Grimsby Power Station

Environmental Permit Variation Application
Main Supporting Document

The Environmental Permitting (England and Wales) Regulations 2016

Applicant: RWE Generation UK PLC

EPR/WP3036QH/V002

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Quality information

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1. Non-Technical Summary

This document presents the supporting information for an application made by RWE Generation UK PLC ('RWE'), to vary the Environmental Permit for Grimsby Power Station ('the Installation') (EPR/WP3036QH/V002) located to the northwest of Grimsby, the location of which is illustrated in Figure 1 (Appendix A). The variation application is being submitted to add a new Schedule 1, Part A combustion activity to the Environmental Permit, as advised in pre-application discussions with the Environment Agency (Reference: EPR/WP3036QH/V003).

The Installation is regulated under an existing Environmental Permit to operate 10 x 4.8 MW net thermal input (MW_{th}) natural gas fired engines with an aggregated net thermal input of 48 MW_{th}, operating for up to 1,500 hours per annum. This existing Medium Combustion Plant is herein referred to as 'Grimsby A'.

This Environmental Permit variation is being requested to add an additional four 9.9 MW_{th} gas fired engines and one 6.1 MW_{th} gas fired engine (i.e. a total additional net thermal input of 45.75 MW_{th}). This new plant is collectively referenced herein as 'Grimsby B'. Grimsby A and Grimsby B will form a single Installation but will be able to operate completely independently of one another with Grimsby B also operating for up to 1,500 hours per annum.

Both the Grimsby A and Grimsby B gas engines will be housed within individual containers, as shown in Figure 2 of Appendix A to this document.

The addition of the new Grimsby B gas fired engines will result in the overall net thermal input for the Grimsby Power Station increasing to 93.75 $MW_{th.}$ As a result of this increase in net thermal input to >50MW_{th}, the Grimsby Power Station will require an Environmental Permit variation to operate as a Part A(1) combustion activity for the Burning of any fuel in an appliance with a rated thermal input of 50 or more megawatts as defined under Schedule 1, Part 2, Section 1.1 Part A(1) of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) ('EP Regulations').

The proposed revised Installation Boundary is illustrated in Figure 3 (Appendix A).

The existing Grimsby A gas engines have an electrical export capacity of up to 20 MW_e with the Grimsby B gas engines adding a further 20 MW_e electrical export capacity to the Site. Both Grimsby A and Grimsby B will operate as peaking plants to supply electricity to the National Grid during periods of peak demand. Peaking plants are generating plants that are operated at short notice when the National Grid rapidly requires additional electricity supply, during periods of high demand or when existing supplies onto the grid cease to generate. Reciprocating engines have been selected as the optimum technology for use at Grimsby B, due to the ability of such engines to be fast response units, essential for peaking plant duties.

Both Grimsby A and Grimsby B have associated raw lubricating oil and waste lubricating oil storage facilities. The existing Grimsby A raw lubricating oil and waste lubricating oil storage tanks are located to the north east of the Grimsby A generators. The Grimsby B raw lubricating oil and waste lubricating oil storage tanks will be installed on land to the south Grimsby B generators. Grimsby B will introduce five new 12.5 m high single-flue stacks (one per gas engine), which have been designated as Emission Points A11 to A15.

The Grimsby B site area will be gravel surfaced in keeping with the existing site surfacing for Grimsby A.

The Grimsby A plant was granted planning permission in December 2016, under application number DM/0104/16/FUL, with the scheme layout subsequently amended under a Section 73 application, to include for a configuration of a single row of 10 containerised generator sets, each with a generating capacity of 2 MW_e, resulting in a total capacity of 20 MW_e. Grimsby A is currently operational.

Planning permission for the Grimsby B site area (Ref: DM/0491/18/FUL) to add an additional 10 x 4.8 MW_{th} natural gas fired engines was previously granted, but the planning permission expired on the 29th June 2020. RWE are preparing to submit a new planning application for Grimsby B, (Ref: DM/0561/22/FUL) which will be made to the Local Authority, North East Lincolnshire Council (NELC), and is for the revised 5 generator layout. The planning application is not subject to an Environmental Impact Assessment (EIA) under Council Directive 85/337/EEC of 27 June 1985.

An air quality assessment, including detailed air dispersion modelling, has been undertaken and has included consideration of the emissions from both Grimsby A and Grimsby B plant. The modelling assessed the impact of pollutants emitted from the natural gas-fired engines namely oxides of nitrogen (NO_x as NO_2). While the two sites

will operate independently of one another, both Grimsby A and Grimsby B can operate concurrently dependent on National Grid demand for additional generating capacity. The air quality assessment demonstrates that Grimsby B is predicted to have no likely significant adverse effects on human health and sensitive ecosystems, either alone or in-combination with Grimsby A.

Modelled short-term nitrogen dioxide (NO_2) Process Contributions (PCs) are predicted to exceed 10% of the National Air Quality Strategy (NAQS) objective at Receptor R1 which represents the coastal footpath closest to the Site, however, the Predicted Environmental Concentration (PEC) is well below the NAQS at all modelled receptor locations. The maximum PC at the closest residential receptor (Receptor R3) is predicted to be less than 10% of the NAQS, and can, therefore, be screened as insignificant. Likewise, annual PCs are predicted to be less than 1% of the NAQS and, as such can also be screened as insignificant.

The modelling has also shown that maximum modelled NO_x ground level concentrations are insignificant at all but one ecological receptor, the Humber Estuary. Impacts at the Humber Estuary occur over a small area of mudflats which will contain little vegetation and given the inter-tidal nature of the estuary will have limited exposure to atmospheric NO_x. PECs are predicted to be below applicable critical levels.

An assessment of the potential noise generated by the Site was undertaking to support the revised planning application. The noise assessment determines that the Site would have a negative assessment level applicable at each receptor position with noise generation below the monitored background noise level and below that of the former Grimsby Power Station Combined Heat and Power (CHP) plant which the Grimsby A and, subsequent Grimsby B generators replace. The assessment therefore concludes that the operational sound from the Site would provide a negligible adverse impact. The assessment also concludes that the operational sound level range across the Humber Estuary, will be well within the 65dB(A) threshold level for the significance of noise impact on bird populations.

Both the Grimsby A and Grimsby B will utilise air-cooled cooling systems with closed-circuit cooling water loops, therefore the potential for visible plume emissions is considered to be negligible.

Due to the inherent nature of the proposed technology (gas engines) and the fuel employed, the likelihood of the generation of process wastewater is minimal. Therefore, no discharge of process water to controlled waters is proposed from the Site.

It is expected that water usage for the Site will be minimal, and limited to the intermittent replacement or replenishment of water within the cooling water circuits serving the generators. Any contaminated process effluent generated on Site, e.g. from maintenance activities, will be transferred to and stored in a dedicated temporary tank during maintenance work, prior to being taken off-site by licenced contractors for appropriate disposal.

The Site does not have an associated fuel storage area, due to the nature of the fuel (natural gas); with both Grimsby A and Grimsby B connecting to the existing site infrastructure which receives natural gas from the National Grid Transmission (NGT) gas network.

Due to the inherent nature of natural gas which will fuel the gas engines, there will be no residue following its combustion. Consequently, the Site is expected to produce insignificant quantities of process waste. There may be small quantities of waste generated from maintenance and welfare activities, which will be stored, managed and disposed of appropriately.

The key process waste is anticipated to be waste lubricating oil, which will be stored in dedicated above ground tanks, one serving Grimsby A and the second serving Grimsby B. Likewise, each site has a separate above ground tank for raw material storage, i.e. clean lubricating oil. The clean and waste bulk oil storage tanks are designed and fabricated to BS799-5, in accordance with CIRIA C736 paragraph 9.2.5, within a fabricated bunded area to hold at least 110% of storage tank capacity. All four tanks have a storage capacity of up to 5,000 litres each and will be located on concrete hardstanding overlain with gravel. There will be a dedicated area for each site for the delivery of clean lubricating oil and for removing used lubricating oil, however, the location and spill protection of each loading/unloading area is still to be determined. Each tank will have internal drip trays and bund alarms fitted. In addition, spill kits will be available on site and on the tanker.

The Installation will be operated in line with the RWE existing ISO14001:2015 accredited Environmental Management System (EMS) (certificate of conformity provided in Appendix C) including operating procedures to manage the various aspects of the operation of both Grimsby A and Grimsby B, including but not limited to emissions monitoring, accident management, waste minimisation and management, and infrastructure maintenance.

It should be noted that the Site design and layout is still under development and some elements are still to be finalised and these are highlighted in the document.

2. Introduction

This document presents the supporting information for an application made by RWE Generation UK PLC ('RWE'), to vary the Environmental Permit for Grimsby Power Station ('the Installation') (EPR/WP3036QH/V002), in Grimsby, Northeast Lincolnshire, the location of which is illustrated in Figure 1 (Appendix A). The variation application is being requested to add a new Schedule 1, Part A(1) combustion activity to the Environmental Permit, as advised in pre-application discussions with the Environment Agency (EPR/WP3036QH/V003).

The existing Environmental Permit covers the operation of the existing 10 x 4.8 MW thermal input (MW_{th}) natural gas fired engines (Emission Points A1 to A10 and referenced herein as 'Grimsby A') giving an aggregated net thermal input of 48 MW_{th}. The existing Environmental Permit allows Grimsby A to operate for up to 1,500 hours per year. As a combustion plant having a gross thermal input of <50 MW_{th}, the operation of Grimsby A is permitted as a Medium Combustion Plant under Schedules 25A and 25B of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) ('the EP Regulations'). A 70 kVa generator associated internally bunded 1,200 litre diesel tank is present on the western part of the Grimsby A site, located on gravel.

This Environmental Permit variation adds four 9.9 MW_{th} and one 6.1 MW_{th} (total net thermal input of 45.75 MW_{th}) natural gas fired engines (referenced herein as 'Grimsby B') to the Installation. Grimsby B will be located on land to the east of the existing Grimsby A plant, Gate 3, Moody Lane, Grimsby and is on land outside of the existing Permit Installation Boundary. The Grimsby B plant is intended to be operated as a peaking electrical power generation plant and will operate for up to 1,500 hours per year.

The addition of the new Grimsby B gas fired engines will result in the overall net thermal input for the Grimsby Power Station increasing to 93.75 MW_{th}. As a result of this increase in net thermal input to >50MW_{th}, the Grimsby Power Station will require an Environmental Permit variation to operate as a Part A(1) combustion activity for the Burning of any fuel in an appliance with a rated thermal input of 50 or more megawatts as defined under Schedule 1, Part 2, Section 1.1 Part A(1) of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) ('EP Regulations').

The variation application is being made under the EP Regulations, and is being submitted in parallel with a planning application for Grimsby B (DM/0561/22/FUL) to North East Lincolnshire Council (NELC).

2.1 Background

The existing Grimsby Power Station Installation is regulated by the Environment Agency (EA) under Environmental Permit number EPR/WP3036QH (dated 30/04/2019).

The Grimsby B is proposed to be installed on approximately 0.18 ha of land to the east of the current Grimsby A plant area on an area of existing hardstanding. The Installation Boundary for the Site will, therefore, need to be extended to encompass the land areas proposed to accommodate Grimsby B. The existing Grimsby A and Grimsby B land areas are shown in Figure 2 (Appendix A), with the new proposed Installation Boundary shown in Figure 3 (Appendix A). The approximate central point of the Installation Boundary is NGR 525321, 411329.

2.2 Proposed Operations

The Grimsby Power Station Installation will comprise Grimsby A and Grimsby B power generation plant, located on the site of the de-commissioned Combined Heat and Power Station (CHP), on the Pyewipe Industrial Estate, Grimsby. The CHP plant served the former Huntsman Tioxide Chemical Works, which is now closed and demolished. The CHP plant has been de-commissioning and therefore no longer forms part of the operational Grimsby Power Station site.

The Grimsby A plant was granted planning permission in December 2016, under application number DM/0104/16/FUL, with the scheme layout subsequently amended under a Section 73 application, to include for a configuration of a single row of 10 containerised generator sets, each with a generating capacity of 2 MW_e, resulting in a total capacity of 20 MW_e. The Grimsby A plant is currently operational.

Original planning permission for Grimsby B (Ref: DM/0491/18/FUL), which included an additional 10 x 2 MW_e containerised generator sets, expired on 29th June 2020. RWE is in the process of submitting a new planning application (Ref: DM/0561/22/FUL) for the Grimsby B plant. Due to the scale of the operations and the limited operating hours, no Environmental Impact Assessment (EIA) was required in support of the planning application.

RWE proposes to install an additional 5 gas fired generators on 0.18 ha of land (Grimsby B) to the east of the existing Grimsby A plant. The existing Grimsby A plant consists of ten Jenbacher JGS420 natural gas fired engines, each 4.8 MW_{th} with a total net thermal input of 45.75 MW_{th} and gross electrical output of 20 MW_e. The new Grimsby B plant will have a total thermal input of 45.75 MW_{th} and gross electrical output of 20.7 MW_e, comprises of four Jenbacher JMS624 gas-fired engines, with a net thermal input of 9.9 MW_{th}, and one Jenbacher JMS616 gas-fired engine, with a net thermal input of 6.1 MW_{th}.

Grimsby A and Grimsby B will operate independently as a peaking plants and each will be operational for up to 1,500 hours per year. It is anticipated that most of the generation will be during winter months, when there is peak electricity demand and requirement for additional supply.

The Installation (Grimsby A and Grimsby B) will be operated by personnel located both on-site and remotely by staff located at the central Hythe control room which is manned 24 hours a day 7 days a week and is connected to the Installation via the secure RWE network. Grimsby A and Grimsby B will connect to the existing site natural gas supply. Power generated from the Installation will be exported to National Grid's National Electricity Transmission System (NETS) via separate control rooms, switch gear and transformers for each of Grimsby A and B to ensure that each plant can operate completely independently.

