EPR PERMIT APPLICATION SUPPORT DOCUMENT

RDF Energy No 1 Ltd

Newport Energy from Waste Facility

Prepared by:
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Glossary of Terms

Term	Definition
Advanced Conversion Technology	A suite of technologies which have the capacity to convert solid waste materials into gas for the generation of renewable energy. Technologies include Pyrolysis, Gasification and Anaerobic Digestion. The technologies used to utilise renewable fuels or waste include: – Direct firing open cycle steam turbine systems, – Integrated gasification combined cycle turbine systems, – Integrated pyrolysis combined cycle turbine systems, – Anaerobically generated biogas fuel in reciprocating engine or gas turbine systems.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between 2 years, which is useful for pollutants that have higher concentrations during the winter months.
AQMA	Air Quality Management Area.
BTEX	BTEX is an acronym that stands for benzene, toluene, ethylbenzene, and xylenes.[1] These compounds are some of the volatile organic compounds (VOCs) found in petroleum derivatives such as petrol (gasoline). Toluene, ethylbenzene, and xylenes have harmful effects on the central nervous system.
By-product	A by-product is a secondary product derived from a manufacturing process or chemical reaction. It is not the primary product or service being produced.
CHP	Combined Heat and Power Plant (CHP) integrates the production of usable heat and power (electricity), in one single, highly efficient process.
CHPQA	The CHPQA (Quality Assurance for Combined Heat and Power) programme is carried out on behalf of the Department for Business, Energy and Industrial Strategy, in consultation with the Scottish Executive, the National Assembly for Wales, and the Northern Ireland Department of Enterprise, Trade and Investment.
DEFRA	Department for Environment, Food and Rural Affairs.
Dioxin	Dioxins and dioxin-like compounds, a diverse range of chemical compounds which are known to exhibit “dioxin-like” toxicity.

	In chemistry, a dioxin is a heterocyclic 6-membered ring, where 2 carbon atoms have been replaced by oxygen atoms.
Eutrophication	Eutrophication or more precisely hypertrophication, is the ecosystem response to the addition of artificial or natural substances, such as nitrates and phosphates, through fertilisers or sewage, to an aquatic system
Exceedance	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
Gasification	Gasification is a process that converts organic or fossil based carbonaceous materials into carbon monoxide, hydrogen, methane and carbon dioxide. This is achieved by reacting the material at high temperatures (>700°C), without combustion, with a controlled amount of oxygen and/or steam.
HVAC	HVAC (heating, ventilation, and air conditioning) is the technology of indoor and vehicular environmental comfort.
ISO14001	ISO 14000 is a family of standards related to environmental management that exists to help organizations (a) minimize how their operations (processes etc.) negatively affect the environment (i.e. cause adverse changes to air, water, or land); (b) comply with applicable laws, regulations, and other environmentally oriented requirements, and (c) continually improve in the above.
LAQM	Local Air Quality Management.
NO	Nitrogen monoxide, a.k.a. nitric oxide.
NO_2	Nitrogen dioxide.
NOx	Nitrogen oxides.
O_3	Ozone.
PAH	Polycyclic aromatic hydrocarbons (PAHs), also known as poly-aromatic hydrocarbons or polynuclear aromatic hydrocarbons, are potent atmospheric pollutants that consist of fused aromatic rings and do not contain heteroatoms or carry substituents. Naphthalene is the simplest example of a PAH. PAHs occur in oil, coal, and tar deposits, and are produced as by-products of fuel burning (whether fossil fuel or biomass). As a pollutant, they are of concern because some compounds have been identified as carcinogenic, mutagenic, and teratogenic.
Percentile	The percentage of results below a given value.
PLC	A Programmable Logic Controller, PLC or Programmable Controller is a digital computer used for automation of electromechanical processes, such as control of machinery.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
PPB parts per billion	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppb means that for every billion (10^9) units of air, there is one unit of pollutant present.

