Thorney Lane Data Centre Emergency Back-Up Generation Facility

Environmental Permit Application EPR/SP3224LP
Supporting Statement

Amazon Data Services UK Limited

Project Reference: EPR/SP3224LP/A001
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SP3224LP-APP-SS

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Delivering a better world

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Glossary/ Abbrevation	Term
AA	Amenity Area
AMP	Accident Management Plan
AQMA	Air Quality Management Area
AWS	Amazon Web Services
BAT	Best Available Techniques
BGL	Below ground level
BGS	British Geological Survey
BMS	Building Management System
BREF	BAT Reference
BS	Bike Shelter
BST	Bin Store
CAS	Chemical Abstracts Service
CCB	Client Control Building
CCTV	Closed Circuit Television
CHP	Combined Heat and Power
CO	Carbon Monoxide
COSHH	Control of Substances Hazardous to Health
CRT	Canal and Rivers Trust
DAA	Directly Associated Activity
DC	Data Centre
EA	Environment Agency
EED	Energy Efficiency Directive
ELV	Emission Limit Values
EMS	Environmental Management System
EP	Environmental Permit
EPMS	Electrical Power Monitoring System
EPR	Environmental Permitting Regulations
ER	Ecological Receptor
ERA	Environmental Risk Assessment
ESOS	Energy Savings Opportunities Scheme
ETS	Emissions trading Scheme
FAQ	Frequently Asked Questions
FL	Fuel Loading
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GH	Guard House
GHG	Green House Gas
GI	Ground Investigation
GIS	Gas Insulated Switchgear
GWP	Global Warming Potential
HC	Hydrocarbon

Glossary/ Abbrevation	Term
HR	Human Receptor
HV	High Voltage
ID	Identity
IED	Industrial Emissions Directive
ISO	International Standards Organisation
IT	Information Technology
km	Kilometres
kV	Kilovolt
LCP	Large Combustion Plant
LLP	Limited Liability Partnership
MAGIC	Multi-Agency Geographic Information for the Countryside
MCP	Medium Combustion Plant
m	Metres
mOD	Metres Above Ordnance Datum
MV	Medium Voltage
MW	Megawatts
MWh	Megawatt Hour
MWth	Megawatts thermal
NGET	National Grid Electricity Transmission
NOx	Nitrogen Oxides
NVZ	Nitrate Vulnerability Zones
OPV	Overfill Protection Valve
PC	Process Contribution
PM	Particulate Matter
PPM	Planned Preventative Maintenance
PROW	Public Right of Way
SAC	Special Area of Conservation
SCR	Site Condition Report
SOP	Standard Operating Procedure
SOx	Sulphur Oxides
SPA	Special Protection Area
SPH	Sprinkler Pump House
SRP	Spill Response Plan
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage System
UK	United Kingdom
WST	Water Storage Tanks and Screen

1. Report Context

1.1 Introduction

AECOM Limited ('AECOM') has been commissioned by Amazon Data Services UK Ltd ('the Operator') to prepare an application under the Environmental Permitting (England and Wales) Regulations[1], as amended ('EPR') for an Environmental Permit for the emergency back-up generation facility for the proposed data centre at Thorney Wood Business Park, Thorney Lane North, Iver in Buckinghamshire. The environmental permit will be for the emergency backup generators and associated fuel storage and handling ('Proposed Installation').

This report has been prepared to support the permit application and details the supporting information for the site. The document is structured as follows:

- Section 1 presents general background to the overall project, summarises the purpose of the facility, and describes the legislative context of the development. This section is supported by a number of drawings and plans presented in Application Part 11.
- Section 2 summarises the environmental setting of the proposed installation and the current site conditions. It is supported by a Site Condition Report (SCR) in Application Part 4.
- Section 3 presents a summary of the management arrangements to be employed at the proposed installation
- Section 4 describes the proposed technical installation in more detail explaining the technical standards to be met and associated design philosophies. This section also summarises compliance with the relevant regulatory standards to demonstrate the proposed installation will comply with the relevant Best Available Techniques (BAT). This section is supported by a detailed assessment of BAT presented in Application Part 5.
- Section 5 summarises emissions to air, land and water associated with the operation of the proposed installation.
- Section 6 presents the proposed arrangements for monitoring and control of the proposed processes.
- Section 7 presents the conclusions of the environmental risk assessment of the proposed installation and is supported by a number of separate assessments in Application Parts 6-8 inclusive.
- Section 8 presents an overview of the approach to commissioning, decommissioning and closure.

1.2 The Operator

The applicant and operator is Amazon Data Services UK Limited, the operator of Amazon Web Services' (AWS) data centres in the United Kingdom. AWS is the world's most comprehensive and broadly adopted cloud, and is part of Amazon . It allows clients to access technology services, such as computing power, storage, and databases, on an as-needed basis instead of instead of owning and maintaining physical data servers on their own.

The Proposed Installation and wider data centres, subject to the grant of planning permission, will form part of Amazon's planned £8 billion investment in the UK (2024-2028) to build, operate, and maintain data centres. This investment is part of the Amazon's long-term commitment to supporting growth and productivity across the country and is estimated to contribute £14 billion to the UK's total Gross Domestic Product (GDP) through to 2028 and

[1] The Environmental Permitting (England and Wales) Regulations 2016, as amended.

support an average of more than 14,000 full-time equivalent (FTE) jobs on an annual basis at local UK businesses. These positions all form part of the Amazon data centre supply chain, ranging from construction, facility maintenance, engineering, telecommunications, and other jobs within the broader local economy. These investments form part of Amazon's planned £40 billion investment in the UK over three years (2025-2027), including new fulfilment centres, delivery stations, and corporate office buildings.

Amazon is resolutely committed to sustainability with a commitment to reach net-zero carbon emissions by 2040 —10 years ahead of the Paris Agreement. It is the largest corporate purchaser of renewable energy globally for the fifth year in a row (according to Bloomberg NEF). In 2023, the company met its goal to match all the electricity consumed across its global operations, including its data centres, with 100% renewable energy - seven years ahead of its original target of 2030. Overall, the Applicant's demonstrated track record and global sustainability commitments underscore its ability to deliver environmentally responsible development.

Amazon Data Services UK Limited is listed on Companies House with registered number 09959151.

The Directors, and their dates of birth, as listed on Companies House are provided in application form part A.

1.3 Proposed Installation

The Environmental Permit application will be made for the combustion activities (including fuel storage and handling) associated with emergency backup generators only and not the wider data centre operations. The installation boundary for the Environmental Permit will include the areas covered by these activities only. The Installation boundary is shown on Drawing TLBP-ACM-00-XX-DR-A-92001 Proposed IED Permitting Boundary (Application Part 10 Figures and plans.

The wider data centre development consists of the construction of commercial buildings to comprise data centres (DC-A and DC-B), ancillary offices, associated plant, equipment and emergency backup generators and associated fuel storage, landscaping, sustainable drainage systems and parking.

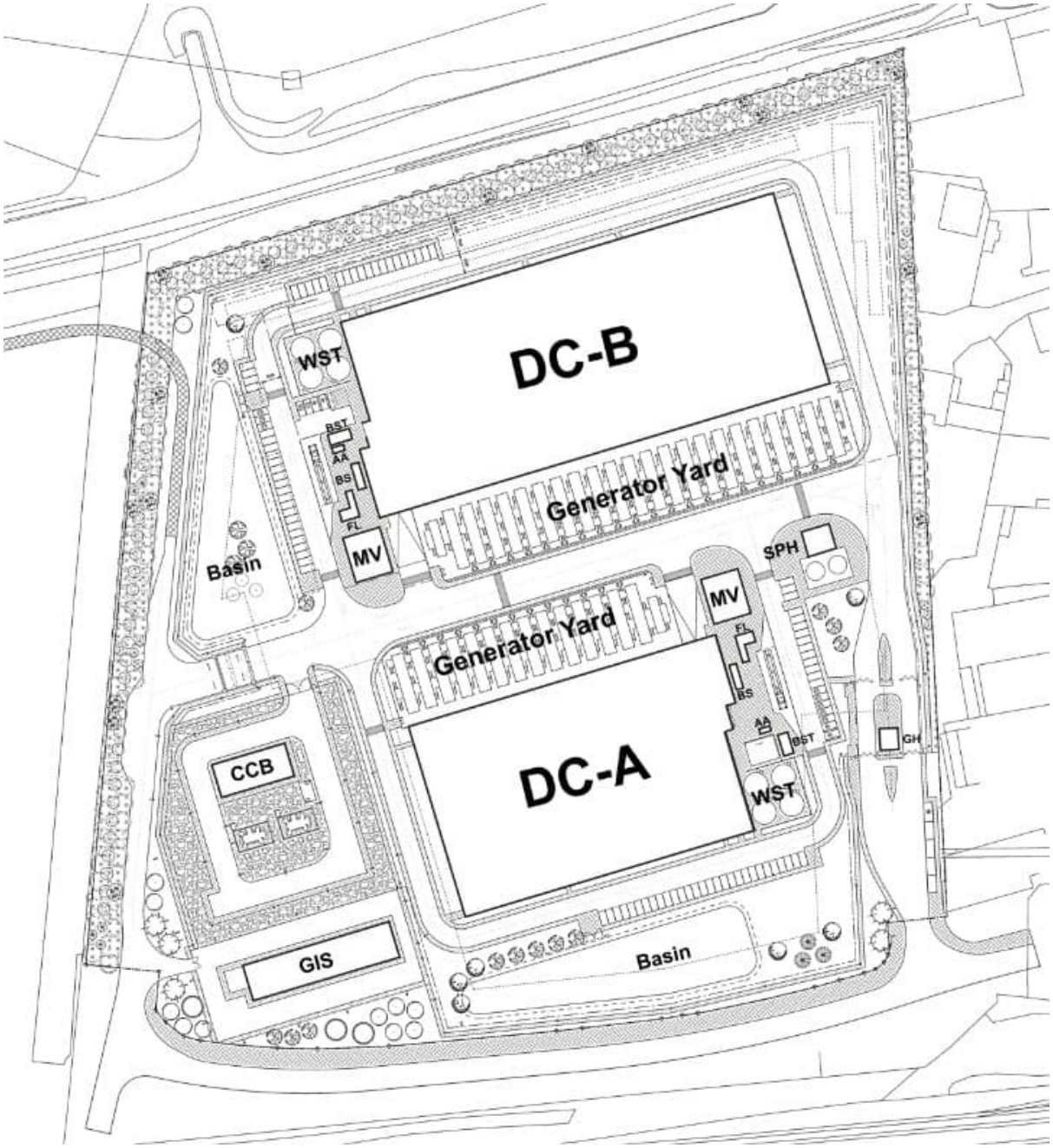
A bank of emergency generators will be provided to support the data centre operation in the event of a power outage. Each individual generator will be classed as medium combustion plant (MCP) with an aggregated thermal input for the site which will exceed 50 MWth.

The installation will include 36 containerised generators to provide backup power supply for the main data centre buildings, a smaller ‘house’ generator for each building to cover noncritical operations in an emergency such as offices, the proposed generator fuel storage and handling areas, and associated emission points only.

The emergency generators and associated fuel loading and storage will be classed as the Proposed Installation throughout this report and is located within a central area within the wider Data Centre Site.

The wider site layout is shown in Plate 1 below.

Plate 1. Thorney Lane Data Centre Site Layout



Legend

DC-A - Data Centre Building (1st Phase)
DC-B - Data Centre Building (2nd Phase)
GH - Guard House
SPH - Sprinkler Pump House
MV - MV Building
FL - Fuel Loading
BS - Bike Shelter
AA - Amenity Area
BST - Bin Store
WST - Water Storage Tanks and Screen
CCB - Client Control Building
GIS - GIS Sub-Station

1.4 Regulatory Framework

This environmental permit application is made under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) ('the EP Regulations').

The activities proposed under the environmental permit (permitted activities) are summarized in Table 1.

Table 1. Permitted Activities

Activity Ref No	Activity under EPR 2016 Schedule 1	Description of specified activity	Limits of specified activity
Installation Activities			
A1	Burning fuel in an appliance with a rated thermal input in excess of 50 megawatts {Schedule 1 Activity – Chapter 1, Section 1.1, Part A (1) (a)}.	Operation of emergency standby generators burning diesel or HVO solely for the purpose of providing electricity to the installation in the event of a failure of supply from the National Grid including testing and maintenance. The development comprises; • 36 x main generators, • 2 x house generators.	From receipt of raw material (diesel or HVO) to combustion in emergency standby generators. Emergency standby generators for electricity production to exhaust of products of combustion to atmosphere to generation, storage and dispatch of wastes. Electricity produced at the installation cannot be exported to the National Grid. With the exception of testing and maintenance, the generators shall only be operated for on-site emergencies and not for elective power generation.
Directly Associated Activities (DAA)			
A2	Storage of Raw Materials	Fuel for the generators and other maintenance related materials such as lubricants.	From receipt of raw materials to use within the facility.
A3	Refuelling Operations	Filling of generator fuel tanks.	Fuelling activities undertaken at designated fill points on the refuelling laybys.
A4	Foul Water Drainage	Management of generator yard and refuelling area foul water.	Inputs to site foul drainage system from generator and fuel loading areas until discharge to wider site foul water drainage via interceptors.

1.5 Non-Permitted Activities

The wider data centre development consists of a number of non-permitted activities which sit outside the installation boundary including:

- two 2-storey data centre buildings (i.e., DC-A and DC-B);
- a high voltage (HV) substation compound which includes a transformer yard with switchgear and an associated Client Control Building (CCB);
- a Gas Insulated Switchgear (GIS) building;
- sustainable drainage systems including 3 stormwater attenuation ponds;
- ancillary structures including but not limited to;
    - 2 no. medium voltage (MV) switch rooms;
    - 1 no. security guardhouse;
    - 1 no. centralised sprinkler tank and pump house;
    - 1 no. water treatment plant;
    - Perimeter security fence;
    - Centralised Water Treatment Plant with associated storage tanks; and
    - Landscape buffering will be provided to screen the wider data centre campus.
- a total of 111 car parking spaces and 32 cycle parking spaces.

In association with the above, hard and soft landscaping, external lighting, plant, boundary treatments including security fencing, and a service yard with an internal circulation road and footpaths are also proposed on Site.

The Site's proposed main access is via an adapted secure entrance at the southern end of the Site connecting to the public highway at Thorney Lane North. The Site's secondary proposed access comprises a grasscrete (or similar) Emergency Vehicle Access Road connecting to the public highway at Hollow Hill Lane.

2. Environmental Setting and Site Condition

2.1 Site Location

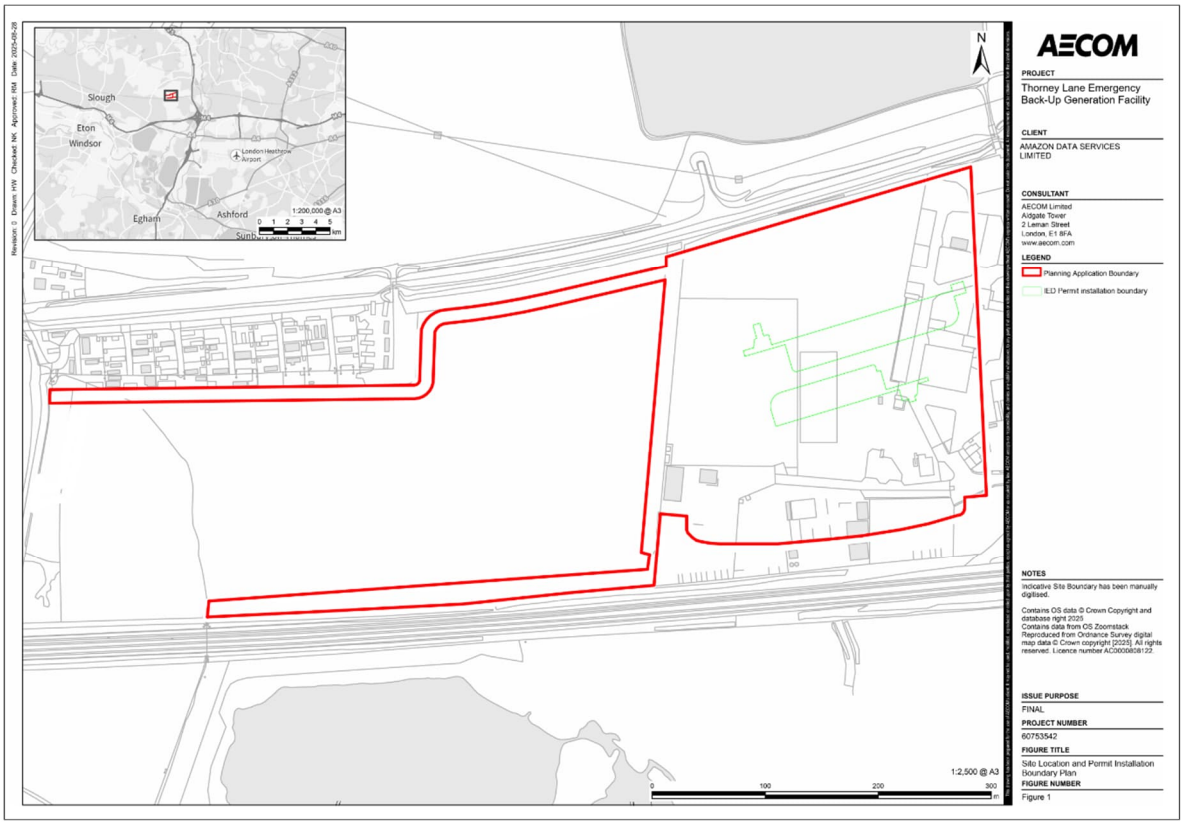
The Thorney Lane Data Centre site occupies approximately 9.54 hectares within Thorney Business Park in Iver, Buckinghamshire. The Proposed Installation is centred at E502987, N180006 in the centre of the data centre campus and is approximately 0.8 hectares.

There is an extant planning permission (PL/22/1775/FA dated 29th May 2024) for data centre use at this site. The operator is seeking some amendments to this planning permission to reflect its specific design and layout requirements via a new full planning application

The site is located approximately 1.2km south of Iver Town centre, 27km of London City Centre and 5km east of Slough. Heathrow airport is approximately 6km south-east. Grand Union Canal Slough arm borders the subject immediately to north, with the Great Western Rail Line and Elizabeth Line immediately south. To the east lies the remainder of the Thorney Business Park and to the west are arable fields and Mansion Lane.

The Data Centre Campus Location is shown in Plate 2 below with the installation boundary shown in green.

Plate 2. Data Centre Location



2.2 History of the Site

2.2.1 Current Setting

The Proposed Installation is situated within the eastern part of the proposed Data Centre which lies within the western end of Thorney Business Park. This area was previously a mixed commercial and industrial complex occupied by multiple tenants split between several different storage yards, as well as temporary offices, a concrete batching plant, fuel points, and storage

of filming support and accommodation trailers. The business park is now vacant and has mostly been cleared to ground level.

The remainder of Thorney Business Park is situated to the immediate east of the Data Centre campus.

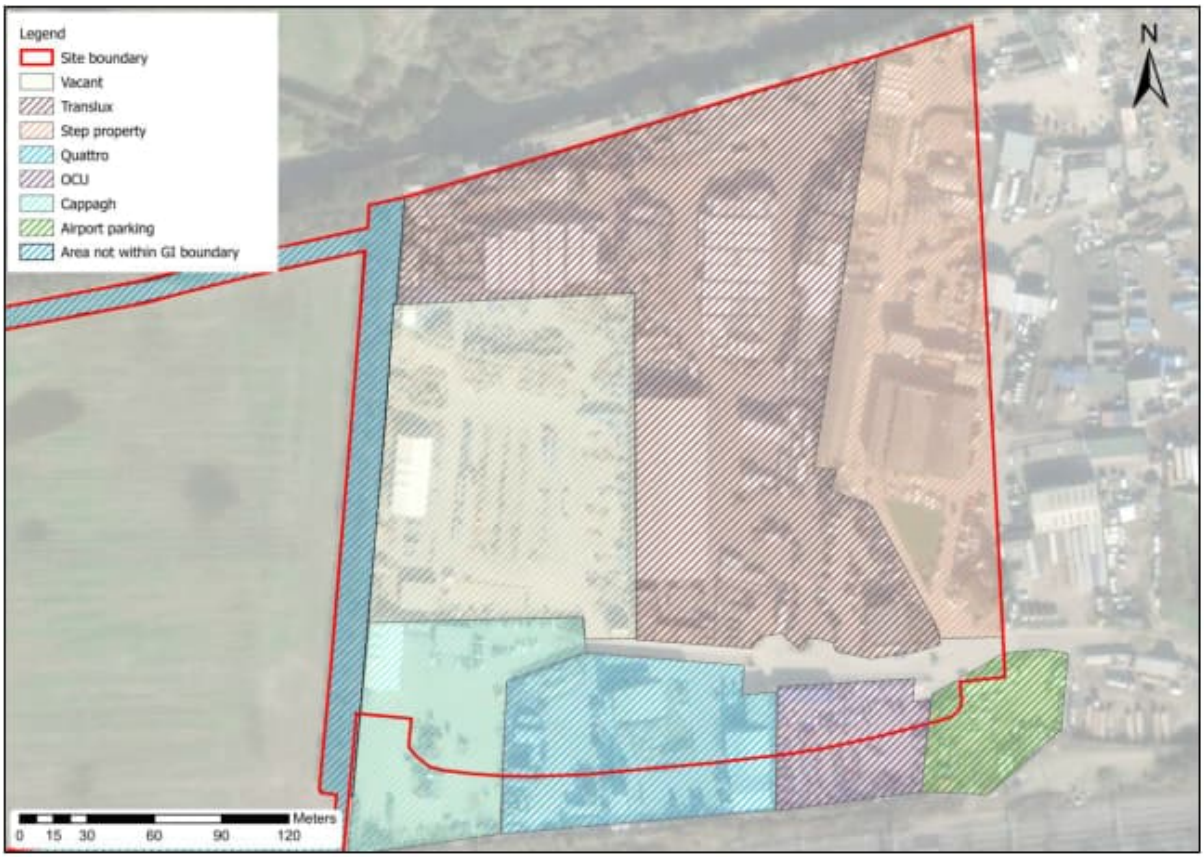
A summary of the previous site uses for the wider data centre site as confirmed in the Ground Contamination Desk Study and Preliminary Risk Assessment[2] produced by Aru is provided in Table 2 and shown on Plate 3.

Table 2. Summary of Previous Site Users

Site User	Land-use
Quattro (Waste Management & Concrete Mix Plant)	This area comprised a concrete batching plant and an associated storage yard. The concrete plant is not in regular operation and serves primarily as a contingency facility for other sites. The site is mainly utilised for the overnight parking and maintenance of lorries. Along the eastern boundary, three large sheds are located, which were used for vehicle servicing and fuel storage.
Cappagh (Construction, Skips, Aggregates & Utility Connections)	Used as a storage depot for vehicles and materials. A temporary unit was located in the northern section of the site and was being utilised as office space. The remainder of the site was occupied by stored materials, aggregates, and a selection of chemicals, including petroleum-based lubricants. Fuel tanks were situated centrally and were used for refuelling Cappagh lorries and onsite plant.
Translux (Film & TV - Suppliers of Trailers and Campervans) and Vacant plot	The vacant plot, formerly occupied by a ground engineering company, was operated by Translux. This area, along with the northern section of the Translux site, was utilised for storing and servicing film industry trailers. The southern portion of the Translux area included their former servicing sheds and was temporarily used for the storage of Quattro cement lorries. A pumping station and a disused substation were located within the eastern area of this plot..
Step Property (Multi Tennant Licenced Area)	The southern portion of this area consists of demolished structures (numerous small units and two large buildings), while the northern section was previously operated by Speedy Fuels for refuelling their fuel tankers.
Airport Parking	This area was utilised as overflow parking in support of Heathrow Airport operations.
OCU formerly Instalcom - (utility service providers)	The area was previously utilised for storage but was vacated to provide supplementary parking for the Quattro offices, in addition to serving as a storage zone for materials and aggregates.

[2] ARUP, Ground Contamination Desk Study and Preliminary Risk Assessment, December 2025

Plate 3. Summary of Previous Site Uses and Features Within Thorney Business Park



Source: "Ground Contamination Desk Study and Preliminary Risk Assessment (Reference Number ARP-276894-24-XX-XX-LQ-RP-00005)

Within its immediate surroundings:

- Grand Union Canal Slough Arm and the associated Grand Union Canal Walk Public Right of Way (PROW) borders the data centre campus immediately to the north and is approximately 137m to the north of the Proposed Installation Boundary;
- Great Western Rail Line and Elizabeth Line borders the data centre campus immediately to the south and is approximately 160m south of the Proposed Installation boundary;
- Thorney Business Park East borders the data centre campus immediately to the east ; and
- Arable fields borders the data centre campus immediately to the west and is approximately 60m west of the Proposed Installation boundary.

The closest residential receptors comprise Richings Park, located approximately 300m south-east of the Proposed Installation (on the opposite side of the railway line), and Grand Union Place halting / caravan site, is approximately 300m to the north west of the Proposed Installation boundary.

