. However, the capacity of individual generators are all below 15 MWth so the plant does not fall under the scope of Chapter III of the Directive and therefore are not required to meet the requirements of the EU BAT Conclusions document for Large Combustion Plant (LCP), including the Emission Limit Values (ELVs) set in the Best Available Technique (BAT) conclusions. To cover this gap in the EU guidance the MCPD will inform site specific BAT for certain IED Chapter II activities, including gas engines generating electricity with a capacity of more than 50 MWth, operated as the primary activity on the site.

On this basis, the EA will include MCPD requirements in the permit, as the minimum standards. These are influenced by the type and frequency of the generator's operation. As the planned operation of the generators is for the purpose of maintenance and testing only and for less than 50 hours the operation per year, the generators are unlikely to be subject to any Emission Limit Values (ELVs) or testing restrictions, provided it can be demonstrated that no adverse environmental impacts are predicted, for example to local air quality.

As the aggregated combustion capacity is greater than 20 MWth, the site will be required to obtain a Greenhouse gas emission permit as part of the Emissions Trading System. Conditions will be set out within the Permit detailing the requirements to monitor and report on emissions from the site, including specifying the frequency of monitoring and methods used. Annual monitoring reports will also be required to be submitted.

2.2 Permitting Regime – IED or MCPD

As identified above, the generators will be permitted under the Environmental Permitting (England and Wales) Regulations 2016. The total aggregated capacity of the generators is above 50 MWth and will therefore be permitted under the IED. However, because the individual combustion is below 15 MWth the installation will be permitted as an IED Chapter II installation but not a Chapter III (LCP) installation. This means the installation will not be required to meet the BAT Conclusions for the LCP. The permit will therefore follow the guidelines set out under the MCPD.

Under the EPR a permit is required to operate the plant, including the commissioning. The permit application process has therefore been programmed to achieve a permit prior to the commissioning phase in the project programme.

2.3 Scheduled activities

The "activities" that are proposed are defined in the EPR:

Section 1.1 Part A(1)(a) burning any fuel in an appliance with a rated thermal input of 50 or more megawatts. In accordance with the EPR:

"…where two or more appliances with an aggregate rated thermal input of 50 or more megawatts are operated on the same site by the same operator, those appliances must be treated as a single appliance with a rated thermal input of 50 or more megawatts."

2.4 Directly Associated Activities

Schedule 1, Part 1 Regulation 2(1) of the EP Regulations provides that a Directly Associated Activity (DAA) is an operation that, in relation to any other activity:

- Has a technical connection with the activity;
- Is carried out on the same site as the activity; and
- Could have an effect on pollution.

As the purpose of the on-site fuel storage is to serve the generators and the Scheduled Activity above, this storage of fuel therefore constitutes a directly associated activity to be covered in this Permit Application.

3. Data Centre Description

3.1 Installed Engines

In response to Part B3 question 7a.

The site comprises 42 containerised generators for emergency purposes as set out in Table 3-1. In addition, there is one single emergency generator serving the substation which has a thermal input capacity of 0.39 MWth.

Table 3-1 Generator details

ID	Type	Model	Rated Electrical Output (MWe)	Thermal Input (MWth)
A1	Main generator 1	CAT 3516E	2.8	8
A2	Main generator 2	CAT 3516E	2.8	8
A3	Main generator 3	CAT 3516E	2.8	8
A4	Main generator 4	CAT 3516E	2.8	8
A5	Main generator 5	CAT 3516E	2.8	8
A6	Main generator 6	CAT 3516E	2.8	8
A7	Main generator 7	CAT 3516E	2.8	8
A8	Main generator 8	CAT 3516E	2.8	8
A9	Main generator 9	CAT 3516E	2.8	8
A10	Main generator 10	CAT 3516E	2.8	8
A11	Main generator 11	CAT 3516E	2.8	8
A12	Main generator 12	CAT 3516E	2.8	8
A13	Main generator 13	CAT 3516E	2.8	8
A14	Main generator 14	CAT 3516E	2.8	8
A15	Main generator 15	CAT 3516E	2.8	8
A16	Main generator 16	CAT 3516E	2.8	8
A17	Main generator 17	CAT 3516E	2.8	8
A18	Main generator 18	CAT 3516E	2.8	8
A19	Main generator 19	CAT 3516E	2.8	8
A20	Main generator 20	CAT 3516E	2.8	8
A21	Main generator 21	CAT 3516E	2.8	8
A22	Main generator 22	CAT 3516E	2.8	8
A23	Main generator 23	CAT 3516E	2.8	8
A24	Main generator 24	CAT 3516E	2.8	8

ID	Type	Model	Rated Electrical Output (MWe)	Thermal Input (MWth)
A25	Catcher 1	CAT 3516E	2.8	8
A26	Catcher 2	CAT 3516E	2.8	8
A27	House 1	CAT C32	0.72	2.1
A28	Main generator 25	CAT 3516E	2.8	8
A29	Main generator 26	CAT 3516E	2.8	8
A30	Main generator 27	CAT 3516E	2.8	8
A31	Main generator 28	CAT 3516E	2.8	8
A32	Main generator 29	CAT 3516E	2.8	8
A33	Main generator 30	CAT 3516E	2.8	8
A34	Main generator 31	CAT 3516E	2.8	8
A35	Main generator 32	CAT 3516E	2.8	8
A36	Main generator 33	CAT 3516E	2.8	8
A37	Main generator 34	CAT 3516E	2.8	8
A38	Main generator 35	CAT 3516E	2.8	8
A39	Main generator 36	CAT 3516E	2.8	8
A40	Catcher 3	CAT 3516E	2.8	8
A41	Catcher 4	CAT 3516E	2.8	8
A42	House 2	CAT C32	0.72	2.1
A43	Substation generator	C170 D5	0.136	0.39
Total installed capacity			113.4	324.6
*Thermal input capacity calculated based on an estimated efficiency of 35%. The total installed capacity does not include the substation generator as it has a MWth capacity of <1MWth.				

