Best Available Techniques Assessment

SOF-11 Docklands Datacentre: EPR/QP3108ST/A001

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1.0 INTRODUCTION

HDR | Hurley Palmer Flatt (HDR) has been appointed by the operator, SOF-11 Docklands DC UK BIDCO Limited (Docklands DC) to prepare a Best Available Technique (BAT) assessment to support the application (ref EPR/QP3108ST/A001) for a new bespoke Environmental Permit for the installation located at Greenwich View Place, Isle of Dogs, London (TQ 37672 79263).

Docklands DC as the legal operator are required to apply to the Environment Agency (EA) for an Environmental Permit because the total thermal capacity of the site's combustion plant exceeds the 50MW threshold stipulated in the regulations[1].

For a detailed description of the site and surrounding area, please refer to the Non-technical summary submitted as part of the application for a permit.

1.1 Purpose of this report

It is a requirement that the operator demonstrates how they comply with the indicative BAT requirements, with assessment to be completed as part of the application for an environmental permit. 'Techniques' include both the technology used and the way the installation is designed, built, maintained, operated and decommissioned.

1.2 Assessment approach

In the absence of specific BAT reference documents (BREF notes) for this type of installation this BAT assessment has been produced using the EA's 'Data Centre FAQ Headline Approach v10' (June 2018) and EPR guidance document: 'Combustion Activities (EPR 1.01)'. This focuses on the management, operation, emissions, and monitoring for the site.

Section 2.0 of this report aims to provide justification against each applicable BAT requirement as set out in the EA's guidance document above.

Section 3.0 of this report focuses on additional BAT requirements/considerations on the provision of backup power by diesel generators not covered in the EA's guidance document above.

[1] The Environmental Permitting (England and Wales) Regulations 2016

2.0 BAT ASSESSMENT OF THE PERMITTED INSTALLATION

This BAT assessment has been produced using the EA's EPR guidance document: "Combustion Activities (EPR 1.01)" which focuses on the management, operation, emissions and monitoring of the site.

2.1 Energy Efficiency

BAT requirements	Justification
1. Demonstrate that the proposed or current situation represents BAT where there are other considerations involved, e.g. recovering energy from waste affects the energy efficiency of the process.	The site does not operate any boilers, furnaces, steam, or gas turbines. The sole combustion plant onsite is standby diesel generators (SDGs) for the provision of electricity when the grid supply is interrupted. Individually, each SDG is <15MWth and therefore they are not classed as Large Combustion plant (LCP) under the Industrial Emissions Directive (IED). There are no formal BAT-AEELs that apply to Datacentre SDGs such as are being applied for. As such we have sought to apply the guidelines found in the 'Data Centre FAQ Headline Approach v10'. The electricity efficiency of SDGs range from 30-40%. Heat recovery on generators is not a viable option, since these generators are backup plant that operates infrequently (approx. <50 hours pa). A periodic preventative maintenance (PPM) regime is in place onsite. This involves regular checks of the generators to help ensure each generator is operating efficiently.
Boilers and furnaces 2. Carry out regular checks to minimize leakage of air into units operating below atmospheric pressure. 3. Ensure good design, operation, and maintenance of burners.	
Steam turbines 4. Replace existing turbines with more efficient turbines. 5. Increase cycle efficiency by measures such as reheating steam between stages, improving the vacuum on condensers and using very high, including supercritical, pressures to increase the working temperature difference and cycle efficiency. 6. Take steam from between stages or from a backpressure exhaust for use in, for example, process or building heating.	
Gas turbines 7. In large installations, consider installing more than one smaller turbine to allow for more efficient load following. 8. Consider measures to improve the efficiency of the turbine: • increasing the combustion temperature, but balanced against increase NOx levels and amounts of excess air required • using concentric shafts to connect different stages of compression and expansion - this is common in aero derivative machines • intercooling between stages of air compression and reheating between stages of expansion. Such features are normally incorporated at the design stage and may not be relevant to retrofits 9. The exhaust from even the most efficient gas turbines contain large amounts of heat that should be recovered and used for process or building heating (CHP), or steam may be fed to a steam turbine to provide additional power in a combined cycle (CCGT). Supplementary fuel may also be fired in the heat recovery boiler to meet the heat demands. The design of the system needs to optimize the characteristics of the turbines and boiler to achieve the best overall performance.	