Other notable land uses in the vicinity of the Proposed Installation include Ridgeway Industrial Estate (approximately 365m to the north-east on the opposite side of the Grand Union Canal), Court Lane Business Park (approximately 1km to the east), the Cemex Langley asphalt mixing plant (approximately 650m to the south of the site), Richings Park Sports Park (approximately 840m to the south east), Grand Union Place caravan/halting approximately 300m to the west of the site, Hollow Hill Lane caravan / halting site approximately 650m north west of the site, and High Lane Yachting Boatyard (to the west of Mansion Lane).

2.2.2 Environmental Constraints

The environmental constraints and designations located within 500m of the wider Data Centre Site, as per the Multi-Agency Geographic Information for the Countryside (MAGIC) Maps[3] are listed below. The main environmental constraints are summarised below:

- The majority of the Proposed Installation is located within the South Bucks District Council Air Quality Management Area (AQMA) No 2; and,

Historic landfills lie to the west and the east of the Proposed Installation boundary. .There are a number of surface water features in the area surrounding the Site, including:

- The Grand Union Canal (Slough Arm) approximately 137m to the north of the Proposed Installation boundary;
- Multiple drainage channels to the east, west and south;
- Horton Brook approximately 500m south west from the Proposed Installation boundary;
- Colne Brook approximately 700m to the south of the Proposed Installation boundary; and,
- Various surface waterbodies associated with Colne Brook to the south, including Colnbrook West, Orlitts Lake and Old Slade

2.2.3 Site Access Arrangements

Vehicular access for the Proposed Installation will be via a dedicated access road to the east (there is an extant permission -planning application ref. PL/22/1710/FA and live planning application ref. PL/24/2751/FA).

2.2.4 Site Condition

A Site Condition Report for the Proposed Installation is presented in Application Part 4, characterising the condition of the ground and groundwater across the Proposed Installation area associated with historical activities on the site.

The area was predominantly commercial and industrial in nature, as described above. The environmental sensitivity of the site is considered to be as follows:

- Groundwater – Low to High sensitivity - the superficial deposits of the Lynch Hill Gravel Member - Sand and Gravel is classed as Principal Aquifer and the underlying bedrock of the London Clay Formation is classed as unproductive aquifer. The Lynch Hill Gravel Member Principal Aquifer is classed as high vulnerability for groundwater pollution.
- Surface water – There are no surface water features on the Data Centre Site or the Proposed Installation. There is a private surface water drainage network serving Thorney Business Park.
- Land use – Medium sensitivity – the Site is surrounded by industrial and commercial facilities. The closest residential receptor is approximately 300 m southeast of the Proposed Installation. The closest ecological receptor is 1.5 km south of the Proposed Installation.

Information on relevant hazardous substances which will be stored at the Proposed Installation, their physical containment, and the management techniques adopted to prevent and control releases are included within the Site Condition Report (Application Part 4).

The activities at the Proposed Installation site will be carefully controlled both by local containment and operational techniques. The measures put in place will ensure that

[3] Department for Environment, Food and Rural Affairs (DEFRA). MAGIC Map Application. Available at https://magic.defra.gov.uk/ [accessed 6 May 2025]

operations during the life of the facility are unlikely to lead to pollution of groundwater or the ground and will not lead to deterioration of the state of the land.

3. Management Arrangements

3.1 Introduction

The Proposed Installation will develop a management system prior to commencement of operations in accordance with the EA guidance – 'Develop a management system: Environmental Permits' as a good practice measure.

3.2 Environmental Management System

An environmental management system (EMS) will be established on site and will cover those elements requiring environmental permitting.

The EMS will follow and operate to the broad principles of ISO 14001 standard including the incorporation of a robust regulatory compliance system. The EMS will be underpinned by an environmental policy and the following will be in place:

a. senior leadership commitment to continual improvement,

b. established environmental policies, procedures and processes to drive and monitor compliance with applicable regulations,

c. a process and team that conducts internal compliance audits to assess environmental aspects and impacts of our data centre facilities, and

d. supplier code of conduct and contractual requirements that specify environmental compliance requirements and monitoring practices for suppliers.

All staff and external contractors will be made aware of the environmental policy and relevant EMS requirements as part of the induction training and a copy of the policy and procedures will be made available on site.

A system of keeping all relevant records including, but not limited to, the following will be developed and implemented prior to commissioning:

- Records of incidents, accidents and emergencies including details of follow-up;
- Monitoring records, including those required by the environmental permit; and
- Any other record to be kept as part of the permit.

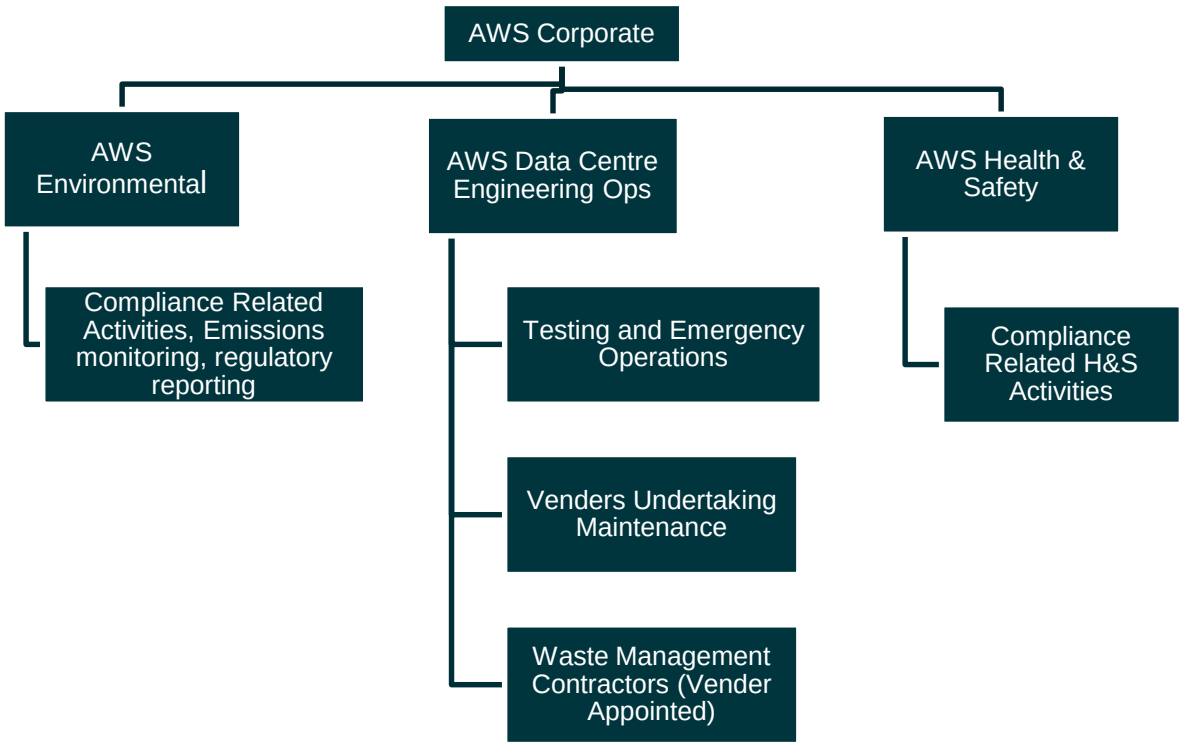
Systems will be developed and implemented for undertaking audits, reporting of environmental performance, objectives, targets and programmes for future improvements.

Prior to commencing hot commissioning of the generators, all key EMS systems will be in place.

3.3 Organisation

A draft organogram for the Proposed Installation is provided in Plate 4 below and indicates the main lines of responsibility. Roles and responsibilities will be clearly defined within the management system.

Plate 4. Organogram



The back-up emergency generators will be operated from an onsite control room. Routine checks and inspections of the generators and permitted area of the facility will be undertaken . The plant will be available for 24 hours a day, 365 days per year, subject to the limit on operating hours for each generator emergency back-up generation up to a maximum 500 hours in any one year. Due to the back-up nature of the plant in reality the operational hours will be well below this.

Further details on specific aspects of the management systems for the installation are provided in the following sections.

3.4 Operations and Maintenance

Management systems will be put in place to ensure that those operations which have the potential to give rise to significant environmental effects are controlled. These systems will cover periods where the generators are not running as well as testing and emergency operation scenarios and start-up and shutdown of the installation.

Planned preventative maintenance routines will be established to ensure all key plant components which have the potential to affect the environmental performance of the installation remain in good working order. Maintenance routines will draw on manufacturer's recommendations, modified as appropriate by operational experience during the lifetime of the installation. Maintenance will be carried out by contractors in accordance with the operator's maintenance requirements which will include.

- A series of maintenance procedures developed for the main items of plant at the site including generator yards and fuel loading areas. Procedures will provide an indication of reference documents along with procedural steps including who will undertake the work, the relevant mechanism for recording the information and the action/reporting to be completed if an issue is identified.

- There will be a significant element of planned preventative maintenance to ensure high standards of performance.

- Maintenance scheduling will be undertaken making reference to statutory requirements, manufacturer's recommendations and from plant history once site becomes operational.

- Following maintenance, details of work undertaken will be recorded.

- Reports relating to maintenance activities and effectiveness will be provided to senior management including any recommendations for further action.

- All plant items will be serviced and maintained according to manufacturer's schedules and recommendations.

3.5 Competence and Training

Key competency requirements for data centre staff will be set out covering the operation of the installation and the relevant training individuals require. This will be subject to annual review or as operations change. Training will ensure that all staff are aware of relevant elements of the EMS, including relevant operational procedures and the requirements of the environmental permit when issued. Induction procedures will be established for the identification and provision of training and updated knowledge for all personnel engaged in activities affecting environmental performance.

All subcontractors working on the site will be subject to a competency assessment. In addition, where any subcontractor has any operational input to the site, they must fulfil any relevant obligations under the EMS. Training will be provided to the subcontractor at the beginning of their contract term in the form of the site induction process; the subcontractor will in turn be responsible for training their own personnel and providing records of such training back to the operator. This will include all maintenance staff carrying out routine maintenance at the installation.

Records of relevant training will be stored and maintained. As a minimum, records will include details relating to the date, type of training and training provider.

3.6 Accident Management

An Emergency Response Plan (ERP) will be established prior to commencing operation of the Proposed Installation. The ERP will detail those actions required in the event of an emergency, or accident/incident. This will include small incidents such as minor spills and leaks and complaints, as well as major incidents such as fire and major spills. In particular, a system for recording and allocating appropriate follow-up for accidents, incidents and non-conformances will be established prior to operation. The ERP will be supported by a Spill Response Plan.

The installation will be controlled via an onsite control room. Routine daily inspections and maintenance will be carried out by a suitably qualified member of staff and subcontractors. Emergency considerations for the generator yard and fuel loading areas include:

- Each engine will be fitted with a weighted slam-shut valve with a fusible link across the top of each engine. In the event of a fire, the link will melt, and the valve will drop, shutting off the fuel supply. These systems will link to the site security office where personnel will alert relevant employees and call the Fire and Rescue Service to attend if necessary.

- Generator yard and fuel loading areas are provided with gravity fed foul drainage which flow to Class 1 interceptors (there will be one interceptor for each generator yard and one for each fuel loading areas). Each interceptor will have a 10,000l capacity and will be monitored from the BMS for the presence of hydrocarbon indicating a leak or a spill. On

detection of hydrocarbon, an isolation valve will automatically close to prevent material leaving the interceptor and discharging to the wider foul sewer network. Contaminated material isolated in the interceptor will be removed by vacuum tanker for offsite disposal at an appropriately licenced facility.

- In the event of a fire in the generator and fuel loading areas, the control will activate the isolation valves to ensure fire waters are contained within the interceptors to allow removal by vacuum tanker if necessary.
- Generator yard and fuel loading areas will be provided with spill response equipment.
- In the event that firewater or other contaminated waters did exceed the capacity of the Proposed Installation drainage and entered the wider foul water drainage network then this system would be isolated to prevent offsite release. Waters would be tested and if they can't be released to sewer then arrangements would be made for removal by vacuum tanker if necessary for offsite disposal.

To support this application, an initial Environmental Risk Assessment (ERA) is provided in Application Part 6, which includes an assessment of potential accident risks. This will be reviewed prior to commencing operation and maintained as part of the AMP throughout the operational life of the installation.

As part of the design process, hazards will be identified and reviewed with a view to minimising safety, health and environmental risks.

3.7 Climate Change

A climate change adaptation risk assessment was carried out and is presented in the Environmental Risk Assessment (Document Reference (SP3224LP-APP-ERA) in Application Part 6. Climate change adaptation and mitigation will be considered in the proposed data centre design. Climate related risks and any associated mitigation plans will be managed within the Company systems.

3.8 Site Security

The engines will be containerised and located within the centre of the data centre campus. There will be a number of physical and electronic security measures in place across the data centre campus including:

- Sitewide access control systems for both pedestrians and vehicles that will strategically limit access to key areas to discourage attempts at unauthorised entry and promote the use of the site as intended.
- Access control zoning to ensure critical areas are located behind several layers of access control that only authorised users will have access to.
- Vehicle security entrance at the main entrance to the Site with oversight from a dedicated Guard House.
- Secure emergency access route to the West of the Site which will be secured with an automatic bi-fold gate.
- Both campus entrance points will be provided with Hostile Vehicle Mitigation (HVM).
- 24/7/365 comprehensive video surveillance monitored on Site by trained security staff with images retained for forensic review post incident.
- Visitor management to ensure visitors are pre-approved, checked in at the Guard House, escorted, and monitored during their attendance at the Site.
- On-Site dedicated monitoring of all alarms and video surveillance from a central Security Control Room (SCR) with full visibility of the Site.

4. Proposed Technical Installation

4.1 Technical Standards

The Proposed Installation will be operated in accordance with a new bespoke EPR Permit issued by the EA. The EPR permit will include the activities and techniques detailed within this application which will be developed in accordance with the standards and guidance which detail 'Best Available Techniques' (BAT).

The proposed diesel generators are each classed as medium combustion plant (MCP), however the aggregated total rated thermal input of the installation as a whole will be above 50 MWth and therefore it will be regulated EPR as a Schedule 1, Part 2, Section 1.1 A(1)(a) – burning of any fuel in an appliance with a rated thermal input of 50 or more megawatts.

However, the diesel generators proposed will each have a net thermal input significantly below 15 MWth. Therefore, although the total combined thermal input of all engines is greater than 50MWth, the aggregation rules set out within the Industrial Emissions Directive (IED)[4] do not apply and therefore the installation is not classed as a large combustion plant (LCP). Accordingly, the installation does not fall within Chapter III of the IED and instead is a Chapter II combustion plant. The emission limits relevant to LCPs within the relevant BAT Conclusions do not apply.

Although the generators are MCP, the total operating hours for each generator per year will not exceed 500 hours, and as such they will not be required to comply with the emission limits set out in Schedule 25A EPR.

At the time of writing there are no relevant published BAT reference documents (BREF notes) for data centres and the previous combustion sector guidance document: 'Combustion Activities (EPR 1.01)' was withdrawn in August 2018.

The EA has published:

- "Data Centre FAQ Headline Approach v21" (November 2022)[5] as a working draft guidance document detailing the approach to permitting and regulatory obligations for data centres under the Industrial Emissions Directive (IED) and the Environmental Permitting Regulations.
- "Emergency backup diesel engines on installations: best available techniques[6]" for MCP that operate up to 500 hours per annum.

A BAT assessment (Document Reference SP3224LP-APP-BAT) has therefore been developed using engineering information provided by the Operator, based on the design parameters of the Proposed Installation, available information about the local environment and the applicable standards and guidelines, outlined in the "Data Centre FAQ and the Emergency Backup Generator guidance documents. The assessment is presented in Application Part 5.

4.2 Data Centre Design Considerations

4.2.1 Grid Reliability and Redundancy

A data centre is filled with various servers and associated IT equipment. This equipment requires a stable and constant supply of electricity to operate.

Data Centres require a high level of uninterruptible power provision, and being supplied by the national grid brings a risk of a mains failure events (black out) or fluctuations outside of acceptable limits (brown outs). Data centres are considered nationally critical infrastructure

[4] Article 29 – https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32010L0075&from=EN
[5] Data Centre FAQ Headline Approach v21' (November 2022).
[6] Environment Agency Guidance "*Emergency backup diesel engines on installations: best available techniques*" August 2023

underlining their strategic importance to the national economy and digital resilience. Downtime, i.e., power failures or voltage drops, even momentarily, may mean loss of service to customers, e.g., banks. This could have significant negative implications to site services, both in terms of direct financial costs and indirectly through reputational damage.

Power for the data centre will be supplied from/by the National Grid. National Grid 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.

The overall reliability of supply for the National Grid Electricity Transmission (NGET) System is reported each year in the annual National Electricity Transmission System Performance Report[7]. The performance for England and Wales for the five years from 2020 – 2021 year are presented in table 3 and as can be seen the majority of these events had no impact on electricity users with <2.7% resulting in loss of supplies to customers.

Table 3. NGET Transmission System Performance

Year	Reliability (%)	No of Events in England & Wales	No of Events Resulting in Loss of Supply	Longest Outage (mins)	Outage Closest to Site
2020 - 2021	99.999966	455	10	454	Culham Jet
2021 -2022	99.999936	517	11	321	Elstree Culham Jet
2022 - 2023	99.999997	412	11	762	Watford Barking
2023 - 2024	99.999998	390	5	8	Barking
2024 - 2025	99.999832	394	6	1,663	Nort Hyde SGT3 and Iver 12 circuit

Source: https://www.neso.energy/industry-information/industry-data-and-reports/system-performance-reports

4.2.2 Data Centre Electrical Supply and Redundancy

The main data centre development will include the installation of a HV substation compound which includes a transformer yard with switchgear and an associated Client Control Building (CCB)

The power distribution system for the wider data centre campus starting from the HV intake substation down to the low voltage distribution, is designed to be safe, reliable, redundant, robust, and efficient and have in- built redundancy.

For resilience reasons, it is preferable to have numerous power supplies to the site as this provides an alternate route to switch to, should one supply be compromised during an outage. If one supply route fails, the Data Centre can switch to the alternate supply that is unaffected. This is a process known as “bus coupling.” This ability to switch to the unaffected supply route reduces the duration for which the generators operate in the event of an outage.

The site will be supplied with a 132 kV dual-circuit supply from the National Grid. The dual redundant circuit provides security of supply in the event of a fault or loss of supply from one source; the other circuit is capable of supplying full load to the site.

To achieve this redundancy, the operator is proposing for the full supply to be split 50%/50% (dual feeds) from the National Grid substation, each capable of supplying the 100%, if required.

[7] https://www.neso.energy/industry-information/industry-data-and-reports/system-performance-reports

The MV distribution configuration implements a proprietary AWS open-loop system with rapid/fast restoration capability. Each DC building is served by two (2) redundant MV feeders, ensuring supply resilience.

In the event of an MV supply failure - whether caused by upstream infrastructure faults (including but not limited to cable, transformer, or switchgear failures in the supply chain from NGET through GIS to AWS HV substation)- the following sequence applies:

1. The automated system initiates a rapid transfer of affected DC loads to the remaining operational MV feeder
2. This transfer sequence takes precedence over generator start-up protocols
3. Backup generator activation is configured as a contingency measure, triggering only upon failure of the automated transfer sequence

Post-event recovery procedures may include manual switching operations within upstream substations (e.g., busbar transfers, MV coupler engagement) to re-establish dual power supply redundancy.

This configuration specifically prevents unnecessary generator starts, as the backup generation system is designed to activate only upon failure of all primary power restoration measures.

This scheme prioritizes switching between buses at the data centre MV switchgear over Generator start up. Therefore, if the A bus fails the entire MV system automatically swings to the B bus and vice versa)

The on-site infrastructure is designed on N+1 reliability (i.e. components (N) have at least one independent back-up component (+1). This means that there is redundancy built into the system, so that any one component, or any one distribution path can be out of service without affecting operations. Similarly, for the grid connection to the data centre to fail, it would require a number of failures to the upstream distribution network to occur simultaneously. The requirement to run back-up generators is therefore minimised.

The specific number of back-up generators in use (and the relevant loads required) will always be reflective of, and proportionate to, the power demands at the time, to maintain operations until the supply is restored.

4.3 Emergency Generators and Their Operation

4.3.1 Overview

The proposed installation will consist of 2.8MW main generators and smaller house generators as follows:

- 14 main generators and 1 house generator for DC-A;
- 22 main generators and 1 house generator for DC-B;
- Each generator has its own belly tank for fuel storage; and
- Two above ground top-up fuel storage tanks with associated fuel loading areas.

At the time of writing the procurement of the generators is still progressing and the maximum net thermal input of the main generators are anticipated to be up to 7.57 MWth and the house generators up to 3.5 MWth. To maintain flexibility for procurement, the Operator is therefore seeking a permit for up to 280 MWth for the site

The Operator has screened out generators which cannot meet the required BAT emissions standards and has undertaken worst case emissions assessments for the purposes of the application.

In relation to BAT, the Environment Agency's guidance[5]. for new data centre generators specifies that, at a minimum, they must meet the following standards:

"*New Data Centre diesel engines (prime movers) shall be emissions optimised (i.e. not efficiency optimised) to at least one of the two recognised main international standards 2g-TA Luft or US EPA tier 2 or an equivalent. This has requirements for2000mg/m^3 NOx; 650 mg/m^3 for CO; particulates and dust 130 mg/m^3 and 150 mg/m^3 for hydrocarbons (all at reference conditions and 5% O2).* "

The Environment Agency's guidance[5] goes on to state for NOx emissions that "*we would ordinarily expect specification sheets provided to EA at permitting to be EPA Tier 2 D1 test cycle (ISO8178-4) figures and/or 2g TA-Luft. This broadly equates to 2000mg/m3 (+/-10% tolerance) at 5% O2 = 750mg/m3 (+/-10% tolerance) at 15% O2 being realised between about 67% and 87% of peak load rating. Typically the best match to '2g' being at 75% quoted load rating as the default single point for comparison.*"

The generator specification sheets used for the Air Quality assessment have been provided in Appendix A and the indicated emissions for 75% load are summarised in Table 4 below and show the generators meet BAT

Table 4. Generator Emissions at 75% Load

Generator	Type	emissions (mg/Nm^3) at 75% load and at 5% Oxygen			
		NO_2	CO	Hydrocarbons	Particulate Matter
CAT (3516E)	Main	1,910	159	14	6
CAT (175-20)	Main	1,568	551	66	19
Cummins (QSK95-G5)	Main	1,830	78	49	15
CAT (3512B)	House	1,546	386	77	37
MTU (20V4000G94F)	House	1,865	99	27	8

The specifications for the final generators selected will be provided as a pre-operational condition.

4.3.2 Operating Modes

The generators will only operate during periods of testing, maintenance and to provide emergency back-up electricity to the data centre should there be a break in supply from the grid as summarised in Table 5 below.

Table 5. Generator Operating Scenarios

Scenario	Operation hours/year/generator	Description
Scenario 1 Biweekly	**13h total** (Biweekly – 26 per annum @ 0.5 h)	Consider all generators per site at 10% load, one at a time. One generator tested at a time – daytime only. Conservatively modelled at 100%.
Scenario 2 Biannual	**8h total** (biannual – 2 per annum @ 4h)	Consider all generators per site, run at 100% load. One generator tested at a time – daytime only.
Scenario 3 Maintenance	**10h total** (over the course of the year)	Consider all generators per site, run at 100% load. One generator tested at a time – daytime only.
Scenario 4 Emergency Scenario for Power Outage.	**72h total** (single event)	Consider all generators per site, run simultaneously at 100% load.

No electricity will be exported to the grid from the generating installation.

The full installation would only be required to operate as emergency back-up in the event of a grid outage. Such continuous operation would be up to a maximum 500 hours per year. Individual generators would be test operated up to a maximum of 50 hours per year.

4.3.3 Operational Controls to Minimise Generator Operation

The Operator will utilise an integrated Building Management System (BMS) and an Electrical Power Monitoring System (EPMS): these are additional control tools which will be used to monitor physical assets and equipment status and performance. The BMS/EPMS presents real time and historical data, providing valuable performance metrics. The BMS will be used to monitor that data centre assets are functioning correctly. Alarms will be set up in the BMS/EPMS to alert the Operations and Environmental teams of any issues with systems and equipment.

These measures will minimise the potential for emergency operation of the diesel generators, reducing the overall environmental impact from the installation, in the rare event that they are triggered to operate.

4.3.4 Generator Design

4.3.4.1 Engine Type

Each generator will comprise a containerised compression ignition reciprocating engine which includes an air intake system, combustion chamber, an exhaust system and an electrical generator, together with common auxiliary plant.

The air intake system will feature filters to remove any contamination present, such as dirt, dust or grit, which could damage or reduce efficiency of the plant.

4.3.4.2 Combustion

Within the engines, diesel and combustion air are ignited by means of compressing the air to elevate temperature. As the burning mixture of fuel and air expands, a piston is pushed transferring energy released from combustion to an engine flywheel, from which a connected alternator is used to generate electricity.

4.3.4.3 Start Up and Shut Down Procedures

The installation will be capable of rapid start up within approximately 45 seconds when generation is required and a controlled shut down after use.

As per the EA FAQ guidance, the engines are regarded as having minimal start-up and shut-down periods and the operational hours start on the first fuel ignition.