PPM parts per million	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppm means that for every billion (10^6) units of air, there is one unit of pollutant present.
Pyrolysis	Pyrolysis is a thermochemical decomposition of organic material at elevated temperatures in the absence of oxygen.
Ratification (Monitoring)	Involves a critical review of all information relating to a data set, in order to amend or reject the data. When the data have been ratified they represent the final data to be used (see also validation).
RDF	Refuse-derived fuel (RDF) or solid recovered fuel/ specified recovered fuel (SRF) is a fuel produced by shredding and dehydrating solid waste (MSW) with a Waste converter technology. RDF consists largely of combustible components of municipal waste such as plastics and biodegradable waste.
Renewable Energy	Renewable energy is generally defined as energy that comes from resources which are continually replenished on a human timescale such as sunlight, wind, rain, tides, waves and geothermal heat. Renewable energy is also defined under the Renewable Energy Directive as comprising energy from the biomass fraction of waste.
ROC	Renewable Obligation Certificates
SCADA	SCADA (supervisory control and data acquisition) is a type of industrial control system (ICS). Industrial control systems are computer controlled systems that monitor and control industrial processes.
SCR	Selective catalytic reduction (SCR) is a means of converting nitrogen oxides, also referred to as NOx with the aid of a catalyst into diatomic nitrogen, N_2, and water, H_2O. A gaseous reductant, typically anhydrous ammonia, aqueous ammonia or urea, is added to a stream of flue or exhaust gas and is adsorbed onto a catalyst.
SRF	SRF can be distinguished from RDF in the fact that it is produced to reach a standard such as CEN/343 ANAS.
Synthesis Gas (Syngas)	Syngas, or synthesis gas, is a fuel gas mixture consisting primarily of hydrogen, carbon monoxide, methane and very often some carbon dioxide. The name comes from its use as intermediates in creating synthetic natural gas (SNG) and for producing ammonia or methanol.
µg/m³ micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of 1ug/m^3 means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
UKAS	United Kingdom Accreditation Service.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.
USA	Updating and Screening Assessment.

Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers.
Validation (monitoring)	Screening monitoring data by visual examination to check for spurious and unusual measurements (see also ratification).
VSD	Adjustable speed drive (ASD) or variable-speed drive (VSD) describes equipment used to control the speed of machinery. Many industrial processes such as assembly lines must operate at different speeds for different products. Where process conditions demand adjustment of flow from a pump or fan, varying the speed of the drive may save energy compared with other techniques for flow control.

NON TECHNICAL SUMMARY

RDF Energy No.1 Limited (the '*Applicant'* or the *'Operator'*) is making a New Bespoke Installation Permit Application for the proposed operation of an energy from waste facility at their site on Alexandra Dock, Newport, South Wales.

The proposed Installation is located on land off Tom Lewis Road, Associated British Ports, Alexandra Docks, Newport, NP20 2WF (National Grid Reference: ST 31253 84755).

The proposed development is an energy from waste facility which has been designed to recover energy from the combustion and incineration of Refuse Derived Fuel (RDF) feedstocks specifically for the production of electricity. The facility will produce a high temperature flue gas which is then used to raise steam and generate electricity, through steam cycle turbine generation.

The facility is designed to combust Refuse Derived Fuel (RDF) feedstocks to produce heat to raise steam in a conventional tube boiler for subsequent utilisation in a steam turbine for the production of renewable electricity with a gross electrical output of up to 24MWe (net 20MWe).

The Installation has been designed to process approximately 260,000 tonnes of pre-prepared Refuse Derived Fuel (RDF) per annum.

The treatment process will be permitted by Natural Resources Wales (NRW) as a Waste Co-Incineration Activity and will be operated in accordance with the Environmental Permitting (England and Wales) Regulations 2018 (As Amended) and Chapter IV of the Industrial Emissions Directive (IED).

The proposed process meets the definition of an Installation as defined by Section 5.1 *'Incineration and Co-Incineration of Waste'* paragraph A(1)(b) namely:

'The incineration of non-hazardous waste in a waste incineration plant or waste co-incineration plant with a capacity exceeding 3 tonnes per hour.'

General Overview

Refuse Derived Fuel (RDF) will typically be delivered directly to the Feedstock Reception Building in loose bulk form. Walking floor HGV's will reverse into the unloading lane and unload directly into one of the two Feedstock Bunkers during which a visual inspection will take place.

Each feedstock bunker is 2,508 m^3 in volume and 6 m deep, and served by dedicated cranes. The front area of the bunkers is utilised for reception and mixing, while the back area is utilised as the feeding bunker. This equates to approximately 2 days fuel supply.

Additionally, baled RDF will be delivered to site and stored externally in the Feedstock Transit Area in order to meet extended public and national holiday periods. Bales will be stored in pile sizes of 450m^3 and will have a separation distance of 6m (2 bales in height and 5 rows) in line with recognised best practice and fire prevention requirements. As such, the Feedstock Transit Area has a capacity approximately equivalent to 2 days fuel supply. Bales will be appropriately wrapped to ensure no possibility of odour or dust emissions.