Emissions will be discharged to atmosphere via individual stacks, the stacks serving the Grimsby A gas engines (Emission Points A1 to A10) each terminate at a height of 8 m above ground level, while the stacks serving Grimsby B gas engines (Emission Points A11 – A15) each terminate at a height 12.5 m above ground level. The main emissions to air from the stacks will be:

- Oxides of nitrogen (NO_x) comprising nitric oxide (NO) and nitrogen dioxide (NO_2); created by the chemical combination of atmospheric oxygen and nitrogen within the high temperature combustion zone; and
- Carbon monoxide (CO).

Due to the inherent nature of natural gas, there would not be any emissions of sulphur dioxide (SO_2) or particulate matter (PM) from the engines. Whilst there will be CO emissions, due to incomplete natural gas combustion, emissions will be controlled by primary means and balanced against the requirement to minimise NO_x, as this has a greater potential for air quality impacts. The findings from similar assessments indicate that CO impacts will also be insignificant, especially noting that there has never been a failure to comply with the EU CO limit value in any EU country. Likewise, the MCPD does not set an emission limit for CO against which to assess, as such, the assessment of CO emissions has been screened out of further consideration in the air quality assessment.

Grimsby A and Grimsby B plant will be maintained to ensure optimum thermal and electrical efficiency and to minimise emissions generation. It is therefore envisaged that extractive monitoring will be carried out in accordance with MCP guidance requiring monitoring of emissions to commence within 4 months of the permit being issued or the start of operation, whichever is the latest, and every three years thereafter.

The only raw material stored at the Installation will be lubricating oil, which will be stored in two separate bunded tanks, one each for Grimsby A and Grimsby B, each having a capacity of up to 5,000 litres. The Site will produce small quantities of waste in the form of used lubricating oil, which will also be stored in two designated waste oil storage tank, one serving Grimsby A and one serving Grimsby B and each having a capacity of up to 5,000 litres. All waste oil will be disposed of appropriately off site by a licensed contractor.

There will be no process emissions to water, sewer or land from the Site.

To reduce the noise from the gas engines, each generator is installed inside its own enclosure. The Grimsby A generators are located within steel shipping containers, which have been specifically designed to act as acoustic enclosures, with a flat steel roof, on which is mounted the air intake, radiator, exhaust silencers and 8 m exhaust stack. The Grimsby B generators will be located within precast concrete enclosures, which have been specifically designed to act as acoustic enclosures, complete with a forced draught ventilation system to provide the required cooling air and combustion air for the generation set. Suitably designed attenuators will be installed in the air intake and discharge ventilation ductwork to reduce noise breakout from the engine enclosures. The exhaust from each engine will be attenuated using a combined reactive absorptive silencer and then ducted to individual tailpipes each terminating at a height 12.5 m above ground level.

The cooling water radiators for the engines will be mounted externally to the generator enclosures and will be a flatbed fin coil design using energy efficient fan motors and a low noise fan configuration and elevated on a raised platform above the engine enclosure.

This application covers the following proposed activities and also the directly associated activities (DAA) for an Environmental Permit for the Site.

Schedule 1 Table S1.1 of the current permit comprises scheduled activity AR1 and directly associated activities AR3 – AR4. This variation application will add another combustion activity (AR2) to the permit. It is therefore proposed to vary Schedule 1 Table S1.1 of the existing permit as shown in Table 1 below.

Table 1. Schedule 1 Listed Activities

Activity Ref	Schedule 1 – Part 2 Reference	Description of Activity	Limits of Specified Activity	Details of the Activity
AR1	Section 1.1 Part A(1)(a): Burning of any fuel in an appliance with a rated thermal input of 50 MW or more.	Ten gas engines with total thermal input of 48 MW	From receipt of natural gas to the discharge of exhaust gases and the generation of electricity for export. Maximum of 1,500 hours operation per year.	No change in the description of activities for AR1.
		Five gas engines with total thermal input of 45.75 MW	From receipt of natural gas to the discharge of exhaust gases and the generation of electricity for export. Maximum of 1,500 hours operation per year.	New activity
Directly Associated Activities				
AR2	Directly Associated Activity	Lubricating oil and diesel storage	From receipt of raw materials to handling, on-site storage and handling for use.	No changes to the activity description or limits.
AR3	Directly Associated Activity	Discharge of uncontaminated rain water drainage of uncontaminated rain water from plant roof area.	Handling and controlled discharge via soakaway system	New activity

2.3 Operating Regime

It is intended that Grimsby A and Grimsby B will each operate for up to 1,500 hours per year. Each plant is intended to operate independently of one another, with each having dedicated infrastructure to support its independent operation, including separate lubricating and waste oil tanks, control rooms (with switch gear) and power transformers.

Grimsby A and Grimsby B will be expected to operate flexibly during their lifetime with hours of operation driven by the dynamics of the energy market. Both sites are designed to be able to operate 24 hours per day, 7 days per week with programmed offline periods for maintenance.

It is, however, anticipated that Grimsby A and Grimsby B are likely to operate concurrently during winter months, when there is peak electricity demand and requirement for additional supply. As the Grimsby B site may be operated concurrently with the existing Grimsby A site this has been accounted for within the air quality and noise assessments undertaken to support the Permit application.

2.4 Environmental Setting

The Installation is to the north-western edge of Grimsby and falls within the administrative area of NELC. It is bound to the north by largely undeveloped land with the remains of infrastructure associated with the former Huntsman Tioxide works, which was demolished in 2015. The Humber Estuary sea wall is approximately 430 m north of the Site. The Humber Estuary has been designated as a Special Protection Area (SPA), Special Area of Conservation (SAC), Ramsar site and Site of Special Scientific Interest (SSSI).

The wider Grimsby Power Station site lies immediately to the south of the Installation, including a gas compound. Moody Lane is situated approximately 100 m to the south, which runs southeast and turning south to the A180, and a railway is located approximately 320 m south which runs northwest toward Immingham Docks. Numerous commercial and industrial premises lie to the south of this road and form the South Humberside Industrial Estate /

Pyewipe Industrial Estate, with the nearest commercial property being the Dunlop Oil & Marine site, located approximately 170 m to the southwest.

The Site is bound to the west by undeveloped former industrial land and the remains of infrastructure associated with the former Tioxide Grimsby Combined Heat and Power (CHP) plant and the former Huntsman Tioxide works. Beyond this lie commercial developments which form the Riverside Industrial Estate, Pyewipe Wastewater and Sewage Treatment Works and the Humber Estuary.

The closest sensitive human receptor, a hotel on Appian Way, Pyewipe, is located approximately 500 m from the Site with the closest residential property located approximately 950 m south of the Site in Haven Gardens on the far side of A180 main trunk road into Grimsby.

3. Site Condition Report

The Grimsby B Plant is to be developed on an existing area of hardstanding covering an area of approximately 0.18 hectares (ha) located to the east of the existing Grimsby A plant on land owned by RWE. The Grimsby A and B site areas are shown in Figure 2 (Appendix A), with the proposed overall Installation Boundary shown in Figure 3 (Appendix A). The existing Grimsby A site is 0.25 ha, therefore the total area of the Site will be approximately 0.43 ha.

The Installation lies on land that was formerly part of the Huntsman Tioxide plant, which has been demolished. The Installation is currently surrounded by undeveloped former industrial land and remains of infrastructure associated with the former Huntsman Tioxide works.

The Installation Site comprises the following:

- The western area of the Site is largely occupied by the Grimsby A plant area, with infrastructure including a workshop, lighting columns, transformer and control room and switch room in the western area, ten natural gas fired engines and a HV termination point in the central area, and two (fresh and waste) lubrication oil tanks (5,000 l each) and lighting columns in the eastern area. There is also a 70kVa diesel generator and associated 1,200 litre bunded fuel tank in the western part of the Grimsby A site. The Grimsby A site surface mainly consists of shingle and, in places, crushed demolition material (brick and concrete), and has received regular herbicide treatment;
- The eastern area of the Site (Grimsby B plant area) is mainly covered by concrete hardstanding, with a small area of gravel surface consisting of shingle and, in places, crushed demolition material (brick and concrete), and has received regular herbicide treatment; and
- The main feature present on Grimsby B area is a concrete bund in the north-eastern corner, where a gas oil storage tank related to legacy use of the site was historically located. There is no other evidence of previous buildings or structures. Historic data held by RWE for the legacy CHP plant subsequent environmental permit surrendered for that plant has not noted any significant spills or contamination within the former gas oil storage tank bund.

The environmental sensitivity of the Installation site is considered to be as follows:

- Groundwater - Low to High sensitivity - The underlying Flamborough Chalk Formation – Chalk bedrock deposit is classified as a Principal Aquifer. The underlying superficial deposits consist of Tidal Flat Deposits - Clay and silt designated as Unproductive Aquifer. The sensitivity of the underlying deposits is therefore classified as varying from low to very high.
- Surface water - High sensitivity – The Humber Estuary, located approximately 0.4 km to the east of the Site, is a Statutory designated site.
- Land use – Low sensitivity – the Site is surrounded by industrial land and no significant land uses have been identified.

The Application Site Condition Report is presented in Appendix B.

4. Operating Techniques

4.1 Technical Standards

By virtue of the total thermal input of Grimsby A and Grimsby B (approximately 93.75 MW_{th}) the Grimsby Power Station Site will fall under the EP regulations as a Section 1.1 Part A(1)(a) combustion activity for the 'Burning of any fuel in an appliance with a rated thermal input of 50 MW_{th} or more'. However, the gas engines that make up Grimsby A and B, and the overall Installation do not comprise a Large Combustion Plant (LCP) as defined by the Industrial Emissions Directive (IED), as the gross thermal input to each engine is less than 15 MW_{th}. As the net thermal input into all the individual engines is <10 MWth (and therefore less than the aggregation threshold of 15 MWth), in accordance with the IED and the LCP Best Available Techniques (BAT) Reference document (BRef), the engines fall outside the definition of LCP. As the thermal input for individual engines is >1 MW and <50 MW, the engines are defined as Medium Combustion Plants (MCP), and as such are required to comply with the requirements of Schedule 25 of the EP Regulations.

The Site will operate in accordance with the conditions of the Environmental Permit and also applicable EA Sector Guidance:

- EPR 1.01: How to Comply with your Environmental Permit, Additional Guidance for: Combustion Activities;
- MCP and specified generator permits: how to comply; and
- MCP and specified generators: environmental permits.

In addition, the Site operates in accordance with the EA guidance – 'Develop a management system: Environmental Permits' as a good practice measure.

Figure 2 (Appendix A) shows the Installation Site boundary, including the proposed layout of the generators and oil storage.

The Installation will be operated in accordance with the existing management system currently in place for Grimsby A, which will be amended as required to include the proposed operation of Grimsby B prior to commencement of operations.

4.2 Process Description

Grimsby A and Grimsby B are both fast response peaking plants comprising a number of individual reciprocating gas engines. Fast response peaking plants are used to quickly increase or 'top up' the generating capacity during periods of increased need ('peak periods') by the National Grid. Peaking plants are normally dormant and can be brought online at short notice to help cope with periods of high demand or low supply nationally.

Reciprocating engines typically have one or more cylinders in which fuel combustion occurs. The engines convert the chemical energy of the fuel into mechanical energy, in a design similar to a marine engine (HFO and/ or gas oil engine type) or automotive Otto (lean-burn gas engine type) engine. The gas engines which make up both Grimsby A and Grimsby B are lean-burn gas engines. In comparison to gas turbines, combustion in reciprocating engines is not continuous and takes place inside closed combustion chambers. During combustion, the pressure and temperature increase is very high and this allows a high conversion efficiency for the comparatively small units used.

Small power plants based upon multiple reciprocating engine units are more efficient than gas turbine based plants in situations where considerable load variations are possible and rapid response to generation is required, and are considered cost-efficient solutions for peaking electricity supplies. In order to maintain satisfactory efficiency of peaking plants, smaller engines with the capability of quick start-up and shutdown are necessary, such that individual engines can be run at optimum loading and hence optimum efficiency.

Furthermore, reciprocating engines are able to maintain good performance at part load, with typically only a 10% increase in Specific Fuel Consumption (SFC) at half-load. Thermal performance below half-load deteriorates whilst pollutant emissions in exhaust gas increases.

4.2.1 Grimsby A

The Grimsby A plant comprises ten 4.8 MW_{th} gas reciprocating engines to provide a total net installed capacity of 48 MW_{th} and generating 20 MW_e gross electrical output. The details of the Grimsby A generators are provided in Table 2. The Grimsby A gas engine generators operate for a maximum of 1,500 hours annually, as per the existing Environmental Permit.

Table 2. Grimsby A Generator Details

Generator	Net Thermal Input (MWth)	Associated Emission Point Grid Reference (X,Y)
Generator 01	4.8 MW_{th}	A1 - 525295, 411310
Generator 02	4.8 MW_{th}	A2 - 525296, 411315
Generator 03	4.8 MW_{th}	A3 - 525298, 411320
Generator 04	4.8 MW_{th}	A4 - 525299, 411325
Generator 05	4.8 MW_{th}	A5 - 525300, 411331
Generator 06	4.8 MW_{th}	A6 - 525301, 411336
Generator 07	4.8 MW_{th}	A7 - 525303, 411341
Generator 08	4.8 MW_{th}	A8 - 525304, 411346
Generator 09	4.8 MW_{th}	A9 - 525305, 411351
Generator 10	4.8 MW_{th}	A10 - 525307, 411357

The shipping container engine enclosures are sound insulated and have forced ventilation which provides a positive pressure into the container, and provides sufficient air flow for both cooling and combustion. Combustion air for the engines is drawn from inside the engine building. The cooling water radiators for the engines are of flatbed fin coil design using energy efficient fan motors and a low noise fan configuration mounted external to the generator enclosure on a raised platform above their respective engine enclosure. Figure 2 (Appendix A) presents the layout for the existing Grimsby A plant.