BAT requirements	Justification
Reciprocating engines 10. Maximise engine efficiency by measures such as turbo charging and air intercooling. However, this should be balanced against increased NOx emissions. 11. Recover exhaust gas heat for process or building heating or absorption chilling. 12. Recover lower-grade heat from engine coolants. 13. Where additional heat is required, supplementary fuel may be fired into the boiler, although this can be complicated by the pulsating exhaust and size limitations. 14. (These features are usually incorporated at the design stage.)	

2.2 Avoidance, recovery, and disposal of wastes

BAT requirements	Justification
1. Store, handle and transport all waste streams to prevent the release of waste, dust, VOC, leachate, or odour.	Typically, waste generation from the permitted installation (SDGs and associated storage tanks) is low. In normal operation these waste streams are usually generated as a result of the operator's maintenance regime. This aims at prolonging the life of the plant, resolving issues early and minimising the generation of waste as oils or lubricants. Expected waste streams include: • Lubrication oils used in maintenance and servicing; • Air and fuel filters • Fuel that has reached end of life; • Used spill kits; • Decommissioned plant. Waste containers are located across the site to capture the various hazardous waste streams. Where waste does need to be removed from site, this is completed using an appropriate licenced waste carrier with duty of care information retained. The wastes generated from the installation are not considered to have any significant dust or odour emissions. In line with the permit requirements the operator will aim to minimise waste generation through efficient use of raw materials including diesel, filters, and lubrication oils.
2. Store bottom ash and fly ash separately. This provides flexibility to re-use the different ash fractions. 3. Where scale allows, store ash fractions and other dusty residues in closed silos fitted with high level alarms and dust abatement plant. 4. Explore markets for waste streams, for example: • bottom ash for aggregate • PFA for cement manufacture and construction products • FGD gypsum and fused slags for construction products 5. Recycle materials back into the process whenever possible, e.g. re-using partially reacted lime. 6. Where recycling or re-use is not possible, then consider regeneration of other materials or return to the manufacturer e.g.: • ion exchange resins • reverse osmosis membranes • molecular sieves • catalysts	Not applicable to the permitted installation.

2.3 Operations

BAT requirements	Justification
Liquid fuels The in-furnace techniques for controlling releases of NOx and particulates are based on burner design, the method of atomization and the control of primary, secondary and tertiary air. A control loop system is required to govern the air and fuel supply and is significant in air pollution control. Such techniques may not be practical for small installations using compact, high thermal rating combustion chambers. Solids removal from the fuel may be required. Efficient atomisation of oil fuels is necessary and fuel viscosity at the burners is a primary consideration. Oil (including bitumen) emulsions and many heavy fuel oils have high sulphur contents and may have high vanadium and nickel contents. The use of oil fuels containing sulphur will result in some sulphur trioxide releases, as well as sulphur dioxide. Where low sulphur oils (below 1% w/w sulphur) are used, this may preclude the need for flue gas desulphurisation (FGD). The Sulphur Content Of Liquid Fuels Regulations 2000 (SCOLF) allows for derogation from this limit where the Emission Limit Values set out in LCPD are met.	Low sulphur gas oil is to be used onsite. Fuel will periodically undergo fuel polishing to help remove suspended solids and impurities. This helps ensure efficient combustion. It also increases the expected life of the fuel which helps reduce the need for additional deliveries and the need to dispose fuel due to degradation via the accumulation of impurities.
Gaseous fuels These include natural gas and others, e.g. mine gas; vaporised LPG, refinery gas and gases from the production of smokeless fuel; together with that from the gasification of coal, oil or other carbonaceous matter in a separate plant, or the underground gasification of coal. Air: If a plant designed for and normally operated on gaseous fuel not requiring the use of flue gas treatment, has to use standby fuel because of an interruption in the gas supply, then for short periods only such plant may be allowed to operate without flue gas treatment.	Not applicable to the permitted installation.