Onsite RDF storage will be managed to ensure that it is strictly time limited, with external storage and internal storage (within the internal storage bunkers) typically not exceeding 10 days and 3 days respectively. All storage of RDF is in accordance with the minimum requirement stipulated within NRW's Guidance Note 16 *Fire Prevention & Mitigation Plan Guidance – Waste Management*.

Typically, there will be no additional processing of the RDF upon arrival. However, a mobile shredder and de-baler will be utilised to loosen bales and shred any oversize directly prior to storage in the Feed Bunkers where required.

Cranes will be utilised to move, mix and feed the RDF into the feeding hopper, which subsequently automatically calls for more RDF when required.

RDF is then automatically transferred into the metering bins to allow for controlled feeding into the inclined moving grate combustion system. The grate consists of three separate grate sections in longitudinal direction. The grate is constructed as a water-cooled moving grate in the first and second section and as an air-cooled moving grate in the last section. The design of the grate ensures maximum contact between combustion air and the waste thus insuring complete and efficient combustion. The design capacity of the plant at 100% MCR is 28.8 tons/hr. The combustion air for the process is taken directly from the storage bunkers to facilitate odour and fugitive emissions control whilst maintaining a partial negative pressure within the reception hall.

The flue gas is then directed to the boiler for the generation of high pressure steam at approximately 41 bar pressure and 415°C. The high-pressure steam is then expanded through the steam turbine at a flow rate of 105 t/hr producing a gross electrical generation of 24 MWe, of which approximately 20 MWe is exported to the National Grid via the Distribution Network Operator.

The turbine plant includes a steam bypass to allow control and adjustment of the inlet mass flow. Steam is diverted through a pressure reducing station and air-cooled condenser for recirculation through the process.

The combustion products from the boiler are directed through the flue gas treatment (FGT) and air pollution control (APC) unit comprising a dry scrubber and baghouse filter prior to discharge through the 50 m high stack (A1).

Thermal calculations have been performed across the design fuel LHV range throughout the boiler design operating range effectively ensuring compliance with statutory regulations including the 2 seconds minimum syngas combustion retention time above 850°C IED requirement. The physical installation will have AGAM acoustic pyrometers installed in the furnace first pass accurately mapping the furnace temperature with auxiliary burners able to meet any shortcomings at low loads.

Flue gas cleaning and pollution control consists of Selective Non-Catalytic Reduction (SNCR) through urea injection within the first pass of the boiler, a dry scrubbing system incorporating lime injection for acid gas neutralisation and activated carbon powder injection for absorption and removal of heavy metals, dioxins, VOCs and other harmful substances and a fabric filter for particulates removal.

Emissions to Air

All emissions to atmosphere will be via a single 50m high stack (Emission Point A1).

All combustion products / flue gases are passed through multiple gas clean up stages and abatement stages resulting in all emissions to atmosphere being comfortably within the stipulated Emission Limit Values (ELVs) for Chapter IV IED activities.

Odour

All loose waste unloading and storage takes place internally within the Fuel Reception Building under controlled conditions.

Due to the design of the building structure and the fully enclosed RDF handling activities, there is little potential for offsite odour emissions and impacts to arise from these activities onsite.

Vehicles delivering waste to site are enclosed. Entry to the reception building is via fast acting electrically controlled roller shutter doors to minimise fugitive emissions. All vehicles are required to reverse enter the reception hall to discharge fuel directly into the storage bunkers. The discharge of fuel will only take place once the roller shutter doors are closed.

The primary means of odour mitigation at the site is through the internal extraction and subsequent thermal oxidisation of air from the Fuel Reception Building via the primary combustion air fans. The extraction of reception hall ensures that the building is maintained at slight negative pressure therefore minimising the escape of odours, whilst also providing a high level of volumetric air exchange and preferential working environment.

The potential for odour emissions arising from the external storage of baled wastes is limited due to the strict control measures in place. No odorous wastes are accepted onsite, all bales are required to be well wrapped (6 layers) and a site inspection is undertaken twice daily. Any damaged, poorly wrapped or odorous bales are immediately removed and placed internally for processing.

Noise

The site is located in a predominantly industrial dockside location and is not considered to be sensitive to noise. The noise mitigation strategy for the site ensures that all major plant and equipment is located within buildings designed and constructed with acoustically resilient building fabric, any key external plant and equipment (fan enclosures, flue attenuators and screens) is abated and that all emergency release points and vents are appropriately controlled.