For Grimsby A, the use of reciprocating gas engines is considered to represent BAT for the purpose of providing a rapid-start, short-term power supply during periods of peak demand, as required by the National Grid. The generators are not designed to be CHP-Ready and it is not intended to be utilised as a CHP at present as the sites operation as a peaking plant, with low and unpredictable annual running hours, does not lend itself to CHP capability. The potential for CHP use will be assessed every two years, as per regulatory requirements.

4.2.1.1 Cooling System

Each engine includes its own independent cooling system which is a liquid closed loop system with mechanically forced air cooling via radiators sized to meet cooling demands for the engine under all operational scenarios. Cooling water temperatures are regulated using mechanically and electrically operated three-way thermostatic valves, allowing the engine to reach operational temperature in the shortest possible time.

The cooling circuit is a sealed system, comprising; an electrically driven circulation pump, expansion vessel, fill and drain connections, automatic de-aeration, pressure and temperature gauges and connection to the radiator. The radiators are filled with biodegradable ethylene glycol antifreeze and the level of antifreeze checked and topped up as required as part of the engines routine maintenance undertaken in line with the Site's ISO 14001 certification by appropriately trained staff or maintenance contractors. Each engine enclosure is in a self-bunded area designed to retain any spills or leaks that occur within the enclosure. The cooling system is fitted with a low and high pressure alarm, which will alert operators to potential issues.

The cooling heat exchangers (radiators) are horizontal flatbed fin coil configuration, suitable for outdoor mounting and capable of handling the complete cooling requirements of the engines under all operational scenarios. Dry cooling technologies such as air-cooled condensers are best suited to developments at locations with restricted water resources.

4.2.1.2 Process Control System

Each engine has a dedicated/ modular control system, which controls all engine associated equipment and allows remote engine control from the RWE system. Normal operation is remote via the RWE system (central Hythe

control room). The Hythe Control room is manned 24 hours a day, 7 days a week and connects to the Sites DCS via the secure RWE network. Each engine can be operated locally/ manually if required.

The generators only operate together at full load if they are run. As such if the demand from the national grid is less than the generating capacity the Site does not operate, i.e. the generators are not run at part loads.

4.2.1.3 Engine Control System

Each generator has its own control system which monitors and controls the following:

- Starting equipment (motors and batteries);
- Oil lubricating system;
- Water cooling system;
- Ventilation and temperature control;
- Fire and gas detection system within the engine cell;
- Electrical synchronisation and power control;
- Exhaust gas purge system;
- Power and control of engine auxiliaries;
- Generator Protection;
- Synchronisation (control of engine synch breaker);
- Automatic engine control (AVR etc.); and
- Provision of engine status information for remote monitoring and control.

4.2.1.4 Control System

A Master Control Panel (located in the switchgear container LV room) is used as an engine Master Control System and a means of interface with the remote RWE system. Each generator is connected to a designated controller which selects how quickly the engine will start and ramp up to full load dependant on what Capacity Market application the generator is be used for.

4.2.1.5 Ancillary Equipment and Structures

The operation of the Grimsby A plant is supported by a number of ancillary operations, including:

- Engine fuel gas supply;
- Engine lubricating system;
- Engine jacket water system; and
- Fire protection system.

A short summary of the above ancillary equipment is provided below.

4.2.1.6 Engine Fuel Gas Supply

The gas fuel system feeding each engine complies with current UK regulations and comes from the Site's existing gas pressure reducing skid via underground supply to each engine enclosure. . Fitted externally to the enclosure will be purge valves, a manual isolation valve, a slam shut valve and a cartridge filter. The external slam shut valve will operate normally dependent on engine loads conditions i.e. the valve will actuate open upon engine demand signal and close upon engine stop signal. The slam shut valve will isolate the gas supply quickly (<3 seconds) under emergency stop situations or a fire or gas alarm signal.

4.2.1.7 Engine Lubricating System

The engines have a requirement for lubrication oil for everyday operation. There are two bulk oil storage tanks located to the east of the generators, between the Grimsby A and Grimsby B sites, one 5,000-litre clean oil tank and one 5,000-litre waste oil tank. Each tank will be located on concrete hardstanding overlain with gravel and will be designed and fabricated to BS799-5, in accordance with CIRIA C736 paragraph 9.2.5 and in compliance with Oil Firing Technical Association for the Petroleum Industry (OFTEC) standard OFS T200 for Steel oil storage tanks and tank bunds. The fabricated bunded area is designed to hold at least 110% of the storage tank capacity.

Clean oil is delivered by supply tanker and is pumped into the clean oil bulk tank for storage as part of a manually initiated oil transfer operation. There will be a dedicated area for the delivery of clean lubricating oil and collection of waste oil, however, the location and containment measures to be implemented at the loading/ unloading area are still to be determined. Each tank will have an internal drip tray and bund alarm fitted. In addition, spill kits will be available on site and on the tanker.

The clean oil tank is fitted with an oil tank level monitor which provides local display of tank level and also provides a high level and a low level volt free output to a local control panel. These outputs illuminate a high level warning LED (to prevent over filling) and a low level warning LED. Low level volt free contact is also hardwired into oil pump starter circuit, to inhibit pump operation when level is low.

The clean oil tank is fitted with a gear pump installed within the tank bund to deliver fresh oil to the clean oil distribution manifold. The clean oil distribution manifold is a fully welded system at height external to each enclosure and runs the full length of the Site. The gear pump automatically runs during engine operation to constantly top up the manifold collection tank, to ensure that the lube oil distribution manifold has a constant volume of oil for engine gravity feed. The manifold collection tank has an overfill pipe to spill lube oil back into the clean bulk oil tank to prevent over-filling as well as high level and low level switches, which control the operation of the gear pump. These switches also illuminate control panel LEDs for local indication. Oil is gravity fed from the clean oil manifold collection tank to each engine via an engine solenoid valve which is automatically controlled by the engine control panel. The manifold will be inspected on a routine basis to check for signs of damage or points of potential failure.

The oil system also allows for the engines to be filled directly from the main bulk oil storage tank if required. This is achieved via a mobile gear pump unit and a quick release connection on the clean oil pipework local to the engine module. The mobile pump is powered via a wall mounted socket in the engine cell and controlled locally/ manually.

When required, waste oil is pumped from the engines to the waste oil storage tank. Waste oil transfer from the engines to the bulk tank is a manually controlled operation i.e. not automatic. A mobile gear pump unit is used to pump the waste oil from the engine sump to the bulk waste oil storage tank. The mobile gear pump unit drains the engine via a quick release hose connection on the engine module and is delivered to the waste bulk oil tank via a flexible hose reel included with the waste bulk tank. Each tank will have internal drip trays and bund alarms fitted. All staff are fully trained to undertaken oil transfer operations in accordance with the Site's ISO 14001 certification, however, a spill kit and response unit are in place in the unlikely event of any spill events.

The waste oil storage tank is also fitted with an oil tank level monitor which provides a local display of tank level. Two high level (HH and H) volt free contacts are wired to the oil control panel to indicate locally when the waste oil tank requires draining via a tanker.

4.2.1.8 Engine Jacket Water System

When the engine is off load the jacket water will be kept at a pre-determined temperature using a thermostatic electric water heating jacket system on each engine, to allow for immediate loading after engine start. The temperature at which the jacket water will be held during offline periods depends on whether the fast start application has been selected. If the engine is set up for a fast-start then the jacket pre-heating circuit will maintain the engine jacket water circuit at 70°C. If the fast start function has not been selected the engine shall maintain a temperature of 57°C in the engine jacket water circuit.

4.2.1.9 Fire Protection

The engine enclosure is constructed using non-combustible materials and fitted with a Fire Detection Unit consisting of:

- Thermal fire detection (engine room) positioned above alternator;
- Optical fire detection (engine room) positioned at the air outlet to detect smoke being blown down the enclosure; and
- Optical fire detection (control room) positioned above the +A-Panel in the control room of the cell.
- A gas detection system is also installed as part of the fire prevention system.

In the event of a fire being detected by any of the above sensors the following response is triggered:

- All ventilation dampers close;

- Ventilation fans stopped;
- Engine hard stopped (Priority 2) - gas solenoid valves closed and generator breaker open (after no more than 1 second);
- Fire Alarm Beacon Activated;
- Fire Alarm (Digital Output) activated; and
- All gas valves (gas train and external gas isolation valves) closed.

Likewise if gas is detected within an engine enclosure then the following process would be triggered automatically by the engine control system:

- All ventilation dampers opened;
- Ventilation fans run at maximum speed;
- Engine hard stopped (Priority 2) - gas solenoid valves closed and generator breaker open (after no more than 1 second);
- Gas Beacon Activated;
- Pre-Gas alarm (Digital Output) activated if gas concentration is at 10% of LEL or gas alarm (digital output) activated if gas level is 20% LEL; and
- All gas valves (gas train and external gas isolation valves) closed.

A fire or gas alarm in any engine cell will cause a normal shutdown of all other engines on the Grimsby A Site.

Fire extinguishers are provided in the following locations:

- Each engine cell; and
- HV section of switchgear container.

4.2.1.10 Gas Reception Facility

The existing gas receiving station for the Site provides the supply to Grimsby A. No additional gas treatment or conditioning is undertaken once it is received.

4.2.1.11 Water Supply Infrastructure

The key water requirement for the Site is for the existing welfare facilities. Minor quantities of water are required for periodic replacement or replenishment of the water within the cooling water circuit for the engines; this is however relatively infrequent.

4.2.1.12 Surface Water Drainage

The existing surface water drainage regime at the Site comprises infiltration to ground via a granular (shingle) surface layer over areas that have a low risk of contamination, i.e. not covered by the gas engines or other ancillary equipment.

A surface water management plan will be developed for the Site and will be submitted in support of the permit application. There are no process emissions to controlled waters from the Site operations.

4.2.2 Grimsby B

The Grimsby B gas engines will comprise an additional fast response peaking plant, with a gross output capacity of up to 20.7 MW_e. The operational capacity will vary depending on the demand from the National Grid; and is likely to always be lower than the maximum capacity. However, all assessments regarding the Grimsby B operation have been undertaken assuming 100% of the capacity is utilised, as a conservative approach.

The Grimsby B plant will comprise five gas reciprocating engines. The details of the Grimsby B generators are set out in Table 3. Operating at maximum continuous rating (MCR) the four Jenbacher JMS624 gas-fired engines will achieve a gross electrical efficiency (Lower Heating Value (LHV)) of 43.27% and the Jenbacher JMS616 gas-fired engine 41.95% when combusting natural gas with a LHV of 9.5 kWh/Nm^3.

Table 3. Grimsby A Generator Details

Generator	Net Thermal Input (MWth)	Associated Emission Point Grid Reference (X,Y)
Generator 01	9.9	B 1 - 525344.9, 411327.3
Generator 02	9.9	B 2 - 525343.8, 411322.4
Generator 03	9.9	B 3 - 525342.6, 411317.6
Generator 04	9.9	B 4 - 525341.4, 411312.7
Generator 05	6.1	B 5 - 525340.2, 411307.9

The new concrete gas engine enclosures for the Grimsby B site will be force ventilated to provide a positive pressure and be sized to provide sufficient air flow for both cooling and combustion. Combustion air for the engines will be drawn from inside the engine building. The cooling water heat exchangers (radiators) for the engines will be mounted external to the building and will be a flatbed fin coil design using energy efficient fan motors and a low noise fan configuration and elevated on a raised platform above their respective engine enclosure.

Grimsby B will use lean-burn gas engines fitted with LEANOX control system, to minimise NO_x emissions. The use of reciprocating gas engines is considered to represent BAT for the purpose of providing a rapid-start, short-term power supply during periods of peak demand, as required by the National Grid.

Since the output capacity of the peaking plant is <300 MW, it is not required to be CCR compliant.

For Grimsby B, the use of reciprocating gas engines is considered to represent BAT for the purpose of providing a rapid-start, short-term power supply during periods of peak demand, as required by the National Grid. The generators are not designed to be CHP-Ready and it is not intended to be utilised as a CHP at present as the sites operation as a peaking plant, with low and unpredictable annual running hours, does not lend itself to CHP capability. The potential for CHP use will be assessed every two years, as per regulatory requirements.

4.2.3 Cooling System

Each engine includes its own independent cooling system which is a liquid closed loop system with mechanically forced air cooling via radiators sized to meet cooling demands for the engine under all operational scenarios. Cooling water temperatures are regulated using mechanically and electrically operated three-way thermostatic valves, allowing the engine to reach operational temperature in the shortest possible time.

The cooling circuit is a sealed system, comprising; an electrically driven circulation pump, expansion vessel, fill and drain connections, automatic de-aeration, pressure and temperature gauges and connection to the radiator. The radiators will be filled with biodegradable ethylene glycol antifreeze and the level of antifreeze checked and topped up as required as part of the engines routine maintenance undertaken in line with the Site's ISO 140001 certification by appropriately trained staff or maintenance contractors. Each engine enclosure is a self-bunded area designed to retain any spills or leaks that occur within the enclosure and the cooling system is fitted with a low and high pressure alarm which will trigger an investigation.

The cooling heat exchangers (radiators) will be a horizontal flatbed fin coil configuration, suitable for outdoor mounting and capable of handling the complete cooling requirements of the engines under all operational scenarios. As stated previously for Grimsby A, based on the location of the Site and the limited anticipated operational period of the peaking plant, it is considered that the cooling system selected for the Grimsby B plant is considered to be BAT.