2.4 Point source emissions to water

BAT requirements	Justification
Oil storage 1. Fit a high-level alarm to oil tanks. 2. Drain decanted water from oil storage tanks and storm water from bunded areas to a water treatment plant, or direct it to an appropriate disposal facility. You should deal with liquid effluents generated during periodic tank cleaning in a similar way. 3. Use oil removal facilities such as partition chambers or plate separators for water contaminated with oil.	The installation will generally store enough diesel to provide 72 hours' worth of electricity to the site. Bulk diesel tanks are stored above ground inside the main building inside sealed rooms which significantly reduces the risk of spillages entering the environment. The bulk tanks are connected via pipes directly to the SDGs. To help prevent accidental release of fuel, bulk tanks are double skinned, located inside secondary containment, with leak detection and overfill alarms in place. All fill points are inside the bunds and over drip trays to capture any spills. Each bulk tank is fitted with an overfill alarm float switch which will signal to the tanker operator to stop further filling. Also fitted is an overfill prevention valve, protecting against over filling of the bulk tank should the overfill alarm float switches fail. Regular visual checks for leaks / spills. Spill kits within close proximity of fuel storage and fill points. Emergency preparedness and spill response training available. Fuel delivery procedures implemented. Suppliers to adhere to procedures. with surrounding area covered in good quality hardstanding.
Coal storage 4. Where there is a significant risk of pollution of water or groundwater, you should collect and treat leachate. **De-ionisation effluent** 5. Neutralise water de-ionisation plant regeneration effluent before discharge **Process water (e.g. wet scrubbing)** 6. Chemically treat, neutralise and settle the effluent from wet scrubbing before discharge. 7. Quantify organics, including dioxins, furans and PAHs in the treated effluent. At low levels they are normally most effectively treated in a biological plant, usually by the sewerage undertaker. 8. Discharge volumes for sea water scrubbing make most treatment impracticable. Since contaminants are likely to be present in very low concentrations, focus your effort on minimising mass releases where practicable.	Not applicable to the permitted installation.

BAT requirements	Justification
Ash handling 9. Handle ashes in a solid state and not as slurry. Hydraulic transport of ashes produces a wastewater stream that is likely to contain metal salts and organic compounds. If there is a market for the ash, you should not use a handling technique that will prevent its re-use. **Cleaning liquids** 10. Neutralise or treat wash waters and cleaning-out solutions to produce an acceptable waste before discharge or disposal. 11. Boiler cleaning wastes require appropriate disposal.	Not applicable to the permitted installation.
Site drainage including rainwater 12. Use an efficient oil/water separation/interceptor system. Further treatment may be required to remove dissolved hydrocarbons. 13. Direct discharge to controlled waters will only be allowed where discharges will meet discharge requirements under all conditions.	Under normal conditions there is no discharge to sewer other than surface water run-off and sanitary effluent and this is not expected to contain diesel / fuel.
Waste water treatment 14. On-site wastewater treatment plant effluent must meet discharge standards. **Cooling tower purge** 15. Optimise the dosing regime for biocides in evaporative cooling towers to minimise their use. 16. Chemically treating the main cooling water circuit may allow reduced use of biocides. Do not release accidental overdoses of biocides into the environment. **Thermal plumes** 17. In terms of the overall energy efficiency of an installation, the use of once-through systems is an appropriate measure. It may be acceptable to use water from a river or an estuary for once-through cooling, provided that: • fish can still migrate through the extended heat plume in the receiving water • the cooling water intake minimises fish entrainment • heat load does not interfere with other users of the receiving surface water.	Not applicable to the permitted installation.