3.2 Size on units needed

The number and configuration of the generators has been selected in order to ensure that the service requirements of the data centre and associated servers / critical infrastructure in the event of any temporary grid interruptions / failures can always be met, whilst providing the necessary redundancy / resilience to cover any generator failure / maintenance.

Based on the critical power requirements, diesel generators in the range between insert range 3 and 9 MWth were considered to provide the best solution because:

- Units are readily available for this back up purpose;
- They can be modularised (containerised);
- Components are “off the shelf” and easily changeable; and
- Each unit / module is self-sufficient.

Furthermore, a single smaller ‘house’ generator is also to be installed to supply cover non-critical loads (e.g., office lights, office fire system) during an emergency.

The decision for a larger number of smaller generators to be installed on-site, rather than a smaller number of larger generators, was made early in the process based on the flexibility it allows in the event of an emergency situation, whilst appropriately managing risk of unit failure and still guaranteeing supply (two catcher/ redundant generators operating at partial load in the event of emergency).

This proposed solution ensures that the generators are operated at their optimal design capacity (typically high loads) should they be required, which maximises the fuel efficiency/combustion and therefore emissions to air. Operating a smaller number of diesel generator with greater rated electrical outputs at suboptimal low loads can have an adverse impact on engine operations and ultimately their longevity, if repeatedly used over long periods.

The Electrical Supply Arrangement can be found in Appendix 03– 02 Electrical Supply Arrangement.

3.3 Operating Regime

In response to Part B3 question 7a.

The planned maintenance and testing regime of the generators is set out in Table 3-2. This shows that each generator is planned to operate for significantly less than 50 hours which are used purely for a stand-by emergency role as stated in the EA Data Centre FAQ (v.21 2022).

Table 3-2 Generator use regime

Scenarios	Operating profile	Description
Scenario 1: Biweekly	0.5 hour runs fortnightly = 13 hours per year	Each of the 42 generators to be tested, one at a time. Generators will be tested at 25% load (but conservatively modelled at 100%).
Scenario 2: Biannual	Up to 4 hours running, twice per year = 8 hours per year	Each of the 42 generators to be tested, one at a time. Generators will be tested at 100% load.
Scenario 3: Maintenance	10 hours of cumulative running over the course of the year	Each of the 42 generators to be tested, one at a time. Generators will be tested at 100% load.
Scenario 4: Emergency scenario (e.g., power utility outage)	A single (worst-case and rare) event of all generators running to simulate a power utility outage. The air quality modelling will establish the maximum emergency generator run hour availability.	A single event where 42 generators will operate simultaneously at 100% load, 8760 hours per year (in order to find the worst case hours for assessment against the hourly air quality standard for NO_2)
	Total planned run time – 31 hours per year per generators	

3.4 Network reliability and in-built redundancy

In the event of a loss of power supply, i.e. temporary grid blackout, the generators will be utilised to maintain power supply. These generators are designed to automatically activate and provide power to the plant pending restoration of mains power. Every effort will be made to ensure that the generators would not be required in practice, as described below.

Power for the data centre will be supplied from/by the National Grid which operates its transmission system in accordance with the Security and Quality of Supply Standard which is a requirement of its Transmission Licence. In accordance with this standard, a level of redundancy is also built into the transmission system.

National Grid's National Electricity Transmission system Performance Report for 2022 – 23[6] states The Overall Reliability of Supply for the National Grid Electricity Transmission (NGET) System during 2022-23 was: 99.999997%. During 2022 – 23, the report states that there were 412 NGET events where transmission circuits were disconnected either automatically or by urgent manual switching. The vast majority of these events had no impact on electricity users with 11 resulting in loss of supplies to customers. The total estimated unsupplied energy for these 11 incidents during 2022-23 was 7.1 MWh. The longest loss of supply lasted 762 minutes (12.7 hours) at Tinsley Park substation in Sheffield. Of the 11 incidents the closest was at Watford South Substation located approximately 30km south of the Site.

The power distribution system, on-site, starting from the High Voltage 9HV) (132kV) UKPN connection at Sundon substation down to the Operators 132/20kV Transformer, is designed to be safe reliable, robust and efficiency and have a high in-built redundancy.

Building A and Building B are both equipped with a Catcher system which is an electrical infrastructure element that provides redundant power to the critical loads. This system is shared across all electrical lineups.

Each Building will be equipped with two catcher distinct systems consisting of a Catcher Unit Substation Switchboard (MEDS-1.1C and MEDS-2.1C) with a dedicated utility supply and an emergency generator for the provision of power. The Catcher installation distributes the "reserve" power from the catcher MEDS to downstream equipment connected throughout the data centre building, when needed.