4.3.4.4 Generator Emissions Rates

The EA guidance for backup diesel generators is that they, as a minimum achieve the following standards:

"*TA-Luft 2g' or Tier II USEPA with guaranteed emissions: this has requirements for 2000mg/m^3 NOx; 650 mg/m^3 for CO; particulates and dust 130 mg/m^3 and 150 mg/m^3 for hydrocarbons (all at reference conditions and 5% O_2)*."

Generators which cannot meet these standards have been screened out from further consideration during procurement.

As outlined in 4.3.1 above, the generator specification sheets used for the Air Quality assessment have been provided in Appendix A and the indicated emissions for 75% load which are summarised in Table 4 above and show the generators meet BAT

4.3.4.5 Generator Flue and Exhaust Design

Each generator has its own dedicated flue with stacks rising to 25m. Each stack will be orientated vertically and will be unimpeded by cowls or caps.

4.3.4.6 Generator Noise Attenuation

The generator noise will be mitigated by positioning each generator in its own enhanced enclosure.

4.3.4.7 F-GAS

Fluorinated gases or 'F-gas' will not be used in the permitted activities e.g. generators and associated fuel storage.

There is potential that F-gases will be used in the air conditioning units. This plant is to be maintained in accordance with manufacturer specifications and recommendations with relevant documentation retained. Once the site is operational, an F-gas register is to be maintained onsite, and will include details such as plant make, model and serial, the type and volume of refrigerant, and maintenance history. Any significant releases or leaks are to be recorded and, where significant, notified to the EA as soon as possible.

4.3.5 Fuel Storage

The fuel storage arrangements for the Proposed Installation comprise:

- A separate fuel loading area for each generator yard;
- A top-up tank for each generator yard and associated fuel loading area
- A belly tank for each generator;
- Fuel polishing system.

The generator yards and fuel loading areas will have impermeable surfacing with gravity fed drainage (see 4.4 below for more details) which feeds into the wider foul drainage network via Class 1 interceptors for each generator yard and each fuel loading areas.

More details of fuel storage and fuel loading are provided in the sections to follow.

4.3.5.1 Top-Up Tanks

Diesel will be stored in two main top-up tanks (one for each generator yard), each holding approximately 40,000 litres. The tanks will be designed to meet the requirements of the Oil Storage Regulations[8] and CIRIA C736[9].

[8] Statutory Instrument 2001 No 2954, "The Control of Pollution (Oil Storage) (England) Regulations 2001, https://www.legislation.gov.uk/uksi/2001/2954/contents
[9] CIRIA, C736, "Containment Systems for the Prevention of Pollution – Secondary, Tertiary and Other Measures for Industrial and Commercial Premises", 2014.

Tanks will be of carbon steel construction that will meet British Standard (BS) 5410, BS 799-5 or equivalent standard. Tanks will include:

- Sight gauges which are attached to the tank by a bracket along the length of the gauge and is equipped with a valve that closes automatically when the gauge is not in use.
- The tanks will be fitted with an automatic Overfill Protection Valve (OPV) to the tank fill line. Tanks will be equipped with level monitoring connected to the BMS with integral alarms for low level, fill warning level and high level. An audible alarm will sound at the fill point cabinet when the fill warning level has been reached, alerting the operator to stop filling. If fuel filling continue and the high level alarm is reached then this will automatically close the motorised inlet valve preventing further filling of the tank. This reduces the risk of accidents, impacts, and fugitive emissions from entering the environment and causing harm.
- The tanks and pipework will be integrally bunded to 110% as per the Oil Storage regulations and containment will be provided with leak detection float switches which will audibly alarm in the BMS in the event the primary tank becomes compromised.
- Each top-up tank will be connected to the fill point at the fuel loading station for that generator yard. Connections to the fill point will be either screw or a fixed coupling design. The connection points will be subject to planned preventative maintenance and inspection to ensure the connection does not become corroded or debris has become trapped.

The main top-up tanks will be re-filled from fuel delivery vehicles in the designated fuel unloading (bunded) area. All delivery staff and maintenance engineers will be trained and will hold contact details for the relevant employees to alert in the event of any spill incident. Contact details will also be held local to the filling point.

4.3.5.2 Generator Belly Tanks

Each main generator will have its own dedicated 19,500 litre bunded belly tank (useable capacity 17,400 litres) and each house generator will have its own 5000 litre belly tank (useable capacity 4,560 litres). The belly tank for each generator sits below the generator and are sized to provide 24 hours continuous operation at 100% rated load.

Each belly tank will also be constructed of carbon steel to relevant BS and will be bunded to 110% of the capacity of the internal tank. The tanks will be fitted with digital OLE electronic gauges which can be read at the tank or remotely via the BMS.

OPVs will also be fitted to each belly tank fill line to prevent overfilling and each tank shall have sufficient capacity for 20% overfill prevention. Similar to the top-up tanks, leak detect float switches will also be provided within the belly tank bund and an audible alarm will be provided once the float level has been reached in the event of a leak.

The belly tanks will be automatically re-filled from the main top-up tank via above ground fill lines.

4.3.5.3 Tank Pipework

Pipework provided to transfer fuel from the fuel loading points to the top up and onward to belly tanks will comprise a pipe-in-pipe arrangement constructed of welded pipes to the appropriate standards (e.g. DN80 in DN125 or equivalent). Pipework will have leak detection and be routed above ground with flanges kept to a minimum to minimse the risk of leaks. If a leak is detected, pipework can be isolated to minimise the volume of liquid lost.

The pipework entering the generator canopy is anticipated to step down to single skin pipework and connect to motorised valves and to the belly tank through a bunded area. The generator supply and return lines are also single-skinned pipework connecting through internal connection between the belly tank and the generating set canopy.

All pipework will be supported by appropriate brackets/supports.

4.3.5.4 Fuel Fill Points

The 2 no. fill points (1 per generator yard) are to be located external to each data centre building and will be located in a lockable cabinet with a drip tray to capture minor spills.

Each fuel fill cabinet shall have a fuel control panel which shall display the current fuel level in all belly tanks and top-up tanks. The control panel can be used to select each tank for individual filling. This shall control the transfer pumps and motorised valves in each canopy and provide the overfill prevention controls / alarms at the fill cabinet for the fill operator.

The operator can choose which top-up/belly tank they wish to fill from the touch screen and when selected, the motorised valve associated to that tank will be actuated and the fill operation can commence. If a motorised valve has not been actuated then fuel offloading cannot commence.

The motorised valve in each tank is connected to the tank's OPV – if the high alarm signals for the tank being filled, the control system will automatically stopped the motorised valve and fuel transfer will stop. The OPV will be configured in a fail-safe configuration as normally on signal. In the event of loss of signal from the OPV, the generator controller will close the motorised valve if it is still open.

The fuel fill area will be surfaced with impermeable hard standing to ensure any spillages are directed to the nearest foul drain. A Class 1 fuel interceptor will be installed at each loading ramp to prevent any spillages f from entering the foul water system. Further details of the drainage system is provided in Section 4.4 below.

4.3.5.5 Fuel Polishing

Each belly tank will be fitted with an automatic fuel polishing system with an integrated pump and filter assembly, programmed to operate at pre-defined intervals. When operating, the polisher pump will draw fuel from the belly tank before passing it through a 10micron particulate and water separator before returning it to the opposite end of the belly tank.

This unit filters the fuel in the tank, removing moisture and particulates from the fuel and ensuring the generators run cleanly. The aim is to help maintain the fuel to a usable standard, preventing early degradation and ultimately extending the life of the fuel.

4.3.5.6 Fuel Management Procedures and Security

Fuel consumption will be low in this installation due to the plant being used for emergency back-up power generation only. As such, fuel deliveries are anticipated on average to be less than once per year. When required, refuelling is conducted by trained fuel tanker drivers and supervised by a trained member of the site engineering team.

A standard operating procedure (SOP) is to be implemented to facilitate refuelling activities. This SOP is intended to help reduce the risk of a spillage during refuelling. These will be supplemented by supplier procedures for fuel deliveries. Furthermore, additional controls will be developed to help reduce the risk of an incident including a Spill Response Plan (SRP) for spill response and spill kits.

A periodic preventative maintenance (PPM) regime will be implemented once the Proposed Installation is operational to include generators, tanks, pipework, fuel loading area/equipment, interceptors and drainage. Inspections will include periodic visual checks for leaks / spills and checks for suitably stocked spill kits, and that these are located within close proximity of fuel storage tanks and fill points. Spill kits and drain covers will be located in the vicinity of each fill point and each generator yard to reduce the risk of spilt fuel entering the drainage network during refuelling or in an emergency.

The site will be operated 24-7 with a 24-7 on site operations team trained in spill response and a 24-7 managed security staff with CCTV and an alarm system in place. Entry and exit to the site will be tightly controlled via a security gate and turnstiles. The site will have security office that allows operations to switch on all external luminaries on intruder detection by an operation switch. Natural surveillance of publicly accessible areas will be enabled to the site from a

dedicated Guard House at the main entrance which will enhance visibility at the site entrance, making it more difficult for potential criminals to operate unnoticed.

The site perimeter security will include fencing to demarcate public and private areas and clearly define ownership to discourage criminal behaviour. Perimeter detection systems and secure vehicle access control points will be deployed to deter, detect, and delay attempts at intrusion.

4.4 Proposed Installation Drainage

4.4.1 Foul Drainage

As indicated in section 4.3 above, the Proposed Installation will be surfaced with impermeable hardstanding both around the generator yards and in the fuel loading areas. Surfacing will be laid with falls to direct surface runoff and/or spills towards the foul drainage system.

Rain water or spills collected from the fuel loading areas and generator yard areas will be gravity fed to the foul drains and into the wider site foul drainage network via Class 1 full retention fuel and oil separators.

The interceptors will be Class 1 Full Retention Petrol Interceptors - SPEL Forecourt Separator FP 1C/SC or similar approved. Each interceptor will be specified to have a minimum 10,000 litre capacity which will be sufficient to retain the possible loss of the contents of one compartment of a road tanker, which may be up to 7,560 litres. Each interceptor will be continuously monitored on the BMS for the presence of hydrocarbons and in the event that hydrocarbons are detected will automatically activate an isolation valve to prevent release of the material within the interceptor being discharged into the wider foul drain network.

Foul water for the Data Centre Site as a whole will comprise domestic effluent and industrial wastewater which will discharge by gravity to the foul water pumping station to the south east of the Site. The discharge from this Site will be controlled to meet the maximum discharge rate allowed and balancing tanks will be provided on the industrial wastewater network to store the excess flows.

The foul drainage system is presented on drawing C-12000 in Part 10 of the Application, Figures and Plans.

4.4.2 Surface Water Drainage

No surface run off from the generator yard and fuel loading areas will enter the surface water drainage system.

The drainage strategy is for the wider data centre facilitates gravity collection of rainwater from proposed building roofs and roads via a new surface water network which will connect new gullies, channels and rainwater pipes into a combination of geocellular attenuation tanks and detention basins.

The wider Data Centre Site will discharge surface water offsite restricted to 40.1 l/s into a new pipe run flowing approximately 420 metres to the west of the Site to an existing culvert that flows southwards under the railway line. The wider data centre surface water network has attenuation capacity of around 5,270 m^3 spread across three attenuation tanks and two detention basins.

4.5 Resource Management

4.5.1 Raw Materials

Raw materials required for the Proposed Installation will be limited. The main materials used within the installation will be diesel or equivalent such as HVO, for fuel and lubrication oil.

Top up of lubricants or coolant will be undertaken during scheduled maintenance where required. The maintenance contractor will be responsible for this and will be responsible for reporting any spillage incident and actions taken in accordance with Environmental Management System requirements.

A list of raw materials, their use, storage and quantities is provided in Table 6 below.

Table 6. Raw Materials for the Proposed Installation

Material	CAS Number	Description	Hazardous Properties	Hazardous Identification	Purpose	Estimated Storage Quantity and Storage Type
Diesel (or HVO in Future)	68334-30-5	Liquid fuel oil, complex combination of hydrocarbons produced by the distillation of crude oil	Health Hazard Harmful	H227 – Combustible liquid H304 – May be fatal when swallowed and enters airways H315 – Causes skin irritation H332 – Harmful if inhaled H351 – Suspected of causing cancer H373 – May cause damage to organs through prolonged or repeated exposure (bone marrow, liver, thymus)	• Testing • Emergency	2 x top up tanks (1 per DC) – 40,000 litre capacity per tank 36 x belly tanks (1 per main generator) – brim-full capacity is 19,500 litres per tank and useable capacity is 17,400 litres per tank. 2 x belly tanks (1 per house generator) – brim-full capacity is 5,000 litres per tank and useable capacity is 4,560 litres per tank.
Ethylene Glycol	107-21-1	Liquid coolant mono-constituent substance	Health Hazard Harmful	H304 – May be fatal when swallowed and enters airways H373 – May cause damage to organs through prolonged or repeated exposure (bone marrow, liver, thymus)	Very low usage – used within closed circuit cooling water (CCCW) system.	Used as an additive to coolant water there will be no routine storage on site. This substance will only be present diluted within the closed loop cooling system for the engines.
Lubricating Oil	Various	Refined hydrocarbon with additives	Health Hazard Harmful	H208 – may produce allergic reaction	Low usage – used within a closed loop system with minimal requirement for top up during routine maintenance	No routine storage – brought to site as needed for maintenance.
Waste Lubricating Oil	Various	Refined hydrocarbon with additives	Health Hazard Harmful	H208 – may produce allergic reaction	Low usage – depends on usage	No routine storage onsite, waste oil will be removed as part of maintenance contract.

4.5.2 Waste

It is anticipated that waste generation during operation of the facility will be very low, primarily resulting from maintenance activities. Waste generation will be from the following limited sources: used engine air intake filters; and used lubricating oils.

All contractors carrying out maintenance on the plant will be responsible for the management of wastes generated from their immediate activities – which are removed from the site by the vendor upon completion of maintenance. The operator will be supplied with copies of records of waste removed from the site and associated recovery/disposal routes.

The permit requirements in relation to waste minimisation will be complied with and the operator will aim to minimise raw material consumption and therefore prevent the generation of waste.

4.5.3 Energy Use and Efficiency

The following section provides information on energy consumption and basic energy efficiency measures, for the installation.

4.5.3.1 Energy Use

The energy consumption has been calculated assuming that all operating scenarios including a 72 grid outage occur in any one year. This is a very conservative approach as the likelihood of the engines being required for emergency backup for 72 hours per year is very low.

Table 7 below provides a breakdown of the energy requirements of the installation.

Table 7. Energy Consumption

Energy Source	Hours Per Generator	Site MWth	Annual MWh
Testing and Maintenance	31	276	8,556
Emergency	72	280	20,160
Total			**28,716**

4.5.3.2 Energy Efficiency

The diesel generators proposed to be installed will have an electrical efficiency of at least 37%.

There is no defined BAT associated with energy efficiency levels relevant to emergency diesel engines such as those proposed at the installation. The efficiency sits within indicative efficiencies stated in the provisional EA guidance for data centres using diesel engines (noting these efficiencies are identified for the purpose of calculating thermal input).

Energy management will form an integral part of the Installations EMS and measures will be in place to minimise energy use as far as possible. Training programmes will be in place to ensure that operational and maintenance staff are aware of relevant procedures for ensuring energy efficiency.

Efficiency parameters will be monitored, and a commissioning test will be carried out, at full load after commissioning and after each modification that could significantly affect the net electrical efficiency, net total fuel utilisation, and/or net mechanical efficiency of the generators. On-site electricity usage will be minimised as far as possible within the constraints of the process optimisation.

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

4.5.3.3 Energy Efficiency Directive

The Energy Efficiency Directive (EED) 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, the Data Center is therefore exempt from the EED requirements.

4.5.3.4 UK Emissions Trading Scheme (ETS)

A Greenhouse Gas (GHG) permit is required for installations with combustion plant in excess of 20MWth. The operator will apply for this permit prior to the plant becoming operational.

Participating in UK ETS will require extensive monitoring of generator operational hours and fuel use to determine CO2 emissions per year. This data will verified and subject to audit as part of the EMS.

4.5.3.5 UK Energy Savings Opportunities Scheme (ESOS)

ESOS is a mandatory energy assessment scheme for organisations in the UK that meet the qualification criteria. At the time of writing these criteria are any company that either:

- employs 250 or more people
- has an annual turnover in excess of £44 million, and an annual balance sheet total in excess of £38 million

ESOS reporting will be managed via the Operator's energy team.

5. Emissions

5.1 Overview

This section sets out a summary of the emissions from the Proposed Installation.

5.2 Emissions to Air

The primary point source emissions to air are associated with the operation of the diesel-fired backup generators, which are intended for emergency use and periodic testing. Each generators has its own stack and the stack locations are summarised in the table below and are shown on Figure 2 Overall Site Layout and Emissions Point Plan in Part 10 of the application, Figures and Plans.

Table 8. Stack Locations

Stack	X	Y	Stack	X	Y
DC-A					
DC-A_Gen1 (A1)	502964.0	179986.7	DC-A_Gen9 (A9)	502914.7	179973.1
DC-A_Gen2 (A2)	502963.1	179986.3	DC-A_Gen10 (A10)	502913.6	179972.8
DC-A_Gen3 (A3)	502954.9	179984.1	DC-A_Gen11 (A11)	502904.6	179970.4
DC-A_Gen4 (A4)	502954.0	179983.8	DC-A_Gen12 (A12)	502903.6	179970.0
DC-A_Gen5 (A5)	502939.4	179979.9	DC-A_Gen13 (A13)	502889.7	179966.3
DC-A_Gen6 (A6)	502938.5	179979.6	DC-A_Gen14 (A14)	502888.8	179966.0
DC-A_Gen7 (A7)	502929.6	180052.1	DC-A_House (A15)	502964.9	179986.8
DC-A_Gen8 (A8)	502928.6	179976.9			
DC-B					
DC-B_Gen1 (A16)	502903.7	180041.7	DC-B_Gen13 (A28)	503028.1	180077.1
DC-B_Gen2 (A17)	502904.7	180041.9	DC-B_Gen14 (A29)	503026.3	180076.8
DC-B_Gen3 (A18)	502913.5	180044.1	DC-B_Gen15 (A30)	503014.3	180073.1
DC-B_Gen4 (A19)	502915.3	180044.5	DC-B_Gen16 (A31)	503012.4	180072.3
DC-B_Gen5 (A20)	502929.1	180048.8	DC-B_Gen17 (A32)	503001.8	180069.3
DC-B_Gen6 (A21)	502927.5	180048.3	DC-B_Gen18 (A33)	503000.2	180068.7
DC-B_Gen7 (A22)	502940.9	180052.1	DC-B_Gen19 (A34)	502990.1	180066.0
DC-B_Gen8 (A23)	502941.9	180052.5	DC-B_Gen20 (A35)	502988.0	180065.3
DC-B_Gen9 (A24)	502954.0	180055.8	DC-B_Gen21 (A36)	502977.0	180062.2
DC-B_Gen10 (A25)	502952.7	180055.4	DC-B_Gen22 (A37)	502975.0	180061.7
DC-B_Gen11 (A26)	502964.9	180059.2	DC-B_House (A38)	502902.9	180041.5
DC-B_Gen12 (A27)	502963.6	180058.7			

In terms of assessing the point source emissions to air, as the type of generator to be used at the installation is not fixed, the emissions data used to inform the dispersion modelling assessment is an amalgamation of emissions parameters across a number of generator types shortlisted for the installation by the operator. All generator types from which data has been sourced are diesel-fired and BAT compliant. It is assumed that should the generators that are installed at the Site be Hydrotreated Vegetable Oil, their emission parameters are likely to be no worse than those reported here. The data selected for each emissions parameter is the most precautionary value, with regards to air quality impacts, across the range of generator types short-listed. Thus, providing a reasonably precautionary estimate of generator emissions.

The release parameters for point source releases to air for each generator type are summarised in the table below.

Table 9. Main Gensets

Parameter	Main Generators[2]	House Generators[3]
No. on Site	36	2
Stack Height (m)	25	25
Stack Diameter (m)	0.6	0.6
Efflux Velocity (m/s)	8.97	4.20
Emission Temperature (^{O}C)	434	
Air Flow (m^3/hr)	9129.01	4275.56
NOx (mg/Nm^3)[1]	2678.8	2051.1
CO (mg/Nm^3)[1]	606.6	572.2
Hydrocarbon (as Benzene) (mg/Nm^3)[1]	65.3	96.4
Particulate Matter (mg/Nm^3)[1]	32.1	43.4

[1] Dry, 0°C, 5% O_2.
[2] Generators used to inform this data are: CAT (3516E); CAT (175-20); Cummins (QSK95-G5).
[3] Generators used to inform this data are: CAT (3512B); MTU (20V4000G94F).

The main parameters considered are associated with the release of combustion gases during generator operation which include:

- Oxides of nitrogen (NOx)
- Carbon monoxide (CO)
- Particulate matter
- Hydrocarbons.

5.3 Emissions to Water

5.3.1 Process Water

There is no process water required as part of the Proposed Installation. There will be no associated process water discharge to surface water or foul sewer from the Proposed Installation.

5.3.2 Foul Sewer

As explained in section 4.4 above, surface run-off from the Proposed Installation is all gravity fed to the foul drains. It passes through Class 1 full retention fuel and oil separators(one interceptor per generator yard and one interceptor per fuel loading area) before discharging

to the wider site foul drain network and subsequently flow.to the foul water pumping station to the southeast of the site which discharges to the Thames Water foul sewer network.

The discharge points to sewer from the Proposed Installation are therefore identified as the outlet from each interceptor to the wider site foul drain network. Thes points are summarised in the table below and are shown on Drawing Figure 2 Overall Site Plan and Emissions Plan in Part 10 of the application, Figures and Plans.

Table 10. Discharge Points to Sewer

Release Point to Wider Site Foul Sewer	X	Y	Release Point to Wider Site Foul Sewer	X	Y
DC-A			**DC-B**		
Generator Yard (S1)	502891	179965	Generator Yard (S3)	503044	180056
Fuel Loading Area (S2)	503010	179979	Fuel Loading Area (S4)	502866	180056

5.3.3 Discharge to Surface Water

As described in Section 4.4, there is no discharge to surface water from the Proposed Installation.

5.3.4 Emissions to Groundwater

There are no identified point source emissions to groundwater from the Proposed Installation.

5.4 Emissions to Land

There will be no direct emissions to land as part of the operation of the installation.

Surfacing around the area of the generators, fuel storage and loading will be surfaced in concrete with kerbing and equipped with dedicated drainage that will gravitate to the foul sewer via Class 1 interceptors.

There will be no soakaways in the vicinity of the generators or fuel loading areas. Consequently, no direct emissions to land will occur as a result of the operation of the Proposed Installation. Regular inspections of the hardstanding areas and drainage systems will be carried out to identify and repair possible damage and prevent any potential releases to land.

5.5 Noise

An assessment of the noise effects from the facility has been included within Application Part 8 and a summary of its conclusions is provided in Section 7.4.4 of this document.

The following have been identified as potential noise and vibration sources:

- Fans (including inlets, outlets, stacks, and enclosures);
- Pumps, drives and motors;
- Exhaust stacks; and
- Generator engines.

The main sources of noise from the installation would be those associated with combustion. Each engine will be fully containerised which will reduce the noise emitted.

5.6 Fugitive Emissions to Air, Water or Land

The risk of dust and particulate accumulation is low at the Proposed Installation given the nature of the activities and the materials handled.

There is a negligible potential for fugitive releases of diesel and lubricants primarily during maintenance activities. .

5.7 Odour

The probability of exposure to odours is considered negligible, as the installation is not anticipated to have any notable source of odour. Any fugitive emissions from leaks/spills from diesel would be primarily associated with maintenance activities which will be managed and controlled in accordance with procedures incorporated in the EMS, reducing the risk of leaks and ensuring that spills are dealt with swiftly should they occur.

6. Monitoring

6.1 Process Monitoring

Key process monitoring will be carried out to monitor the permitted facilities plant performance including water usage, energy consumption (diesel and electricity), hours of operation and power generated. These performance parameters will be reported on an annual basis.

The plant performance and equipment will be continually monitored, and a system will be in place to optimise performance.

6.2 Infrastructure

An infrastructure monitoring plan will be implemented at the Proposed Installation, so as to protect the soil and groundwater beneath the site. The site will maintain appropriate maintenance procedures, housekeeping standards and spill response procedures which will reduce the impact.

Regular inspection of all site infrastructure associated with bulk storage of oils, chemicals and fuels will be undertaken. The routine infrastructure audits are likely to comprise identification of issues relating principally to:

- Minor leaks;
- Standing water in bunded areas; and
- Bulk storage tank bunds.

6.3 Emissions to Air

The generators associated with this installation are classified as new MCP under the Environmental Permitting Regulations. Their primary function is to provide emergency power in the event of a national grid supply failure, with expected operational usage limited to less than 50 hours per year.

Due to their low operating hours and classification as emergency back-up generators, these generators fall under the category of “excluded generators”, making them exempt from the requirement to meet Best Available Techniques (BAT) Emissions Limit Values (ELVs) for new MCP installations. Therefore routine monitoring of emissions to air is not required

Monitoring of the emissions from the generators will be undertaken as per EA guidance for low-risk generators. Test ports will be included in the design of the exhaust flue ductwork to allow for MCERTs compliant monitoring. Compliance will be in the form of type-certification to the relevant standard and not by individual engine exhaust point source emissions monitoring.