2.5 Point source emissions to air

BAT requirements	Justification
NOx control 1. Control emissions of NOx by a combination of the following, as applicable: • combustion control systems • combustion temperature reduction • low NOx burners • over fire air (OFA) • flue/exhaust gas recycling • reburn • selective catalytic reduction (SCR) • selective non-catalytic reduction (SNCR).	The SDGs are designated as standby plant operating less than 50 hours pa. As such, there is currently no emissions abatement technology such as SCR/ SNCR proposed. SCR technology has not been shown to be effective when plant operates for short periods (<15min) as is often the case with the site's generators. "Low emissions" or "Emissions optimised" (EO) generators that meet the TA-luft 2g standard have been selected vs. "fuel optimised" (FO) engines. Engines are turbocharged and low temperature aftercooled to aid "clean burn" combustion of fuel. The flues / exhaust stacks from the SDGs have been raised to the maximum permissible height under planning (7.4m above the roof level). NOx emissions are controlled by limiting the operation of the generators to maintenance and testing only. The maintenance and test regime is such that only one or two generators are tested at a time. Monthly testing is expected to be completed offload (0%) with the annual test completed onload (75%).
2. Use low NOx burners for coal- and oil-fired plant. 3. Use OFA or equivalent for existing coal-fired plant above 100 MWth). 4. Use dry low NOx burners in new natural gas-fired gas turbines. For natural gas-fired gas turbines, use water/steam injection, or convert to dry low NOx burning.	Not applicable to the permitted installation.
5. Where air quality standards or other environmental standards must be met, you must use SCR or SNCR for smaller plant (<100 MW).	A detailed air quality dispersion modelling assessment has been completed and identified the impact on air quality of the sites testing and maintenance regime, to be non-significant. See section 3.0 for further consideration of the sites impact on air quality.
6. For new coal and oil-fired plant above 100MW, use SCR or primary measures to achieve equivalent NOx levels. 7. Only combustion optimisation and SCR are feasible on >500MW PF plant firing low volatile coal. In these cases, you need SCR for new plant. You need a site-specific assessment for existing plant.	Not applicable to the permitted installation.
SOx control 1. Use low sulphur fuels as a primary measure.	The site uses low sulphur fuel

BAT requirements	Justification
2. For large coal or oil-fired plant, use wet limestone scrubbing or seawater scrubbing for flue gas desulphurisation (FGD). 3. Consider dry sorbent injection for pulverised and liquid fuel furnaces which are too small to justify FGD. 4. For fluidised bed combustors, consider in-bed sulphur capture. 5. Consider IGCC for new large-scale solid and liquid fuel fired plant.	Not applicable to the permitted installation.
Control of CO_2, CO and volatile organic compounds (VOC) Where necessary, the use of catalytic oxidation in the exhaust gas stream will reduce carbon monoxide emissions to less than 100 mg/m3. **Metals and their compounds** Controlling particulate levels and selecting residual fuel oils with a low ash content will control levels of most metals. **Halogens** Techniques used for abating sulphur dioxide will also reduce these gases.	A detailed air quality dispersion modelling assessment has been completed and identified the impact on air quality of the sites testing and maintenance regime, to be non-significant.
Polycyclic aromatic hydrocarbons (PAHs) and Dioxins Measures to reduce particulate matter emissions will also significantly reduce emissions of these compounds.	Not applicable to the permitted installation.

2.6 Fugitive emissions

BAT requirements	Justification
You should where appropriate: 1. Windbreaks should be created by natural terrain, banks of earth or planting of long grass and evergreen trees in open areas. This has aesthetic benefits and such vegetation is able to capture and absorb dust without suffering long-term harm. Hydro seeding should be used to rapidly establish vegetation on waste tips, slag heaps or other apparently infertile ground. 2. Where materials are delivered by sea and dust releases could be significant, use self-discharge vessels or enclosed continuous unloaders. 3. Minimise dust generated by grab-type ship unloaders by ensuring adequate moisture content of the material as delivered, minimising drop heights and using water sprays or atomised mist at the mouth of the ship unloader hopper. 4. Fugitive emissions from fly ash should be prevented by dust suppression, or by enclosing its handling and storage.	Not applicable to the permitted installation.
5. Intercept rainwater run-off from open areas, especially coal and raw materials stocking areas, and remove the suspended solids by settlement or other techniques. Where there are potentially vulnerable receptors, monitor the quality of the water discharged from the storage and blending areas.	Raw materials are not stored in open areas. Diesel is the significant raw material associated with the permitted installation and is stored in bulk tanks that are self-enclosed and located internal to the main building. In normal practice there is little risk of spilt / leaked fuel entering the drainage system. Spill kits are available to help contain spilt fuel.
6. Plant used to pre-treat and store raw materials should be totally enclosed, with extraction and arrestment plant as appropriate, to prevent emissions to atmosphere. For some gasification processes coal is milled to a very fine dust and needs to be handled with an inert gas blanket. 7. Gasifiers should be coal-charged using a double lock system, whereby the gases released from the reactor during charging are contained within the lock hopper. After closure of the charge valve they are routed either to recompression for re-injection into the crude gas stream or to a vent treatment system. Alternatively, a wet feed (slurry) system may be used with comparable features.	Not applicable to the permitted installation.
8. You should demonstrate that the potential risks of contamination of land by deposition of dust, leachate or run-off are not significant and that you can comply with the requirements of the Groundwater Directive.	The site is covered in hardstanding and under normal conditions there is no discharge to sewer other than surface water run-off and sanitary effluent and this is not expected to contain diesel / fuel.