In each critical electrical lineup, the Utility Switchboard is supplied from a third "catcher" source in addition to the utility and generator sources. This allows critical loads to be automatically transferred to the catcher system in case of failure on the normal power supply or equipment. The catcher system helps reduce generator runtime by providing an alternative backup power source to the critical loads. Instead of relying solely on the generators for backup power during a utility failure, the catcher system can take over and supply power to the critical loads. This allows the generators to remain in standby mode, reducing their runtime.

In case of loss of mains supply, a certain amount of load is transferred to one of the catchers and the other catcher can be utilized to provide a fully available second source for all the unaffected lineups and the critical load. Catcher loading will be monitored and actively balanced through the use of a Dynamic Load Balancing (DLB MK2) control system. See Appendix 03– 02 Electrical Supply Arrangement for further details.

[6] Available at: https://www.nationalgrideso.com/document/289196/download

4. Potential Emissions

A summary of the potential emissions from the site are detailed in the Environmental Risk Assessment provided as part of the EP Application (see Document Reference 302321-ARP-XX-XX-RP-Z-1005).

4.1 Emissions to air

Detailed atmospheric dispersion modelling (see Document Reference 302321-ARP-XX-XX-RP-Z-1006) has been undertaken to assess the potential impact of the use of the generators during routine testing and maintenance regime as set out in Table 3-1. A worst case scenario of running the generators on diesel has been modelled, however it should be noted that if HVO can be sourced locally then the generators will be operated using the more sustainable HVO.

Furthermore, an additional scenario was also considered to assess the potential impact in the unlikely event of an emergency outage. The scenario considered a single event where 42 generators will operate simultaneously at 100% load, 8760 hours per year.

The Air Quality Assessment concluded that:

- Following the assessment of each of the testing scenarios, it is considered that there would be no significant effects as a result of the testing of the generators.
- The generators were also assessed for an emergency scenario, where it was found that the probability of an exceedance for hourly mean NO_2 was found to be unlikely (less than 5%) for a run time of 55 hours. For a run time of 48 hours, the probability of exceedance was found to be highly unlikely (less than 1%), according to Environment Agency guidance. There are predicted exceedances of the critical level for daily mean NO_x, however the chances of this scenario occurring is considered to be unlikely
- The emergency scenario was also compared against the US Acute Exposure Guideline Levels (AEGLs) for NO_2. Exceedances of the lower AEGL 1 limit were predicted under the emergency scenario (one exceedance for the 10-minute, 30-minute and 1-hour limits). The AEGLs guidance states that effects of exposure to AEGL 1 are "*not disabling and are transient and reversible upon cessation of exposure"*. Additionally, the risk of this scenario occurring is very unlikely based on electrical grid reliability for the area and inbuilt design resilience.
- Overall, the assessment has concluded that there would be no significant effects as a result of the Proposed Development.

In addition to the stacks, all fuel storage tanks (generator belly tanks and top up tanks) will be fitted with an air vent.

4.2 Emissions to water

There are no point source emissions to and from the generators or associated fuel storage.

4.3 Emissions to land

There are no point source emissions to and from the generators or associated fuel storage.

Discharge of surface water will be restricted to run-off from the roof hardstanding and paved areas.

4.4 Fugitive Emissions

The potential fugitive emissions from the site have been considered in the ERA which also details the measures to manage any potential significant releases. The assessment is included with the application as Document 302321-ARP-XX-XX-RP-Z-1005.

4.5 Noise and Vibration

A Noise and Vibration Assessment has been completed for the planning application for the facility and is contained in Appendix 03– 06 Noise Assessment. The generators are located within noise attenuating container units with the individual associated exhaust flues reaching a height of 25m above ground level.

Arup has carried out a baseline environmental noise survey around the Proposed Development site. Statistical analysis for the measured data has been carried out to establish the typical daytime baseline sound levels least affected by the local construction activities, and night-time baseline levels. The established baseline levels have been used to inform the day and night-time plant noise emission limits and are aligned with the local authority requirements.

The operating scenarios are detailed in Table 3-2. For ‘normal’ (scenario 1) and ‘generator testing’ (scenarios 2 and 3) operational scenarios, the results show that predicted plant noise levels would not exceed the noise emission limits during the day and night-time periods at the nearest sensitive receptors.

During a full emergency scenario (scenario 4), the predicted plant noise levels marginally exceed the night-time noise emission limits at two of the closest receptor assessment locations. However, given the small magnitude of the exceedance (it is widely accepted that a 3dB change in noise levels is considered ‘barely perceptible’); and the rarity of this event (i.e. a total utility power failure combined with maximum cooling needs); and the likely short duration of such an emergency event, this is not expected to cause a significant adverse impact at the nearest sensitive receptors. Furthermore, the scheme design has been optimised to minimise noise in a way which is considered to be proportionate to the degree of risk and other development and site constraints.

For all scenarios that have been assessed, predicted plant noise is not expected to exceed the proposed limits and/or cause disturbance to nearby noise sensitive spaces.

5. BAT Assessment

In response to Application Form Part B3 question 3a.

This section provides a review and assessment of the site against BAT, in-line with the relevant applicable guidance.