An Environmental Noise Assessment has been undertaken in accordance with BS 4142:2014+A1:2019 and concludes that there will be no significant impact to nearby sensitive receptors as a result of the installation.

Waste Management

There are two principal types of solid by-products produced from the operation of the facility. These are:

- Slag (Bottom ash and Boiler Ash); and
- APC Residue (Air Pollution Control (APC) residues).

Riddling, slag and boiler ash (collectively referred to as slag) is stored within a common bunker prior to export offsite for recovery purposes. Riddling and slag are quenched prior to conveyance to the bunker, boiler ash is fed via a humidifier to the bunker to prevent dust emissions. APCr is collected within a silo and tankered offsite for disposal as hazardous waste.

Emissions to Controlled Water

There will be no direct process emissions to controlled water arising from the Installation.

Uncontaminated clean surface water runoff captured from roof drainage and external roadways / car parking areas will be discharged directly to controlled waters (Newport Docks) via a SUDs attenuation tank.

Surface water run-off from other external areas of the site will pass through Class 1 oil interceptors before discharge via the attenuation tank to controlled waters. Surface water SuDs features onsite include a rainwater harvesting tank, permeable paving and the attenuation tank (900m^3). Surface water will be discharged from the tank in accordance with an agreed SuDs discharge flow rate of up to 100 l/s via a pump station and new rising main to the tidal estuary of Newport Dock.

Domestic effluent will be treated at an onsite packaged sewage treatment plant prior to discharge to the dock.

Any effluent arising from the process plant including washdown waters, boiler blowdown etc will be collected in the Sedimentation Basin and treated at the onsite Waste Water Treatment Plant (WWTP) prior to discharge to the docks or removal offsite via tanker. The WWTP incorporates a combination

of settlement, pH correction and biological treatment (packaged Bio-Disc process plant) to ensure parameters are in line with permitted emission limit values.

During normal operation, the external Feedstock Transit Area for bale storage will be empty. As such, surface water run-off will normally be discharged via the attenuation tank to the docks. During periods where bales are stored within the area, drainage will be diverted to the WWTP.

External storage of slag is within a concrete lined bunker. Surface water from this area is recirculated for cooling purposes. Any water not utilised for this purpose is directed to the WWTP.

Emissions to the docks are via one discharge point (W1).

Emissions to Sewer

There will be no emissions to sewer arising from the Installation.

Emissions to Land

There will be no emissions to land arising from the Installation.

Impact

The air emissions from the proposed development have been modelled using ADMS 4.2 and AERMOD atmospheric dispersion modelling software.

The air quality impact assessment considered the air impact to all identified residential, sensitive habitat and ecological receptors.

It is the conclusion of the modelling that the Installation is unlikely to have a significant impact at any of the receptor locations examined and is unlikely to have a significant impact on the environment.

All of the air emissions from the Installation have been risk assessed against their potential impact on human health. The results of the assessment are that the proposed installation will not present any risk to human health.

1. INTRODUCTION

This document has been prepared on behalf RDF Energy No. 1 Ltd ('*RDF Energy*' or the '*Applicant*' hereafter) by Sol Environment Ltd and provides supporting evidence as required by Environmental Permit Application Forms B2 and B3 issued by Natural Resources Wales (NRW).

The Applicant is making this application for a Bespoke Part A(1) Installation Permit Application under The Environmental Permitting (England and Wales) (Amendment) Regulations 2018 for the proposed operation of an energy from waste facility.

The proposed Installation is located on land at Tom Lewis Road, Associated British Ports, Alexandra Docks, Newport, NP20 2WF (National Grid Reference: ST 331253 184755).

The facility is designed to use Refuse Derived Fuel (RDF) feedstocks to produce heat to raise steam in a conventional gas-fired boiler for utilisation in a steam turbine for the production of renewable electricity with a gross electrical output of approximately 24MWe.

The Installation has been designed to process approximately 260,000 tonnes of pre-prepared Refuse Derived Fuel (RDF) per annum.

The main features of the proposed Installation, as described in this document are as follows:

- *Fuel Reception Building:* For the delivery and reception of RDF feedstocks;
- *Grate Combustion System:* Comprising one incineration line for the thermal combustion of waste;
- *Steam Boiler:* For the production of high-pressure steam using heat recovered from the flue gases from the furnace;
- *Steam Turbine Generator:* Comprising a steam turbine and generator for the conversion of steam into electricity; and
- *Flue Gas Treatment:* Consisting of selective non-catalytic reduction (SNCR) for the reduction of Nitrogen Oxides (NOx), hydrated lime injection for acid gas neutralisation, activated carbon powder injection for absorption and removal of heavy metals, dioxins, VOC and other harmful substances and fabric filters for removal of particulates.