4.2.4 Process Control System

As with Grimsby A each engine has a dedicated/ modular control system, which controls all engine associated equipment remotely from RWE central Hythe control room, is manned 24 hours per day 7 days per week, via RWE's secure network. Each engine can also be operated locally/ manually if required.

It is intended that all the generators would operate together at full load if they are to operate at all. As such, if the demand from the national grid is less than the generating capacity, it is anticipated that the Site would not operate, i.e. the generators would not be run at part loads.

4.2.4.1 Engine Control System

Each engine has its own control system which monitors and controls the following:

- Starting equipment (motors and batteries);
- Oil lubricating system;
- Water cooling system;
- Ventilation and temperature control;
- Fire and gas detection system within the engine cell;
- Electrical synchronisation and power control;
- Exhaust gas purge system;
- Power and control of engine auxiliaries;
- Generator protection;
- Synchronisation (control of engine synch breaker);
- Automatic engine control (AVR etc.); and
- Provision of engine status information for remote monitoring and control.

4.2.5 Ancillary Equipment and Structures

To support the operation of the gas engines, including the cooling system, a number of ancillary operations are required, including:

- Engine fuel gas supply;
- Engine lubricating system;
- Engine jacket water system; and
- Fire protection system.

A short summary of the above ancillary equipment is provided below.

4.2.5.1 Engine Fuel Gas Supply

The gas fuel system feeding each engine will comply with current UK regulations. The fuel gas will shall be taken from the existing gas pressure reducing skid. With gas supply pipework runs underground and penetrate the ground individually outside each engine enclosure. Fitted externally to the enclosure will be purge valves, a manual isolation valve, a slam shut valve and a cartridge filter. The external slam shut valve will operate normally dependent on engine loads conditions i.e. the valve will actuate open upon engine demand signal and close upon engine stop signal. The slam shut valve will isolate the gas supply quickly (<3 seconds) under emergency stop situations or a fire or gas alarm signal.

4.2.5.2 Engine Lubricating System

The engines have a requirement for lubrication oil for everyday operation. There will be two new bulk oil storage tanks to serve the Grimsby B site, one 5,000-litre clean oil tank and one 5,000-litre waste oil tank. The Grimsby B lubrication oil tanks are located to the southeast of the Grimsby B generators and will serve the Grimsby B generators exclusively, while the two existing lubrication located between the Grimsby A and Grimsby B sites will serve the Grimsby A generators only. Each tank will be located on concrete hardstanding overlain with gravel and will be designed and fabricated to BS799-5, in accordance with CIRIA C736 paragraph 9.2.5 and in compliance with Oil Firing Technical Association for the Petroleum Industry (OFTEC) standard OFS T200 for Steel oil storage tanks and tank bunds. The fabricated bunded area is designed to hold at least 110% of the storage tank capacity.

Clean oil is delivered by supply tanker and is pumped into the clean oil bulk tank for storage as part of a manually initiated oil transfer operation. There will be a dedicated area for the delivery of clean lubricating oil and collection of waste oil, however, the location and containment measures to be implemented at the loading/ unloading area are still to be determined. Each tank will have an internal drip tray and bund alarm fitted. In addition, spill kits will be available on site and on the tanker.

The clean oil tank will be fitted with an oil tank level monitor which provides local display of tank level and also provides a high level and a low level volt free output to a local control panel. These outputs will illuminate a high level warning LED (to prevent over filling) and a low level warning LED. Low level volt free contact is also hardwired into oil pump starter circuit, to inhibit pump operation when level is low.

The clean oil tank will be fitted with a gear pump installed within the tank bund to deliver fresh oil to the clean oil distribution manifold. The clean oil distribution manifold is a fully welded system at height external to each enclosure and runs the full length of the Grimsby B engines. The gear pump automatically runs during engine operation to constantly top up the manifold collection tank, to ensure that the lube oil distribution manifold has a constant volume of oil for engine gravity feed. The manifold collection tank will have an overfill pipe to spill lube oil back into the clean bulk oil tank to prevent over-filling as well as high level and low level switches, which will control the operation of the gear pump. These switches will also illuminate control panel LEDs for local indication. Oil is gravity fed from the clean oil manifold collection tank to each engine via an engine solenoid valve which will be automatically controlled by the engine control panel. The manifold will be inspected on a routine basis to check for signs of damage or points of potential failure.

The oil system will allow for the engine to be filled directly from the main bulk oil storage tank if required. This is achieved via a mobile gear pump unit and a quick release connection on the clean oil pipework local to the engine module. The mobile pump will be powered via a wall-mounted socket in the engine cell and controlled locally/ manually.

When required, waste oil is pumped from the engines to the waste oil storage tank. Waste oil transfer from the engines to the bulk tank is a manually controlled operation i.e. not automatic. A mobile gear pump unit is used to pump the waste oil from the engine sump to the bulk waste oil storage tank. The mobile gear pump unit drains the engine via a quick release hose connection on the engine module and is delivered to the waste bulk oil tank via a flexible hose reel included with the waste bulk tank. Each tank will have internal drip trays and bund alarms fitted. All staff are fully trained to undertaken oil transfer operations in accordance with the Site's ISO 14001 certification, however, a spill kit and response unit are in place in the unlikely event of any spill events.

The waste oil storage tank will also be fitted with an oil tank level monitor which provides local display of the tank level. Two high level (HH and H) volt free contacts are wired to the oil control panel to indicate locally when the waste oil tank requires draining via a tanker.

4.2.5.3 Engine Jacket Water System

When the engine is off load the jacket water will be kept at a pre-determined temperature using a thermostatic electric water heating jacket system on each engine, to allow for immediate loading after engine start. The temperature at which the jacket water will be held during offline periods depends on whether the fast start application has been selected. If the engine is set up for a fast-start then the jacket pre-heating circuit will maintain the engine jacket water circuit at 70°C. If the fast start function has not been selected the engine shall maintain a temperature of 57°C in the engine jacket water circuit.

4.2.5.4 Fire Protection

The engine enclosure will be constructed using non-combustible materials and be fitted with a Fire Detection Unit consisting of 1x Siemens FSA20 Tripping Unit Located within Module Control Panel (+A) with the following individual fire detectors connected in series to the detection unit

- Thermal Fire Detection (Engine Room) positioned above alternator;
- Optical Fire Detection (Engine Room) positioned at the air outlet to detect smoke being blown down the enclosure; and
- Optical Fire Detection (Control Room) positioned above the +A-Panel in the control room of the cell.
- A gas detection system will also be installed as part of the fire prevention system.

In the event of a fire being detected by any of the above sensors the following response will be triggered:

- All ventilation dampers close;
- Ventilation fans stopped;
- Engine hard stopped (Priority 2) - gas solenoid valves closed and generator breaker open (after no more than 1 second);
- Fire Alarm Beacon Activated;

- Fire Alarm (Digital Output) activated; and
- All gas valves (gas train and external gas isolation valves) closed.

Likewise if gas is detected within an engine enclosure then the following process would be triggered automatically by the engine control system:

- All ventilation dampers opened;
- Ventilation fans run at maximum speed;
- Engine hard stopped (Priority 2) - gas solenoid valves closed and generator breaker open (after no more than 1 second);
- Gas Beacon Activated;
- Pre-Gas alarm (Digital Output) activated if gas concentration is at 10% of LEL or gas alarm (digital output) activated if gas level is 20% LEL; and
- All gas valves (gas train and external gas isolation valves) closed.

A fire or gas alarm in any engine cell will cause a normal shutdown of all other engines on the Grimsby B Site.

Fire extinguishers are to be provided in the following locations:

- Each engine cell; and
- HV section of switchgear container.

4.2.5.5 Gas Reception Facility

The existing gas receiving station for the Site will provide the supply to the Grimsby B generators. No additional gas treatment or conditioning is proposed to be undertaken on Site once it is received.

4.2.5.6 Surface Water Drainage

The existing surface water drainage regime at the Grimsby Site comprises infiltration to ground via a granular (shingle) surface layer. It is proposed that this regime will be continued for the general areas of the Grimsby B site for areas that have a low risk of contamination, i.e. not covered by the gas engines or other ancillary equipment.

Additional storage and a filtration soakaway will be provided to deal with surface water collected from the Grimsby B building roof. The soakaway system will utilise the existing tank bund at the northern end of the Site which will be modified by the drilling of 10-20 cored holes to allow surface water to drain away. Water from the generator building roof will be gravity fed into the soakaway this is detailed in the Drainage Strategy provided in Appendix F.

A surface water management plan will be developed for the Site and will be submitted in support of the permit application. There will no process emissions to controlled waters from the Site operations. There will be a dedicated area for the delivery of clean lubricating oil and collection of waste oil, however, the location and containment measures to be implemented at the loading/ unloading areas and subsequent rainwater control measures are still to be determined.

4.3 Management Systems

The Site will be operated in line with the existing EMS, which is accredited to the requirements of ISO14001 (certificate of conformity provided in Appendix C) and is compliant with the guidance set out by the EA. The EMS will be amended to include the proposed operations prior to commencement of operation of Grimsby B. The EMS outlines policies and procedures aiming to minimise the risk of pollution and subsequent harm to the environment and to human health which may arise from the operations, maintenance, accidents, incidents and non-conformances specific to the Site.

The EMS and procedures will be available for inspection at the Site and will be applicable to all staff, contractors and visitors. The EMS has been developed to enable compliance with the Environmental Permit and other legislative requirements for the protection of the environment and human health.

Written procedures clearly describing roles and responsibilities, actions and communication channels for the operation of the Site will be available for operational personnel dealing with emergency situations which may arise at the Site.

The EMS and procedures will be externally audited and include contingency plans written in preparation for any foreseeable abnormal events. Internal review of the EMS (or relevant parts therein) will be undertaken at an appropriate frequency or in the event of a change in operations/ Site processes.

The internal auditing programme will be updated to reflect the changes to the Site and will be reviewed regularly to ensure conformance with the EMS and compliance with applicable compliance obligations. The programme will identify opportunities to enhance environmental and EMS performance and to implement preventative/ corrective actions to minimise the risk of non-compliance. The findings of any such review and audits will be communicated to all staff and relevant external contractors as appropriate and where appropriate improvement works and corrective actions will be implemented. All internal reviews, audits, amendments to the EMS and improvement measures implemented will be recorded for reference and inspection purposes.

4.4 General Maintenance

RWE will produce Operations and Maintenance (O&M) Manuals for the Grimsby A and Grimsby B plant and associated ancillary infrastructure. The Installation will have a service and maintenance schedule in place with an accredited contractor, anticipated to be consistent with those currently serving Grimsby A. RWE will implement an appropriate automated system for scheduling and recording plant maintenance work and for reporting events and associated corrective actions. All plant and equipment will be incorporated within these systems, enabling the system to flag any fault with plant and equipment so the plant operator can action it.

Routine maintenance will be undertaken annually with major maintenance events undertaken periodically on each major unit. As Grimsby A and Grimsby B are not intended for continuous use, the frequency of regular required maintenance is expected to be low. Any materials required for maintenance works for the gas engines will be brought to Site by the maintenance contractor and removed for appropriate treatment and / or disposal off-site on completion of works. No materials, including chemicals, required for maintenance works will be stored on Site.

Any effluent and other wastes generated from maintenance works will normally be disposed of to an appropriate disposal facility off Site.

4.5 Raw Materials

The use of hazardous materials within the Site will be eliminated by design where possible, and minimised where it is not practical to eliminate them.

Materials will be stored in appropriate containers, with suitable spill protection including; bunding or on bunded pallets (where appropriate), within dedicated storage areas.

The main raw material used is natural gas, which fuels the existing and the new gas engines. It is anticipated that up to 45,742.5 kW of natural gas will be required for the operation of the Grimsby A site and likewise for the for the Grimsby B site, per hour when operational (based on a Lower Heating Value (LHV) of 9.5 kWh/Nm^3); therefore total gas usage is estimated to be up to 68,614 MW for up to 1,500 hours of annual operation per site. The Site will receive natural gas from the NTS to ensure that the quality of the gas fed to the generators is of suitable quality. Gas will not be stored on Site prior to use as a fuel.

There will be two 5,000 litre above ground clean lubricating oil storage tanks on Site to facilitate lubricating oil changes, one serving the Grimsby A site and the other the Grimsby B site. Each tank will be located on concrete hardstanding overlain with gravel. and will be designed and fabricated to BS799-5, in accordance with CIRIA C736 paragraph 9.2.5, within a fabricated bunded area to hold at least 110% of storage tank capacity. There will be a dedicated area for the delivery of clean lubricating oil to each tank, however, the location and containment measures to be implemented are still to be determined. Each tank will have an internal drip tray and bund alarm fitted. In addition, spill kits will be available on-site and on the tanker.

There are two separate clean oil distribution manifolds, one serving the Grimsby A site and the other the Grimsby B site. These are fully welded circuits installed at height external to each engine enclosure which runs the full length of the Grimsby A and Grimsby B generator enclosures, respectively, connecting the clean oil tank to each engine with an automatic topping-up system to supply the generators as required based on operational running. The manifold will be inspected on a routine basis to check for signs of damage or points of potential failure.

The site will hold small volumes of cleaning and maintenance materials on site which will be stored in compliance with the requirements of COSHH within suitable bunded storage units within the plant areas. No other hazardous

materials, including chemicals, will be stored on Site. Any materials required for maintenance works will be brought on Site by the maintenance contractors, and removed following completion of works.

Secondary containment will be provided to all storage containers, including tanks and IBCs, in line with the appropriate legislation and regulatory guidance. In general, all bunds and bunded pallets will be sized to accommodate a minimum of 110% of the maximum storage vessel volume located in the bund.