In order to determine BAT for the Proposed Development, the following steps were taken:

- The project team compared initial air quality emission rates from an array of generators available, to identify the most acceptable generators that could be taken forward;
- The model inputs were further refined by comparing parameters with the noise team to ensure consistency and agree a generator specification suitable for both air quality and noise;
- The assessment was undertaken using diesel fuel to understand any potential constraints and understand the worst-case scenario. However, if HVO can be sourced locally then the generators will be operated using HVO, which is expected to see a reduction in NO_x, PM_{10} and $PM_{2.5}$ emissions. Additionally, HVO is known to be a sulphur free fuel and would therefore eliminate sulphur emissions.
- A stack height assessment was undertaken in preliminary air quality modelling.

5.1 Generator Type

The EA's Data Centre FAQ guidance note states that *"We accept that oil fired diesel generators are presently the default technology for standby generators in data centres."*

The EA's Data Centre FAQ guidance note also states that the default is "*emissions optimised engines specified to TA-Luft 2g, or US EPA Tier 2 standard or equivalent NOx emission levels in the range of 2000 mg/m3 of NOx at 5% oxygen and reference conditions"*. The Air Quality Assessment (see Document Reference 302321-ARP-XX-XX-RP-Z-1006) confirmed that the generators meet the TA Luft 2g standard.

Sections 3.1 and 3.2 provide justification of the choice of engine generator configuration and plant sizing which inform BAT.

Regarding the determination of engine type, diesel/HVO engines are considered to be BAT on the basis that:

- Diesel/HVO fuelled engines has been chosen due to the ability to store the required volumes of fuel on site and therefore maximise energy security in the system.
- Instantaneous supply of electricity is required in the event of power loss to the site, which diesel engines provide.
- The technology is well established, replacement parts are readily available and the maintenance costs are low.
- The size of the engines has been selected in order to ensure fast start up and shut down can be achieved as this is a fundamental requirement of the emergency back-up nature of the generators.

Alternative options considered such as gas turbines and engines are well established in wider industry with clear advantages in terms of emissions to air (reduced levels of NOx and negligible levels of particulates and sulphur). However, as this would require reliance on a third-party for the gas supply, should there be a failure of this supply for whatever reason, it presented an unacceptable a risk for potential business continuity in the event of an electricity grid failure. Given the size constraints with site, the storage of gas on-site to minimise this potential reliance risk is not considered to be feasible.

Due to the power demands at the data centre site, renewable energy sources were also not considered to be feasible for emergency supply as renewable sources are unable to provide a consistent supply of power in the event of an electricity failure. There also isn't the available land on-site to potentially install a network of high-capacity batteries which could store the harnessed renewable energy throughout the year.

5.2 Stack height

A stack height assessment was undertaken in preliminary air quality modelling to determine a suitable height for the proposed generators.

The stack height assessment was undertaken using a preliminary design test fit, which comprised of 38 generators in a similar layout as the final design test fit.

Emissions of short-term NO_2 for Scenario 4 was identified early in the preliminary design development as the likely worse case and therefore the stack height assessment focussed on the predicted short-term NO_2 concentrations for the emergency scenario only.

5.2.1 Flue gas monitoring

The guidance specifies the BAT is also the provision of flue gases sampling ports to allow for monitoring of NOx and Carbon Monoxide in line with web guidance '*Monitoring stack emissions: low risk MCPs and specified generators*'.

Sampling ports will be installed within each of the flues which comply with the EA's MCERTS (monitoring certification scheme). Monitoring is expected to be required within four months of permit granting and when three times the number of maximum average annual operating hours have elapsed.

Further details on the monitoring strategy are set out in Section 7.1.

5.3 Emissions to water/land

No process waters will be generated by operation of the installation, hence there will be no associated process water discharge to ground or groundwater.

Discharges of surface water will be restricted to run-off from the roof hardstanding and paved areas. See Appendix 03Appendix 03– 04 Site Plans and Appendix 03– 03 Drainage Strategy for further details.

5.4 Fugitive emissions / leaks

5.4.1 Fuel storage and distribution

Management systems will be in place at the facility to ensure that the risk from fugitive emissions are minimised, for example through regular inspection and maintenance of plant. Protection systems will include automatically triggered safe plant emergency shutdown in the event of major faults in equipment. Scheduled maintenance of fuel tanks will be incorporated into the Environmental Management System (EMS), to minimise the risk of fugitive emissions.

The standby generator fuel storage, fuel delivery and engine lubrication oil systems have been designed to consider the potential impact of leaks / spillages on the site.

The principal guidance for the design of the oil storage and associated infrastructure is the Control of Pollution (Oil Storage) (England) Regulations 2001. Additionally, the requirement for the safe environmental storage of fuel on-site (including transport of fuel) is covered within the EPR.

Best Available Technique (BAT) Reference (BREF) document 'Emissions from storage' for sites regulated under the IED has also been considered as part of the design.

5.4.1.1 Main, Catcher and House Generators

There are two central fill points serving the main and house generators, one serving Building A and one serving Building B. The fuel fill tanker will park on a dedicated layby with an impermeable surface which will be served by a full retention oil separator with a capacity of 10,000L which is enough to hold at least one fuel tanker compartment. The layby will be kerbed and will slope to the low point drain which is served by the oil separator. The location of the refuelling laybys are shown in Appendix 03– 04 Site Plan. Surface water collected in the separator will be discharged from the site via the foul water system.