6.4 Emissions to Water

Discharges to the foul drainage network from the Proposed Installation will be continuously monitored via the BMS which will monitor for presence of hydrocarbons in each interceptor. Isolation valves will automatically activate when hydrocarbon is detected and prevent discharge of fuel/oil to the wider foul drain network.

7. Impact Assessment

7.1 Introduction

This section discusses the potential impact on sensitive receptors and the surrounding area and shows how the emissions from the Proposed Installation have been assessed and minimised.

Guidance contained in the EA guidance – 'Risk assessments for your environmental permit', has been used to scope and assess the emissions from the Proposed Installation.

Where necessary, baseline impact assessments have been completed to ensure that any predicted significant effects on sensitive receptors can be avoided/ mitigated.

7.2 Site Location and Sensitive Receptors

Potential receptors which could be impacted by the operations of the proposed facility include:

- Residential, commercial and industrial human receptors;
- Habitat receptors associated with designated and other sensitive sites; and
- Location related receptors associated with site geology, hydrogeology and hydrology.

7.2.1 Human Receptors

The receptors are selected to be representative of residential dwellings, recreational areas and schools in the area around the Proposed Installation, identified using online aerial photography and base mapping. A list of the human receptors within the vicinity of the Proposed Installation are shown Application Part 10, Figures and Plans, Figure 3 and in Table 11 below.

Table 11. Human Receptor Locations (from Air Quality Assessment)

Receptor ID	Grid Reference		Description	Minimum Distance and Direction from Generator Emission Points (m)
	X	Y		
HR1	503258.5	179822.7	Residential at Bathurst Walk	330m Southeast
HR2	503219.1	179774.9	Residential at Bathurst Walk	325m Southeast
HR3	503460.3	179818.6	Residential at Bathurst Walk	519m Southeast
HR4	502506.1	180046.0	Residential by the Grand Union Canal Slough Arm	395m West
HR5	502133.8	179679.8	Residential at Southwold Spur	807m West
HR6	501874.6	179329.2	The Langley Heritage Primary School	1.19km Southwest
HR7	502976.0	181034.6	Residential at Leacroft Road	957m North
HR8	502424.4	180544.4	Residential at Mansion Lane	689m Northwest
HR9	502246.6	179078.0	Residential at Parlaunt Road	1.09km Southwest
HR10	503938.1	180412.0	Residential at Thorney Lane North	974m East

Receptor ID	Grid Reference		Description	Minimum Distance and Direction from Generator Emission Points (m)
	X	Y		
HR11	503212.8	179245.7	Residential at North Park	780m South
HR12	503357.6	179590.7	Residential at Syke Cluan	550m Southeast
HR13	503247.7	181271.1	Residential at High Street	1.2km North
HR14	503526.1	181218.6	Iver Village Nursery	1.24km North
HR15	503935.6	180547.4	Residential at Thorney Lane North	1.03km East
HR16	502570.0	180028.0	Residential by the Grand Union Canal Slough Arm	331m West
HR17	503255.0	179582.0	Residential at James Walk	495m Southeast
HR18	503391.0	180979.0	Residential at Addison Close	964m North
HR19	503697.0	180937.0	Residential at Cherry Close	1.09km Northeast
HR20	503797.0	180791.0	Residential at Barnes Way	1.05km Northeast
HR21	502385.0	180319.0	Residential at Mansion Lane	585m Northwest
HR22	502654.0	181036.0	Residential at Langley Park Road	1.01km North
HR23	503015.0	179097.0	Residential at North Park	885m South
HR24	502168.6	179737.6	Residential at Market Lane	755m West

7.2.2 Sensitive Environmental Habitats

EA guidance requires that the effects of stack emissions on designated ecological sites be assessed where they fall within set distances of the source, up to 10km for European designated sites and up to 2km for nationally designated sites.

The Multi-Agency Geographic Information for the Countryside (MAGIC) website was searched to provide details of any:

- European Nature Conservation Sites;
- Special Protection Areas (SPAs);
- Special Areas of Conservation (SACs);
- Ramsar sites; and
- Sites of Special Scientific Interest (SSSIs).

Sensitive nature conservation receptors within 10km of the Proposed Installation boundary used in the Air Quality Assessment (Application Part 7) are listed in Table 12 below and shown in Application Part 10, Figure 4.

Table 12. Sensitive Operational Ecological Receptors

Receptor ID	Ecological	Grid Reference (m)		Distance and Direction from the Site Generator Emission Points (m)
		X	Y	
ER1	Burnham Beeches, SAC and SSSI,	495625.2	184548.6	8.5km northwest
ER2	Windsor Forest and Great Park, SAC and SSSI	496632.0	174939.2	7.9km southwest
ER3	Southwest London Waterbodies, SPA and SSSI	501298.8	174125.3	6.0km south
ER4	Ancient Woodland north of M4	503238.3	178377.4	1.5km south
ER5	Ancient Woodland adjacent to Billet Lane	501650.3	181696.5	1.9km northwest

7.2.3 Hydrology

There are no surface water features on Data Centre Site or Proposed Installation. There are numerous surface water features located in close proximity to the Proposed Installation area. These are presented in Table 13.

Table 13. Surface Water Features

Surface Water Feature	Closest Distance to the Data Centre Site and Direction	Closest Distance to Proposed Installation Boundary and Distance	River Quality Classification
Grand Union Canal	5m north	137m north	• Moderate – Overall • Fail – Chemical • Moderate – Ecological
Horton Brook	Approximately 204m southwest	Approximately 365m southwest	• Moderate – Overall • Fail – Chemical • Moderate – Ecological
Unnamed ponds (Cemex)	Approximately 200m south	Approximately 400m south	N/A
Unnamed land drain	Approximately 630 m west	Approximately 675 m west	N/A
Unnamed land drain	Approximately 380 m southwest	Approximately 485m southwest	N/A
Attenuation pond	Approximately 150 m east	Approximately 200 m east	N/A
Unnamed ponds	Approximately 700 m southwest	Approximately 760 m east	N/A

According to the Groundsure Report (Ref: GS-DHH-8CV-593-QJF, dated 19th June 2025), there are no surface water abstractions points within 1km of the Proposed Installation.

According to the Groundsure Report (Ref: GS-DHH-8CV-593-QJF, dated 19th June 2025), no Nitrate Vulnerability Zones (NVZ) exist within 250m of the Proposed Installation.

According to the Groundsure Report (Ref: GS-DHH-8CV-593-QJF, dated 19th June 2025), a Source Protection Zone 3 is located approximately 232m west of the Data Centre site.

7.2.4 Geology

According to the publicly available data from the BGS Geology Viewer and Groundsure Report (Ref. GS-S4B-X4B-3JZ-GSX, dated 19th June 2025), the Proposed Installation sits on the edge of the London Basin and is considered worked ground (i.e. has been artificially lowered

through anthropogenic activity). Superficial deposits of Lynch Hill Gravel are underlain by a bedrock succession of London Clay.

A summary of the geological succession across the site is presented in the Table 14 below.

Table 14. Summary of Anticipated Geology

Geology	Description (according to the BGS Lexicon of Named Rock Units)	Expected Location
Artificial and Made Grounds		
Worked Ground	Worked Ground is an area where the land surface (natural or artificial) has been lowered as a result of man-made excavations. The purpose of the excavation is unspecified. Composition: void.	Present across the whole Proposed Installation area associated with the gravel quarry.
Superficial Deposits		
Lynch Hill Gravel Member - Sand and Gravel	The Lynch Hill Gravel Formation, now commonly referred to by its updated classification, comprises predominantly sand and gravel deposits, occasionally interspersed with lenses of silt, clay, or peat. These sediments rest unconformably atop the underlying bedrock geology, marking a clear stratigraphic boundary. Geographically, the formation is confined to the Thames Valley and its associated tributaries, where fluvial processes historically shaped its distribution and composition.	Present across the whole Proposed Installation area.
Bedrock		
London Clay Formation	The London Clay Formation is characterised by bioturbated or poorly laminated deposits of blue-grey to grey-brown silty to very silty clay, clayey silt, and occasional silt, with interbedded layers of sandy clay. Its composition includes thin horizons of carbonate concretions—commonly referred to as cementstone nodules—and scattered pyrite. The unit also features minor beds of shells, fine sand partings, and localized pockets of sand, which tend to increase both at the base and near the top of the succession. Notably, thin beds of black rounded flint gravel occur at the basal level and at discrete intervals. Glauconite appears in several sandy layers and clay beds, while white mica is present at specific stratigraphic levels. Geographically, the London Clay extends across the London Basin, East Anglia, and the Hampshire Basin.	Present across the whole Proposed Installation area.

ARUP undertook further ground investigation (GI) work in 2025 across the wider Data Centre Site and the typical succession of geological strata detailed in the ARUP 2025 Ground Contamination Assessment Report is summarised in

Table 15. The ground conditions detailed by ARUP are consistent with the ground conditions encountered during previous GIs at the site.

It is noted that the Harwich Formation was not identified in the previous investigations, potentially because it was not differentiated from the London Clay Formation due to similarities in the soil description towards the base of London Clay Formation.

Table 15. Summary of ground conditions encountered at Thorney Business Park (Arup, 2025)

Stratum	Typical Description	Average Thickness (m)
Hardstanding / Concrete	Grey CONCRETE.	0.30
Made Ground	Grey or brown sandy sometimes clayey GRAVEL / brown gravelly SAND. AND/OR Soft to firm, grey or brown slightly gravelly slightly sandy silty CLAY	1.70
Lynch Hill Gravel Member	Medium dense, orangish brown, sandy sometimes silty GRAVEL / very dense, orangish brown, gravelly SAND.	0.94
London Clay Formation	Firm to stiff, fissured, grey or brown, sandy silty occasionally gravelly CLAY with rare to occasional pyrite nodules, with occasional bioturbation.	23.3
Harwich Formation – Swanscombe Member	Firm to very stiff, dark grey to grey, silty occasionally gravelly CLAY with occasionally to frequent off-white and brown shell fragments.	1.75
Lambeth Group	Stiff to very stiff, grey to brown mottled reddish brown or grey, silty CLAY.	24.5**
White Chalk Sub-Group	Chalk with flints.	Not proven.

* Geological data within the Groundsure Report is taken from the BGS.

** The base of the Lambeth Group or the top of the Chalk Group were not encountered during the most recent GIs and therefore his data has been taken from BGS borehole data.

The thickness and nature of the Made Ground was found to be highly variable across the site (thickness ranges from 0.15m to 2.75m), and the presence of the Lynch Hill Gravel Member and Harwich Formation were found to be inconsistent.

7.2.5 Hydrogeology

According to the Groundsure Report, the superficial deposits of the Lynch Hill Gravel Member - Sand and Gravel is classed as Principal aquifer and the underlying bedrock of the London Clay Formation is classed as unproductive aquifer.

Mapping provided by the BGS included within the Groundsure Report (Ref: GS-DHH-8CV-593-QJF, dated 19th June 2025) outlines the combined vulnerability of groundwater to pollution and has classified the Lynch Hill Gravel Member Principal Aquifer as high vulnerability.

According to Groundsure Report (Ref: GS-DHH-8CV-593-QJF, dated 19th June 2025), the Proposed Installation overlies the Lower Thames Gravels groundwater body, which was classified as being ‘poor’ overall quality in 2019.

The closest active groundwater abstraction licences are located approximately:

- 510m to the south of the Data Centre site and is related to the abstraction of Thames Groundwater (maximum daily volume of 3608m3) by Cemex UK Material Limited at their

Langley Quarry, Richings Park for the purposes of general washing, process water, mineral washing and dust suppression.

- 438m to the northwest of the Data Centre site and is related to the abstraction of Thames Groundwater from borehole at Iver Golf Course for the purposes of spray irrigation (maximum daily abstraction of 70 m3).
- 891m to the north of the Data Centre site and is related to the abstraction of Thames Groundwater from borehole at Shredding Green Farm for the purposes of general farming and domestic (maximum daily abstraction of 1226.9 m3).
- 948m to the northwest of the Data Centre site and is related to the abstraction of Thames Groundwater at Terrace Deposits at Cherry Orchard Nursery for the purposes of trickle irrigation (maximum daily abstraction of 151 m3).
- 949m to the north of the Data Centre site and is related to the abstraction of Thames Groundwater at Shredding Green Farm for the purposes of transfer between sources maximum daily abstraction of 655 m3).
- 952 m to the north of the Data Centre site and is related to the abstraction of Thames Groundwater from pond at Shredding Green Farm for the purposes of spray irrigation (maximum daily abstraction of 1226.9 m3).
- According to BGS GeoIndex Onshore[10], there is one groundwater abstraction well (BGS Ref: TQ07NW430) and it is located approximately 25m to the southeast of the Data Centre site. This abstraction well was constructed in 1935 for Rail and Road Aggregates Ltd, at Gravel Pits, adjoining Iver Station. According to the LHR042 Ground contamination assessment report[11] it is likely that the groundwater was abstracted from the chalk for the purposes of gravel washing. The well was constructed after gravel extraction had ceased at the site and was linked to gravel extraction to the east of the site. The gravel extraction appears to be extended below the water table without any significant water abstraction. It is possible that the gravel extraction (and localised shallow water pumping) may locally draw groundwater from the site (and adjacent landfill to the west) in a more southerly direction, as opposed a more south-easterly direction. The BGS historical borehole records indicate that there are no other deep wells close to the site.

According to LHR042 Thorney Lane, Detailed Quantitative Risk Assessment – Controlled Waters[11] shallow groundwater was generally encountered at depths of up to 1.5m bgl. Groundwater strikes recorded during borehole installation occurred within either the Lynch Hill Gravel Member or the Made Ground. Groundwater level monitoring was conducted across eight rounds between 2024 and 2025, revealing site-wide levels ranging from 28.24 to 31.29mOD, although groundwater was absent at certain locations. The monitoring data indicates a predominantly southernly flow direction. Approximately 100m south of the Proposed Installation lies an active quarry extracting the Lynch Hill Gravel Member; aerial imagery suggests the presence of water-filled pits, implying that localised pumping may be influencing groundwater movement toward the south. Additionally, groundwater appears to flow from a landfill situated to the west, posing potential risks to water quality, particularly in the southwestern proportion of the Proposed Installation. During the 2024 monitoring, several installations purged dry, while during the 2025 monitoring only two locations purged dry. This, alongside the observed variability in the thickness of the superficial deposits, suggests that the shallow groundwater aquifer may be locally truncated and isolated in places, rather than existing as a continuous, highly conductivity unit.

According to LHR042 Thorney Lane, Detailed Quantitative Risk Assessment – Controlled Waters[11] during the 2024 ground investigation, water was recorded in three boreholes targeting the London Clay Formation, with levels ranging between 26.27 mOD and 30.97 mOD (equivalent to 0.6 m to 5.3 m bgl). However, it remains uncertain whether this water originated from seepages within the London Clay itself or represents shallow groundwater that became

[10] British Geological Survey GeoIndex Onshore Viewer, https://mapapps2.bgs.ac.uk/, accessed 10th July 2025
[11] LHR042 Thorney Lane, Ground contamination assessment report, Ref: LHR042-ARP-XX-XX-RP-EC-00001, 16th May 2025

trapped or perched within the borehole. Water was also observed in BH24-07, which targeted the Lambeth Group, with levels recorded between 26.61 mOD and 29.52 mOD (1.48 m to 4.39 m bgl). Comparable groundwater levels were noted in CP105, a Delta-Simons installation featuring a response zone within the London Clay and a 1 m interval of cohesive Lambeth Group. These groundwater levels suggest either sub-artesian pressure in the deeper aquifer or partial hydraulic connectivity with the overlying shallow aquifer. The presence of a relatively thick London Clay deposit (>20 m), underlain by predominantly cohesive upper layers of the Lambeth Group, is expected to inhibit significant connectivity with more transmissive units within the Lambeth Group and the underlying Chalk.

7.3 Pathways for Pollution

In order for a pollution risk to occur, there has to be a source – pathway – receptor (S-P-R) linkage.

Potential pathways to sensitive receptors without controls primarily include, but are not limited to, the following:

- Fuels and lubricants required for the operation of the Proposed Installation might leach into the ground and be washed into surface water or groundwater through the underlying soils.
- Fuels and Lubricants required for the operation of the Proposed Installation could be accidentally released and discharged into surface water.
- Release of firewater to land, ground or surface water.
- Emissions to air from the Proposed Installation will be dispersed in the air to sensitive receptors.

In order to prevent and minimise the risk of pollution from the above pathways, the Operator has introduced the following control measures:

- will use impermeable surfacing across the Proposed Installation including in the generator and fuel loading areas.
- direct all surface runoff, spills/leaks or firewater from the Proposed Installation (generator yard and fuel loading areas) to dedicated drainage channels which are gravitated to the foul drainage network via Class 1 full retention fuel and oil interceptors. The Proposed Installation will not discharge to the surface water drainage network.
- each interceptor is continuously monitored for presence of hydrocarbons via the BMS and is equipped with an isolation valve at the interceptor exit to the wider foul drainage network. On detection of hydrocarbon the interceptor will be automatically isolated from the wider foul drainage network. Similarly the interceptor will be isolated to contain firewater.
- each interceptor will have a 10,000 litre capacity as a minimum which is sufficient to contain the volume in a single road tanker compartment.
- will have dedicated fuel storage tanks (top-up and belly tanks) within appropriate containment (to 110% of each tank) and overfill protection controls as described in Section 4.4 above to prevent loss of materials to soil as well as controlled waters.
- have a contained fuel loading areas with loading controlled from the control panel is monitored via the BMS and includes inbuilt alarms and cut-off controls to prevent off-loading operations where OPVs have been activated. Fuel unloading will detailed in a SOP detailing how fuel off-loading will be undertaken including ensuring that only 1 tanker compartment will be offloaded at a time.

- develop and implement a spill response plan as part of the EMS. Spill response kits will be provided at generator yards and fuel unloading areas to ensure a prompt response in the event of a spill.

7.4 Impact Assessment

The following sections provide an assessment of the impact of releases from the Proposed Installation, so as to underpin and justify the measures that will be put in place for their control and that will adequately protect the environment.

The risk assessment approach has been based on the following four sequential stages:

Identify risks from the activity;

- Assess the risks and check that they are acceptable;
- Justify appropriate measures to control the risks, if necessary;
- Present the assessment

Activities with the potential to impact on the surrounding environment have been identified in line with guidance provided by the EA, and include the following assessments:

- Amenity and accidents;
- Emissions to air;
- Emissions to water;
- Noise
- Site waste; and
- Global warming potential.

7.4.1 Amenity and Accidents

A qualitative environmental risk assessment (Document Reference SP3224LP-APP-ERA) has been undertaken for the Proposed Installation and is included in Application Part 6.

A short description of the key potential risks from the Proposed Installation is provided in the following subsections.

7.4.1.1 Odour

The risk of odour from the site is minimal and will be managed through the EMS, as suggested in Section 6 above.

7.4.1.2 Fugitive Emissions

A qualitative environmental risk assessment (Document Reference SP3224LP-APP-ERA) has been undertaken for the Proposed Installation and is included in Application Part 6.

Based on the various controls placed on the site plant and equipment, it is expected that fugitive emissions from the site will be negligible. The sources reviewed were:

- Windblown dust and particulates from external roads and surfaces;
- Leaks from valves and flanges
- Spillage on surface run-off from pavements, roads and hardstanding

Planned preventative maintenance and inspections are a primary control for fugitive releases.

7.4.1.3 Visible Plumes

The occurrence of a visible plume is dependent on atmospheric conditions such as ambient temperature and humidity, and may be more likely during colder weather when water vapour condenses upon release. However, the risk of visible plumes from standby generators are low

due to generally limited operating hours, preventative maintenance strategies and infrequent use.

7.4.1.4 Accidents

For the management of accidents with lower environmental risk, an AMP will be developed to include the Proposed Installation and all associated equipment.

A number of environmental protection measures will be implemented on site via the EMS to prevent and control spill events, including but not limited to:

- Emergency Response and Spill Response Plans to deal with accidental pollution and any necessary equipment (e.g. spill kits) will be held on site and site personnel will be trained in their use. The EMS will incorporate details on how to appropriately deal with accidental spillages to ensure they are not released into the drainage system.
- Implementation of containment measures, including bunding or double-skinned tanks for fuels and above ground pipework (pipe-in-pipe) arrangement All containment will have leak detection provided monitored from the BMS. All chemicals will be stored in accordance with their COSHH assessments.
- Incorporation of interceptors into the drainage system to prevent spilled fuel entering the wider foul water drainage system.. As described in Section 4.4 each interceptor will be continuously monitored from the BMS for presence of hydrocarbon and if detected an isolation valve will be automatically activated to isolate the system.

7.4.1.5 Flood Risk Assessment

The Proposed Installation is located inland a considerable distance from the sea such that the risk of tidal flooding is considered to be negligible. The Proposed Installation sits within a Flood Zone 1 for risk of flooding from rivers.

The Grand Union Canal bounds the northern Proposed Installation boundary. The Water levels of the Canal are controlled by the Canal & River's Trust (CRT).

The Environment Agency's Flood Map for Planning[12] indicates that the Proposed Installation lies outside the designated Flood Zone.

According to the Groundsure Report (Ref: GS-DHH-8CV-593-QJF, dated 19th June 2025), a single flood event occurred between 30th January and 10th February 2014, approximately 66m south of the Data Centre site.

7.4.2 Point Source Emissions to Air

7.4.2.1 H1 Screening

A H1 screening assessment of emissions to air was conducted using the Environment Agency's H1 tool and is presented as part of the Environmental Risk Assessment (Application Part 6). An assessment was completed for each operating scenario (see Table 5 above). Within the H1 screening:

- Emission process contributions (PCs) which are lower than 1% of the relevant emissions standard for long-term exposure and lower than 10% of the relevant limit for short-term exposure can be screened out as insignificant.
- Predicted Environmental Concentrations (PECs) which are lower than 70% of the relevant long-term emissions standard and lower than 20% of the relevant short-term standard minus 2 * the background concentration can be screened out as insignificant.

The assessment shows that for all scenarios:

[12] Environment Agency's Flood Map for Planning, https://flood-map-for-planning.service.gov.uk, accessed 11th July 2025

- Carbon monoxide (CO) and particulate emissions have a PC less than the threshold and can be screened out as insignificant at stage 1.
- Nitrogen dioxide (NOx) and Hydrocarbon (represented by benzene) do not screen out as insignificant at stage 1. Emissions have been further assessed within the Air Quality Assessment.

7.4.2.2 Air Quality Dispersion Assessment

An Air Quality Assessment (Document Reference SP3224LP-APP-AQA) has been completed to show the dispersion modelling of emissions from the operation of the emergency generators and is presented in Application Part 7.

The assessment quantifies the potential impact of emissions to air from the generators during both routine testing and emergency operation (as per table 5 above).

The assessment considers emissions of the main pollutants associated with the combustion of diesel that have the potential to harm human health and/or sensitive habitats. These include NO_x, CO, total hydrocarbons (HC), and particulate matter (PM_{10}). For the purposes of this assessment, several assumptions have been made to ensure that the outputs of the dispersion modelling are reasonably precautionary. These assumptions include:

- The modelled emissions parameters for each generator represents the worst-case value, in terms of air quality impact, across the short-list of generator models being considered for the installation. For example:
  - The highest emissions concentration of each pollutant
  - The lowest emissions exit velocity
  - The lowest emissions temperature
- Each generator has been modelled to operate at 100% load for all testing, maintenance and emergency operations. Emission rates used in the modelling represent maximum rated output for each generator, and no partial-load adjustments have been applied.

Detailed dispersion modelling using the atmospheric dispersion model ADMS (V6) has been used to calculate the predicted PC at each receptor location. These concentrations have been compared with the relevant Environmental Standard for each pollutant species released.

The assessment has identified that the operation of the installation under testing and maintenance, and under emergency operation would not cause an air quality compliance issue with impacts screened out as insignificant. Hypergeometric distribution analysis of the hourly mean NO2 impact during an emergency outage event identified the probability of an exceedance occurring of less than 1% with up to 72 hours of emergency operation in a year.

In relation to impact on ecological sites:

- All scenarios screened as insignificant against the air quality standards and for nitrogen deposition; and
- All scenarios were <0.1% of the critical load for acid deposition.

7.4.3 Point Source Emissions to Water

There are no point source emissions to the ground/groundwater as part of the Proposed Installation.

As stated above in Section 5.3, the emissions to water include rainwater from the generator areas/fuel loading and storage, discharging to the foul drainage network by oil/fuel separators which can be isolated on detection of hydrocarbons.

On this basis it is considered that the risk of impact to controlled water from the Proposed Installation will be low.

7.4.4 Noise

The Noise Impact Assessment (Document Reference SP3224LP-APP-NIA) is presented Application Part 8 and the results conclude that based on the data centre design and its embedded noise mitigation measures:

- during back-up generator testing and maintenance scenarios, noise levels at all receptors are predicted to not exceed the respective daytime and night-time noise limits assessed in accordance with BS 4142. The operational noise impact from the Proposed Installation during testing and maintenance is assessed as not significant
- In the emergency scenario, the predicted noise levels at HR1, HR3 and HR4 are considered an adverse, not significant impact. At receptor HR2, during the night-time, a significant adverse impact is predicted. However, due to National Grid reliability, the in-built redundancy and infrastructure maintenance, the likelihood of the emergency scenario to occur in practice and/or for any significant period of time is unlikely and only generators required to meet the load at the time of the outage being operated. Therefore should be considered acceptable for the purposes of granting an Environmental Permit.