The EMS will comprise procedures for controlling raw material delivery including for oil transfer operations, and spill response procedures. Spill kits will be available at various locations at the Site, including the designated area for material delivery.

4.6 Waste

The main waste stream generated on Site is anticipated to comprise waste lubricating oil. There are two 5,000 litre above ground waste lubricating oil storage tanks, one serving the Grimsby A site and the other the Grimsby B site. Both tanks are located adjacent to the respective clean lubricating oil tanks, and will stand within the compound located as per the Site layout drawings, Figure 2 – Appendix A.

The waste lubrication oil tanks will be located on concrete hardstanding overlain with gravel. and will be designed and fabricated to BS799-5, in accordance with CIRIA C736 paragraph 9.2.5 and in compliance with Oil Firing Technical Association for the Petroleum Industry (OFTEC) standard OFS T200 for Steel oil storage tanks and tank bunds. The fabricated bunded area is designed to hold at least 110% of the storage tank capacity.

The waste oil will be transferred from the engines to the waste oil tank via a dedicated flexible hose reel included within the waste bulk tank. The hose is manually connected to each engine as required during service intervals with the waste oil pumped from the engine sump, using a mobile gear pump, to the waste oil tank. Each tank will have internal drip trays and bund alarms fitted.

The flexible hose will be reeled in and stored within the bunded waste oil tank when not in use. There will be a dedicated area for the delivery of clean lubricating oil and collection of waste oil, however, the location and containment measures to be implemented at the loading/ unloading area are still to be determined. Spill kits will be available on site.

In addition to the waste lubricating oil, it is anticipated that small quantities of operational waste will be generated from the operation and maintenance of the Site, in addition to minor amounts of general waste from plant staff.

Other wastes including chemical waste will be either removed immediately from the Site or stored in appropriate containers pending removal. Disposal of such wastes will be at a licensed waste disposal facility. No chemical, lubricant or fuel discharge will be permitted and any container of such fluids will be provided with appropriate bunding.

RWE will endeavour to minimise waste generation from the Site's operations, by implementation of appropriate measures. RWE will also record the nature and quantity of all waste generated at the Installation in line with the existing procedures used for Grimsby A. It is anticipated that all waste generated on Site will be managed appropriately via licensed carriers and treatment facilities.

4.7 Energy Use

Grimsby A and Grimsby B are each expected to combust up to 68,614 MW of natural gas (LHV of 9.5 kWh/Nm^3) per year sourced from the NTS based on 1,500 hours of annual operation. The internal electricity "parasitic load" of each sites operations when the site is operational is estimated to be up to 2.4 MW per year. It is not anticipated that there will be any "parasitic load" with regards to gas consumption at the Site.

4.8 Energy Efficiency

When operating at MCR the four Grimsby B Jenbacher JMS624 gas-fired engines will achieve a gross electrical efficiency LHV of 43.27% and the Jenbacher JMS616 gas-fired engine a gross electrical efficiency LHV of 41.95%, which are within the BAT-Associated Energy Efficiency Levels (BAT-AEEL) of 39.5–44% for net electrical efficiency (%) for new engines combusting natural gas. Likewise, it is considered that the existing Grimsby A Jenbacher JGS420 generators have an electrical efficiency of 41.4% and therefore also operate within the BAT-AEEL.

The equipment selected for use and associated ancillary equipment is considered to represent energy efficient units for the proposed duties.

Elements of the generators' design that help achieve the high energy efficiency include the following:

- Modern design following current best practices in optimising efficiency;
- The use of dry air cooling instead of wet cooled condensers, which minimise visual impact (minimal potential for visible plumes) whilst maximising plant efficiency;
- High efficiency motors and drives so as to reduce parasitic loads;
- The generator components have been sized appropriately for the design capacity of the plant, so that each element is operating optimally and efficiently; and
- Effective insulation of hot surfaces.

The Grimsby A and Grimsby B plant will also be subject to regular planned maintenance in order to optimise their efficiency.

It is therefore expected that RWE as part of the design, implement energy efficiency measures which will achieve conversion efficiencies in excess of the BAT-AEEL.

The existing Grimsby A generators are limited to a maximum of 1,500 hours of operation per year. The Grimsby B generators will also operate for a maximum of 1,500 hours per year. Each site can operate independently to one another or could be call upon to operate concurrently as required by the National Grid. Due to the limited hours of availability and, given that the Site is to operate as a peaking plant, the actual number of hours operated will vary year to year dependant on Grid requirements, and cannot be predicted. It is therefore not considered appropriate for cogeneration (combined heat and power) or district heating use under Article 14 of the Energy Efficiency Directive.

5. Emissions to Air, Water and Land

5.1 Emissions to Air

Grimsby B will comprise five gas fired engines, four with a thermal input of approximately 9.92 MW and one with a thermal input of approximately 6.08 MW; with the combined thermal input for the peaking plant estimated to be 45.75 MW. The thermal input of each of the engines is therefore below 50 MW however, having a thermal input >1 MW, the individual engines at the Site are covered under the MCPD and are required to comply with the relevant ELVs, provided by Schedule 25 of the EP Regulations.

Likewise, the Grimsby A , has an existing MCPD permit to operate 10 x 4.8 MWth natural gas fired engines giving an aggregated thermal input of 48 MWth and operating for up to 1,500 hours per annum.

The use of natural gas means that emissions of sulphur dioxide (SO_2) and particulates (PM) from the Grimsby A and Grimsby B sites will be negligible, and therefore have not been considered further.

Emissions of nitrogen oxides (NO_x) will be controlled by primary means operated and controlled through an automated process control system in accordance with BAT. Likewise, CO emissions, due to incomplete natural gas combustion, will also be controlled by primary means and balanced against the requirement to minimise NO_x, as this has a greater potential for air quality impacts. The findings from similar assessments indicate that CO impacts will also be insignificant, especially noting that there has never been a failure to comply with the EU CO limit value in any EU country. Likewise the MCPD does not set an emission limit for CO against which to assess, As such, the assessment of CO emission has been screened out of further consideration in the air quality assessment.

5.1.1 Flue Stacks

The Grimsby A and Grimsby B sites will release flue gas via stacks exiting from the roof of each gas engine's enclosure (Emission Points A01 - A15). Details of the air emission and details of the point source emissions parameters are shown in Table 4.

Table 4. Emission Parameters and Pollutant Emission Rates per Engine

Parameter	Emission Points A01 to A10	Emission Points A11 to A14	Emission Point A15
Location	**Grimsby A**	**Grimsby B**	**Grimsby B**
Generator Type	Jenbacher JGS 420	Jenbacher J624 GS-H-312	Jenbacher J616 GS-J-12
Number of Units	10	4	1
Assessed Stack Locations (OS Grid reference)	A01: 525312, 411355 A02: 525310, 411350 A03: 525309, 411345 A04: 525308, 411341 A05: 525307, 411336 A06: 525305, 411331 A07: 525304, 411326 A08: 525303, 411321 A09: 525302, 411316 A10: 525300, 411312	A11: 525345, 411327 A12: 525344, 411322 A13: 525343, 411318 A14: 525341, 411313	525340, 411308
Stack Height (m above finished ground level)	8.0	12.5	12.5
Volumetric Flow at Stack Exit Parameters (Am^3/s)	6.80	12.36	7.85
Internal Flue Diameter (m)	0.50	0.68	0.54
Average Efflux Velocity (m/s)	34.6	34	34
Temperature (ºC)	451	348	362
O_2 Content (% dry)	9.4	9.4	9.3

Parameter	Emission Points A01 to A10	Emission Points A11 to A14	Emission Point A15
Moisture (%)	11.5	10.8	11.0
Assumed Maximum Annual Operating Hours (for assessment purposes)	1,500	1,500	1,500
Oxides of Nitrogen (NO_x) ELV (MCPD, mg/Nm^3)	190	95	95
Oxides of Nitrogen (NO_x) emission rate (g/s)	0.84	0.80	0.49

The generators will operate in accordance with the MCPD

The Air Quality Assessment for the Site is provided in Appendix D, with a summary of the predicted impacts discussed in Section 7. The locations of the Emission Points for emissions to air are shown on Figure 2 (Appendix A).

5.1.2 Use of NO_x Abatement Measures

The Grimsby B generators will be designed to achieve NO_x (oxides of nitrogen) emissions not exceeding 95 mg/Nm^3 (in dry exhaust gas at 15% O_2 Standard Test Conditions, 273 K, 101.3 kPa) and will comply with the emission limits stipulated in the MCPD for reciprocating gas engines installed after December 2018.

The existing Grimsby A generators were designed to achieve NO_x emissions not exceeding 190 mg/Nm^3 (in dry exhaust gas at 15% O_2 Standard Test Conditions, 273 K, 101.3 kPa) which was applicable for reciprocating gas engines put into operation before 20th December 2018.

The Grimsby A and Grimsby B sites achieve the specified NO_x emission limits without requiring the use of a catalytic reduction system and maintain emissions control through the engine management system. The Grimsby A and Grimsby B generators have therefore not been designed to include space for installation of supplementary NO_x emissions abatement systems in future.

5.2 Emissions to Water

There will be no process emissions to water from the Installation activities.

It is expected that there will be small quantities of uncontaminated rainwater run-off from the Site. Rainwater falling on the Grimsby A generators roofs and wider site area currently percolates though the sites gravel surface until it reaches the concrete underlaying the site area after which it runs from the concrete until it meets a permeable layer, i.e. either a gap in or the edge of the concrete base after which it percolates into the soil.

For Grimsby B, water landing on the wider site will follow a similar philosophy to the Grimsby A site, however, rainwater from the roof of the Grimsby B generators will be directed into the bunded area to the north of the Grimsby B Generators. Clean rainwater in the bunded area will subsequently percolate into the ground through boreholes drilled through the concrete to allow drainage of area.

5.3 Emissions to Sewer

There are no process related emissions to Sewer from the Installation activities.

Foul water discharges from the Site only consist of domestic sewerage from the operator welfare areas, which discharge to an on-site septic tank and soakaway.

Due to the nature of the discharge (i.e. domestic sewage, non-process emission) it is not proposed to be included within the Environmental Permit.

5.4 Emissions to Land

There will be no process emissions to land from the Site.

5.5 Odour

It is considered that, due to its inherent nature of the materials used onsite and the containment applied to the stored materials, that the Installation activities will not generate significant odour.

5.6 Noise

An assessment of the potential noise impacts has been completed and is presented in Appendix E. The assessment sets out the predicted impacts and effects associated with operation of the Grimsby A and Grimsby B peaking plants.

The assessment determines that the noise levels likely to be generated at all residential receptors is at a low level of between LAeq,T 31-34 dB(A) and well within the WHO/ BS 8233 advised daytime LAeq,T level of 50 dB, applicable to outdoor amenity areas. The resulting BS 4142 assessment level of between -13 dB to -31 dB, provides a positive indication that operational noise from the Site would provide a negligible adverse impact.

It further states that the specific sound level from operation of the Installation would be steady and expected to provide no tonal, or impulsive, character at the distant receptor positions. Therefore, the noise impact will be low.

In terms of impact at ecological receptors the noise assessment concludes that the operational noise level range is well below the 65 dB(A) threshold level for the significance of noise impact on bird populations at the Humber Estuary SAC and Local Wildlife Site (LWS).

The predicted specific sound level at the Continental Tyres premises (Training Centre), is LAeq,T 52 dB, which is 6 dB below the existing ambient LAeq,T level of 58 dB and which would provide only a small 1 dB increase to the existing level. Such a modest daytime noise level and small noise change would be unlikely to cause any adverse impact to the Training Centre use.

The noise assessment, therefore, concludes that the operational sound from the overall Installation activities would present a negligible adverse impact on the closest residential, commercial and SAC/ LWS receptors.

6. Monitoring

6.1 Infrastructure

The existing Site infrastructure monitoring plan will be extended to include the Grimsby B site once it is operational and accounting for the fact that the Installation will now be a Part A scheduled activity, this will take into account the additional and more stringent monitoring requirements that this requires.

The routine infrastructure audits will comprise identification of issues relating principally to:

- generating units;
- storage tanks;
- storage areas;
- surface water;
- Minor leaks;
- Standing water in bunded areas; and
- Oil tank bunds.

They will consist of a combination of weekly, monthly and quarterly inspections, alongside more infrequent activities such as drainage surveys and bund integrity tests as applicable.

6.2 Emissions to Air

There are ten existing Emission Points on the Grimsby A site:

- Generator 01 - Emission Point A01;
- Generator 02 - Emission Point A02;
- Generator 03 - Emission Point A03;
- Generator 04 - Emission Point A04;
- Generator 05 - Emission Point A05.
- Generator 06 - Emission Point A06;
- Generator 07 - Emission Point A07;
- Generator 08 - Emission Point A08;
- Generator 09 - Emission Point A09; and
- Generator 10 - Emission Point A10.

There are five new Emission Points to air associated with the Grimsby B site and equipment covered by this variation, comprising:

- Generator 11 - Emission Point A11;
- Generator 12 - Emission Point A12;
- Generator 13 - Emission Point A13;
- Generator 14 - Emission Point A14; and
- Generator 15 - Emission Point A15.

Due to the individual thermal input of the engines being equal to or greater than 1 MW and less than or equal to 20 MW, the monitoring requirements of the MCPD apply to the emissions from all the gas engines. This requires that extractive monitoring is carried out within 4 months of the permit being issued or the start of operation, whichever is the latest, and then every three years as per MCP guidance for plant less than or equal to 20 MW_{th}.

The Environmental Permit will specify the emission limits and applicable analytical requirements for emissions monitoring. The proposed monitoring requirements are shown below in Table 5.