The refuelling will be carried out by trained fuel tanker drivers. This reduces any significant risk of spillages and leaks. Spill kits will also be available to deal with any leaks. Relevant spill response equipment will be

situated at various locations around the site, designed for the particular hazard characteristics of the materials (fuel) present.

Fuel will be delivered to the site using fuel tankers. There will be two 40,000L litres top up tanks (one for each data centre hall) which the fuel tankers will dispense fuel to. The top up tanks will be contained within a secondary containment bund which can hold 110% of the capacity. The bund will be constructed with materials which are suitable to contain diesel/HVO. 40,000L of diesel is needed to meet the requirement to be able to provide uninterrupted power for three days without any external assistance. The tank has integral level alarms remotely monitored via the Energy Power management System (EPMS) allowing instant accurate assessment of the filling level.

The diesel will be pumped via pipework from the central top up tanks to the individual belly tanks located beneath the generators. At present fuel pipes located below ground will be double skinned and fitted with leak detection, where possible below ground pipelines will be kept to a minimum. Where the pipes are above ground, they will be single skinned pipes and located close to building perimeters. All pipework will be regularly maintained and inspected and inspected prior to use.

Each belly tank will have a capacity of 16,000 litres. The belly tanks will be integrally bunded with 110% capacity. The belly tanks will also be provided with alarms (low, low low, high, high high and leak detection) in the event of pressure loss/significant leakage into the bund, as well as having alarms which alert at high and low fluid levels, both during filling and operation. These alarms will be remotely monitored via the EPMS. The operator will also carry out daily checks for signs of smaller leakage not notified by the alarm system.

The schematics detailing the fuel distribution are contained in Appendix 03– 05 Fuel Schematics.

Fuel integrity is maintained with each generator housing a fuel polishing unit to constantly circulate and filter the fuel. The fuel polisher will be fitted with a leak detection which will be connected to the EPMS.

The generators, fuel storage and any above ground pipelines will be located on or over hardstanding. The uncontaminated surface water from the generator areas, fuel storage and any surfacing beneath above ground fuel transport lines will be directed towards the attenuation pond in the south west corner of the site. The attenuation pond will be fitted with an impermeable liner to ensure any potential contamination cannot infiltrate into the ground. A Penstock valve will be installed to prevent site water from entering the attenuation pond in the event of an emergency which requires the closing of the surface water drainage system. On the downstream side of the attenuation pond, the flow of the surface water leaving the site will be controlled by a flow meter. An oil interceptor will be located downstream of the flow control device which will have an oil compartment capacity of 225L. An alarm will be triggered when the oil compartment capacity if full. The surface water will then leave the site via SW1 as shown on Installation Boundary and Emission Points Drawing (see Appendix 03– 04 Site Plans).

Fuel spill kits will be present at the time of refuelling. All spillages will be logged, investigated and corrective action will be taken.

5.4.1.2 Substation Generator

The small generator located within a dedicated room within substation building will be filled via and external cabinet mounted to the wall of the substation building. This cabinet will be fitted with a drip tray. The fuel tanker will connect into the fuel fill cabinet which will then direct fuel directly to the generator belly tank located beneath the generator. The belly tank will be integrally bunded to 110% capacity. The belly tank will be fitted with alarms (low, low low, high, high high and leak detection) in the event of pressure loss/significant leakage. The alarms will be connected to the EPMS system.

Temporary fuel spillage barriers will be erected around the fuel tanker when the filling of the belly tanks is being undertaken to capture any fuel in the event of a spill during the refuelling process.

The schematics detailing the fuel distribution are contained in Appendix 03– 05 Fuel Schematics.

Fuel spill kits will be present at the time of refuelling. All spillages will be logged, investigated and corrective action will be taken.

5.4.1.3 Odour

It is anticipated that fugitive emissions of odour from the activity will not be significant for the facility. Diesel/HVO will be contained within vented tanks and therefore would only be a potential source of odour if a spill were to occur. Procedures will be incorporated within the EMS to ensure the potential for spills is minimised and they are dealt with swiftly should they occur.

5.4.1.4 Dust

No powders or other dry materials will be used or stored at the installation and therefore fugitive emissions of dust are unlikely to occur.

6. Resource Use and Efficiency

6.1 Raw Materials

In response to Application Form Part B3 question 3c.

In response to Application Form Part B3 question 6d.

The raw materials to be used at the site are:

Diesel fuel oil: each generator will require (when providing 'standby' power):

- Main generators CAT 3516E (8 MWth): up to 757.1 L per hour (at 100% load)
- House generators CAT C32 (2.1 MWth): up to 249 L per hour (at 100% load)

Lubricating oil and anti-freeze: to be used in the engines and other mechanical equipment. Occasional top up or replacement will be required during scheduled or forced maintenance periods only.

The lubricating oil and anti-freeze for the generators will be stored within the engines and manually topped up during servicing by an appointed service contractor.

Transformer oil: Occasional top up or replacement will be required. No lubricating oil/anti-freeze or transformer oil will be stored on site by the operator; all oils will be brought to site and topped up/replaced during planned or forced maintenance periods only.

The BAT objective with regard to raw materials is achieved by the appropriate design, operation and maintenance of the generators to ensure the lowest possible consumption rate of fuel; by the selection of least hazardous materials; and by the provision of appropriate storage methods.

The generator engines are designed for the combustion of diesel fuel oil, this being the fuel recommended/specified by the engine manufacturers. The diesel fuel will have a low sulphur content.