The Installation will make an important contribution to regional waste management and local renewable energy generation and will provide a single treatment facility for RDF materials that would otherwise be destined for landfill or foreign export.

The process meets the definition of a listed activity as defined by Schedule 1 of the Environmental Permitting Regulations 2018.

As such, the proposed facility meets the definition of an Installation as defined by Section 5.1 *'Incineration and Co-Incineration of Waste'* paragraph A(1)(b) namely:

'The incineration of non-hazardous waste in a waste incineration plant or waste co-incineration plant with a capacity exceeding 3 tonnes per hour.'

The remainder of this application support document is structured accordingly:

- Section 2: Provides a detailed planning history of the site and associated activities;
- Section 3: Provides specific details associated with the New Bespoke Installation Permit Application;
- Section 4: Provides specific nature and detailed description of the emissions to air, water emissions and waste associated with the Installation;
- Section 5: Provides details of all environmental monitoring associated with the Installation;
- Section 6: Provides a BAT description of the proposed technology and provides a comparison against the applicable guidance and emission limit values for the Installation; and
- Section 7: Provides an Environmental Impact and Assessment of the Installation against the requirements of the Habitats Directive.

All technical appendices associated with the Installation are included within the technical annexes and comprise the following:

- Annex A: Figures;
- Annex B1: Energy Balance;
- Annex B2: Technical Information;
- Annex B3: Global Warming Potential (GWP);
- Annex C1: Air Quality Assessment and HHRA;
- Annex C2: Environmental Noise Assessment;

- Annex C3: Environmental Risk Assessment;
- Annex C4: H5 Assessment - Site Condition Report;
- Annex D1: EMS Summary;
- Annex D2: Accident Management Plan;
- Annex D3: Fire Prevention & Mitigation Plan;
- Annex D4: Odour Management Plan;
- Annex E: Planning Permissions.

The location of the Installation is provided overleaf in Figure 1.1.

The site layout and Installation Boundary is provided in Figure 1.2.