The Operator has prepared a Noise Management Plan (Document Reference SP3224LP-APP-NMP) in accordance with the EA guidance and this is presented in Application Part 9.

7.4.5 Site Waste

Details of the waste generated on site are discussed in Section 4.5.2 of this document.

All operational waste, likely to comprise minor quantities of waste generated by maintenance activities, will be dealt with in accordance with the site's waste management procedures, with appropriate designated storage areas for hazardous and non-hazardous wastes, and consigned via a registered waste carrier for treatment or disposal at a suitably licenced waste facility.

7.4.6 Global Warming Potential

To understand the global warming (GWP) potential of the Proposed Installation, the H1 methodology has been utilised. The current Excel version of the tool is not fully operational at the time of writing.

The GWP has been calculated assuming that all scenarios are run in any one year. This is a very conservative approach as the likelihood of the engines being required for emergency backup for 72 hours per year is very low. The GWP effects set out below are accordingly likely to be overestimated. Information regarding grid reliability and other resilience measures in place at the data centre are described in Section 4.

The assessment in the Environmental Risk Assessment was done on a worst case basis of using diesel as the fuel. However, the intention is to move to HVO as soon as practicable which has a lower GWP potential. The latest DEFRA CO_2 factors[13] for diesel and for HVO have been used within the H1 software.

The total GWP score calculated on this basis for each fuel type is presented in Table 16 below.

Table 16. Global Warming Potential

Scenario	GWP - Diesel	GWP - HVO
Scenario 1 - Testing No 1	943	14
Scenario 2 - Testing No 2	580	8
Scenario 3 - Maintenance	725	11
Scenario 4 - Emergency	5,222	76
Total All Scenarios	**7,470**	**109**

[13] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2025

8. Commissioning, Decommissioning and Closure

8.1 Commissioning

A commissioning plan for the generators will be developed for the installation to outline the commissioning and associated monitoring activities and will be agreed with the EA prior to any commissioning activities taking place.

8.2 Decommissioning and closure

A plan for appropriate decommissioning and closure of the Proposed Installation at the end of its operating life will be developed by the operator. The plan will ensure that the site is returned to the baseline condition.

Decommissioning would be undertaken safely, in line with specific procedures and subject to risk assessment and permit to work schemes, and with regard to the environmental legislation at the time of decommissioning. The required licences and permits would also be acquired.

Appendix A Typical Generator Specifications

Contents

	Genset	Marine	O & G	Rail	C & I
Application	X				
Engine model	20V4000G94F				
Fuel type	EN590				
Rated power [kW]	3088				
Rated speed [rpm]	1500				
Application Group	3D				
Legislative body	NEA Singapore for ORDE				
Test cycle	D2				
Data Set No.	XZ54954100066				
Data Set Basis	NEA Singapore for ORDE				
Fuel sulphur content [ppm]	5				

Content **Page**

PDF	Name	Project no. **AWS**	Size **A4**
Configurator	Lenhof, Torsten (TARC)	Order no. **AWS FRA 044**	
Approver1	Kneifel, Alexander (TSLE)	EDS-ID **2524-22.03.2023**	
Approver2	Koliwer, Michael (TV)		
Approver3			
Approver4			
User	FN2\witzigmann		

Engine model **20V4000G94F**

Title **Emission data sheet**

Description of Revision	Frequency
Data generated by EDS Creator version 1.0 and uniplot. Ref.-dataset: 420122_364_NEA_G94F_D2.nc for 294 in EDS platfrom.	

Emissionstage **NEA Singapore for ORDE**

Sheet **1** of **6**

Configuration-ID	Documentation
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Emissionstage basis **NEA Singapore for ORDE**

General Disclaimers (valid for Measured and NTE values)

Please note that these data are physical and/or technical values only referring to and representing a normative defined operating condition. Any change in operating time and conditions will have impact on physical values and engine behavior, which must be considered and assessed within the complete propulsion system especially in regard to emission compliance and product safety.

Measurements listed in this EDS are representative of the listed engine rating at the time of testing. These measurements and results can change according to instrumentation, boundary condition, and engine to engine variability. In addition - changes to the engine family hard or software may occur which could result in changes to some of the listed values.

Emissions data measurement procedures are conducted according to applicable rules and standards as per “Emission Stage/Optimization”. Potential deviations from these procedures are documented internally.

The listed emission values relate to the corresponding certification data. Seller doesn´t take any responsibility or liability neither out or in connection with the contract nor on any other basis
- beyond these specified operating conditions of the engine
- and for any installation/modification of the entire propulsion system by the customer itself or any third party
and the customer will indemnify MTU on first demand for any third party claim out or in connection with this.

Seller reserves the right to amend specifications and information without notice and without obligation or liability. No liability for any errors, facts or opinions is accepted. Customers must satisfy themselves as to the suitability of this product for their application. No responsibility for any loss as a result of any person placing reliance on any material contained in this data sheet will be accepted.

Seller reserves all rights in the information contained in this data sheet. It shall not be reproduced, made available to a third party or otherwise used in any way whatsoever.

When applicable, emission values are measured after combined exhaust streams.

Measured Emissions data is based on single operating points and thus cannot be used to compare to regulations which use values based on a weighted cycle.

Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures, and instrumentation. Over time deterioration may occur which may have an impact on emission levels.

The SO2 emission rates comprehend exclusively the SO2 content as found in the fuel source, oil consumption effects are not included. Variation of sulfur content in the fuel changes only the stated SO2 emissions, cross sensitivity to other emissions (e.g. particulates) is not possible.

All values based on metric units, inaccuracies for non metric values can occur, values are not binding.

Specific to gas engines: The listed emission values are based on gas composition at the time of certification measurement. Gas composition is as displayed in the EDS-document. Carbon dioxide and methane concentrations have direct influence on the corresponding displayed carbon dioxide and methane emissions.

EAT Specific Disclaimers (valid for EDS values)

NH3 emissions levels measured with AVL SESAM i60/ 4 FT Multi Component Exhaust Measurement System (FTIR) including EPA 40 CFR 1065 legislation compliant automated checks for linearity.
Generators or engines with exhaust after-treatment systems require a stabilization period of approximately 1 hour to ensure stable temperatures across SCR prior to performing an emissions test. Performing emissions measurements before a stable temperature has been achieved can result in inconsistent emission values. NOx Values only applicable if temperatures across SCR reached for DEF Dosing.

NTE Disclaimers (valid for NTE calculated values)

Calculated not to exceed values (NTE) are not proven by tests and therefore the accuracy is not guaranteed.

All emission data shown in chapters Emission Data Sheet, Not to Exceed Values, and Type Approval were gathered from a corresponding certification engine under test conditions shown above and complying to corresponding TEN data.

PDF	Name	Project no. **AWS**	Size **A4**
Configurator	Lenhof, Torsten (TARC)	Order no. **AWS FRA 044**	
Approver1	Kneifel, Alexander (TSLE)	EDS-ID **2524-22.03.2023**	
Approver2	Koliwer, Michael (TV)		
Approver3			
Approver4			
User	FN2\witzigmann		

Engine model **20V4000G94F**

Title **Emission data sheet**

Description of Revision	Frequency

Data generated by EDS Creator version 1.0 and uniplot.
Ref.-dataset: 420122_364_NEA_G94F_D2.nc for 294 in EDS platfrom.

Emissionstage **NEA Singapore for ORDE**

Sheet **2** of **6**

Configuration-ID	Documentation
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Emissionstage basis **NEA Singapore for ORDE**

Engine data

	Genset	Marine	O & G	Rail	C & I
Application	X				
Engine model	20V4000G94F				
Fuel type	EN590				
Application Group	3D				
Legislative body	NEA Singapore for ORDE				
Test cycle	D2				
Fuel sulphur content [ppm]	5				
mg/mN^3 values base on residual oxygen value of [%]	5				

Engine raw emissions*

Cycle point	[-]	n1	n2	n3	n4	n5
Power	kW	3090	2317	1545	772	309
Power relative	[-]	1	0.75	0.5	0.25	0.1
Engine speed	1/min	1501	1501	1501	1501	1500
Engine speed relative	[-]	1	1	1	1	1
Filter smoke number	Bosch	0.18	0.2	0.7	0.89	0.04
Exhaust temperature after ETC	grdC	453	420.8	421	378.5	259
Exhaust back pressure after ETC (static)	mbar	34	23	11	5	2
Exhaust back pressure after ETC (total)	mbar	52	35	16	5	0
Exhaust mass flow wet	kg/h	18500	15819	11326	7150	5284
NOX-Emissions specific	g/kWh	6.46	5.32	4.78	4.56	9.18
CO-Emissions specific	g/kWh	0.23	0.29	1.1	1.36	3.2
HC1-Emissions specific	g/kWh	0.07	0.08	0.1	0.18	0.84
NMHC-Emissions specific	g/kWh	0.07	0.08	0.1	0.18	0.82
NOX+HC1-Emissions specific	g/kWh	6.53	5.4	4.88	4.74	10.02

PDF	Name	Project no. AWS	Size A4
Configurator	Lenhof, Torsten (TARC)	Order no. AWS FRA 044	
Approver1	Kneifel, Alexander (TSLE)	EDS-ID	
Approver2	Koliwer, Michael (TV)	2524-22.03.2023	
Approver3			
Approver4			
User	FN2\witzigmann		

Engine model
20V4000G94F

Title
Emission data sheet

Description of Revision	Frequency

Data generated by EDS Creator version 1.0 and uniplot.
Ref.-dataset: 420122_364_NEA_G94F_D2.nc for 294 in EDS platfrom.

Emissionstage
NEA Singapore for ORDE

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Emissionstage basis
NEA Singapore for ORDE

NOX+NMHC-Emissions specific	g/kWh	6.53	5.4	4.88	4.74	10
CO2-Emissions specific	g/kWh	642.1	655.7	668.8	721.9	867.8
PM-Emissions specific (Meas.)	g/kWh	0.019	0.023	0.089	0.139	0.061
NOX-Emissions (based on 5% O2)	mg/m3N	2306	1865	1624	1429	2350
NOX+HC1-Emissions (based on 5% O2)	mg/m3N	2331	1891	1656	1484	2560
NOX+NMHC-Emissions (based on 5% O2)	mg/m3N	2330	1891	1655	1483	2556
CO2-Emissions (based on 5% O2)	mg/m3N	223679	223479	222718	222190	217876
CO-Emissions (based on 5% O2)	mg/m3N	81	98.2	364.9	418	803.3
HC1-Emissions (based on 5% O2)	mg/m3N	24.4	26.7	32.3	55.5	210.4
PM-Emissions (based on 5% O2)	mg/m3N	6.4	7.8	29.7	42.9	15.4
Oxygen (O2)	%	10.3	11.5	12	13.3	16

PDF	Name	Project no. **AWS**	Size **A4**
Configurator	Lenhof, Torsten (TARC)	Order no. **AWS FRA 044**	
Approver1	Kneifel, Alexander (TSLE)	EDS-ID **2524-22.03.2023**	
Approver2	Koliwer, Michael (TV)		
Approver3			
Approver4			
User	FN2\witzigmann		

Engine model **20V4000G94F**

Title **Emission data sheet**

Description of Revision	Frequency

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Ref.-dataset: 420122_364_NEA_G94F_D2.nc for 294 in EDS platfrom.

Emissionstage **NEA Singapore for ORDE**

Sheet **4** of **6**

Configuration-ID	Documentation
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Emissionstage basis **NEA Singapore for ORDE**

Engine data

	Genset	Marine	O & G	Rail	C & I
Application	X				
Engine model	20V4000G94F				
Fuel type	EN590				
Application Group	3D				
Legislative body	NEA Singapore for ORDE				
Test cycle	D2				
Fuel sulphur content [ppm]	5				
mg/mN^3 values base on residual oxygen value of [%]	5				

Not to exceed emission values*

Cycle point	[-]	n1	n2	n3	n4	n5
Power	kW	3090	2317	1545	772	309
Power relative	[-]	1	0.75	0.5	0.25	0.1
Engine speed	1/min	1501	1501	1501	1501	1500
Engine speed relative	[-]	1	1	1	1	1
NOX-Emissions specific	g/kWh	7.11	6.92	6.22	6.84	17.44
CO-Emissions specific	g/kWh	0.4	0.49	2.08	2.72	6.4
HC1-Emissions specific	g/kWh	0.12	0.13	0.18	0.36	2.43
NMHC-Emissions specific	g/kWh	0.12	0.13	0.18	0.35	
NOX+HC1-Emissions specific	g/kWh	7.23	7.05	6.4	7.21	19.87
NOX+NMHC-Emissions specific	g/kWh	7.22	7.05	6.4	7.2	
PM-Emissions specific (Meas.)	g/kWh	0.028	0.037	0.134	0.209	0.227
NOX-Emissions (based on 5% O2)	mg/m3N	2537	2424	2111	2143	4464
NOX+HC1-Emissions (based on 5% O2)	mg/m3N	2578	2469	2172	2254	5075

PDF	Name	Project no. **AWS**	Size **A4**
Configurator	Lenhof, Torsten (TARC)	Order no. **AWS FRA 044**	
Approver1	Kneifel, Alexander (TSLE)	EDS-ID	
Approver2	Koliwer, Michael (TV)	**2524-22.03.2023**	
Approver3			
Approver4			
User	FN2\witzigmann		

Engine model **20V4000G94F**

Title **Emission data sheet**

Description of Revision	Frequency

Data generated by EDS Creator version 1.0 and uniplot.
Ref.-dataset: 420122_364_NEA_G94F_D2.nc for 294 in EDS platfrom.

Emissionstage **NEA Singapore for ORDE**

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Configuration-ID	Documentation
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Emissionstage basis **NEA Singapore for ORDE**

NOX+NMHC-Emissions (based on 5% O2)	mg/m3N	2577	2468	2171	2252	
CO-Emissions (based on 5% O2)	mg/m3N	137.7	166.9	693.4	836.1	1607
HC1-Emissions (based on 5% O2)	mg/m3N	41.5	45.4	61.4	111	610.2
PM-Emissions (based on 5% O2)	mg/m3N	9.7	12.6	44.5	64.3	57

PDF	Name	Project no. **AWS**	Size **A4**
Configurator	Lenhof, Torsten (TARC)	Order no. **AWS FRA 044**	
Approver1	Kneifel, Alexander (TSLE)	EDS-ID **2524-22.03.2023**	
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Approver3			
Approver4			
User	FN2\witzigmann		

Engine model **20V4000G94F**

Title **Emission data sheet**

Description of Revision	Frequency

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Ref.-dataset: 420122_364_NEA_G94F_D2.nc for 294 in EDS platfrom.

Emissionstage **NEA Singapore for ORDE**

Sheet **6** of **6**

Configuration-ID	Documentation
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Emissionstage basis **NEA Singapore for ORDE**

Exhaust Emission Data Sheet
C3500 D5e
50 Hz Diesel Generator Set
2g TA Luft Emissions

Engine Information:

Model:	Cummins Inc. QSK95-G5	Bore:	7.48 in. (190 mm)
Type:	4 Cycle, VEE, 16 cylinder diesel	Stroke:	8.27 in. (210 mm)
Aspiration:	Turbocharged and Aftercooled	Displacement:	5816 cu. in. (95.3 liters)
Compression Ratio:	15.5:1		
Emission Control Device:	Turbocharged and Aftercooled		
Emission Level:	Stationary Emergency		

Performance Data	1/4 Standby	1/2 Standby	3/4 Standby	Full Standby	Full Prime	Full Continuous
Engine BHP @ 1500 RPM (50 Hz)	1024	2049	3073	4097	3642	3060
Fuel Consumption L/Hr (US Gal/Hr)	201 (53)	370 (98)	549 (145)	725 (192)	656 (173)	546 (144)
Exhaust Gas Flow m³/min (CFM)	220 (7765)	367 (12948)	506 (17873)	626 (22097)	585 (20665)	504 (17813)
Exhaust Gas Temperature °C (°F)	352 (666)	387 (728)	389 (732)	434 (813)	414 (777)	388 (731)
Exhaust Emission Data						
HC (Total Unburned Hydrocarbons)	0.35 (150)	0.16 (75)	0.10 (49)	0.07 (33)	0.08 (38)	0.10 (49)
NOx (Oxides of Nitrogen as NO_2)	4.44 (1859)	4.12 (1863)	4.02 (1830)	4.74 (2270)	4.04 (1869)	4.02 (1859)
CO (Carbon Monoxide)	0.44 (185)	0.21 (94)	0.17 (78)	0.25 (118)	0.24 (111)	0.17 (78)
PM (Particulate Matter)	0.12 (42)	0.05 (21)	0.04 (15)	0.03 (14)	0.04 (18)	0.04 (15)
SO_2 (Sulfur Dioxide)	0.005 (1.8)	0.005 (1.8)	0.004 (1.8)	0.004 (1.8)	0.004 (1.8)	0.004 (1.8)
Smoke (FSN)	0.67	0.43	0.33	0.35	0.42	0.33

All values (except smoke) are cited: g/BHP-hr (mg/Nm³ @ 5% O2)

Test Conditions

Steady-state emissions recorded per ISO8178-1 during operation at rated engine speed (+/-2%) and stated constant load (+/-2%) with engine temperatures, pressures and emission rates stabilized.

Fuel Specification:	40-48 Cetane Number, 0.0015 Wt.% Sulfur; Reference ISO8178-5, 40 CFR 86, 1313—98 Type 2-D and ASTM D975 No. 2-D. Fuel Density at 0.85 Kg/L (7.1 lbs/US Gal)
Air Inlet Temperature	25 °C (77 °F)
Fuel Inlet Temperature:	40 °C (104 °F)
Barometric Pressure:	100 kPa (29.53 in Hg)
Humidity:	NOx measurement corrected to 10.7 g/kg (75 grains H_2O/lb) of dry air
Intake Restriction:	Set to 18 in of H_2O as measured from compressor inlet
Exhaust Back Pressure:	Set to 1.5 in Hg
Note:	mg/m³ values are measured dry, corrected to 5% O_2 and normalized to standard temperature and pressure (0°C, 101.325 kPa)

The NOx, HC, CO and PM emission data tabulated here are representative of test data taken from a single engine under the test conditions shown above. Data for the other components are estimated. These data are subjected to instrumentation and engine-to-engine variability. Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures and instrumentation. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may results in elevated emission levels.

PERFORMANCE DATA[EM1365]

September 22, 2023

Performance Number: EM1365 **Change Level: 06**

SALES MODEL:	C175-20	**COMBUSTION:**	DIRECT INJECTION
BRAND:	CAT	**ENGINE SPEED (RPM):**	1,500
MACHINE SALES MODEL:		**HERTZ:**	50
ENGINE POWER (BKW):	3,064.0	**FAN POWER (KW):**	84.0
GEN POWER WITH FAN (EKW):	2,800.0	**ASPIRATION:**	TA
COMPRESSION RATIO:	15.3	**AFTERCOOLER TYPE:**	SCAC
RATING LEVEL:	STANDBY	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC+1AC, 2AC
PUMP QUANTITY:	2	**AFTERCOOLER TEMP (C):**	46
FUEL TYPE:	DIESEL	**JACKET WATER TEMP (C):**	99
MANIFOLD TYPE:	DRY	**TURBO CONFIGURATION:**	PARALLEL
GOVERNOR TYPE:	ADEM4	**TURBO QUANTITY:**	4
ELECTRONICS TYPE:	ADEM4	**TURBOCHARGER MODEL:**	GTB6251BN-48T-1.38
CAMSHAFT TYPE:	STANDARD	**COMBUSTION STRATEGY:**	LOW EMISSION
IGNITION TYPE:	CI	**FUEL RATE (RATED RPM) NO LOAD (L/HR):**	70.5
INJECTOR TYPE:	CR	**PISTON SPD @ RATED ENG SPD (M/SEC):**	11.0
FUEL INJECTOR:	4439454		
REF EXH STACK DIAMETER (MM):	356		

INDUSTRY	SUBINDUSTRY	APPLICATION
ELECTRIC POWER	STANDARD	PACKAGED GENSET
OIL AND GAS	LAND PRODUCTION	PACKAGED GENSET

General Performance Data

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	ISO BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	ISO VOL FUEL CONSUMPTN (VFC)	ELEC SPEC FUEL CONSUMPTN (ESFC)	ISO ELEC SPEC FUEL CONSUMPTN (ESFC)
EKW	%	BKW	KPA	G/BKW-HR	G/BKW-HR	L/HR	L/HR	G/EKW-HR	G/EKW-HR
2,800.0	100	3,064	2,316	206.9	202.9	745.7	731.5	226.4	222.1
2,520.0	90	2,765	2,090	212.4	208.3	691.0	677.8	233.1	228.6
2,240.0	80	2,467	1,865	216.9	212.8	629.6	617.6	238.9	234.3
2,100.0	75	2,318	1,752	218.5	214.4	595.9	584.6	241.2	236.6
1,960.0	70	2,169	1,640	219.0	214.9	558.9	548.3	242.4	237.8
1,680.0	60	1,871	1,414	219.0	214.8	482.2	473.0	243.9	239.3
1,400.0	50	1,573	1,189	218.8	214.6	405.0	397.3	245.9	241.2
1,120.0	40	1,275	964	224.8	220.5	337.3	330.9	256.0	251.1
840.0	30	978	739	236.1	231.6	271.6	266.4	274.8	269.6
700.0	25	829	626	244.8	240.2	238.7	234.1	289.8	284.3
560.0	20	680	514	256.3	251.4	204.9	201.0	311.0	305.1
280.0	10	382	289	302.9	297.1	136.1	133.5	413.1	405.2

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
EKW	%	BKW	KPA	DEG C	DEG C	KPA	DEG C	KPA	DEG C
2,800.0	100	3,064	273.6	49.5	608.1	209.7	447.4	275	212.8
2,520.0	90	2,765	261.0	48.6	595.7	198.5	440.1	263	206.3
2,240.0	80	2,467	240.6	47.9	580.8	182.1	434.1	242	195.3
2,100.0	75	2,318	227.1	47.6	572.5	171.7	431.9	229	187.5
1,960.0	70	2,169	209.8	47.4	564.0	158.7	431.4	211	176.7
1,680.0	60	1,871	171.8	47.0	544.4	130.6	429.5	174	155.4
1,400.0	50	1,573	132.6	46.4	521.2	102.5	424.0	134	134.4
1,120.0	40	1,275	100.3	44.9	492.7	81.0	411.9	102	113.5
840.0	30	978	71.6	43.5	454.3	62.2	389.1	73	93.0
700.0	25	829	58.5	43.0	431.4	53.8	373.7	60	83.0
560.0	20	680	46.4	42.8	399.0	45.8	348.8	48	73.2
280.0	10	382	25.1	43.0	310.5	31.1	275.3	27	54.6

General Performance Data (Continued)

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	ENGINE OUTLET WET EXH VOL FLOW RATE (0 DEG C AND 101 KPA)	ENGINE OUTLET DRY EXH VOL FLOW RATE (0 DEG C AND 101 KPA)

PERFORMANCE DATA[EM1365]

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EKW	%	BKW	M3/MIN	M3/MIN	KG/HR	KG/HR	M3/MIN	M3/MIN
2,800.0	100	3,064	290.2	655.7	18,283.1	18,916.6	248.6	228.3
2,520.0	90	2,765	282.5	630.4	17,788.1	18,375.1	241.4	222.6
2,240.0	80	2,467	267.9	591.7	16,856.7	17,391.5	228.5	211.3
2,100.0	75	2,318	257.8	566.7	16,203.3	16,709.6	219.5	203.2
1,960.0	70	2,169	244.4	535.5	15,343.0	15,817.9	207.6	192.3
1,680.0	60	1,871	214.5	466.8	13,424.8	13,834.7	181.5	168.2
1,400.0	50	1,573	183.4	394.9	11,431.8	11,776.2	154.7	143.5
1,120.0	40	1,275	157.5	333.5	9,799.4	10,086.0	133.0	123.6
840.0	30	978	134.3	274.5	8,345.5	8,575.8	113.2	105.5
700.0	25	829	123.6	245.8	7,682.0	7,884.6	103.8	97.0
560.0	20	680	113.7	217.4	7,066.2	7,240.4	95.5	89.5
280.0	10	382	96.2	161.3	5,973.9	6,089.6	80.3	76.1

Heat Rejection Data

PUMP POWER IS INCLUDED IN HEAT REJECTION BALANCE, BUT IS NOT SHOWN.