2.7 Monitoring

BAT requirements	Justification
1. Emissions to air Many plants in this sector will be subject to the detailed monitoring requirements of Annex VIII of the Large Combustion Plant Directive (LCPD). For plants co-incinerating waste, the provisions of Articles 10, 11 and Annexes II and III of the Waste Incineration Directive (WID) should also apply. The monitoring requirements of the LCPD and WID are considered to represent appropriate measures for this sector. The LCPD requires that: For existing plant using continuous emission monitors the emission limit values shall be regarded as having been complied with if the evaluation of the results indicates, for operating hours within a calendar year, that: (a) none of the calendar monthly mean values exceeds the emission limit values; and (b) in the case of: Sulphur dioxide and dust: 97% of all the 48 hourly mean values do not exceed 110% of the emission limit values. nitrogen oxides: 95% of all the 48 hourly mean values do not exceed 110% of the emission limit values. For new plants, emission limit values shall be regarded, for operating hours within a calendar year, as complied with if: (c) no validated daily average value exceeds the relevant figures set out in part B of Annexes III to VII, and (d) 95% of all the validated hourly average values over the year do not exceed 200% of the relevant figures set out in part B of Annexes III to VII. For both existing and new plants, start-up and shut-down periods shall be disregarded. Installations that do not fall within the scope of WID or LCPD should meet the benchmark standards except where you can clearly demonstrate that this is not the appropriate measure. We may require you to monitor and report releases more frequently than required by WID or LCPD where it is considered appropriate to do so. You should process the readouts from continuous emission monitors using software that reports monitoring compliance, to enable direct comparison with the emission limit values specified in relevant European legislation and in this guidance. In order to relate emission concentrations to mass releases, you will need to measure or otherwise determine the stack gas flow rate. In order to relate measurements to reference conditions, you will need to determine temperature and pressure. Determination of oxygen or water vapour content may also be required. All such measurements should be recorded.	The site is not subject to Annex VIII of the Large Combustion Plant Directive. A detailed air quality modelling assessment has been completed that assesses the impact of the sites testing and maintenance regime as well as the potential impact on air quality if a power failure were to occur. This can be found in the EPR application. Once the site is operational an Air Quality Management Plan (AQMP) will be prepared. The aim of this will be to minimise the impact on local air quality during emergency operation of the combustion plant onsite.
2. Emissions to water and sewer For combustion plants co-incinerating waste and operating air pollution control equipment with an aqueous discharge, you should comply with Article 8 and Annexes III and IV of the Waste Incineration Directive (WID).	Not applicable to the permitted installation.

3.0 ADDITIONAL BAT CONSIDERATIONS

3.1 Requirement for backup power and redundancy

The main source of power at the installation is electricity, supplied via the National Grid. As with all buildings, supplied with power via the national electricity grid, there is a risk that mains failure events (black outs) or fluctuations in quality of mains power outside of acceptable limits (brown outs), will occur during the operational lifetime of the building.

Power failures or voltage drops, even momentarily, could have significant negative implications to site services, both in terms of direct financial costs and indirectly through reputational damage. Therefore, resilience of power supply is critical to the sites ability to operate.

Given this risk, the installation has emergency SDGs to provide electricity to the site. In the event of grid failure, power is initially provided by the sites Uninterruptible Power Supply (UPS) System (Arrangement of Batteries) until the sites generators start up and take the site electrical load. These start from ‘cold’ to take on the load from the UPS (typically within 15 – 30 seconds). The backup generators then provide ongoing power until a stable mains electrical supply is restored.

3.2 Grid electrical supply

For resilience reasons, it is preferable to have numerous power supplies to the site; this provides an alternate route to switch to, should one supply be compromised during an outage. This can be provided in several ways, but the common option is to have separate supply routes within one substation, or to have multiple substations onsite. In some instances, sites may have several substations with several routes in each substation, thus providing a very high level of reliability. If one supply route fails, the site can switch to an alternate supply that is unaffected. A process known as “bus coupling”. This ability to switch to an unaffected supply route reduces the duration for which the generators operate in the event of an outage.