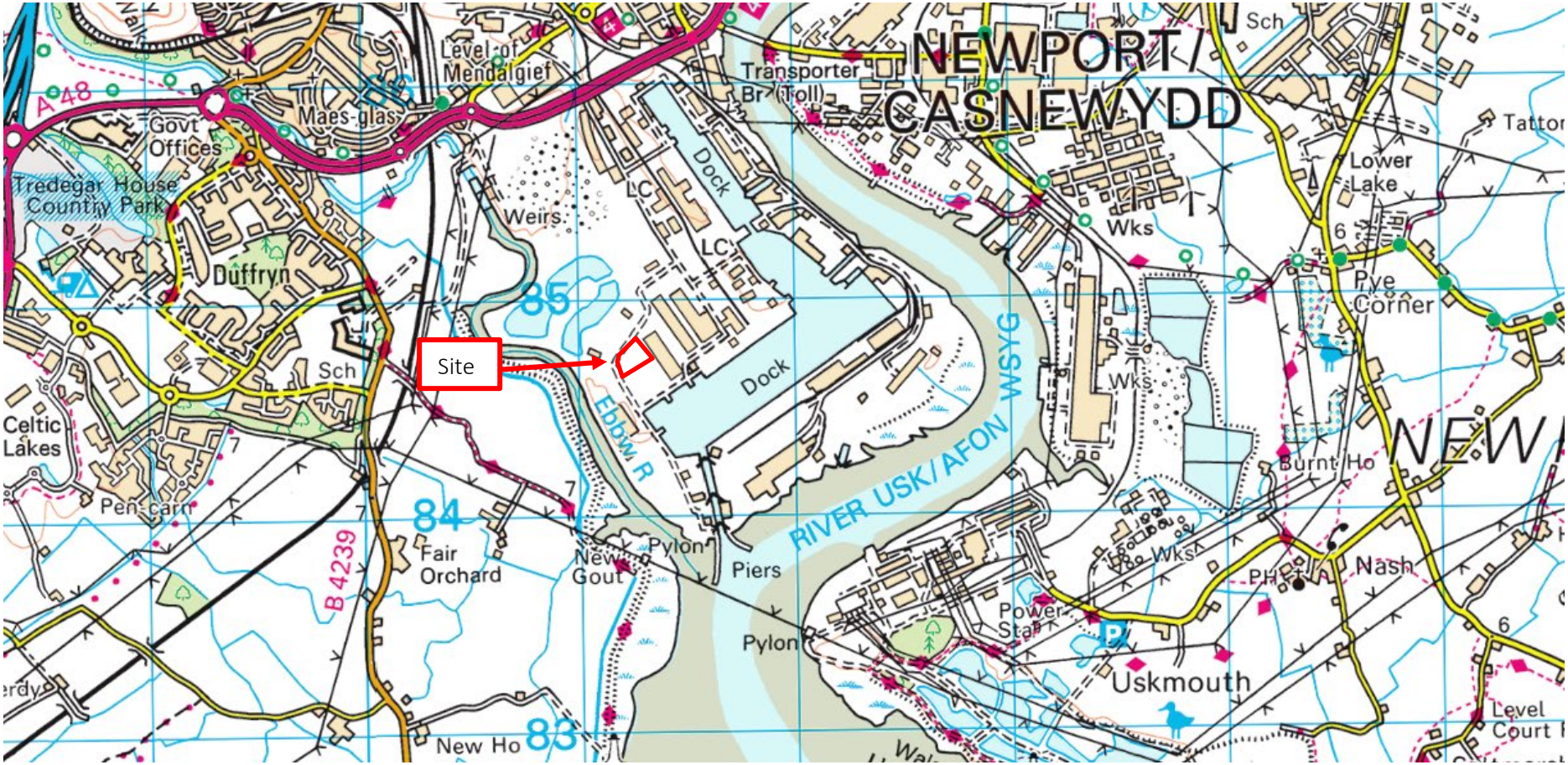

Figure 1.1: Site Location

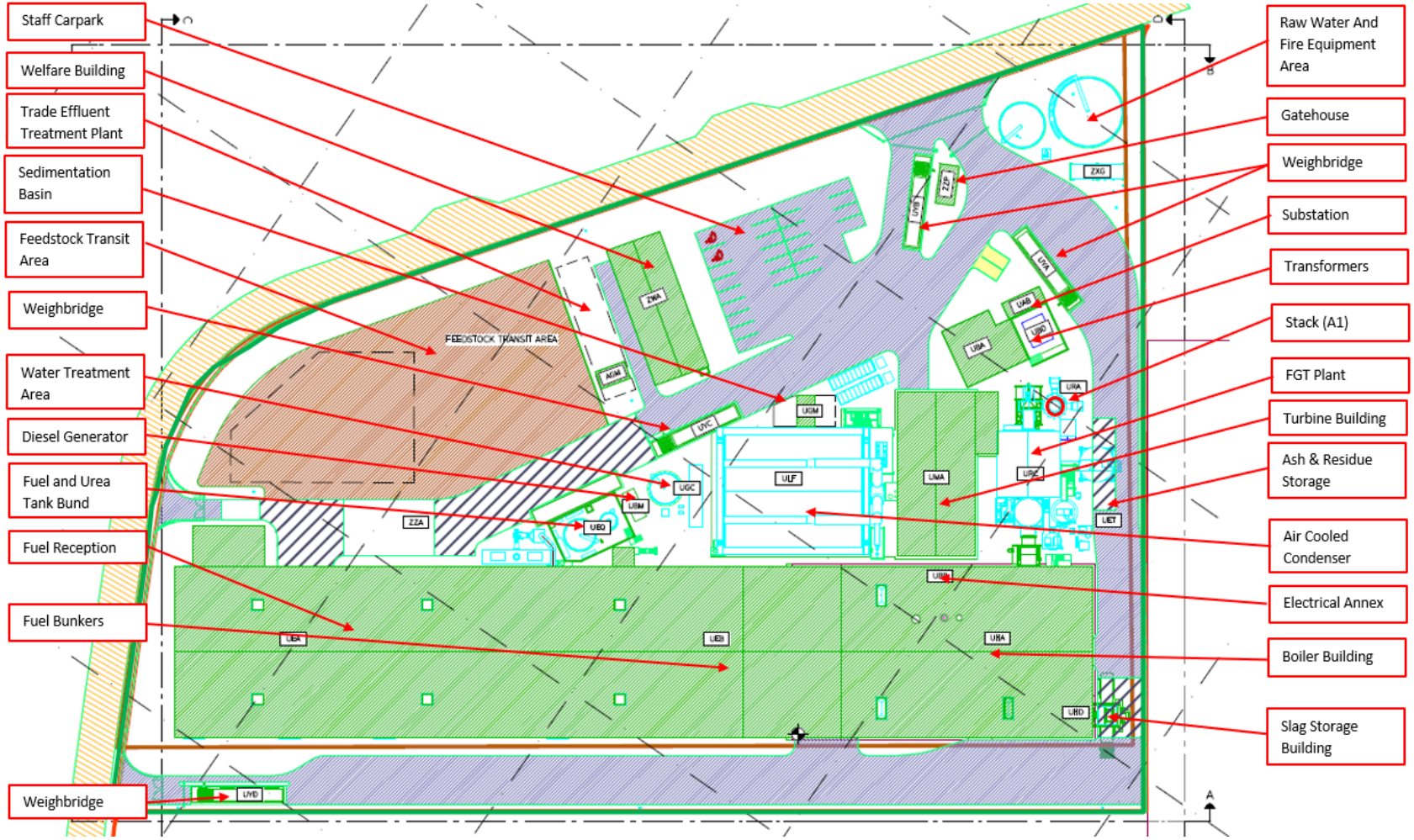

Figure 1.2: Installation Boundary and Site Layout

2. PLANNING STATUS

The Applicant has an extant planning permission at the site for the development and has undertaken a number of minor variations to the planning conditions which have been approved by Newport City Council in 2022.

The extant Planning Permission has been included within *Annex E – Planning Permission* and the details pertaining to all known planning permissions are provided in Table 2.1 below.

Table 2.1: Planning History

Reference	Description	Status	Date Granted
22/0802	NMA relating to planning permission 19/0599 for the bulk drying and pelleting facility and on-site energy centre.	Approved	01/12/2022
21/0091	Partial discharge of condition 11 (materials) and 12 (Japanese Knotweed) of planning permission 19/0599 for the variation of conditions 1 (approved plans) of planning permission 17/1185 for the variations of conditions for bulk drying and pelleting facility with onsite energy centre, open store bays, site access and parking, security gate house, site office and workshop and elevated conveyor to the quay.	Approved	12/03/2021
20/1040	NMA to permission 19/0599. Amendments seek repositioning of welfare building and boxing out a section of boiler house wall and fuel hall roof.	Approved	03/10/2020
19/1144	Partial discharge of conditions 02 (environmental management plans), 03 (drainage management plan), 04 (oil & petrol interceptors), 05 (site investigation), 06 (disabled parking), 07 (construction management plan), 08 (written scheme of investigation), 09 (vehicle track testing) & 10 (cycle storage) of planning permission 19/0599 for variation of conditions 1 (approved plans) of planning permission 17/1185 for the variation of conditions for bulk drying and pelleting facility with onsite energy centre, open store bays, site access and parking, security gate house, site office and workshop and elevated conveyor to the quay. Application accompanied by an addendum to original environmental statement.	Approved	30/04/2020