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXH RECOVERY TO 177C	FROM OIL COOLER	FROM 2ND STAGE AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BKW	KW	KW	KW	KW	KW	KW	KW	KW	KW
2,800.0	100	3,064	1,592	187	2,759	1,506	401	328	3,064	7,533	8,025
2,520.0	90	2,765	1,518	186	2,580	1,420	372	298	2,765	6,980	7,435
2,240.0	80	2,467	1,413	183	2,366	1,310	339	266	2,467	6,360	6,775
2,100.0	75	2,318	1,347	181	2,245	1,247	321	250	2,318	6,020	6,413
1,960.0	70	2,169	1,266	179	2,107	1,178	301	232	2,169	5,646	6,014
1,680.0	60	1,871	1,092	175	1,817	1,022	259	196	1,871	4,870	5,188
1,400.0	50	1,573	915	169	1,521	850	218	161	1,573	4,091	4,358
1,120.0	40	1,275	781	161	1,269	691	181	134	1,275	3,408	3,630
840.0	30	978	656	151	1,020	528	146	108	978	2,744	2,923
700.0	25	829	594	146	891	449	128	95.1	829	2,411	2,568
560.0	20	680	529	141	755	358	110	81.0	680	2,070	2,205
280.0	10	382	395	131	467	170	73.2	51.1	382	1,374	1,464

Sound Data

SOUND DATA REPRESENTATIVE OF NOISE PRODUCED BY THE "ENGINE ONLY"

EXHAUST:SOUND POWER(1/3 Octave Frequencies)

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	100 HZ	125 HZ	160 HZ	200 HZ	250 HZ	315 HZ	400 HZ	500 HZ	630 HZ	800 HZ
EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
2,800.0	100	3,064	128.0	94.0	113.5	107.0	108.2	111.5	111.0	112.0	115.4	114.0	112.2
2,520.0	90	2,765	126.7	94.3	112.6	106.3	107.7	111.3	110.3	111.0	114.9	112.7	111.2
2,240.0	80	2,467	125.2	93.2	109.9	105.6	107.4	109.6	108.8	110.5	113.7	111.5	110.3
2,100.0	75	2,318	124.6	92.0	108.5	105.0	106.9	107.7	107.7	109.5	113.2	111.0	110.1
1,960.0	70	2,169	124.0	91.9	108.5	104.7	106.3	106.5	107.2	109.3	113.1	110.6	109.8
1,680.0	60	1,871	123.1	91.1	108.7	105.1	105.2	106.6	107.6	109.6	112.3	110.2	109.5
1,400.0	50	1,573	121.9	89.8	107.3	105.7	105.0	106.2	107.9	109.3	111.0	109.3	108.5
1,120.0	40	1,275	120.4	90.9	103.0	105.8	103.5	104.9	107.9	108.2	109.9	108.1	107.2
840.0	30	978	119.0	92.4	102.6	104.7	101.9	104.5	107.8	105.6	108.2	107.2	106.4
700.0	25	829	118.4	92.9	104.6	103.2	101.4	103.5	107.3	105.3	107.4	106.7	106.1
560.0	20	680	118.2	89.0	109.7	100.4	103.6	102.8	104.8	105.1	107.5	106.3	106.1
280.0	10	382	116.2	83.6	105.4	101.7	100.4	100.0	101.2	102.2	105.4	105.4	105.0

EXHAUST:SOUND POWER(1/3 Octave Frequencies)

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	1250 HZ	1600 HZ	2000 HZ	2500 HZ	3150 HZ	4000 HZ	5000 HZ	6300 HZ	8000 HZ	10000 HZ

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EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
2,800.0	100	3,064	117.6	119.1	119.2	119.1	117.1	114.1	110.0	107.0	104.5	102.9	118.8
2,520.0	90	2,765	116.3	117.7	118.1	118.2	116.2	113.1	109.1	106.0	103.7	101.9	113.6
2,240.0	80	2,467	114.8	116.4	116.5	117.0	115.5	112.3	108.3	105.0	103.1	101.7	106.4
2,100.0	75	2,318	113.9	115.7	115.9	116.4	115.1	111.9	107.9	104.6	102.8	102.1	102.7
1,960.0	70	2,169	113.1	115.1	115.2	115.7	114.6	111.5	107.5	104.1	102.7	102.6	99.1
1,680.0	60	1,871	111.8	113.9	113.7	114.0	113.5	110.4	106.5	103.1	102.4	102.6	95.4
1,400.0	50	1,573	110.7	112.5	112.0	112.1	112.1	108.8	105.2	102.0	102.3	100.4	93.9
1,120.0	40	1,275	109.3	110.7	110.1	110.5	110.4	107.2	103.7	100.9	102.2	97.1	92.7
840.0	30	978	107.8	109.6	108.4	108.9	108.6	105.6	102.1	100.3	99.7	95.5	91.4
700.0	25	829	107.0	108.9	107.4	108.2	107.7	104.8	101.4	100.5	98.1	95.1	91.0
560.0	20	680	106.5	108.2	106.5	107.5	107.1	104.2	100.8	100.3	96.8	94.8	90.7
280.0	10	382	105.9	107.4	105.6	105.9	105.6	102.0	101.3	96.6	95.7	94.2	89.3

MECHANICAL:SOUND POWER(1/3 Octave Frequencies)

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	100 HZ	125 HZ	160 HZ	200 HZ	250 HZ	315 HZ	400 HZ	500 HZ	630 HZ	800 HZ
EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
2,800.0	100	3,064	126.4	90.0	99.2	97.8	103.0	102.1	110.0	109.6	111.2	111.9	113.4
2,520.0	90	2,765	125.6	89.7	98.1	97.5	102.2	102.0	109.2	109.2	110.9	111.8	113.0
2,240.0	80	2,467	124.6	89.5	97.1	97.4	101.7	102.4	108.9	109.5	110.9	111.9	112.7
2,100.0	75	2,318	124.3	89.4	96.4	97.3	101.4	102.5	108.5	109.9	110.8	111.9	112.5
1,960.0	70	2,169	124.1	89.3	96.4	97.4	101.4	102.6	108.0	110.1	110.6	111.8	112.4
1,680.0	60	1,871	123.6	88.5	96.5	97.7	101.1	102.5	107.5	109.8	110.3	111.7	112.1
1,400.0	50	1,573	122.8	87.8	96.8	98.3	100.3	102.2	107.2	109.1	110.0	111.5	111.5
1,120.0	40	1,275	122.2	86.9	97.0	99.4	99.8	102.6	106.5	108.8	110.0	111.0	110.4
840.0	30	978	121.8	86.0	95.9	99.3	99.0	103.0	106.3	108.8	110.5	111.5	109.9
700.0	25	829	121.7	85.5	94.7	98.6	98.3	103.2	106.6	108.9	111.0	112.2	110.1
560.0	20	680	121.9	85.0	94.0	97.8	97.4	103.0	106.7	109.3	111.7	113.0	110.9
280.0	10	382	121.9	84.9	94.1	99.1	94.5	102.4	105.6	109.1	111.4	113.4	111.5

MECHANICAL:SOUND POWER(1/3 Octave Frequencies)

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	1250 HZ	1600 HZ	2000 HZ	2500 HZ	3150 HZ	4000 HZ	5000 HZ	6300 HZ	8000 HZ	10000 HZ
EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
2,800.0	100	3,064	114.5	114.4	114.6	115.1	114.1	113.6	111.3	111.8	113.1	112.3	121.2
2,520.0	90	2,765	114.2	114.0	114.3	114.6	113.7	112.6	111.0	111.1	112.4	111.4	119.5
2,240.0	80	2,467	113.9	114.1	114.3	114.5	113.5	111.9	110.4	110.3	111.8	110.6	114.7
2,100.0	75	2,318	113.9	114.2	114.4	114.3	113.4	111.6	110.2	110.0	111.4	110.7	112.1
1,960.0	70	2,169	113.8	114.3	114.4	114.1	113.3	111.4	110.0	109.7	111.3	111.0	109.6
1,680.0	60	1,871	113.2	114.4	113.9	113.5	112.7	110.9	109.4	109.0	110.8	110.9	107.0
1,400.0	50	1,573	112.3	113.3	112.8	112.5	111.6	110.1	108.6	108.1	110.6	108.7	105.6
1,120.0	40	1,275	111.9	112.5	112.1	111.7	110.6	109.5	107.8	107.3	109.9	106.3	104.0
840.0	30	978	111.3	112.6	111.7	111.2	109.9	109.0	107.1	106.7	107.9	104.7	102.2
700.0	25	829	111.3	112.4	111.4	111.1	109.7	108.9	106.7	106.4	106.4	104.3	101.8
560.0	20	680	111.9	112.4	111.3	110.9	109.8	109.0	106.0	105.6	105.0	104.1	101.5
280.0	10	382	112.5	112.7	111.8	110.6	110.2	108.3	105.9	103.6	104.1	103.3	100.1

Emissions Data

DIESEL

RATED SPEED NOMINAL DATA: 1500 RPM

GENSET POWER WITH FAN	EKW	2,800.0	2,100.0	1,400.0	700.0	280.0
PERCENT LOAD	%	100	75	50	25	10
ENGINE POWER	BKW	3,064	2,318	1,573	829	382
TOTAL NOX (AS NO2)	G/HR	20,101	10,935	8,148	4,159	3,291
TOTAL CO	G/HR	2,912	3,901	2,024	1,427	1,224
TOTAL HC	G/HR	507	539	682	837	912
TOTAL CO2	KG/HR	1,992	1,590	1,077	612	343
PART MATTER	G/HR	86.4	154.7	159.9	138.1	69.9

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TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,264.7	1,567.7	1,714.3	1,491.5	2,200.2
TOTAL CO	(CORR 5% O2)	MG/NM3	337.0	551.0	421.8	519.6	805.1
TOTAL HC	(CORR 5% O2)	MG/NM3	49.1	65.9	123.6	265.7	522.6
PART MATTER	(CORR 5% O2)	MG/NM3	8.3	18.8	28.8	44.9	38.0
TOTAL NOX (AS NO2)	(CORR 15% O2)	MG/NM3	840.4	581.7	636.1	553.4	816.4
TOTAL CO	(CORR 15% O2)	MG/NM3	125.1	204.5	156.5	192.8	298.8
TOTAL HC	(CORR 15% O2)	MG/NM3	18.2	24.5	45.8	98.6	193.9
PART MATTER	(CORR 15% O2)	MG/NM3	3.1	7.0	10.7	16.7	14.1
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,103	764	835	726	1,072
TOTAL CO	(CORR 5% O2)	PPM	270	441	337	416	644
TOTAL HC	(CORR 5% O2)	PPM	92	123	231	496	975
TOTAL NOX (AS NO2)	(CORR 15% O2)	PPM	409	283	310	270	398
TOTAL CO	(CORR 15% O2)	PPM	100	164	125	154	239
TOTAL HC	(CORR 15% O2)	PPM	34	46	86	184	362
TOTAL NOX (AS NO2)		G/HP-HR	4.88	3.51	3.85	3.73	6.40
TOTAL CO		G/HP-HR	0.71	1.25	0.96	1.28	2.38
TOTAL HC		G/HP-HR	0.12	0.17	0.32	0.75	1.77
PART MATTER		G/HP-HR	0.02	0.05	0.08	0.12	0.14
TOTAL NOX (AS NO2)		G/KW-HR	6.64	4.77	5.23	5.07	8.70
TOTAL CO		G/KW-HR	0.96	1.70	1.30	1.74	3.24
TOTAL HC		G/KW-HR	0.17	0.23	0.44	1.02	2.41
PART MATTER		G/KW-HR	0.03	0.07	0.10	0.17	0.18
TOTAL NOX (AS NO2)		LB/HR	44.31	24.11	17.96	9.17	7.26
TOTAL CO		LB/HR	6.42	8.60	4.46	3.15	2.70
TOTAL HC		LB/HR	1.12	1.19	1.50	1.84	2.01
TOTAL CO2		LB/HR	4,392	3,504	2,375	1,350	757
PART MATTER		LB/HR	0.19	0.34	0.35	0.30	0.15
OXYGEN IN EXH		%	10.6	11.6	12.0	13.3	15.4
DRY SMOKE OPACITY		%	0.6	2.0	3.1	4.1	1.5
BOSCH SMOKE NUMBER			0.72	0.86	0.96	1.05	0.81

RATED SPEED POTENTIAL SITE VARIATION: 1500 RPM

GENSET POWER WITH FAN		**EKW**	**2,800.0**	**2,100.0**	**1,400.0**	**700.0**	**280.0**
PERCENT LOAD		**%**	**100**	**75**	**50**	**25**	**10**
ENGINE POWER		**BKW**	**3,064**	**2,318**	**1,573**	**829**	**382**
TOTAL NOX (AS NO2)		G/HR	24,121	13,122	9,777	4,991	3,950
TOTAL CO		G/HR	5,242	7,023	3,643	2,569	2,204
TOTAL HC		G/HR	674	717	907	1,113	1,213
PART MATTER		G/HR	120.9	216.6	223.8	193.4	97.8
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,717.7	1,881.2	2,057.1	1,789.7	2,640.2
TOTAL CO	(CORR 5% O2)	MG/NM3	606.6	991.9	759.3	935.3	1,449.2
TOTAL HC	(CORR 5% O2)	MG/NM3	65.3	87.6	164.3	353.4	695.0
PART MATTER	(CORR 5% O2)	MG/NM3	11.6	26.3	40.3	62.9	53.2
TOTAL NOX (AS NO2)	(CORR 15% O2)	MG/NM3	1,008.5	698.1	763.3	664.1	979.7
TOTAL CO	(CORR 15% O2)	MG/NM3	225.1	368.1	281.7	347.1	537.8
TOTAL HC	(CORR 15% O2)	MG/NM3	24.2	32.5	61.0	131.1	257.9
PART MATTER	(CORR 15% O2)	MG/NM3	4.3	9.8	14.9	23.3	19.7
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,324	916	1,002	872	1,286
TOTAL CO	(CORR 5% O2)	PPM	485	793	607	748	1,159
TOTAL HC	(CORR 5% O2)	PPM	122	164	307	660	1,297
TOTAL NOX (AS NO2)	(CORR 15% O2)	PPM	491	340	372	323	477
TOTAL CO	(CORR 15% O2)	PPM	180	294	225	278	430
TOTAL HC	(CORR 15% O2)	PPM	45	61	114	245	481
TOTAL NOX (AS NO2)		G/HP-HR	5.86	4.21	4.62	4.47	7.68
TOTAL CO		G/HP-HR	1.27	2.25	1.72	2.30	4.28
TOTAL HC		G/HP-HR	0.16	0.23	0.43	1.00	2.36
PART MATTER		G/HP-HR	0.03	0.07	0.11	0.17	0.19
TOTAL NOX (AS NO2)		G/KW-HR	7.96	5.72	6.28	6.08	10.44
TOTAL CO		G/KW-HR	1.73	3.06	2.34	3.13	5.82
TOTAL HC		G/KW-HR	0.22	0.31	0.58	1.36	3.21
PART MATTER		G/KW-HR	0.04	0.09	0.14	0.24	0.26
TOTAL NOX (AS NO2)		LB/HR	53.18	28.93	21.55	11.00	8.71
TOTAL CO		LB/HR	11.56	15.48	8.03	5.66	4.86
TOTAL HC		LB/HR	1.49	1.58	2.00	2.45	2.67
PART MATTER		LB/HR	0.27	0.48	0.49	0.43	0.22

Regulatory Information

PERFORMANCE DATA[EM1365]

September 22, 2023

NON-CERTIFIED	1970 - 2100
THIS ENGINE RATING IS NOT EMISSIONS CERTIFIED BY ANY DOMESTIC OR FOREIGN AGENCY.	

Altitude Derate Data

ALTITUDE DERATE DATA IS BASED ON THE ASSUMPTION OF A 20 DEGREES CELSIUS(36 DEGREES FAHRENHEIT) DIFFERENCE BETWEEN AMBIENT OPERATING TEMPERATURE AND ENGINE INLET SCAC TEMPERATURE. AMBIENT OPERATING TEMPERATURE IS DEFINED AS THE AIR TEMPERATURE MEASURED AT THE TURBOCHARGER COMPRESSOR INLET.

STANDARD

ALTITUDE CORRECTED POWER CAPABILITY (BKW)

AMBIENT OPERATING TEMP (C)	0	5	10	15	20	25	30	35	40	45	50	55	60	NORMAL
ALTITUDE (M)														
0	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	2,857	2,361	3,064
250	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,052	3,005	2,757	2,403	3,064
500	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,015	2,813	2,609	2,552	3,064
750	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	2,979	2,765	2,609	2,533	3,064
1,000	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	2,907	2,711	2,587	2,487	3,064
1,250	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	2,799	2,662	2,546	2,421	3,064
1,500	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	3,064	2,777	2,603	2,475	2,367	3,064
1,750	3,036	3,036	3,036	3,036	3,036	3,036	3,036	3,036	3,036	2,688	2,532	2,425	2,341	3,036
2,000	3,002	3,002	3,002	3,002	3,002	3,002	3,002	3,002	2,992	2,590	2,488	2,416	2,349	3,002
2,250	2,821	2,821	2,821	2,820	2,820	2,819	2,818	2,817	2,776	2,520	2,437	2,374	2,322	2,821
2,500	2,579	2,579	2,578	2,577	2,575	2,574	2,573	2,567	2,507	2,448	2,386	2,330	2,277	2,578
2,750	2,557	2,557	2,556	2,555	2,554	2,553	2,552	2,545	2,496	2,437	2,379	2,324	2,233	2,556
3,000	2,486	2,487	2,486	2,485	2,485	2,484	2,483	2,477	2,438	2,387	2,336	2,272	2,174	2,486
3,250	2,367	2,367	2,367	2,367	2,366	2,366	2,366	2,361	2,340	2,314	2,280	2,207	2,129	2,367
3,500	2,258	2,258	2,258	2,258	2,258	2,258	2,258	2,255	2,244	2,232	2,209	2,153	2,093	2,258
3,750	2,170	2,170	2,170	2,170	2,170	2,170	2,170	2,168	2,162	2,156	2,145	2,117	2,055	2,170
4,000	2,110	2,110	2,110	2,111	2,111	2,112	2,112	2,110	2,104	2,096	2,087	2,064	2,015	2,109
4,250	2,044	2,045	2,046	2,046	2,047	2,048	2,048	2,046	2,039	2,031	2,023	2,008	1,973	2,044
4,500	1,980	1,981	1,982	1,983	1,984	1,984	1,985	1,982	1,975	1,968	1,960	1,950	1,926	1,979

Cross Reference

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
4577024	LL6688	4806566	GS269	-	BXR00001	
4577024	LL6687	5683573	PG325	-	TZ800100	
4577024	LL6688	5683573	PG325	-	TZ800100	

Performance Parameter Reference

Parameters Reference:DM9600-14

PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600
APPLICATION:
Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.
PERFORMANCE PARAMETER TOLERANCE FACTORS:
Power +/- 3%

PERFORMANCE DATA[EM1365]

Torque +/- 3%
Exhaust stack temperature +/- 8%
Inlet airflow +/- 5%
Intake manifold pressure-gage +/- 10%
Exhaust flow +/- 6%
Specific fuel consumption +/- 3%
Fuel rate +/- 5%
Specific DEF consumption +/- 3%
DEF rate +/- 5%
Heat rejection +/- 5%
Heat rejection exhaust only +/- 10%
Heat rejection CEM only +/- 10%
Heat Rejection values based on using treated water.
Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.
On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.
On 3500 and C175 engines, at speeds below Peak Torque these values are provided for reference only, and may not meet the tolerance listed.
These values do not apply to C280/3600. For these models, see the tolerances listed below.
C280/3600 HEAT REJECTION TOLERANCE FACTORS:
Heat rejection +/- 10%
Heat rejection to Atmosphere +/- 50%
Heat rejection to Lube Oil +/- 20%
Heat rejection to Aftercooler +/- 5%
TEST CELL TRANSDUCER TOLERANCE FACTORS:
Torque +/- 0.5%
Speed +/- 0.2%
Fuel flow +/- 1.0%
Temperature +/- 2.0 C degrees
Intake manifold pressure +/- 0.1 kPa
OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.
REFERENCE ATMOSPHERIC INLET AIR
FOR 3500 ENGINES AND SMALLER
SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.
FOR 3600 ENGINES
Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.
MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE
Location for air temperature measurement air cleaner inlet at stabilized operating conditions.
REFERENCE EXHAUST STACK DIAMETER
The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.
REFERENCE FUEL
DIESEL
Reference fuel is #2 distillate diesel with a 35API gravity;
A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 15 deg C (59 deg F), where the density is 850 G/Liter (7.0936 Lbs/Gal).
GAS
Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.
ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD
Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.
ALTITUDE CAPABILITY
Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.

PERFORMANCE DATA[EM1365]

Standard temperature values versus altitude could be seen on TM2001.
When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.
Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.
Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.
REGULATIONS AND PRODUCT COMPLIANCE
TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.
Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.
EMISSION CYCLE LIMITS:
Cycle emissions Max Limits apply to cycle-weighted averages only. Emissions at individual load points may exceed the cycle-weighted limit.
WET & DRY EXHAUST/EMISSIONS DESCRIPTION:
Wet - Total exhaust flow or concentration of total exhaust flow
Dry - Total exhaust flow minus water vapor or concentration of exhaust flow with water vapor excluded
EMISSIONS DEFINITIONS:
Emissions : DM1176
EMISSION CYCLE DEFINITIONS
1. For constant-speed marine engines for ship main propulsion, including,diesel-electric drive, test cycle E2 shall be applied, for controllable-pitch propeller sets
test cycle E2 shall be applied.
2. For propeller-law-operated main and propeller-law-operated auxiliary engines the test cycle E3 shall be applied.
3. For constant-speed auxiliary engines test cycle D2 shall be applied.
4. For variable-speed, variable-load auxiliary engines, not included above, test cycle C1 shall be applied.
HEAT REJECTION DEFINITIONS:
Diesel Circuit Type and HHV Balance : DM9500
HIGH DISPLACEMENT (HD) DEFINITIONS:
3500: EM1500
RATING DEFINITIONS:
Agriculture : TM6008
Fire Pump : TM6009
Generator Set : TM6035
Generator (Gas) : TM6041
Industrial Diesel : TM6010
Industrial (Gas) : TM6040
Irrigation : TM5749
Locomotive : TM6037
Marine Auxiliary : TM6036
Marine Prop (Except 3600) : TM5747
Marine Prop (3600 only) : TM5748
MSHA : TM6042
Oil Field (Petroleum) : TM6011
Off-Highway Truck : TM6039
On-Highway Truck : TM6038
SOUND DEFINITIONS:
Sound Power : DM8702
Sound Pressure : TM7080
Date Released : 10/27/21

October 11th, 2023

To Whom It May Concern:

With regards to Cummins Power Systems (CPS) manufactured diesel generator set model **C3500D5e** rated for 50Hz operation and equipped with Cummins **QSK95-G5** engine:

When tested under the following conditions:

Table 1	
Fuel Specification:	ASTM D975 No. 2-D S15 diesel fuel with 0.0015% sulfur content (by weight), and 42-48 cetane number.
Air Inlet Temperature:	77 °F
Fuel Inlet Temperature:	104 °F (at fuel pump inlet)
Barometric Pressure:	29.53 in. Hg
Humidity:	NOx measurement corrected to 75 grains H2O/lb. dry air

Based on engine emissions validation testing, the table below represents the nominal performance and exhaust emissions data for the generator set listed above:

	Standby					
PERFORMANCE DATA	**0%**	**10%**	**25%**	**50%**	**75%**	**100%**
Power Output (kWe)	0	280	700	1400	2100	2800
BHP @ 1500 RPM (50 Hz)	175	563	1146	2117	3087	4097
Fuel Consumption (L/Hr)	68	127	222	382	551	725
Exhaust Gas Flow (m3/min)	118	160	238	376	508	626
Exhaust Gas Temperature (°C)	198	283	365	387	389	434
NOx (Oxides of Nitrogen)	1877	1824	1874	1866	1861	2226
NMHC (Nonmethane Hydrocarbons)	551	241	132	73	48	33
CO (Carbon Monoxide)	669	298	170	90	78	118
PM (Particulate Matter)	135	36	28	16	12	13
All emissions values above are cited as mg/ Nm3@5% O2, 0°C and 101.325 kPa.						

Steady-State emissions recorded per ISO8178-1 during operation at rated engine speed (+/-2%) and stated constant load (+/-2%) with engine temperatures, pressures and emission rates stabilized.

The NOx, HC, CO, and PM emission data tabulated here are representative of test data taken from a single engine under the test conditions shown above. Data for the other components are estimated. This data is subject to instrumentation and engine-to-engine variability. Field emissions test data is not guaranteed to these levels. Actual field test results may vary due to test ambient, site conditions, installation, fuel specification, test procedures, instrumentation and ambient correction factors. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.

PERFORMANCE DATA[EM2120]

September 22, 2023

Performance Number: EM2120 **Change Level: 02**

SALES MODEL:	3516E	**COMBUSTION:**	DIRECT INJECTION
BRAND:	CAT	**ENGINE SPEED (RPM):**	1,808
MACHINE SALES MODEL:		**HERTZ:**	50
ENGINE POWER (BKW):	3,086.0	**FAN POWER (KW):**	120.0
GEN POWER WITH FAN (EKW):	2,800.0	**ADDITIONAL PARASITICS (KW):**	18.0
COMPRESSION RATIO:	14.7	**ASPIRATION:**	TA
RATING LEVEL:	MISSION CRITICAL STANDBY	**AFTERCOOLER TYPE:**	ATAAC
PUMP QUANTITY:	1	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC, ATAAC
FUEL TYPE:	DIESEL	**INLET MANIFOLD AIR TEMP (C):**	50
MANIFOLD TYPE:	DRY	**JACKET WATER TEMP (C):**	104
GOVERNOR TYPE:	ADEM5	**TURBO CONFIGURATION:**	PARALLEL
ELECTRONICS TYPE:	ADEM5	**TURBO QUANTITY:**	4
IGNITION TYPE:	CI	**TURBOCHARGER MODEL:**	GTB6051N-44T-1.25
INJECTOR TYPE:	EUI	**CERTIFICATION YEAR:**	2018
FUEL INJECTOR:	3920221	**CRANKCASE BLOWBY RATE (M3/HR):**	117.0
UNIT INJECTOR TIMING (MM):	64.34	**FUEL RATE (RATED RPM) NO LOAD (L/HR):**	61.3
REF EXH STACK DIAMETER (MM):	305	**PISTON SPD @ RATED ENG SPD (M/SEC):**	13.0
MAX OPERATING ALTITUDE (M):	250		

INDUSTRY	SUBINDUSTRY	APPLICATION
ELECTRIC POWER	STANDARD	PACKAGED GENSET

General Performance Data

THE INLET MANIFOLD AIR TEMP LISTED IN THE HEADER, AND IN THE GENERAL PERFORMANCE DATA, IS THE AVERAGE INLET MANIFOLD TEMP FRONT TO REAR ON THE ENGINE.