A site wide failure is considered to be extremely rare as it would require a catastrophic regional failure on the grid, or at the supplying power station, and would likely impact not only the site but the majority, if not all of, London city.

Grid power supply to the site is highly reliable. The overall reliability of supply for the National Grid Electricity Transmission (NGET) System during 2019-20 was >99.999974%[2]. Thus, outages are considered to be highly rare; 1 in 10 if not a 1 in 20 year event. If a power outage were to occur the standby generators would operate until a stable mains electrical supply is available/restored. Even in the event of an outage, it is not anticipated that the generators would exceed 500 hours as sites have the option to switch to another supply (as discussed in Section Grid electrical supply3.2 above).

[2] https://www.nationalgrideso.com/document/177156/download

3.3 Redundancy arrangement

The installation has incorporated redundancy / resilience as a risk measure to help ensure that power provision is not interrupted even in the event of a mains failure.

The site has adopted a redundancy arrangement which means if any generator fails to start, the other generators can still carry the site electrical load. This is possible because the site standby generators are able to provide significantly more than the maximum amount of power that the site could ever require.

This redundancy arrangement also means that only a proportion of the sites' generators will be required to operate in the event of an outage. This design approach also means that it is not possible to operate all of the sites' generators simultaneously, as the power provision would exceed that required by the site.

There are a number of redundancy arrangements available such as 'n+1', '2n', '2n+1', where 'n' is the required number of generators to carry the sites maximum electrical load. In reality the sites electrical load is far below the maximum. To show how this affects the electrical load on the generators please see the below examples with A partially loaded and B fully loaded:

Generator redundancy arrangement for both Scenarios A&B:

Electrical power output per diesel generator = 2000 kW
Number of generators = 2
Total power available from generators = 4000 kW
Redundancy arrangement = 2n

Scenario A: Electrical load below maximum design (reality)

Peak electrical load = 1200 kW
Max electrical load = 2000kW
Generators required to carry total load = 1
Load on generator if carried by one generator = 60%
Load on generator if carried by two generators = 30%

Scenario B: Electrical load at maximum of design (unlikely)

Peak electrical load = 2000 kW
Max electrical load = 2000kW
Generators required to carry total load = 1
Load on generator if carried by one generator = 100%
Load on generator if carried by two generators = 50%

At the installation, the redundancy arrangement for the generators is n+1. This arrangement means that there is a generator spare should one fail to start. In reality less than half of the generators are required to power the site because this arrangement caters for the maximum electrical load, i.e. 100% when in reality the site load is 15-35%.

3.4 Exhaust stacks / flues

Please see the site plan & emissions point diagram provided with the application for details of stack locations.

In designing the flues from the combustion plant, the potential impact to local air quality has been considered and dispersion of pollutants prioritised. As a result, the generator flues have been orientated vertically and at the maximum height permitted under planning (7.4m above the roof level).

Combining the flues into a single windshield was not possible under the current design due to space constraints and the geographical location of the generators being split in two separate buildings. Additionally, a single stack would compromise the redundancy arrangement for the site, meaning generators may not be able to operate which is a critical component of a functioning datacentre in the event of an outage. Additionally, in normal operation generators are tested individually to minimise air quality and noise impacts. Thus, a combined flue arrangement would have little impact on emissions.

For these reasons we do not consider a common windshield to be BAT for this installation. The number and grouping of stacks that have been selected were deemed to be the most appropriate at the time of construction.

3.5 Air Quality Management Plan (AQMP)

BAT for prolonged operation of the combustion plant is to develop and implement an Air Quality Management Plan (AQMP) in response to a power outage or blackout. Once the site is operational an Air Quality Management Plan (AQMP) will be prepared. The aim of this will be to minimise the impact on local air quality during emergency operation of the combustion plant onsite.

This is based on a decision tree aimed at notifying (as required) highly sensitive receptors / the Environment Agency in the event of a prolonged grid outage.

This includes observations on the current weather conditions / wind direction / time of day / day of the week and their likely impact on local air quality.

The plan will be developed in conjunction with the Local Authority and its Local Air Quality Management (LAQM) process.