Diesel has been selected due to the ability to store sufficient volumes on site to ensure security of supply. It should be noted that the generators can also be run on HVO and shall be used when it is available and sourced locally. Other fuels have been considered but do not currently provide the same level of security of supply. Natural gas could not be stored in sufficient volumes and would be reliant on the National Transmission System, a contract for uninterruptable supply would be excessively costly given the infrequency of use. Due to the limited hours of operation, any potential benefits from the lower impacts associated with emissions from natural gas are reduced.

The lubricating and transformer oils may have other alternatives, however the type of fluids used are limited to those recommended/specified by the engine manufacturers and site engineers.

6.2 F-gases

In response to Application Form Part B3 question 6d.

F-gases will be used within the wider data centre however will not be used as part of the Scheduled Activities or Directly Associated Activities listed; namely the combustion of fuels with a rating >50MWth for the back-up diesel generators, together with the storage of the associated diesel fuel.

6.3 Energy Efficiency

In response to Application Form Part B3 question 6a and 6b

The Energy Efficiency Directive exempts "those peak load and back-up electricity generating installations which are planned to operate under 1,500 operating hours per year as a rolling average over a period of five years".

As the total installed planned maintenance and testing schedule falls below the 1500 hour threshold (42 generators x 31 hours each = 1,302 hours), the data centre is therefore exempt from the EED requirements and an assessment of energy efficiency is not required.

The generators will be subject to regular maintenance and inspection that will include ensuring the engines are optimised to minimise the heat rate (energy consumption) whilst maintaining the relevant emissions standards.

The generators are designed for use in the event of an emergency. The efficiencies of the main generators approximately 35% with a total installed capacity of 324.59 MWth and an electrical output of 113.4 including the substation generator.

The provision/implementation of combined heat and power (CHP) is not applicable as the generators will each operate for substantially less than 500 hours per annum for the provision of emergency power generation.

Energy recovery is also not reasonably practicable for engines of this emergency nature with such small anticipated operational hours. However, as part of the operator's Environmental Management System (EMS), energy use will form one of the key environmental indicator and regular assessments of the site's energy usage will be undertaken with a view to identifying measures to improve energy efficiency, where possible.

Energy efficiency will form part of on-site staff training.

6.3.1 Climate Change Agreement

In response to Application Form Part B3 question 6c.

The operator is not a participant to a Climate Change Agreement (CCA) for the data centre sector, however the operator will assess the site at a corporate level against the European Commission lead Code of Conduct for Energy Efficiency for Data Centres, in-line with the most recently published Best Practice Guidelines[7].

Energy management techniques will be implemented to monitor, record and track power usage effectiveness (PUE) at the data centre.

6.4 Water Minimisation

In response to Application Form Part B3 question 6d.

There will be no consumption of water associated with the generators / combustion activities and use/ storage of diesel at the site.

The wider data centre operation will utilise rainwater which will be subject to on-site water treatment before being distributed to the data centre halls for use.

No fire-fighting water will be stored within the installation boundary but there will be water storage tanks present within the wider site as shown on Installation Boundary and Emission Points Drawing (see Appendix 03– 04 Site Plan).

6.5 Waste Minimisation

In response to Application Form Part B3 question 6e.

The site will not produce significant amounts of waste due to the nature of its operations. Any waste oil generated during testing/ maintenance will be removed from site by the appointed third-party contractor and managed by a suitably regulated waste management contractor. The same applies to any Waste Electric and Electronic Equipment generated on-site (not related to the Scheduled Activity or DAA, but wider site operations).

[7] EC, 2022 Best Practice Guidelines for the EU, Code of Conduct on Data

7. Monitoring

In response to Application Form Part B3 question 4.

7.1 Emissions to Air

Each of the generators will each operate for less than 500 hours per annum and will not be subject to Emissions Limit Values (ELV) as described in Section 2.2. Whilst emergency operation (if required) would increase the total operational hours of each generator, it is extremely unlikely that operation of any single generator would exceed 500 hours per annum (this being the definition of an 'emergency' unit) In the Environment Agency Data centre FAQ Headline Approach[3].

As the generators will also not be used for the elective generation of electricity they will not be considered specified generators in accordance with EPR 2018 and hence will not be subject to the ELV.

In-line with BAT guidance received during engagement with the EA, it is expected that the operator will need to demonstrate that the engines are BAT by including the provision of flue gas sampling ports to allow for NO_x and CO monitoring, designed to meet BS EN 1525924.

Any testing will be undertaken by an organisation with the EA's MCERTS accreditation for these measurements, so that the data meets the requirements of the MCERTS certification for emissions monitoring systems.

In-line with the MCPD requirements captured by the EPR 2018, it is expected that periodic measurements shall be required at least when three times the number of maximum average annual operating hours have elapsed for medium combustion plants with a rated thermal input >1MWth and less than <20MWth. This is for plant which operate <500 hours and have no ELVs associated with their operations.

The first measurements shall be carried out within four months of grant of the permit to, or the registration of, the plant, or of the date of the start of the operation, whichever is the latest.

In addition, the operator will also record:

- the operating hours of each engine for planned maintenance;
- the operating hours of each engine for emergency operation; and
- the amount of fuel used on an annual basis.