THIS STANDBY RATING IS FOR A STANDBY ONLY ENGINE ARRANGEMENT. RERATING THE ENGINE TO A STANDARD PRIME OR CONTINUOUS RATING IS NOT PERMITTED.

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	ISO BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	ISO VOL FUEL CONSUMPTN (VFC)	ELEC SPEC FUEL CONSUMPTN (ESFC)	ISO ELEC SPEC FUEL CONSUMPTN (ESFC)
EKW	%	BKW	KPA	G/BKW-HR	G/BKW-HR	L/HR	L/HR	G/EKW-HR	G/EKW-HR
2,800.0	100	3,085	2,623	208.6	204.6	757.1	742.7	229.8	225.5
2,520.0	90	2,791	2,372	204.1	200.2	669.9	657.2	226.0	221.7
2,240.0	80	2,496	2,122	205.2	201.3	602.5	591.0	228.6	224.3
2,100.0	75	2,349	1,996	206.5	202.6	570.5	559.7	230.9	226.5
1,960.0	70	2,201	1,871	208.2	204.3	539.2	529.0	233.9	229.4
1,680.0	60	1,906	1,621	213.1	209.1	478.0	468.9	241.9	237.3
1,400.0	50	1,612	1,370	219.5	215.3	416.1	408.2	252.7	247.8
1,120.0	40	1,317	1,119	225.8	221.5	349.9	343.2	265.5	260.5
840.0	30	1,022	869	232.4	228.0	279.5	274.2	282.8	277.5
700.0	25	875	744	237.9	233.4	244.9	240.2	297.3	291.7
560.0	20	727	618	247.0	242.3	211.4	207.4	320.9	314.8
280.0	10	433	368	279.7	274.4	142.4	139.7	432.3	424.1

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
EKW	%	BKW	KPA	DEG C	DEG C	KPA	DEG C	KPA	DEG C
2,800.0	100	3,085	311.0	49.4	690.8	245.6	489.6	331	250.0
2,520.0	90	2,791	278.8	41.7	643.9	215.5	462.2	298	226.7
2,240.0	80	2,496	251.6	39.2	621.4	191.7	452.8	269	210.4
2,100.0	75	2,349	237.0	38.2	613.6	180.0	451.2	254	202.4
1,960.0	70	2,201	222.4	37.3	606.3	168.6	450.2	239	194.6
1,680.0	60	1,906	193.4	35.8	592.6	146.5	449.2	208	179.0
1,400.0	50	1,612	165.0	35.1	575.4	125.7	445.1	178	160.5
1,120.0	40	1,317	129.6	33.9	557.2	100.7	444.4	142	137.7
840.0	30	1,022	90.6	33.9	529.9	74.9	436.6	101	111.9
700.0	25	875	72.8	33.7	509.4	62.8	427.3	82	99.2
560.0	20	727	57.3	33.2	482.1	52.6	411.7	66	87.2
280.0	10	433	29.4	32.0	390.7	34.2	343.8	36	64.3

General Performance Data (Continued)

GENSET POWER	PERCENT LOAD	ENGINE POWER	WET INLET AIR VOL	ENGINE OUTLET	WET INLET AIR	WET EXH GAS	ENGINE OUTLET	ENGINE OUTLET

PERFORMANCE DATA[EM2120]

September 22, 2023

WITH FAN			FLOW RATE	WET EXH GAS VOL FLOW RATE	MASS FLOW RATE	MASS FLOW RATE	WET EXH VOL FLOW RATE (0 DEG C AND 101 KPA)	DRY EXH VOL FLOW RATE (0 DEG C AND 101 KPA)
EKW	%	BKW	M3/MIN	M3/MIN	KG/HR	KG/HR	M3/MIN	M3/MIN
2,800.0	100	3,085	240.6	649.5	17,008.6	17,650.8	232.6	212.1
2,520.0	90	2,791	227.3	587.2	16,028.8	16,598.2	218.1	199.7
2,240.0	80	2,496	213.9	542.4	15,018.0	15,529.7	204.1	187.4
2,100.0	75	2,349	205.5	518.4	14,398.1	14,882.8	195.5	179.7
1,960.0	70	2,201	196.7	494.6	13,754.5	14,212.7	186.8	171.8
1,680.0	60	1,906	180.6	451.8	12,594.3	13,000.5	170.8	157.5
1,400.0	50	1,612	164.3	404.4	11,345.5	11,699.3	153.8	142.2
1,120.0	40	1,317	143.3	349.1	9,815.2	10,112.7	132.9	122.9
840.0	30	1,022	118.1	283.4	8,059.2	8,296.8	109.1	101.0
700.0	25	875	106.8	251.7	7,270.8	7,479.2	98.2	91.1
560.0	20	727	97.2	223.7	6,610.6	6,790.6	89.2	83.0
280.0	10	433	79.7	164.8	5,408.4	5,529.4	73.0	68.5

Heat Rejection Data

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXH RECOVERY TO 177C	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BKW	KW	KW	KW	KW	KW	KW	KW	KW	KW
2,800.0	100	3,085	918	167	2,961	1,638	407	1,013	3,085	7,648	8,147
2,520.0	90	2,791	838	149	2,556	1,397	360	872	2,791	6,767	7,209

Emissions Data

DIESEL

RATED SPEED NOMINAL DATA: 1808 RPM

GENSET POWER WITH FAN		EKW	2,800.0	2,100.0	1,400.0	700.0	280.0
PERCENT LOAD		%	100	75	50	25	10
ENGINE POWER		BKW	3,085	2,349	1,612	875	433
TOTAL NOX (AS NO2)		G/HR	20,380	13,146	6,755	3,705	3,901
TOTAL CO		G/HR	3,610	1,053	692	1,090	1,139
TOTAL HC		G/HR	258	272	265	232	190
TOTAL CO2		KG/HR	2,013	1,519	1,103	646	375
PART MATTER		G/HR	244.1	111.1	106.6	121.9	84.6
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,232.3	1,909.7	1,366.0	1,265.0	2,567.7
TOTAL CO	(CORR 5% O2)	MG/NM3	408.2	158.2	143.1	393.0	680.7
TOTAL HC	(CORR 5% O2)	MG/NM3	25.3	35.3	47.5	72.0	95.4
PART MATTER	(CORR 5% O2)	MG/NM3	22.9	14.0	18.8	36.9	43.7
TOTAL NOX (AS NO2)	(CORR 15% O2)	MG/NM3	828.3	708.6	506.9	469.4	952.8
TOTAL CO	(CORR 15% O2)	MG/NM3	151.5	58.7	53.1	145.8	252.6
TOTAL HC	(CORR 15% O2)	MG/NM3	9.4	13.1	17.6	26.7	35.4
PART MATTER	(CORR 15% O2)	MG/NM3	8.5	5.2	7.0	13.7	16.2
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,087	930	665	616	1,251
TOTAL CO	(CORR 5% O2)	PPM	327	127	114	314	545
TOTAL HC	(CORR 5% O2)	PPM	47	66	89	134	178
TOTAL NOX (AS NO2)	(CORR 15% O2)	PPM	403	345	247	229	464
TOTAL CO	(CORR 15% O2)	PPM	121	47	42	117	202
TOTAL HC	(CORR 15% O2)	PPM	18	24	33	50	66
TOTAL NOX (AS NO2)		G/HP-HR	4.98	4.21	3.15	3.17	6.75
TOTAL CO		G/HP-HR	0.88	0.34	0.32	0.93	1.97
TOTAL HC		G/HP-HR	0.06	0.09	0.12	0.20	0.33
PART MATTER		G/HP-HR	0.06	0.04	0.05	0.10	0.15
TOTAL NOX (AS NO2)		G/KW-HR	6.78	5.73	4.28	4.31	9.18
TOTAL CO		G/KW-HR	1.20	0.46	0.44	1.27	2.68
TOTAL HC		G/KW-HR	0.09	0.12	0.17	0.27	0.45
PART MATTER		G/KW-HR	0.08	0.05	0.07	0.14	0.20
TOTAL NOX (AS NO2)		LB/HR	44.93	28.98	14.89	8.17	8.60

PERFORMANCE DATA[EM2120]

TOTAL CO		LB/HR	7.96	2.32	1.52	2.40	2.51
TOTAL HC		LB/HR	0.57	0.60	0.58	0.51	0.42
TOTAL CO2		LB/HR	4,438	3,349	2,431	1,424	826
PART MATTER		LB/HR	0.54	0.24	0.24	0.27	0.19
OXYGEN IN EXH		%	9.5	10.7	11.6	12.4	14.3
DRY SMOKE OPACITY		%	3.5	1.7	2.0	3.3	2.4
BOSCH SMOKE NUMBER			1.18	0.58	0.66	1.13	0.81

RATED SPEED POTENTIAL SITE VARIATION: 1808 RPM

GENSET POWER WITH FAN		**EKW**	**2,800.0**	**2,100.0**	**1,400.0**	**700.0**	**280.0**
PERCENT LOAD		**%**	**100**	**75**	**50**	**25**	**10**
ENGINE POWER		**BKW**	**3,085**	**2,349**	**1,612**	**875**	**433**
TOTAL NOX (AS NO2)		G/HR	24,456	15,776	8,106	4,446	4,682
TOTAL CO		G/HR	5,054	1,475	968	1,526	1,595
TOTAL HC		G/HR	343	361	352	309	253
PART MATTER		G/HR	341.8	155.6	149.3	170.7	118.4
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,678.8	2,291.7	1,639.2	1,518.0	3,081.3
TOTAL CO	(CORR 5% O2)	MG/NM3	571.5	221.5	200.3	550.2	953.0
TOTAL HC	(CORR 5% O2)	MG/NM3	33.6	47.0	63.2	95.7	126.8
PART MATTER	(CORR 5% O2)	MG/NM3	32.1	19.6	26.3	51.7	61.2
TOTAL NOX (AS NO2)	(CORR 15% O2)	MG/NM3	994.0	850.4	608.3	563.3	1,143.4
TOTAL CO	(CORR 15% O2)	MG/NM3	212.1	82.2	74.3	204.2	353.6
TOTAL HC	(CORR 15% O2)	MG/NM3	12.5	17.4	23.5	35.5	47.1
PART MATTER	(CORR 15% O2)	MG/NM3	11.9	7.3	9.8	19.2	22.7
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,305	1,116	798	739	1,501
TOTAL CO	(CORR 5% O2)	PPM	457	177	160	440	762
TOTAL HC	(CORR 5% O2)	PPM	63	88	118	179	237
TOTAL NOX (AS NO2)	(CORR 15% O2)	PPM	484	414	296	274	557
TOTAL CO	(CORR 15% O2)	PPM	170	66	59	163	283
TOTAL HC	(CORR 15% O2)	PPM	23	33	44	66	88
TOTAL NOX (AS NO2)		G/HP-HR	5.98	5.06	3.78	3.81	8.10
TOTAL CO		G/HP-HR	1.24	0.47	0.45	1.31	2.76
TOTAL HC		G/HP-HR	0.08	0.12	0.16	0.26	0.44
PART MATTER		G/HP-HR	0.08	0.05	0.07	0.15	0.20
TOTAL NOX (AS NO2)		G/KW-HR	8.13	6.87	5.13	5.18	11.01
TOTAL CO		G/KW-HR	1.68	0.64	0.61	1.78	3.75
TOTAL HC		G/KW-HR	0.11	0.16	0.22	0.36	0.59
PART MATTER		G/KW-HR	0.11	0.07	0.09	0.20	0.28
TOTAL NOX (AS NO2)		LB/HR	53.92	34.78	17.87	9.80	10.32
TOTAL CO		LB/HR	11.14	3.25	2.13	3.37	3.52
TOTAL HC		LB/HR	0.76	0.80	0.78	0.68	0.56
PART MATTER		LB/HR	0.75	0.34	0.33	0.38	0.26

Regulatory Information

EPA EMERGENCY STATIONARY			**2011 - ----**	
GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 60 SUBPART IIII AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THE "MAX LIMITS" SHOWN BELOW ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE EMERGENCY STATIONARY REGULATIONS.				
Locality	**Agency**	**Regulation**	**Tier/Stage**	**Max Limits - G/BKW - HR**
U.S. (INCL CALIF)	EPA	STATIONARY	EMERGENCY STATIONARY	CO: 3.5 NOx + HC: 6.4 PM: 0.20

Altitude Derate Data

THE TEMPERATURES LISTED IN THE CHART ARE AMBIENT TEMPERATURES. THE FOLLOWING DERATE CHART WAS CALCULATED ASSUMING A 5 DEG C RISE IN AIR TEMPERATURE BETWEEN AMBIENT AND THE TURBOCHARGER INLET.

STANDARD

ALTITUDE CORRECTED POWER CAPABILITY (BKW)

AMBIENT	**0**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**NORMAL**

PERFORMANCE DATA[EM2120]

OPERATING TEMP (C)														
ALTITUDE (M)														
0	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,071	3,086
250	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,037	2,956	3,086
500	3,086	3,086	3,054	3,054	3,054	3,054	3,054	3,051	2,995	2,912	2,812	2,732	2,728	3,054
750	3,025	3,025	3,025	3,024	3,024	3,019	2,961	2,878	2,778	2,699	2,697	2,696	2,694	3,024
1,000	2,966	2,965	2,964	2,964	2,963	2,955	2,894	2,807	2,705	2,628	2,626	2,624	2,622	2,963
1,250	2,897	2,896	2,895	2,894	2,893	2,883	2,817	2,725	2,622	2,557	2,555	2,553	2,551	2,894
1,500	2,828	2,827	2,825	2,824	2,823	2,808	2,739	2,644	2,553	2,493	2,491	2,489	2,487	2,824
1,750	2,757	2,755	2,754	2,752	2,751	2,733	2,661	2,573	2,487	2,429	2,427	2,425	2,423	2,753
2,000	2,678	2,676	2,675	2,673	2,671	2,650	2,583	2,501	2,415	2,342	2,339	2,338	2,335	2,674
2,250	2,596	2,594	2,592	2,591	2,589	2,569	2,504	2,421	2,301	2,226	2,225	2,222	2,221	2,592
2,500	2,523	2,521	2,520	2,518	2,517	2,493	2,426	2,308	2,184	2,114	2,112	2,110	2,109	2,520
2,750	2,451	2,449	2,448	2,446	2,445	2,415	2,317	2,192	2,072	2,013	2,012	2,010	2,008	2,448
3,000	2,362	2,360	2,359	2,358	2,356	2,313	2,213	2,088	1,979	1,924	1,922	1,921	1,919	2,360
3,250	2,298	2,296	2,295	2,294	2,292	2,248	2,147	2,029	1,920	1,866	1,864	1,863	1,862	2,296
3,500	2,235	2,234	2,233	2,231	2,230	2,184	2,086	1,971	1,861	1,809	1,808	1,807	1,805	2,234
3,750	2,174	2,173	2,172	2,171	2,170	2,123	2,030	1,914	1,810	1,781	1,780	1,780	1,779	2,174
4,000	2,116	2,115	2,114	2,113	2,113	2,068	1,975	1,858	1,781	1,752	1,752	1,751	1,751	2,116
4,250	2,051	2,050	2,049	2,049	2,048	2,000	1,905	1,806	1,741	1,713	1,713	1,713	1,713	2,051
4,500	1,968	1,967	1,967	1,967	1,966	1,913	1,825	1,754	1,684	1,658	1,659	1,659	1,659	1,968

Cross Reference

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
4577279	LL1873	5272963	PG270	-	GWZ00001	

Performance Parameter Reference

Parameters Reference:DM9600-14

PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600
APPLICATION:
Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.
PERFORMANCE PARAMETER TOLERANCE FACTORS:
Power +/- 3%
Torque +/- 3%
Exhaust stack temperature +/- 8%
Inlet airflow +/- 5%
Intake manifold pressure-gage +/- 10%
Exhaust flow +/- 6%
Specific fuel consumption +/- 3%
Fuel rate +/- 5%
Specific DEF consumption +/- 3%
DEF rate +/- 5%
Heat rejection +/- 5%
Heat rejection exhaust only +/- 10%
Heat rejection CEM only +/- 10%
Heat Rejection values based on using treated water.
Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.
On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.
On 3500 and C175 engines, at speeds below Peak Torque these values are provided for reference only, and may not meet the tolerance listed.
These values do not apply to C280/3600. For these models, see the tolerances listed below.
C280/3600 HEAT REJECTION TOLERANCE FACTORS:
Heat rejection +/- 10%
Heat rejection to Atmosphere +/- 50%
Heat rejection to Lube Oil +/- 20%

Heat rejection to Aftercooler +/- 5%
TEST CELL TRANSDUCER TOLERANCE FACTORS:
Torque +/- 0.5%
Speed +/- 0.2%
Fuel flow +/- 1.0%
Temperature +/- 2.0 C degrees
Intake manifold pressure +/- 0.1 kPa
OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.
REFERENCE ATMOSPHERIC INLET AIR
FOR 3500 ENGINES AND SMALLER
SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.
FOR 3600 ENGINES
Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.
MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE
Location for air temperature measurement air cleaner inlet at stabilized operating conditions.
REFERENCE EXHAUST STACK DIAMETER
The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.
REFERENCE FUEL
DIESEL
Reference fuel is #2 distillate diesel with a 35API gravity;
A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 15 deg C (59 deg F), where the density is 850 G/Liter (7.0936 Lbs/Gal).
GAS
Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.
ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD
Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.
ALTITUDE CAPABILITY
Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.
Standard temperature values versus altitude could be seen on TM2001.
When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.
Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.
Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.
REGULATIONS AND PRODUCT COMPLIANCE
TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.
Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.
EMISSION CYCLE LIMITS:
Cycle emissions Max Limits apply to cycle-weighted averages only. Emissions at individual load points may exceed the cycle-weighted limit.
WET & DRY EXHAUST/EMISSIONS DESCRIPTION:
Wet - Total exhaust flow or concentration of total exhaust flow

PERFORMANCE DATA[EM2120]

Dry - Total exhaust flow minus water vapor or concentration of exhaust flow with water vapor excluded
EMISSIONS DEFINITIONS:
Emissions : DM1176
EMISSION CYCLE DEFINITIONS
1. For constant-speed marine engines for ship main propulsion, including,diesel-electric drive, test cycle E2 shall be applied, for controllable-pitch propeller sets
test cycle E2 shall be applied.
2. For propeller-law-operated main and propeller-law-operated auxiliary engines the test cycle E3 shall be applied.
3. For constant-speed auxiliary engines test cycle D2 shall be applied.
4. For variable-speed, variable-load auxiliary engines, not included above, test cycle C1 shall be applied.
HEAT REJECTION DEFINITIONS:
Diesel Circuit Type and HHV Balance : DM9500
HIGH DISPLACEMENT (HD) DEFINITIONS:
3500: EM1500
RATING DEFINITIONS:
Agriculture : TM6008
Fire Pump : TM6009
Generator Set : TM6035
Generator (Gas) : TM6041
Industrial Diesel : TM6010
Industrial (Gas) : TM6040
Irrigation : TM5749
Locomotive : TM6037
Marine Auxiliary : TM6036
Marine Prop (Except 3600) : TM5747
Marine Prop (3600 only) : TM5748
MSHA : TM6042
Oil Field (Petroleum) : TM6011
Off-Highway Truck : TM6039
On-Highway Truck : TM6038
SOUND DEFINITIONS:
Sound Power : DM8702
Sound Pressure : TM7080
Date Released : 10/27/21

PERFORMANCE DATA[EM2754]

September 22, 2023

Performance Number: EM2754 **Change Level: 00**

SALES MODEL:	3512B	**COMBUSTION:**	DIRECT INJECTION
BRAND:	CAT	**ENGINE SPEED (RPM):**	1,500
MACHINE SALES MODEL:		**HERTZ:**	50
ENGINE POWER (BKW):	1,500.0	**FAN POWER (KW):**	46.0
GEN POWER WITH FAN (EKW):	1,400.0	**ASPIRATION:**	TA
COMPRESSION RATIO:	15.5	**AFTERCOOLER TYPE:**	SCAC
RATING LEVEL:	MISSION CRITICAL STANDBY	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC, AC
PUMP QUANTITY:	2	**AFTERCOOLER TEMP (C):**	30
FUEL TYPE:	DIESEL	**JACKET WATER TEMP (C):**	99
MANIFOLD TYPE:	DRY	**TURBO CONFIGURATION:**	PARALLEL
GOVERNOR TYPE:	ADEM3	**TURBO QUANTITY:**	2
ELECTRONICS TYPE:	ADEM3	**TURBOCHARGER MODEL:**	GT604105B-53T-1.70
CAMSHAFT TYPE:	STANDARD	**COMBUSTION STRATEGY:**	LOW EMISSION
IGNITION TYPE:	CI	**CRANKCASE BLOWBY RATE (M3/HR):**	56.2
INJECTOR TYPE:	EUI	**FUEL RATE (RATED RPM) NO LOAD (L/HR):**	37.0
UNIT INJECTOR TIMING (MM):	64.34	**PISTON SPD @ RATED ENG SPD (M/SEC):**	10.8
REF EXH STACK DIAMETER (MM):	254		
MAX OPERATING ALTITUDE (M):	800		

INDUSTRY	SUBINDUSTRY	APPLICATION
ELECTRIC POWER	STANDARD	PACKAGED GENSET
OIL AND GAS	LAND PRODUCTION	PACKAGED GENSET

General Performance Data

THIS STANDBY RATING IS FOR A STANDBY ONLY ENGINE ARRANGEMENT. RERATING THE ENGINE TO A PRIME OR CONTINUOUS RATING IS NOT PERMITTED.