Table 5. Proposed Emissions and Monitoring (for insertion into permit)

Release Point	Parameter	Source	Limit (Note [1])	Reference Period	Monitoring Frequency	Monitoring Standard or Method	Comment
A01-A10	Oxides of nitrogen (NO and NO_2 expressed as NO_2)	Engines 1 – 10	190 mg/Nm^3	Average over the sampling period	Every three years	BS EN 14792	Existing emission points
A11-A15	Oxides of nitrogen (NO and NO_2 expressed as NO_2)	Engines 11 – 15	95 mg/Nm^3	Average over the sampling period	Within 4 months of the permit being issued or the start of operation, whichever is the latest, and then every three years	BS EN 14792	New emission points

Note 1: Based on Reference conditions - dry gas, 0°C, 101.3 kPa, 15% O_2

6.3 Emissions to Sewer

There are no process emission to sewer, therefore no monitoring is required.

6.4 Emissions to Water

The key emissions to water will comprise uncontaminated surface (rain) water which will percolate though the Site's gravel surface.

Additional storage and a filtration soakaway will be provided to deal with surface water collected from the Grimsby B generators' enclosure roofs. The soakaway system will utilise the existing tank bund at the northern end of the Site which will be modified by the drilling of 10-20 cored holes to allow surface water to drain away. Water from the Grimsby B generator enclosure roofs will be gravity fed into the soakaway.

A surface water management plan will be developed for the Site and will be submitted in support of the permit application. There will be no process emissions to controlled waters from the Site operations.

7. Environmental Risk Assessment (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 Site 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 Site.

Where necessary, appropriate modelling has been completed to ensure that any predicted significant effects on sensitive receptors can be avoided or mitigated. The results of the modelling assessments are reported in the Air Quality Assessment and Noise Assessment and the included in Appendix D and Appendix E respectively.

7.2 Site Location and Sensitive Receptors

7.2.1 Human Receptors

The Site is located in a predominantly industrial area on the north-western edge of Grimsby. The receptors are selected to be representative of the closest sensitive human receptors to the Site which include residential dwellings, a hotel and recreational areas around the Site and are detailed in Table 6 and illustrated in Figure 4 (Appendix A).

Table 6. Human Receptor Locations

Receptor	Description	Distance from Site (km)	Direction from Site
R1	Coastal Footpath	0.35	NE
R2	Premier Inn Hotel (Appian Way)	0.46	S
R3	Houses at Haven Gardens	0.90	S
X1	Dunlop Oil & Marine (gatehouse and offices)	0.17	SW
X2	Novartis (industrial buildings)	0.37	WNW

7.3 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 10 km for European designated sites (Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar sites (protected wetlands)) and up to 2 km for Sites of Special Scientific Interest (SSSIs) and local nature sites (ancient woods, local wildlife sites (LWS) and national nature reserves (NNRs) and local nature reserves (LNRs)).

Statutory designated sites have been identified through a desk study of the Defra Magic mapping website, which identifies SSSIs, Ramsar sites, SPAs and SACs. European designated sites up to 10 km from the Site are listed in Table 7.

Table 7. Designated Ecological Receptors in the Vicinity of the Site

ID	Ecological Area	Designation	Distance from Site (km)	Direction from Site
R4	Humber Estuary	SAC/ SPA/ RAMSAR/ SSSI	0.42	NE
X3	Humber Estuary	SAC/ SPA/ RAMSAR/ SSSI	0.77	NE

Non-Statutory ecological receptors identified within 2 km of the Site are shown below in Table 8.

Table 8. Non – Statutory Ecological Receptors in the Vicinity of the Site (within 2 km)

ID	Ecological Area	Designation	Distance from Site (km)	Direction from Site
R5	West Field	LWS	0.15	NNE
R6	West Field	LWS	0.13	W

Modelled ecological receptors are illustrated in Figure 5 (Appendix A).

7.3.1 Geology

British Geological Survey (BGS, 1990) shows that the Site is underlain by Made Ground, soft to firm clay of artificially deposited “Warp” / superficial Tidal Flat deposits, Glacial Till and Chalk bedrock.

The geology underlying the Site has been detailed within the Application Site Report (Appendix B).

7.3.2 Hydrology

The Site is adjacent to the River Humber and the River Freshney flows southwest to northeast towards the Site, the natural route has been diverted to the south and east to discharge to the Humber via the docks about 1.5 km east of the Site. The New Cut Drain runs parallel and very close to the River Freshney on the edge of its narrow floodplain, and discharges to the Humber immediately east of the water treatment works, some 400 m east of the Site.

7.3.3 Hydrogeology

The hydrogeology underlying the Site has been detailed within the Application Site Report (Appendix B)..

7.3.4 Pathways for Pollution

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

Pathways to sensitive receptors primarily include, but are not limited to, the following:

- Chemicals and lubricating oil required for the operation of the Site might leach into the ground and be washed into surface water or groundwater through the underlying soils; and
- Combustion gases from the Site will be dispersed in the air to sensitive receptors.

In order to prevent and minimise the risk of pollution, the Site will be designed and managed to isolate or reduce the effectiveness of these pathways, preventing contaminants from migrating off Site other than through properly managed abatement systems.

7.4 Impact Assessment

The following sections provide an assessment of the impact of releases from the Site, 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; and
- Present the assessment as detailed in the EA’s Guidance ‘Risk assessments for your environmental permit’.

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 surface water;
- Emissions to air;
- Site waste;

- Global warming potential; and
- Emissions to groundwater.

7.4.1 Amenity and Accidents

A qualitative risk assessment has been undertaken for the Site and is included in Appendix G of this document.

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

7.4.1.1 Odour

Given the nature of the operations to be undertaken at the Site, it is expected that odour will not be a significant issue and therefore does not require additional management, e.g. through a formal odour management plan (OMP).

7.4.1.2 Noise and Vibration

Measures to be included in the design and operation of the Site for the management and control of noise and vibration are discussed in Section 5.6 of this supporting document to the permit variation application.

These measures have been scoped and developed in consultation with the Local Authority, and include a baseline noise assessment. A copy of the noise assessment undertaken for the Site is included in Appendix E.

7.4.1.3 Fugitive Emissions

Based on the nature of the activities undertaken at the Site and the various controls placed on the Site plant and equipment, it is expected that fugitive emissions to air, water or land will be unlikely to occur.

7.4.1.4 Visible Plumes

The Grimsby A and Grimsby B gas-engine generator plant are designed to use closed loop air cooled heat exchanger systems, therefore removing the potential for the generation of visible plumes. Further assessment of visible plumes from the Site is, therefore, not considered to be required.

7.4.1.5 Accidents

The Site has an existing Accident Management Plan (AMP) which will be updated to encompass the Grimsby B activities to include specific risks from the operation of the new gas fired engines.

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

- Plans to deal with accidental pollution and any necessary equipment (e.g. spillage kits) will be held on Site and all 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 any surface water system; and
- Implementation of containment measures, including use of tanks designed and fabricated to BS799-5, in accordance with CIRIA C736 paragraph 9.2.5 and in compliance with Oil Firing Technical Association for the Petroleum Industry (OFTEC) standard OFS T200 for Steel oil storage tanks and tank bunds. The fabricated bunded area is designed to hold at least 110% of the storage tank capacity. . All chemicals will be stored in accordance with their COSHH guidelines.

Each engine is contained within its own container which is fitted with internal fire detection, which has been detailed in Sections 4.2.1.9 and 4.2.5.4.

As each engine is housed in its own, independent, enclosure which is constructed using non-combustible materials with limited combustible material present within the enclosure. The risk of a large fire at the Installation is considered to be very low as is the risk that a fire would spread between engine enclosures given the operating philosophy set out above. Therefore, the likelihood of the Site needing to deal with large volumes of firewater is also correspondingly low. Each engine enclosure is self-bunded and has the capacity to retain a limited volume of fire water if required, however, it is anticipated that any fire would be left to burn itself out in the enclosed container given the limited amount of combustible material present to burn. A fire water management plan will be developed on the basis of this low risk. It should also be noted that the Site does not have a firewater tank or firefighting main and hydrant system.

7.4.1.6 Flood Risk Assessment

The EA Flood Maps[1] show that the Site is at low risk of flooding from rivers or the sea, and at very low risk outside the identified flood zones for flooding from surface waters and reservoirs. The Site is therefore unlikely to be affected by flooding. A detailed Flood Assessment plan is therefore not considered to be required.

As a best practice measure, flood resilience measures have been incorporated into the design of the Site where appropriate, so as to minimise the amount of damage and reduce the recovery time of the Site in the unlikely case of the Site becoming flooded. These measures include:

- The placement of main plant and flood sensitive equipment at a height above the identified flood level;
- Adequate containment within storage areas so as to ensure material does not wash away and cause pollution;
- Inclusion of flooding scenarios within the existing Power Station's emergency response procedures; and
- Development of a Surface Water Management Strategy for the Site.

7.5 Emissions to Water

There will not be any direct discharges to controlled waters of process water from the activities proposed by this application. As such, due to the inherent nature of the proposed activities, it is anticipated that the quantity of process water generated by the activity will be minimal.

The key emissions to water from the Site will comprise uncontaminated surface (rain) water run-off. A summary of the emissions from the Site to surface water is provided in Section 5.2. A surface water management plan is to be developed and will be submitted in support of the permit application.

7.6 Emissions to Air

An air dispersion modelling exercise has been undertaken to assess the impact on local air quality as a result of the anticipated emissions identified in Table 4 above.

A copy of the Air Quality Impact Assessment is included in Appendix D and the key findings are summarised below.

7.6.1 Impact on Local Air Quality

The Grimsby B gas-engine generator units will be designed such that combustion plant emissions to air comply with the emission requirements specified in the MCPD (i.e. ELVs). The existing Grimsby A units comply with the emission requirements specified in the MCPD at the time of commissioning, i.e. before 20th December 2018.

An air quality impact assessment has been carried out for the Site, with reference to the EA Risk Assessment methodology for Environmental Permitting.

Detailed dispersion modelling has been used to calculate the concentration of pollutants at identified sensitive receptors and these have been compared with National Air Quality Strategy objectives, and Critical Levels and Critical Loads for ecosystems, with consideration for the baseline air quality and ecological deposition rates, in accordance with EA methodology.

The assessment has been based on the worst-case operational scenarios with respect to potential air quality impacts, employing operational design parameters for the alternative technologies and configurations under consideration for the Site. A number of other conservative assumptions have been made in combination, including:

- The use of the worst-case year of meteorological data modelled;
- The use of maximum building sizes within the design;
- Short term operation has been assessed based on continual operation of the Grimsby A and Grimsby B generators, to ensure that meteorological conditions that lead to the worst case impacts are taken into account;
- Long term operation of the Grimsby A and Grimsby B generators based on a maximum of 1,500 hours per year;

[1] https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

- The operation of the Grimsby A and Grimsby B generators at applicable MCPD emission limits (for worst-case/ highest NO_x); and
- Conservative estimates of background concentrations of pollutants at the sensitive receptors.

7.6.2 Screening Assessment Results

The results of the screening assessment using the H1 Risk Assessment software tool indicate that NO_2 can be screened (at Stage One) as insignificant against the NAQS objectives. However, the long-term and short-term process contributions of NO_x are greater than 1% or10% of the relevant NAQS objectives.

Stage two of the screening calculations indicated that the process contributions of NO_x at ecological receptor locations have the potential to exceed the long-term and short-term Critical Levels, and, therefore, detailed dispersion modelling is required to better understand the impacts.

7.6.3 Detailed Dispersion Modelling Results

The impact of the Site's process contribution from point source emissions at human health receptors has been determined based on the maximum predicted concentration at discrete sensitive receptor locations.

The maximum NO_2 short-term Cumulative Contribution (CC) at the worst case human health receptor is not screened as "insignificant" by the dispersion modelling with the maximum hourly mean CC of the Grimsby A and Grimsby B generators at Receptor R1, the coastal footpath, representing 28% of the NAQS. When considered with the background concentration of NO_2 in the Site's vicinity, it represents 32% of the headroom between the short-term baseline concentration and the NAQS and therefore is not predicted to result in a breach of the NAQS objective, and is considered not to be "significant". The maximum NO_2 short-term process contributions at the closest residential receptor is predicted to be less than 10% of the NAQS and, therefore, can be screened as insignificant.

The maximum NO_2 long-term CC at human health receptor where the annual NAQS is applicable, represented by Receptor R3, is screened as "insignificant" by the dispersion modelling with the maximum annual mean CC represents 0.8% of the NAQS. When considered with the background concentration of NO_2 in the Site's vicinity, it represents 36% of the NAQS and therefore is not predicted to result in a breach of the NAQS objective, and is considered not to be "significant".

The maximum NO_x long-term CC at the worst case ecological receptor is not screened as "insignificant" by the dispersion modelling and the maximum annual mean CC represents 11% of the Critical Level at the Humber Estuary designated ecological area. When considered with the background concentration of NO_x in the Site's vicinity, it represents 65% of the Critical Level and therefore is not predicted to result in a breach of the Critical Level. The maximum CC at the West Field LWS is predicted to represent 36% of the Critical Level, however, given that this is not a European or nationally designated ecological sites can, contributions can be screened out insignificant as they represent less than 100% of the NAQS.

Daily average NO_x CCs cannot be screened as "insignificant" with short-term contributions representing more than the Critical Level, however, the dispersion modelling undertaken gives an extremely pessimistic representation of short-term impacts, as the periods of generation are unlikely to coincide with periods of adverse meteorology and are unlikely to last for a full 24 hour period. Although, under the highly conservative assumptions used in this assessment, the short term PC impacts at the receptors in the tidal mudflats can be above the 10% potentially significant effects threshold, the risk of impact on this small region of the mudflats would be expected to be very low as they will contain little vegetation and the inter-tidal nature of the estuary will limit exposure of the tidal mudflats to atmospheric NO_x. Consequently, taking into account both the PC, CC and PEC short term impacts, the effect of the air concentrations of NO_x on all the Humber Estuary designated site was judged to be insignificant.