As detailed in Section 4.1.1, one of the reasons for the decision to choose diesel generators on-site is in relation to their minimal start-up or shut-down times.

Operational hours will be counted from the first fuel ignition. This will include the shorter periods of plant 'overlap' when redundant plant is started as a precautionary measure before final load is reached with the optimum/minimum number of generators in use.

No monitoring of air emissions from fuel storage tanks are proposed.

7.2 Emissions to water

7.2.1 Surface Water

There are no point source emissions to and from the generators or associated fuel storage.

Uncontaminated surface water runoff from the generator area will be directed to the attenuation pond located in the southwest corner of the site before ultimately leaving the site by passing through an oil separator and leaving the site boundary to the wider Anglian Water network.

Monitoring of the surface water discharge from the data centre is not considered necessary.

For the purpose of the EP, in relation to surface water runoff from the permitted installation there will be one point source emission referred to as SW1, the location of which is shown on the Installation Boundary and Emission Points Drawing (see Appendix 03– 04 Site Plans).

7.2.2 Foul Water

There are no point source emissions to and from the generators or associated fuel storage.

The wider data centre, not the permitted installation, will be connected to the municipal combined sewer system for discharges of domestic grey water / sanitary effluent (sinks, toilets, cleaning water, etc.)

Drainage from the fuel refuelling laybys will pass through an oil separator before entering the wider site foul drainage system.

Based on the above information, monitoring of the foul water discharge from the data centre is not considered necessary.

For the purpose of the EP, in relation to foul water discharge from the permitted installation there will be two point source emission locations to water, referred to as WW1 and WW2, the location of which is indicated on the Installation Boundary and Emission Points Drawing (see Appendix 03– 04 Site Plans).

8. Environmental Management Systems

In response to Application Form B2 question 3d.

8.1 Overview

The operator will develop an EMS in line with the requirements of the international standard ISO14001:2015, or a suitable equivalent standard.

The operator has a corporate ISO 14001:2015 Environmental Management Systems (EMS) certification (Document reference Appendix 03– 07 ISO 14001:2015 Accreditation) specifically for its wider co-located data centres. The operator's long term ambition is to have ISO 140001 certification across different types of sites.

The EMS will include the policies, management principles, organisational structure, responsibilities, standards/ procedures, process controls and resources in place to manage environmental protection across all aspects of the business.

The EMS will place particular importance on:

- Reducing risks to the environment to a level that is as low as reasonably practicable using best available techniques;
- Integrating EMS responsibilities within line management;
- A commitment to personnel environmental awareness and competence;
- The ongoing monitoring and review of environmental performance; and
- A commitment to working to achieve continuous improvement in environmental performance.

8.2 Policy

The EMS will include an Environmental Policy which clearly defines the operator's commitment to continual improvement and to developing objectives and targets aimed at preventing pollution and improving environmental performance. The Policy will be reviewed annually by top management and communicated to all employees.

8.3 Organisation

The operator will establish and maintain documented procedures for identifying and recording environmental aspects for all its activities, products and services. Where significant, the environmental aspects will be considered in the development, implementation and maintenance of the EMS. These will also be considered when introducing new or modified activities and services. The operator will also document in the EMS the process for the setting, managing and reviewing environmental objectives and targets.

The operator will document in the EMS the structure and responsibility within the organisation. Senior management will have overall responsibility for the provision and maintenance of an effective EMS Policy and improvement programme and will ensure that the requirements of the EMS are addressed in all management and business decisions.

The operator will maintain an internal audit programme for periodic internal audits of environmental documents, procedures, implementation and compliance status to determine whether the EMS conforms to planned arrangements, and to determine whether it has been appropriately implemented and maintained in accordance with its Environmental Policy.

8.4 Environmental Aspects Evaluation

The environmental significance of the site activities will be determined by means of environmental aspects evaluation. The operator will identify the aspects and impacts (direct and indirect) relevant to its activities, highlighting which substances, activities or incidents related to the aspects that could potentially have a harmful effect on the environment. Any substance, activity or incident that has the potential to cause harm, or under the worst case scenario has a high-risk of potential to harm will be identified as being ‘significant‘.

The operator’s main activities will be identified and recorded, for example in an aspect and impact register; evaluation of these aspects and impacts and the associated implications will be recorded. Environmental aspects will be considered under the following conditions:

- Normal operation (i.e. standard operating procedures and conditions);
- Abnormal operation (i.e. standard operating procedures but non-standard conditions); and
- Emergency conditions.

Aspects which are identified as being ‘significant’ will be managed by establishing operational controls, process, procedures, training and monitoring activities such audits. The operator’s management team will be responsible for reviewing aspects and impacts defined as being significant. All staff will be responsible for working in accordance with procedures relating to environmental compliance.

8.5 Environmental Risk Assessment

Environmental risk assessments, together with the environmental aspect evaluation, will allow routine management system procedures to manage risks under normal circumstances, and emergency plans to mitigate impacts under abnormal circumstances. Such assessments will cover the implications of material storage, oil transfer, drainage and site security.

Environmental risk assessments will be carried out:

- Under normal operating conditions;
- Under potential abnormal/emergency conditions;
- For existing equipment;
- For existing material storage;
- Before a new substance is introduced;
- Before the installation of new plant on-site; and
- Before existing plant is modified.

All significant risks will be recorded, for example in an aspect and impact register.