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	ISO BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	ISO VOL FUEL CONSUMPTN (VFC)
EKW	%	BKW	KPA	G/BKW-HR	G/BKW-HR	L/HR	L/HR
1,400.0	100	1,497	2,045	208.3	204.3	366.8	359.8
1,260.0	90	1,349	1,844	208.2	204.2	330.5	324.2
1,120.0	80	1,204	1,645	207.9	203.9	294.5	288.9
1,050.0	75	1,132	1,546	207.8	203.9	276.7	271.5
980.0	70	1,060	1,448	207.8	203.8	259.1	254.2
840.0	60	917	1,252	208.0	204.0	224.3	220.0
700.0	50	774	1,057	209.5	205.5	190.7	187.0
560.0	40	631	861	212.2	208.2	157.4	154.4
420.0	30	487	665	217.4	213.3	124.5	122.1
350.0	25	414	566	221.8	217.6	108.1	106.1
280.0	20	342	467	228.7	224.3	91.9	90.2
140.0	10	195	266	267.7	262.6	61.4	60.2

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
EKW	%	BKW	KPA	DEG C	DEG C	DEG C	KPA	DEG C
1,400.0	100	1,497	251.7	42.5	606.3	444.0	261	208.1
1,260.0	90	1,349	232.7	40.9	575.2	417.1	243	195.0
1,120.0	80	1,204	204.8	39.2	551.2	400.8	214	179.0
1,050.0	75	1,132	190.3	38.4	540.1	394.5	199	170.6
980.0	70	1,060	175.7	37.6	529.0	388.7	184	161.9
840.0	60	917	146.4	36.3	506.8	378.0	154	143.9
700.0	50	774	117.0	35.7	482.5	367.8	124	125.4
560.0	40	631	88.4	35.0	452.2	353.3	95	106.6
420.0	30	487	61.3	34.3	412.3	331.1	67	87.6
350.0	25	414	49.0	33.9	386.0	314.1	54	78.0
280.0	20	342	37.6	33.6	355.8	293.8	43	68.3
140.0	10	195	20.3	33.0	282.3	242.3	25	53.3

General Performance Data (Continued)

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	ENGINE OUTLET WET EXH VOL	ENGINE OUTLET DRY EXH VOL

PERFORMANCE DATA[EM2754]

September 22, 2023

				FLOW RATE			FLOW RATE (0 DEG C AND 101 KPA)	FLOW RATE (0 DEG C AND 101 KPA)
EKW	%	BKW	M3/MIN	M3/MIN	KG/HR	KG/HR	M3/MIN	M3/MIN
1,400.0	100	1,497	128.1	323.0	9,076.0	9,387.8	123.0	111.7
1,260.0	90	1,349	122.6	296.6	8,016.3	8,297.2	117.4	106.6
1,120.0	80	1,204	113.7	268.2	7,075.5	7,325.9	108.7	98.7
1,050.0	75	1,132	108.8	253.9	6,635.2	6,870.4	103.9	94.4
980.0	70	1,060	103.6	239.7	6,209.4	6,429.7	98.9	89.8
840.0	60	917	92.8	211.5	5,390.9	5,581.6	88.7	80.6
700.0	50	774	81.6	183.3	4,599.2	4,761.3	78.1	70.9
560.0	40	631	70.7	155.4	3,811.0	3,944.7	67.7	61.5
420.0	30	487	60.5	127.9	3,027.8	3,133.7	57.8	52.5
350.0	25	414	55.8	114.6	2,640.8	2,732.7	53.3	48.4
280.0	20	342	51.5	101.7	2,259.3	2,337.5	49.0	44.5
140.0	10	195	45.1	80.4	1,628.4	1,680.5	42.6	38.7

Heat Rejection Data

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXH RECOVERY TO 177C	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BKW	KW	KW	KW	KW	KW	KW	KW	KW	KW
1,400.0	100	1,497	514	121	1,383	715	185	417	1,497	3,691	3,932
1,260.0	90	1,349	479	114	1,238	611	167	366	1,349	3,328	3,545
1,120.0	80	1,204	443	107	1,099	526	149	314	1,204	2,973	3,167
1,050.0	75	1,132	425	104	1,031	488	140	288	1,132	2,797	2,980
980.0	70	1,060	406	101	964	451	131	262	1,060	2,622	2,793
840.0	60	917	368	95.0	834	383	113	211	917	2,276	2,424
700.0	50	774	328	89.0	708	319	96.0	161	774	1,934	2,060
560.0	40	631	286	83.0	586	255	79.5	115	631	1,597	1,701
420.0	30	487	243	77.0	468	189	63.0	73.9	487	1,266	1,348
350.0	25	414	220	74.0	410	154	54.5	56.4	414	1,104	1,176
280.0	20	342	197	71.0	354	120	46.0	41.0	342	944	1,005
140.0	10	195	148	65.0	244	58.1	31.0	19.0	195	631	672

Sound Data

EXHAUST:SOUND PRESSURE(OBCF) DISTANCE:1.5 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	63 HZ	125 HZ	250 HZ	500 HZ
EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1,400.0	100	1,497	116.0	110.0	121.0	116.0	109.0
1,260.0	90	1,349	115.0	109.0	120.0	115.0	108.0
1,120.0	80	1,204	114.0	108.0	119.0	114.0	107.0
1,050.0	75	1,132	113.0	108.0	118.0	114.0	106.0
980.0	70	1,060	113.0	107.0	118.0	113.0	106.0
840.0	60	917	112.0	106.0	117.0	112.0	105.0
700.0	50	774	111.0	105.0	116.0	111.0	104.0
560.0	40	631	109.0	104.0	114.0	110.0	102.0
420.0	30	487	108.0	102.0	113.0	108.0	101.0
350.0	25	414	107.0	102.0	112.0	107.0	100.0
280.0	20	342	106.0	101.0	111.0	107.0	99.0
140.0	10	195	104.0	99.0	109.0	104.0	97.0

EXHAUST:SOUND PRESSURE(OBCF) DISTANCE:1.5 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	2000 HZ	4000 HZ	8000 HZ
EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)
1,400.0	100	1,497	107.0	109.0	109.0	106.0
1,260.0	90	1,349	106.0	108.0	108.0	105.0

1,120.0	80	1,204	105.0	107.0	107.0	104.0
1,050.0	75	1,132	105.0	106.0	107.0	104.0
980.0	70	1,060	104.0	106.0	106.0	103.0
840.0	60	917	103.0	105.0	105.0	102.0
700.0	50	774	102.0	104.0	104.0	101.0
560.0	40	631	101.0	102.0	103.0	100.0
420.0	30	487	99.0	101.0	101.0	98.0
350.0	25	414	98.0	100.0	101.0	97.0
280.0	20	342	98.0	99.0	100.0	97.0
140.0	10	195	95.0	97.0	98.0	94.0

EXHAUST:SOUND PRESSURE(OBCF) DISTANCE:7 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	63 HZ	125 HZ	250 HZ	500 HZ
EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1,400.0	100	1,497	102.0	99.0	110.0	104.0	95.0
1,260.0	90	1,349	101.0	98.0	109.0	103.0	94.0
1,120.0	80	1,204	100.0	97.0	108.0	102.0	93.0
1,050.0	75	1,132	100.0	97.0	107.0	101.0	92.0
980.0	70	1,060	99.0	96.0	107.0	101.0	92.0
840.0	60	917	98.0	95.0	106.0	100.0	91.0
700.0	50	774	97.0	94.0	105.0	99.0	90.0
560.0	40	631	96.0	93.0	103.0	97.0	88.0
420.0	30	487	94.0	91.0	102.0	96.0	87.0
350.0	25	414	94.0	90.0	101.0	95.0	86.0
280.0	20	342	93.0	89.0	100.0	94.0	85.0
140.0	10	195	91.0	87.0	98.0	92.0	83.0

EXHAUST:SOUND PRESSURE(OBCF) DISTANCE:7 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	2000 HZ	4000 HZ	8000 HZ
EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)
1,400.0	100	1,497	94.0	95.0	96.0	91.0
1,260.0	90	1,349	93.0	95.0	95.0	90.0
1,120.0	80	1,204	92.0	94.0	94.0	89.0
1,050.0	75	1,132	92.0	93.0	94.0	89.0
980.0	70	1,060	91.0	93.0	93.0	88.0
840.0	60	917	90.0	91.0	92.0	87.0
700.0	50	774	89.0	90.0	91.0	86.0
560.0	40	631	88.0	89.0	90.0	85.0
420.0	30	487	86.0	87.0	88.0	83.0
350.0	25	414	86.0	87.0	87.0	83.0
280.0	20	342	85.0	86.0	86.0	82.0
140.0	10	195	83.0	84.0	84.0	80.0

EXHAUST:SOUND PRESSURE(OBCF) DISTANCE:15 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	63 HZ	125 HZ	250 HZ	500 HZ
EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1,400.0	100	1,497	96.0	92.0	103.0	97.0	88.0
1,260.0	90	1,349	95.0	92.0	102.0	96.0	87.0
1,120.0	80	1,204	94.0	91.0	101.0	95.0	86.0
1,050.0	75	1,132	93.0	90.0	101.0	95.0	86.0
980.0	70	1,060	93.0	90.0	100.0	94.0	85.0
840.0	60	917	92.0	88.0	99.0	93.0	84.0
700.0	50	774	91.0	87.0	98.0	92.0	83.0
560.0	40	631	89.0	86.0	97.0	91.0	82.0
420.0	30	487	88.0	84.0	95.0	89.0	80.0
350.0	25	414	87.0	84.0	94.0	88.0	79.0
280.0	20	342	86.0	83.0	94.0	88.0	79.0
140.0	10	195	84.0	81.0	91.0	85.0	76.0

EXHAUST:SOUND PRESSURE(OBCF) DISTANCE:15 METER

PERFORMANCE DATA[EM2754]

September 22, 2023

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	2000 HZ	4000 HZ	8000 HZ
EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)
1,400.0	100	1,497	88.0	89.0	89.0	85.0
1,260.0	90	1,349	87.0	88.0	89.0	84.0
1,120.0	80	1,204	86.0	87.0	88.0	83.0
1,050.0	75	1,132	85.0	86.0	87.0	82.0
980.0	70	1,060	85.0	86.0	87.0	82.0
840.0	60	917	84.0	85.0	85.0	81.0
700.0	50	774	83.0	84.0	84.0	80.0
560.0	40	631	81.0	82.0	83.0	78.0
420.0	30	487	80.0	81.0	81.0	77.0
350.0	25	414	79.0	80.0	81.0	76.0
280.0	20	342	78.0	79.0	80.0	75.0
140.0	10	195	76.0	77.0	78.0	73.0

MECHANICAL:SOUND PRESSURE(OBCF) DISTANCE:1 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	63 HZ	125 HZ	250 HZ	500 HZ
EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1,400.0	100	1,497	102.0	94.0	98.0	97.0	94.0
1,260.0	90	1,349	102.0	94.0	98.0	97.0	94.0
1,120.0	80	1,204	102.0	94.0	98.0	97.0	94.0
1,050.0	75	1,132	102.0	94.0	98.0	97.0	94.0
980.0	70	1,060	102.0	94.0	98.0	97.0	94.0
840.0	60	917	102.0	94.0	98.0	97.0	94.0
700.0	50	774	102.0	94.0	98.0	97.0	94.0
560.0	40	631	102.0	94.0	98.0	97.0	94.0
420.0	30	487	102.0	94.0	98.0	97.0	94.0
350.0	25	414	102.0	94.0	98.0	97.0	94.0
280.0	20	342	102.0	94.0	98.0	97.0	94.0
140.0	10	195	102.0	94.0	98.0	97.0	94.0

MECHANICAL:SOUND PRESSURE(OBCF) DISTANCE:1 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	2000 HZ	4000 HZ	8000 HZ
EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)
1,400.0	100	1,497	97.0	97.0	95.0	99.0
1,260.0	90	1,349	97.0	97.0	95.0	99.0
1,120.0	80	1,204	97.0	97.0	95.0	99.0
1,050.0	75	1,132	97.0	97.0	95.0	99.0
980.0	70	1,060	97.0	97.0	95.0	99.0
840.0	60	917	97.0	97.0	95.0	99.0
700.0	50	774	97.0	97.0	95.0	99.0
560.0	40	631	97.0	97.0	95.0	99.0
420.0	30	487	97.0	97.0	95.0	99.0
350.0	25	414	97.0	97.0	95.0	99.0
280.0	20	342	97.0	97.0	95.0	99.0
140.0	10	195	97.0	97.0	95.0	99.0

MECHANICAL:SOUND PRESSURE(OBCF) DISTANCE:7 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	63 HZ	125 HZ	250 HZ	500 HZ
EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1,400.0	100	1,497	90.0	82.0	86.0	85.0	82.0
1,260.0	90	1,349	90.0	82.0	86.0	85.0	82.0
1,120.0	80	1,204	90.0	82.0	86.0	85.0	82.0
1,050.0	75	1,132	90.0	82.0	86.0	85.0	82.0
980.0	70	1,060	90.0	82.0	86.0	85.0	82.0
840.0	60	917	90.0	82.0	86.0	85.0	82.0
700.0	50	774	90.0	82.0	86.0	85.0	82.0
560.0	40	631	90.0	82.0	86.0	85.0	82.0
420.0	30	487	90.0	82.0	86.0	85.0	82.0
350.0	25	414	90.0	82.0	86.0	85.0	82.0
280.0	20	342	90.0	82.0	86.0	85.0	82.0
140.0	10	195	90.0	82.0	86.0	85.0	82.0

MECHANICAL:SOUND PRESSURE(OBCF) DISTANCE:7 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	2000 HZ	4000 HZ	8000 HZ
EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)
1,400.0	100	1,497	85.0	85.0	83.0	87.0
1,260.0	90	1,349	85.0	85.0	83.0	87.0
1,120.0	80	1,204	85.0	85.0	83.0	87.0
1,050.0	75	1,132	85.0	85.0	83.0	87.0
980.0	70	1,060	85.0	85.0	83.0	87.0
840.0	60	917	85.0	85.0	83.0	87.0
700.0	50	774	85.0	85.0	83.0	87.0
560.0	40	631	85.0	85.0	83.0	87.0
420.0	30	487	85.0	85.0	83.0	87.0
350.0	25	414	85.0	85.0	83.0	87.0
280.0	20	342	85.0	85.0	83.0	87.0
140.0	10	195	85.0	85.0	83.0	87.0

MECHANICAL:SOUND PRESSURE(OBCF) DISTANCE:15 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	63 HZ	125 HZ	250 HZ	500 HZ
EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1,400.0	100	1,497	85.0	76.0	80.0	79.0	76.0
1,260.0	90	1,349	85.0	76.0	80.0	79.0	76.0
1,120.0	80	1,204	85.0	76.0	80.0	79.0	76.0
1,050.0	75	1,132	85.0	76.0	80.0	79.0	76.0
980.0	70	1,060	85.0	76.0	80.0	79.0	76.0
840.0	60	917	85.0	76.0	80.0	79.0	76.0
700.0	50	774	85.0	76.0	80.0	79.0	76.0
560.0	40	631	85.0	76.0	80.0	79.0	76.0
420.0	30	487	85.0	76.0	80.0	79.0	76.0
350.0	25	414	85.0	76.0	80.0	79.0	76.0
280.0	20	342	85.0	76.0	80.0	79.0	76.0
140.0	10	195	85.0	76.0	80.0	79.0	76.0

MECHANICAL:SOUND PRESSURE(OBCF) DISTANCE:15 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	2000 HZ	4000 HZ	8000 HZ
EKW	%	BKW	dB(A)	dB(A)	dB(A)	dB(A)
1,400.0	100	1,497	79.0	80.0	78.0	81.0
1,260.0	90	1,349	79.0	80.0	78.0	81.0
1,120.0	80	1,204	79.0	80.0	78.0	81.0
1,050.0	75	1,132	79.0	80.0	78.0	81.0
980.0	70	1,060	79.0	80.0	78.0	81.0
840.0	60	917	79.0	80.0	78.0	81.0
700.0	50	774	79.0	80.0	78.0	81.0
560.0	40	631	79.0	80.0	78.0	81.0
420.0	30	487	79.0	80.0	78.0	81.0
350.0	25	414	79.0	80.0	78.0	81.0
280.0	20	342	79.0	80.0	78.0	81.0
140.0	10	195	79.0	80.0	78.0	81.0

Emissions Data

DIESEL

RATED SPEED NOMINAL DATA: 1500 RPM

GENSET POWER WITH FAN	EKW	1,400.0	1,050.0	700.0	350.0	140.0
PERCENT LOAD	%	100	75	50	25	10

PERFORMANCE DATA[EM2754]

ENGINE POWER		BKW	1,497	1,132	774	414	195
TOTAL NOX (AS NO2)		G/HR	7,308	4,994	3,438	2,152	1,442
TOTAL CO		G/HR	1,359	1,245	1,113	533	571
TOTAL HC		G/HR	310	247	196	156	164
TOTAL CO2		KG/HR	989	745	513	291	165
PART MATTER		G/HR	132.7	119.2	135.5	98.1	78.0
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	1,709.3	1,545.6	1,555.0	1,717.1	2,016.5
TOTAL CO	(CORR 5% O2)	MG/NM3	317.9	385.4	503.5	425.6	798.4
TOTAL HC	(CORR 5% O2)	MG/NM3	72.5	76.5	88.5	124.7	229.4
PART MATTER	(CORR 5% O2)	MG/NM3	31.0	36.9	61.3	78.2	109.1
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	832	756	758	826	978
TOTAL CO	(CORR 5% O2)	PPM	254	324	391	346	651
TOTAL HC	(CORR 5% O2)	PPM	117	122	143	200	374
TOTAL NOX (AS NO2)		G/HP-HR	3.64	3.29	3.31	3.87	5.52
TOTAL CO		G/HP-HR	0.68	0.82	1.07	0.96	2.18
TOTAL HC		G/HP-HR	0.15	0.16	0.19	0.28	0.63
PART MATTER		G/HP-HR	0.07	0.08	0.13	0.18	0.30
TOTAL NOX (AS NO2)		LB/HR	16.11	11.01	7.58	4.74	3.18
TOTAL CO		LB/HR	3.00	2.74	2.45	1.18	1.26
TOTAL HC		LB/HR	0.68	0.54	0.43	0.34	0.36
TOTAL CO2		LB/HR	2,181	1,643	1,131	640	363
PART MATTER		LB/HR	0.29	0.26	0.30	0.22	0.17
OXYGEN IN EXH		%	10.8	11.9	12.8	14.2	16.2
DRY SMOKE OPACITY		%	2.5	2.6	3.8	3.7	3.1
BOSCH SMOKE NUMBER			0.90	0.95	1.40	1.36	1.15

RATED SPEED POTENTIAL SITE VARIATION: 1500 RPM

GENSET POWER WITH FAN		EKW	1,400.0	1,050.0	700.0	350.0	140.0
PERCENT LOAD		%	100	75	50	25	10
ENGINE POWER		BKW	1,497	1,132	774	414	195
TOTAL NOX (AS NO2)		G/HR	8,769	5,993	4,125	2,582	1,730
TOTAL CO		G/HR	2,446	2,241	2,003	959	1,027
TOTAL HC		G/HR	412	329	261	207	218
PART MATTER		G/HR	185.8	166.9	189.7	137.3	109.2
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,051.1	1,854.7	1,866.0	2,060.5	2,419.9
TOTAL CO	(CORR 5% O2)	MG/NM3	572.2	693.7	906.3	766.1	1,437.2
TOTAL HC	(CORR 5% O2)	MG/NM3	96.4	101.7	117.7	165.8	305.1
PART MATTER	(CORR 5% O2)	MG/NM3	43.4	51.7	85.8	109.5	152.8
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	998	907	910	991	1,173
TOTAL CO	(CORR 5% O2)	PPM	457	583	704	623	1,172
TOTAL HC	(CORR 5% O2)	PPM	156	162	190	266	497
TOTAL NOX (AS NO2)		G/HP-HR	4.37	3.95	3.98	4.65	6.62
TOTAL CO		G/HP-HR	1.22	1.48	1.93	1.73	3.93
TOTAL HC		G/HP-HR	0.21	0.22	0.25	0.37	0.83
PART MATTER		G/HP-HR	0.09	0.11	0.18	0.25	0.42
TOTAL NOX (AS NO2)		LB/HR	19.33	13.21	9.09	5.69	3.81
TOTAL CO		LB/HR	5.39	4.94	4.42	2.12	2.26
TOTAL HC		LB/HR	0.91	0.72	0.57	0.46	0.48
PART MATTER		LB/HR	0.41	0.37	0.42	0.30	0.24

Regulatory Information

NON-CERTIFIED	1970 - 2100
THIS ENGINE RATING IS NOT EMISSIONS CERTIFIED BY ANY DOMESTIC OR FOREIGN AGENCY.	

Altitude Derate Data

STANDARD

ALTITUDE CORRECTED POWER CAPABILITY (BKW)

PERFORMANCE DATA[EM2754]

September 22, 2023

AMBIENT OPERATING TEMP (C)	0	5	10	15	20	25	30	35	40	45	50	55	60	NORMAL
ALTITUDE (M)														
0	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,479	1,500
250	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,480	1,457	1,435	1,500
500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,482	1,459	1,436	1,414	1,393	1,500
750	1,500	1,500	1,500	1,500	1,500	1,500	1,485	1,461	1,438	1,415	1,393	1,372	1,352	1,500
1,000	1,466	1,466	1,466	1,466	1,466	1,465	1,441	1,418	1,395	1,373	1,352	1,331	1,311	1,466
1,250	1,424	1,424	1,424	1,424	1,424	1,421	1,398	1,375	1,353	1,332	1,311	1,291	1,272	1,424
1,500	1,384	1,384	1,384	1,384	1,384	1,379	1,356	1,334	1,312	1,292	1,272	1,253	1,234	1,384
1,750	1,344	1,344	1,344	1,344	1,344	1,337	1,315	1,293	1,273	1,253	1,233	1,215	1,196	1,344
2,000	1,306	1,306	1,306	1,306	1,306	1,296	1,275	1,254	1,234	1,214	1,196	1,177	1,160	1,306
2,250	1,270	1,270	1,270	1,270	1,270	1,256	1,235	1,215	1,196	1,177	1,159	1,141	1,124	1,270
2,500	1,234	1,234	1,234	1,234	1,234	1,217	1,197	1,178	1,159	1,141	1,123	1,106	1,090	1,234
2,750	1,199	1,199	1,199	1,199	1,199	1,180	1,160	1,141	1,123	1,106	1,088	1,072	1,056	1,199
3,000	1,166	1,166	1,166	1,166	1,162	1,143	1,124	1,106	1,088	1,071	1,054	1,038	1,023	1,166
3,250	1,133	1,133	1,133	1,133	1,126	1,107	1,089	1,071	1,054	1,037	1,021	1,006	991	1,133
3,500	1,102	1,102	1,102	1,102	1,090	1,072	1,054	1,037	1,021	1,005	989	974	930	1,102
3,750	1,072	1,072	1,072	1,072	1,056	1,038	1,021	1,004	988	973	958	915	855	1,072
4,000	1,042	1,042	1,042	1,040	1,022	1,005	988	972	957	942	885	840	780	1,042
4,250	1,014	1,014	1,014	1,006	989	972	956	941	926	870	825	765	720	1,014
4,500	986	986	986	974	957	941	925	910	855	810	750	705	660	986

Cross Reference

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
4581926	GG1410	4869926	GS655	XJ	DB900001	
5643575	GG1557	5331486	PG278	DK	TNP00001	
5643734	GG1943	5331486	PG278	DK	TZX00001	
5643575	GG1598	5331488	PG278	DK	TNP00001	
5643734	GG1958	5331488	PG278	DK	TZX00001	
4581914	GG1402	5390555	PG241	-	LY900001	

Supplementary Data

Type	Classification	Performance Number
SOUND	SOUND PRESSURE	DM8779
AFTERCOOLER TEMP	60C	EM2755
AFTERCOOLER TEMP	90C	EM2756

General Notes

General Notes EM2754 - 00
SOUND PRESSURE DATA FOR THIS RATING CAN BE FOUND IN PERFORMANCE NUMBER - DM8779

Performance Parameter Reference

Parameters Reference:DM9600-14

PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600
APPLICATION:
Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in

part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.

PERFORMANCE PARAMETER TOLERANCE FACTORS:

Power +/- 3%
Torque +/- 3%
Exhaust stack temperature +/- 8%
Inlet airflow +/- 5%
Intake manifold pressure-gage +/- 10%
Exhaust flow +/- 6%
Specific fuel consumption +/- 3%
Fuel rate +/- 5%
Specific DEF consumption +/- 3%
DEF rate +/- 5%
Heat rejection +/- 5%
Heat rejection exhaust only +/- 10%
Heat rejection CEM only +/- 10%

Heat Rejection values based on using treated water.

Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.

On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.

On 3500 and C175 engines, at speeds below Peak Torque these values are provided for reference only, and may not meet the tolerance listed.

These values do not apply to C280/3600. For these models, see the tolerances listed below.

C280/3600 HEAT REJECTION TOLERANCE FACTORS:

Heat rejection +/- 10%
Heat rejection to Atmosphere +/- 50%
Heat rejection to Lube Oil +/- 20%
Heat rejection to Aftercooler +/- 5%

TEST CELL TRANSDUCER TOLERANCE FACTORS:

Torque +/- 0.5%
Speed +/- 0.2%
Fuel flow +/- 1.0%
Temperature +/- 2.0 C degrees
Intake manifold pressure +/- 0.1 kPa

OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.

REFERENCE ATMOSPHERIC INLET AIR

FOR 3500 ENGINES AND SMALLER

SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.

FOR 3600 ENGINES

Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE

Location for air temperature measurement air cleaner inlet at stabilized operating conditions.

REFERENCE EXHAUST STACK DIAMETER

The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.

REFERENCE FUEL

DIESEL

Reference fuel is #2 distillate diesel with a 35API gravity;
A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 15 deg C (59 deg F), where the density is 850 G/Liter (7.0936 Lbs/Gal).

GAS

Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.

ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD

Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.

ALTITUDE CAPABILITY

PERFORMANCE DATA[EM2754]

Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.
Standard temperature values versus altitude could be seen on TM2001.
When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.
Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.
Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.
REGULATIONS AND PRODUCT COMPLIANCE
TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.
Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.
EMISSION CYCLE LIMITS:
Cycle emissions Max Limits apply to cycle-weighted averages only. Emissions at individual load points may exceed the cycle-weighted limit.
WET & DRY EXHAUST/EMISSIONS DESCRIPTION:
Wet - Total exhaust flow or concentration of total exhaust flow
Dry - Total exhaust flow minus water vapor or concentration of exhaust flow with water vapor excluded
EMISSIONS DEFINITIONS:
Emissions : DM1176
EMISSION CYCLE DEFINITIONS
1. For constant-speed marine engines for ship main propulsion, including,diesel-electric drive, test cycle E2 shall be applied, for controllable-pitch propeller sets
test cycle E2 shall be applied.
2. For propeller-law-operated main and propeller-law-operated auxiliary engines the test cycle E3 shall be applied.
3. For constant-speed auxiliary engines test cycle D2 shall be applied.
4. For variable-speed, variable-load auxiliary engines, not included above, test cycle C1 shall be applied.
HEAT REJECTION DEFINITIONS:
Diesel Circuit Type and HHV Balance : DM9500
HIGH DISPLACEMENT (HD) DEFINITIONS:
3500: EM1500
RATING DEFINITIONS:
Agriculture : TM6008
Fire Pump : TM6009
Generator Set : TM6035
Generator (Gas) : TM6041
Industrial Diesel : TM6010
Industrial (Gas) : TM6040
Irrigation : TM5749
Locomotive : TM6037
Marine Auxiliary : TM6036
Marine Prop (Except 3600) : TM5747
Marine Prop (3600 only) : TM5748
MSHA : TM6042
Oil Field (Petroleum) : TM6011
Off-Highway Truck : TM6039
On-Highway Truck : TM6038
SOUND DEFINITIONS:
Sound Power : DM8702
Sound Pressure : TM7080
Date Released : 10/27/21