3.6 Technology selected to provide backup power

There are currently no BAT reference documents or BREF notes that have been made available by the European Commission for the specific provision of backup power in the data centre industry. We are therefore proposing an alternative which is based on the guidance in the EAs “Data Centre FAQ Headline Approach v10.”.

The following technologies were considered for the provision of emergency power to the datacentre:

- Diesel Generators
- Diesel rotary uninterruptible power supply engines (DRUPS)
- Natural Gas (piped) Fuelled Generator – Spark Ignition Engine
- Natural Gas (piped) Fuelled Generator – Gas Turbine (CCGT or OCGT)
- Liquid Petroleum Gas (LPG) Fuelled Generator – Spark Ignition Engine
- Hydrogen Fuel Cell Technology: Polymer Electrolyte Membrane (PEM) Fuel Cells
- Hydrogen Fuel Cell Technology
- Standby Gas turbine Technology

The conclusion of the assessment was that Gas generators outperform diesel generators on air emissions, but they are inferior when comparing their cold start capability and their reliability in providing an uninterruptible power supply, due to the reliance on an off-site supply of natural gas.

Diesel generators have therefore been selected as BAT for this installation. EA guidance on BAT for Datacentres accepts this conclusion for the following reasons:

- Proven technology for providing reliable power supply
- Start-up time & cold start capability
- Space requirements
- Capital expenditure
- Environmental impact
- Fuel storage

3.7 Operation of the combustion plant

The SDGs under normal circumstances are only operated as part of maintenance and testing, meaning they are unlikely to run more than 50 hours each/ year. The exact regime will be confirmed once the site is operational.

There is no “elective” running of the generators for exporting power from the site. Nor is there any engagement in any aggregation schemes, such Frequency Response / Demand Side Response (DSR) / Triad Management / Short Term Operating Reserve (STOR) etc.

Monthly test regime:
The current plans are to conduct monthly tests on each of the generators. During the test individual generators will be operated for 30 mins offload (i.e. 0% electrical load) usually at weekends after 6pm.

Annual maintenance:
In addition to monthly tests, the current plans are to conduct one single annual test on each of the generators. During this each generator will be tested onload (using current site electrical load) for 2-3hours. It is anticipated that this will be at weekends after 6pm to avoid peak traffic periods.

Grid outage

Despite the low likelihood of a sustained power outage, the Air Quality model has assessed the impacts of a worst-case scenario where all 9 generators operate onload (75% load) for 5 hours. In reality, less than half the generators would be required, the load would likely be <50%, and the duration is unlikely to last for 5 hours before the site can return to grid supply. The model therefore presents a highly pessimistic worst-case scenario.

3.8 Emissions rates

At the time of writing, x9 no 3.2MWe generators have been selected and the NOx emissions rates are best in class, outperforming the other 3MW diesel engines on the market.

The standby nature of the generators typically results in infrequent operation (of less than 50 hours/year/generator). Standby plant operating <500hours per year has been excluded from meeting the emissions limit values (ELVs) of the newly implemented Medium Combustion Plant Directive (MCPD)[3], which specifically aims at reducing air emissions.

3.9 Future expansion

In the unlikely event that expansion is planned, consideration will be given to the EAs ‘Data Centre FAQ Headline Approach v10.’. This would include notifying the EA prior to installation of any further combustion equipment.

3.10 Noise

A noise impact assessment has been completed as part of the planning application which identifies sensitive receptors and potential sources of noise from the installation. The primary noise sources are the sites SDGs. This report identified that there were no significant impacts predicted from site operations under all scenarios.

The generators are provided with acoustic silencers at the air inlets and outlets of the rooms. The rooms will be lined with acoustic absorbent to aid in reducing the internal noise levels. Each generator has an exhaust flue that is ducted to the rooftop and vented 7.4m above the roof level.

Currently there are no BAT reference documents or BREF notes for noise generated by diesel engines. Engines that do not significantly exceed the background day / night-time noise levels by more than 10dB, are considered to be BAT.

[3] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32015L2193

4.0 CONCLUSION

We have set out the proposed techniques for this installation and these are considered to meet the EAs Datacentre BAT requirements, and as a result, it is not anticipated that site activities will significantly impact the environment or human health.