The operator will require and will encourage full and open reporting of all environmental incidents, including near misses. Staff will be encouraged to report environmental incidents and problems which may result from (inter alia) the following factors:

- Pollution incidents;
- Potential incidents;
- Breaches of legislation;
- Supplier non-compliances;
- Contractor non-compliances;
- Non-compliances identified during audits; and
- Management system non-compliances.

Additionally, contractor personnel will be informed of the need to report incidents.

8.6 Monitoring, Control and Change Management

The primary mechanism that will ensure operational control to minimise adverse environmental risks will be the aspect and impacts register. Processes and procedures will address each significant aspect and generate the information and data necessary to monitor adequately the environmental performance of the data centre and develop an understanding of performance so as to identify faults, opportunities for improvement and to optimise maintenance routines.

The EMS will provide for the controlled implementation of changes which may have environmental implications, to ensure any environmental risks posed by a proposed change will be adequately managed. Change control will include consideration of the proposed change requirement, identification of the potential environmental implications, measures required to minimise the potential environmental impacts and the responsibility for resolution and a timescale.

Change control will include consideration of (inter alia):

- Legal obligations;
- Results of routine monitoring activities;
- Changing commercial circumstances;
- Improvement targets;
- Review of the environmental aspects, which will include risks from climate change;
- Complaints or suggestions from the public;
- Staff suggestions; and
- Non-compliances

8.7 Accident Prevention and Management

The operator will develop systems for managing accidents or incidents. Risks as a result of activities undertaken, or proposed to be undertaken, at the data centre will be considered and documented, for example in an environmental aspect and impact register and via risk assessments. The environmental aspect and impact register will be updated to include requirements of the Environmental Permit.

The following will also be developed:

- A Disaster Recovery Plan to counteract potential interruptions to its business activities and to protect critical business processes from the effects of major failures of information systems or disasters. Risk assessments will be undertaken to ensure that the Disaster Recovery Plan has appropriate controls in place; and
- A Emergency Response Plan (ERP), which will detail emergency/accident procedures and incident management responsibilities, including management of significant pollution incidents and fire. The plan will include contact numbers for key company personnel and emergency services.

8.8 Climate Change Adaptation Plan

Adaptation to climate change must now be integrated into the management system for permitted activities. The operator will consider the risks to the site from climate change, the risks the site creates due to climate change and how to embed controls throughout the EMS. Based on climate projections over the coming decades the following risks are identified as potential risks:

- Winter daily maximum temperature could be 4°C more than the current average, with the potential for more extreme temperatures, both warmer and colder than present resulting in potential impacts on the site.

- Daily rainfall intensity could increase by up to 20% on today's values resulting in flooding on the site.
- Average winter rainfall may increase by over 40% on today's averages resulting in potential increased risk of site surface flooding and could impact site wide drainage capacity.
- Sea level rise resulting in flooding events.
- Drier summers could see potentially up to 40% less rain than now.
- Generation of CO2e emissions from generator use.

The Environmental Risk Assessment (Document reference 302321-ARP-XX-XX-RP-Z-1005) submitted as part of the application assesses the above risks. As part of the EMS the operator will develop a Climate Change Adaptation Plan which will be compliant with the EAs guidance on risk assessment and adaptation planning in your management system[8]. The climate change adaptation plan will be monitored on an annual basis by the operator to determine if the plan is achieving its original objectives, managing priority risks, if the plan is still effective and if the plan needs updating.

8.9 Training

Environmental training will be provided; this will be for both general awareness and job-specific training.

The site will be managed by a sufficient number of staff, who have the competencies to operate the site. In accordance with the EMS:

- All staff will have clearly defined roles and responsibilities;
- Records will be maintained of the knowledge and skills required for each post;
- Records will be maintained of the training undertaken and relevant qualifications obtained by staff to meet the competence requirement of each post; and
- Operations will be governed by standard operating instructions.

Each individual's knowledge and skills will be assessed and matched against the needs of the job position. Additional experience and/or training requirements necessary to enable an individual to undertake their assigned role will be identified, prioritised and planned.

Training records will be maintained and training needs regularly reviewed.

All contractors will be given appropriate training prior to the commencement of any works or services.

8.10 Review and Audit

The operator recognises that continuous improvement requires the ongoing appraisal of EMS and Environmental Policy in order to ensure that they remain effective, in line with developing best practice and relevant to the business as a whole. An annual management review of the EMS will be undertaken to ensure that it remains appropriate and effective at controlling environmental performance and to identify any areas where opportunities exist for improvement.

The EMS and site activities will be internally audited at least annually, either by site staff with suitable audit experience and / or training or by a suitably qualified and experienced third party.

Where corrective action is identified as being required, through audit (or otherwise), which for example involves modifications to plant and equipment, the implementation of such changes will be managed via the EMS change management process.

[8] EA, Guidance on climate change: risk assessment and adaptation planning in your management system. Available at https://www.gov.uk/guidance/climate-change-risk-assessment-and-adaptation-planning-in-your-management-system

Appendix 03 – 01 Engine Specification Sheets

Appendix 03 – 02 Electrical Supply Arrangement

Appendix 03 – 03 Drainage Strategy

Appendix 03 – 04 Site Plans

Appendix 03 – 05 Fuel Schematics

Appendix 03 – 06 Noise Assessment

Appendix 03 – 07 ISO 14001:2015 Accreditation