19/0599	Variation of conditions 1 (approved plans) of permission 17/1185 for the variation of conditions. Approved 2019. Changes included alternative layout to include area previously safeguarded for M4 relief road. Relocation of the stack. (Application 19/1144 discharged all of the pre-commencement conditions relating to permission 19/0599.	Granted	13/09/2019

18/0911	Non-material amendment to permission 17/1185 for variation of conditions related to permission 15/1513 for the bulk drying and pelleting facility with onsite energy centre, and other ancillary works. Amendment to proposed internal firing system.	Granted	15/11/2018
17/1185	Variation of conditions 1 (approved plans), 2 (commencement of development) 3 (environmental management plan), 4 (drainage management plan), 5 (oil and petrol interceptors), 6 (contamination investigation), 7 (open mosaic habitats), 8 (disable parking spaces), 9 (construction management plan), 10 (archaeological scheme of investigation), 11 (track testing), 12 (cycle storage), 13 (fire water equipment) and 22 (junction capacity analysis) of planning permission 15/1513. Application accompanied by an addendum to original environmental statement.	Granted	13/07/2018
16/0234	Partial discharge of condition 7 (open mosaic habitats) and 10 (archaeological scheme of investigation) of planning permission 15/1513	Approved	20/04/2016
16/0203	Partial discharge of condition 3 (EMP), 4 (drainage management plan) and 9 (CMP) or planning permission 15/1513	Approved	20/04/2016
15/1513	Variation of conditions 1, 2, 4, 5, 7, 8, 9, 10, 12, 15, 17, 18 and 20 of planning permission 10/1238 Accompanied by an environmental statement to incorporate a phased approach to development.	Granted	03/02/2016
15/1050	Lawful Development Certificate for the partial implementation of planning permission 10/1238	Granted	17/09/2015
10/1238	Development of bulk drying and pelleting facility with onsite energy centre, open store bays, site access and parking, security gatehouse, site office and workshop and elevated conveyor to the quay. Accompanied by an environmental statement.	Granted	11/05/11

3. PROPOSED ACTIVITIES

3.1 Type of Permit

The Applicant is making an application for a Bespoke Installation Permit for the proposed operation of a waste to energy plant.