Likewise the short term CC impacts at West Field LWS, Receptors R5 and R6, are anticipated to exceed the NAQS. However, short-term NO_x concentrations are much less important for vegetation than exceedances of the long-term Critical Level. This is because the main role of NO_x is as a source of nitrogen and vegetation is only affected by long-term changes in nitrogen deposition rather than brief (24 hour) fluctuations. As a result, short-term higher NO_x concentrations will not materially affect nitrogen deposition and thus will not affect vegetation. Given that the annual PEC represents less than 100% of the NAQS, it is considered unlikely that short-term NO_x concentrations will have an adverse effect on the structure or botanical composition of the ecological sites assessed and, as such, can be screened out as insignificant.

The process contribution of NO_x at Statutory ecological receptors is predicted to result in "insignificant" impacts with respect to nutrient nitrogen deposition especially given the tidal nature of the Humber Estuary.

7.7 Noise Emissions

Noise emissions from the operational Grimsby A and proposed Grimsby B gas-engine generators have been assessed, as described in Appendix E. The noise assessments confirmed that operational sound from the Site would provide a negligible adverse impact on the closest residential, commercial and SAC/ LWS receptors.

The operational plant is not expected to result in vibrational emissions and impacts from vibration are expected to be insignificant. Noise impacts on ecological receptors are considered to be insignificant.

7.8 Site Waste

The details of anticipated waste streams generated at the Site are provided in Section 4.6.

All operational waste will be dealt with in accordance with the waste hierarchy. Grimsby Power Station has existing waste management procedures, which will be amended as required for the Grimsby B site, with appropriated 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.

It is therefore considered that further assessment of the waste from the proposed Site operations is not required.

7.9 Global Warming Potential (GWP)

This section is based on guidance presented in the EA guidance – "Assess the impact of air emissions on global warming" [2].

The release of greenhouse gas emissions is anticipated primarily from the direct emissions produced or associated with energy and fuel use. For the purposes of this GWP assessment it has been assumed that the Installation will not import any electricity from the National Grid, and will utilise some of the electricity generated on Site for its use (as a parasitic load). These releases have been identified and their global warming potential calculated below.

The anticipated emission of carbon dioxide resulting from the peaking plant from the consumption/ generation of energy is summarised in Table 9.

Table 9. Energy Consumption

Energy Source Table text	Energy Consumption Primary		
	At Primary Source (MWh)	CO_2 Emission Factor (kg/MWh)	Annual CO_2 Emissions (tonnes)
Grimsby A	68,614	190	13,037
Grimsby B	68,614	190	13,037

The amount of energy consumed by the Grimsby A and Grimsby B sites themselves when generating can be up to 2.4 MW per year, and this has not been included in direct energy use. The parasitic load of the Site is estimated to generate annual CO_2 emissions of 0.8 tonnes, based on a CO_2 Emission Factor of 166 kg/MWh.

[2] Guidance: Assess the impact of air emissions on global warming, EA, published 01st February 2016, available at: https://www.gov.uk/guidance/assess-the-impact-of-air-emissions-on-global-warming

Appendix A Figures

Figure 1. Site Location Plan

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Figure 2. Existing Grimsby A and Proposed Grimsby B Site Boundary's

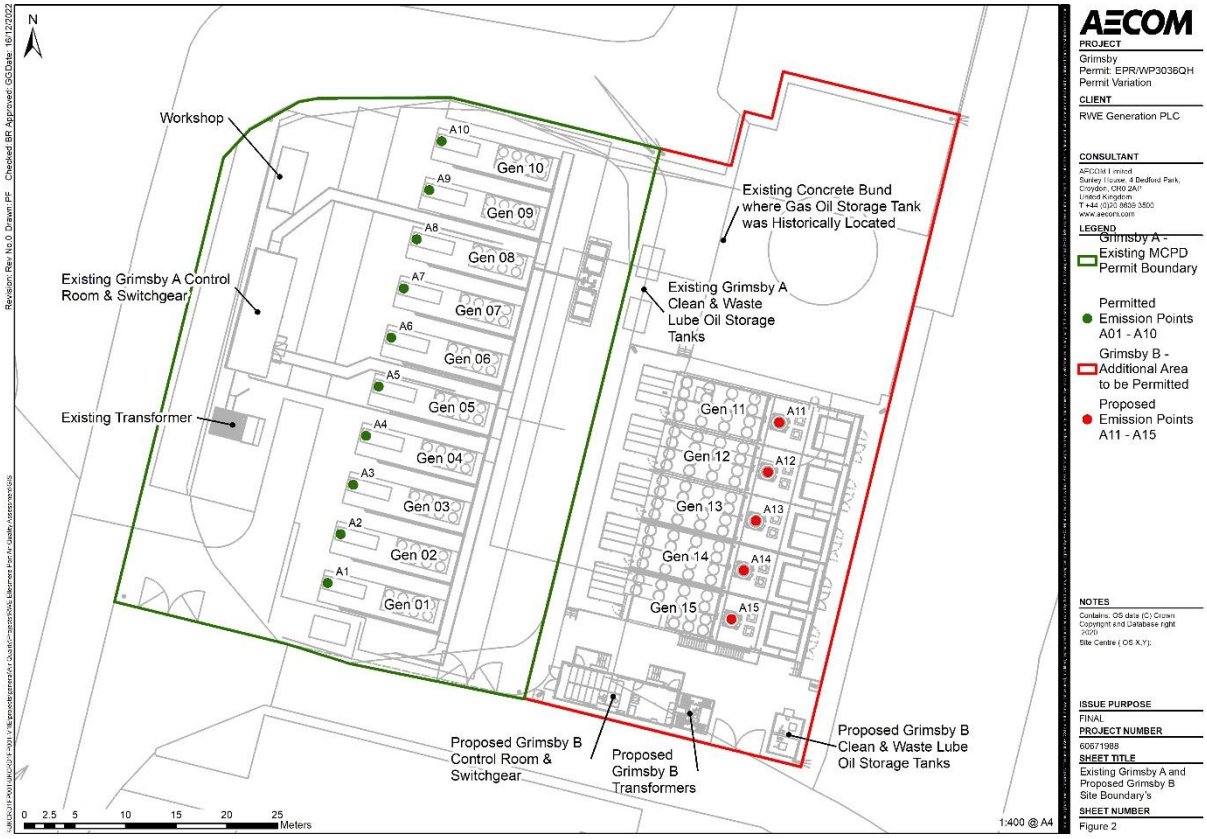

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Figure 3. Proposed Installation Boundary

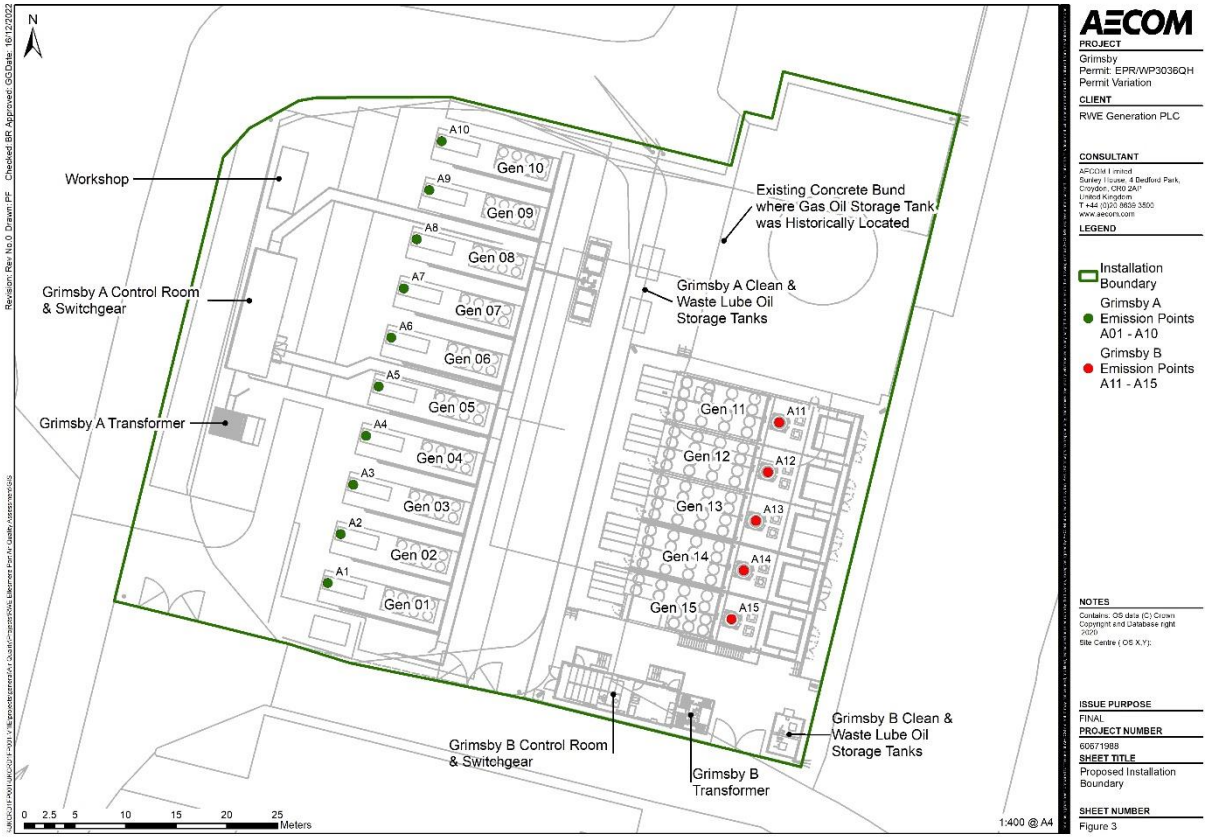

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Figure 4. Modelled Human Receptors

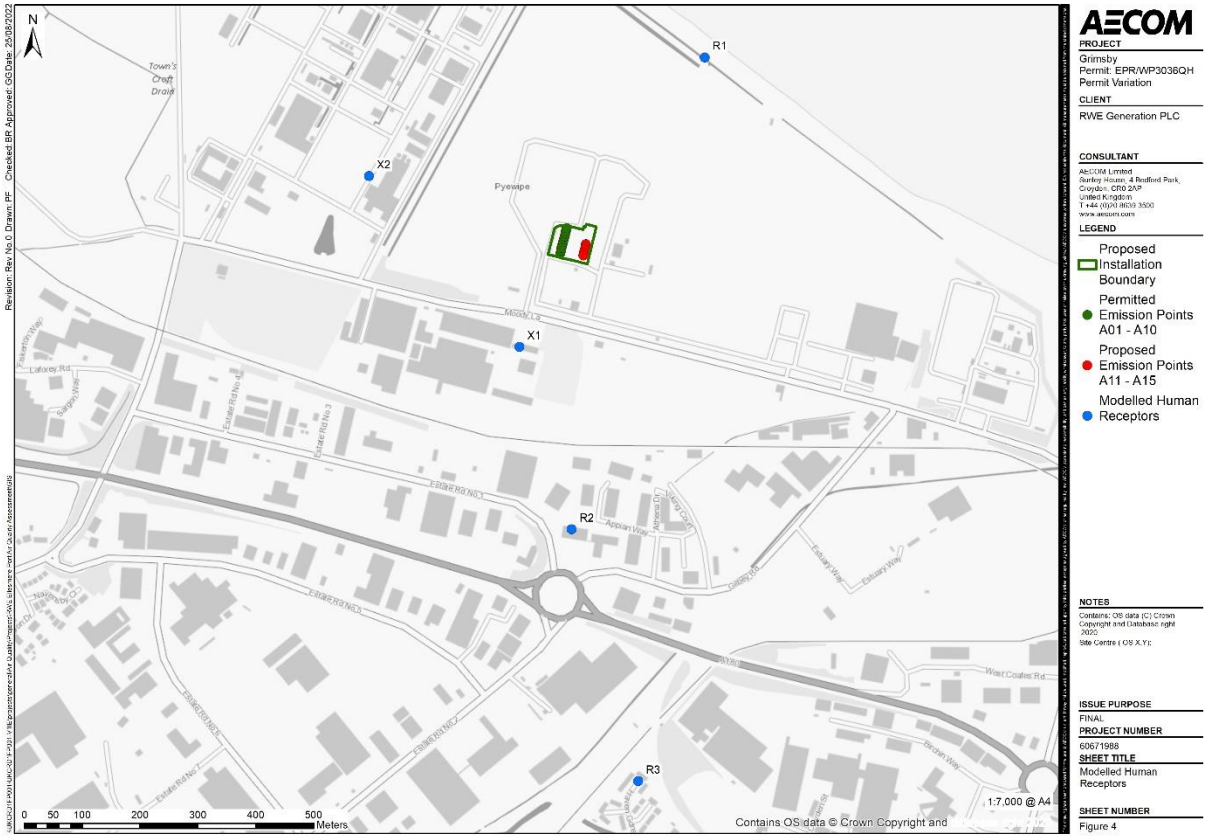

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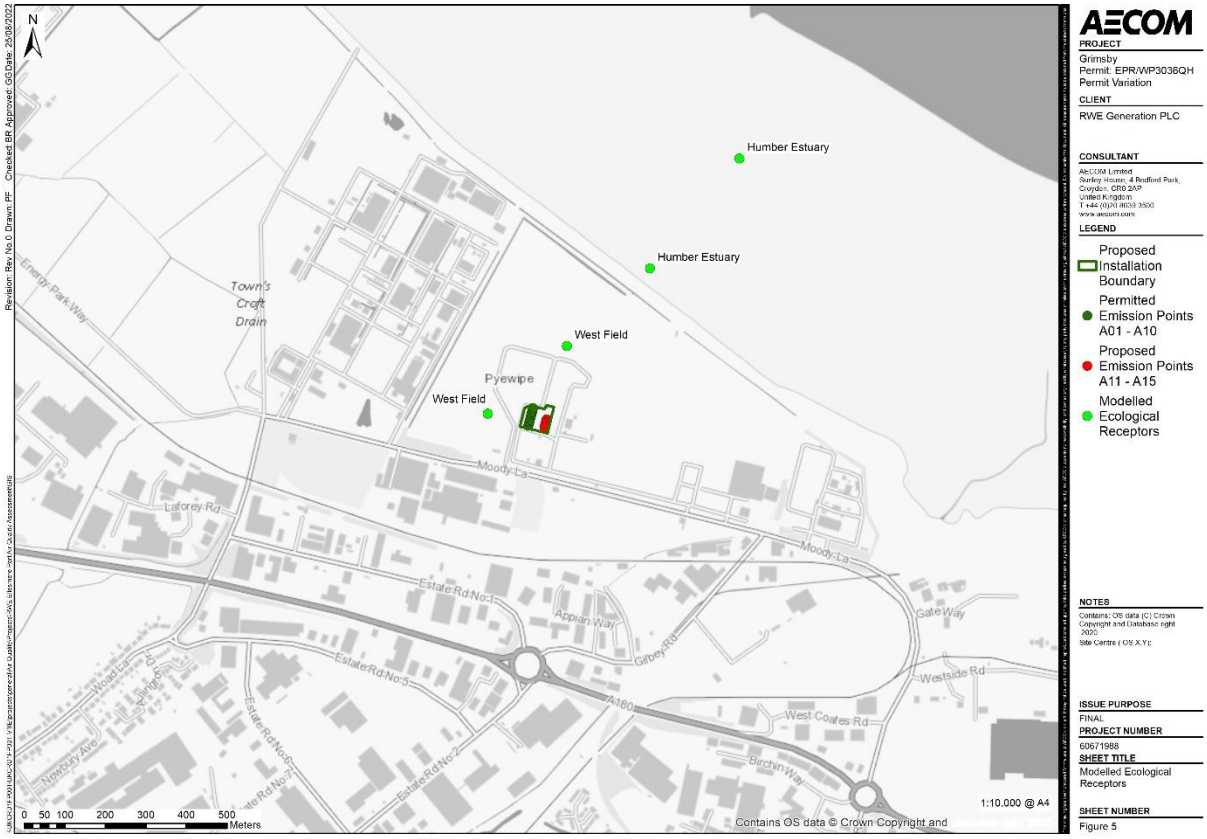
Figure 5. Modelled Ecological Receptors



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Appendix B Site Condition Report

SITE CONDITION REPORT CONTAINED IN APPENDIX B FOLDER

Appendix C Environmental Management System

Lloyd's Register

Current issue date: 19 January 2021
Expiry date: 18 January 2024
Certificate identity number: 10326749

Original approval(s):
ISO 14001 - 19 January 2018

Certificate of Approval

This is to certify that the Management System of:

RWE Generation UK plc

Windmill Hill Business Park, Whitehill Way, Swindon, SN5 6PB, United Kingdom

has been approved by Lloyd's Register to the following standards:

ISO 14001:2015

Approval number(s): ISO 14001 – 00012295

This certificate is valid only in association with the certificate schedule bearing the same number on which the locations applicable to this approval are listed.

The scope of this approval is applicable to:

Activities associated with the generation of electricity by combustion and small scale generation of heat for local customers, including operational, technical and maintenance support functions.

David Derrick

Area Operations Manager UK & Ireland

Issued by: Lloyd's Register Quality Assurance Limited

UKAS MANAGEMENT SYSTEMS
001

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Appendix D Air Quality Assessment

AIR QUALITY ASSESSMENT AND DISPERSION MODELLING FILES CONTAINED IN APPENDIX D FOLDER

Appendix E Noise Assessment

NOISE ASSESSMENT AND MODELLING FILES CONTAINED IN APPENDIX E FOLDER

Appendix F Drainage Strategy

SURFACE WATER DRAINAGE STRATEGY FOR GENERATOR ROOFS CONTAINED IN APPENDIX F FOLDER

Appendix G Qualitative Risk Assessment

Table 10. Assessment of Fugitive Emission Risks

Hazard	Receptor	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Escape of natural gas	Local residents/ businesses beyond the Installation boundary	Gas carried on wind leading to the development of flammable atmospheres	No on-site gas storage facilities minimising the likelihood of large gas release and the development of an explosive atmosphere on Site. If there is a leak in the gas supply pipeline, the quantity released is expected to be dispersed and not lead to the development of an explosive atmosphere. An emergency shutdown valve will be in place that will shut in the event of sudden de-pressurisation of the pipeline. Its primary function is to prevent the continuous loss of gas in the unlikely event of a major leak in the downstream pipework. Gas systems will be included in Site maintenance schedule.	Gas could reach sensitive receptors but appropriate design and management actions should minimise the quantity of gas at receptors. Probability of exposure is therefore very low.	Potential flammable vapour in the vicinity of local receptors	Very Low
Escape of raw materials including lubricating oils	Local surface water and/ or groundwater	Flow by gravity/ drainage systems / unsurfaced areas	Limited external storage facilities; Storage arrangements appropriate to materials being stored; all tank to be located on concrete hardstanding overlain with gravel and designed to BS799-5, in accordance with CIRIA C736 paragraph 9.2.5 and OFTEC OFS T200. Fabricated bunded area designed to hold at least 110% of tank capacity. High and low level tank alarms, internal drip trays and bund alarms fitted. Inspection and maintenance to be undertaken at regular intervals.	Fugitive releases could reach surface water and/ or groundwater but appropriate design and management actions should prevent this from happening. All bulk storage tanks will be bunded to provide sufficient containment in the event of a tank/ containment failure. Probability is therefore low.	Localised pollution of surface water and groundwater.	Low

Table 11. Assessment of Accident Risks

Hazard	Receptor	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Fire	Local residents/ businesses beyond the Installation boundary. Site staff and Infrastructure.	Emissions of smoke to the air and potentially firewater, foam, etc. to site drainage and soil/ groundwater and controlled waters	Each generator engine enclosure is constructed using non-combustible materials and fitted with fire and gas detection. Fire and gas detection system triggers automatic response to shut the generator down and isolate the gas supply to the enclosure. A gas or fire alarm would trigger the other generators on site to shut down and given the nature of the enclosures and distance between them the risk of multiple	Appropriate design and management actions should allow the early detection of and so minimise the risk of fire spreading.	Complaints of smoke/ smells in vicinity from local residential receptors. Localised pollution of surface water and soil/ groundwater.	Low

			engines catching fire has been minimised. Use of portable extinguishers plant wide and smoke vents in designated areas.			
Flooding of the Site and associated contamination of flood waters with lubricating oil stored on site	Local surface water and/ or groundwater	Flow by gravity/ drainage systems/ unsurfaced areas	Appropriate bunding and containment of all stored raw materials on site to prevent escape via flood waters. Appropriately installed and secured storage tanks to prevent tank float off	Negligible. The EA Flood Map for Planning (Rivers and Seas) shows that the site is outside any identified flood zones.	Negligible risk of potential pollution of surface water and groundwater from escape of lubricating oil.	Negligible
Vandalism to plant, equipment and infrastructure and associated loss of lubricating oil stored on site	Local residents/ businesses beyond the Installation boundary Air, land and water. Site staff and Infrastructure.	Emissions resulting from failure/ reduced performance of vandalised plant, equipment and infrastructure	Security fence; Intruder alarms and CCTV cameras at numerous locations on site, security control gates at site entrance with restricted entry; relevant signage; building envelope around a significant proportion of the operation/ process.	Negligible. Appropriate design and management actions should prevent vandalism happening.	Localised pollution of surface water and groundwater. Potential for injury, damage to plant/ equipment.	Low
Loss of containment during oil delivery or waste oil collection, from the lube oil distribution pipework and waste lube oil drainage hose when draining down the engine lube oil system.	Local surface water and/ or groundwater. Local residents/ businesses beyond the Installation boundary.	Emissions to surface water and potential ground water ground resulting from failure of oil storage tanks, or leaks and losses from oil deliver/ collection both during transfer between tanker and storage tanks and between storage tanks and generator enclosures.	Tanks located on concrete hardstanding overlain with gravel. and designed to BS799-5, in accordance with CIRIA C736 paragraph 9.2.5 and OFTEC OFS T200 with fabricated bunding designed to hold at least 110% of tank capacity. Dedicated area for oil delivery/ collection. With containment measures to be implemented (though details of this are outstanding) Spill to be available at all times. Routine inspection of all Site equipment, pipes and oil delivery manifold to check for signs of damage or points of potential failure. Currently no details of any secondary containment for the Site are available.	Negligible. Appropriate design and management actions should prevent vandalism happening.	Localised pollution of surface water and groundwater. Potential for injury, damage to plant/ equipment	Low

Appendix H List of Directors

RWE GENERATION UK PLC

Company Number: 03892782

Registered Office Address: Windmill Hill Business Park, Whitehill Way, Swindon, Wiltshire, SN5 6PB

Company Type: Public limited Company

Incorporated on: 13 December 1999

Table 12. Details of Company Directors (Active only)

Director Name	Role	Date of Birth	Occupation	Appointed On
Jason Anthony Keene	Secretary	-	-	31 December 2012
William Henry Jeffery	Director	September 1970	Head Of Gas Asset Management	1 April 2021
Helen Wendy Mallett	Director	May 1975	Accountant	18 June 2019
Mohamed Shabir Suleman	Director	February 1964	Head Of Commercial Asset Optimisation - UK	27 October 2016

Source: https://find-and-update.company-information.service.gov.uk/company/03892782/officers

Authorised Signatories

The RWE Mid-Merit Cluster Manager, the position currently held by Maria-Chiara Lagana, has delegated authority to sign environmental permits on behalf of RWE Generation UK plc and a signed Delegation of Authority confirming this is provided on the following page.

RWE

To: Whom it may concern

Your ref.
Contact Will Jeffery
Email Will.Jeffery@rwe.com

27th July 2022

Delegation of Authority – Environmental Permits

Dear Sir/Madam,

In regards to all Environmental Permits held by RWE Generation UK plc the Delegations of Authority set out below apply.

Declaration confirming accuracy of applications

The following positions have the authority to sign declarations to confirm the accuracy of applications:

- Pembroke Power Station Manager
- Staythorpe and Kings Lynn Cluster Manager
- Mid Merit Cluster Manager
- Head of Demolition and Closed Sites
- UK Environment Manager.

Receipt of CAR forms

The following positions have the authority to receive CAR forms on the company's behalf for the sites within their area of responsibility:

- Pembroke Power Station Manager
- Staythorpe and Kings Lynn Cluster Manager
- Mid Merit Cluster Manager
- Head of Demolition and Closed Sites
- Portfolio Chemistry Engineers
- Consenting and Permitting Advisors.

Yours faithfully,

Will Jeffery
Head of Gas Asset Management
Director of RWE Generation UK plc

RWE Generation UK plc

Trigonos
Windmill Hill Business Park
Whitehill Way
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Registered Office:
Windmill Hill Business Park
Whitehill Way
Swindon
Wiltshire SN5 6PB

Registered in England
and Wales no. 03892782

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Appendix I Application Checklist

Question Reference	Document Title	Document Reference
Pt A, Q5c	List of relevant personnel	Appendix H, 60671988 Grimsby Main Supporting Document 150223
Pt C2, Q2b, Table 1; PtC3,Q1	Proposed operations	Section 2.2, 60671988 Grimsby Main Supporting Document 150223
Pt C2, Q3d	Management System	Section 4.3, 60671988 Grimsby Main Supporting Document 150223
Pt C2, Q5a	Site Plan	Figure 2 and 3, Appendix A, 60671988 Grimsby Main Supporting Document 150223
Pt C2, Q5b	Additional Land to be Permitted	Appendix B, 60671988 Grimsby Main Supporting Document 150223
Pt C2, Q5c	Non-Technical Summary	Non-Technical Summary, 60671988 Grimsby Main Supporting Document 150223
Pt C2, Q6	Environmental Risk Assessment	Section 7, 60671988 Grimsby Main Supporting Document 150223
Pt C3, Q2	Emissions to air, water, sewer and land	Section 5.1 to 5.4, 60671988 Grimsby Main Supporting Document 150223
Pt C3, Q3a	Technical Standards	Section 4.1, 60671988 Grimsby Main Supporting Document 150223
Pt C3, Q3c	Raw Materials	Section 4.5, 60671988 Grimsby Main Supporting Document 150223
Pt C3, Q4a	Monitoring	Section 6, 60671988 Grimsby Main Supporting Document 150223
Pt C3, Q4a	Monitoring of emissions to air	Section 6.2, 60671988 Grimsby Main Supporting Document 150223
Pt C3, Q6a, Q6c	Energy efficiency	Section 4.8, 60671988 Grimsby Main Supporting Document 150223
Pt C3, Q6b	Energy use	Section 4.7, 60671988 Grimsby Main Supporting Document 150223
Pt C3, Q6d	Raw materials	Section 4.5, 60671988 Grimsby Main Supporting Document 150223
Pt C3, Q6e	Waste	Section 4.6, 60671988 Grimsby Main Supporting Document 150223
Pt C3, Appendix 1, Q10	Monitoring	Section 6, 60671988 Grimsby Main Supporting Document 150223
Pt C3, Appendix 1, Q12	Cogeneration	Section 4.8, 60671988 Grimsby Main Supporting Document 150223

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