The Installation has been designed to accept approximately 260,000 tonnes of Refuse Derived Fuel (RDF) which will be incinerated within an inclined moving grate combustion system, producing high temperature flue gas for the production of steam to produce renewable electricity with a gross electrical output of 24MWe (net 20MWe export).

The use of combustion and the generation and export of electrical energy meets the definition of an *'Co-incineration Plant'* as defined by Chapter 5 *'Waste Management'* of Schedule 1 of the Environmental Permitting Regulations.

The Installation has been designed to accept non-hazardous RDF in accordance with stringent site waste acceptance procedures and agreed specification. All waste will be obliged to meet the specification provided in Table 3.2.

The applicant is making an application for an Environmental Permit to carry out the following listed activities:

Table 3.1: IED Activities

Activity listed in EP Regulations 2013	Description of Specified Activity	Limits of Specified Activity	Specified Waste Management Operation
Section 5.1 *'Incineration and Co-incineration of Waste'* paragraph A(1)(b)	The incineration or co-incineration of non-hazardous waste in a waste incineration plant with a capacity exceeding 3 tonnes per hour	The reception, storage and combustion of non-hazardous RDF feedstocks to produce steam for the generation of renewable electricity. Installation includes all ancillary activities including emissions abatement and electrical generation.	R1: Use principally as a fuel or other means to generate electricity. R13: Storage of waste pending the operations numbered R1

The technical guidance notes used in the preparation of this application document are:

- EPR – The Incineration of Waste (reference EPR 5.01);
- EPR – The Treatment and Disposal of Non-Hazardous Waste (reference EPR 5.06);

- Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (Waste Incineration BREF BAT Conclusions); and
- EPR – How to Comply with your Environmental Permit (reference EPR 1.00).

The main issues identified within these guidance documents and the relevant Best Available Techniques have been built into the site operation procedures that will form the management systems and working plans for the site.

3.2 Installation Boundary

All proposed operations will be contained within the site ownership boundary. A figure showing the proposed building configuration and Installation boundary has been provided in Section 1, Figure 1.2.

A Site Condition Report that provides a baseline conceptual model for the site has been completed and included within *Annex C4 – H5 Assessment – Site Condition Report* of this document.

The Site Condition Report identifies some historical contamination within the Made Ground at the site but none that present a significant risk to future site users. In addition, it does not identify any aspect of the new Installation that presents a potential contamination risk to the environment.

All aspects of the new Installation have been designed in accordance with Natural Resources Wales's Pollution Prevention Guidance and Horizontal Guidance Notes.

3.3 Infrastructure and Design

The facility is to be newly constructed in its entirety including all drainage, foundation works, steel structure and structural slabs, intermediate floors, stairs, external clad walls, roof system, glazing and external doors.

The facility will consist of the following:

- Fuel Reception Building;
- Feedstock Transit Area;
- Fuel Storage Bunkers;
- Fuel Handling Crane System;
- Mobile shredder;
- Grate Combustion System;
- Steam Boiler;
- Flue Gas Treatment (FGT) System;
- Ash Handling and Storage Bunker;
- A 50 m high exhaust stack;
- Turbine and generator set with air cooled condenser;

- Steam water cycle with de-aerator and water treatment plant;
- Waste Water Treatment Plant; and
- Package Sewage Treatment Plant.

Surface Water Drainage

There will be no direct process emissions to controlled water arising from the Installation.

Uncontaminated clean surface water runoff captured from roof drainage and external roadways will be discharged via an attenuation tank to the docks. Rainwater harvesting will be undertaken from roofs with any excess going to the SuDs attenuation tank.

Surface water run-off from any areas where oil or chemicals are potentially used, stored or transported will discharge via Class 1 interceptors to the attenuation tank. These areas include oil unloading areas, steam turbine, transformers, bunded areas around oil storage tanks / diesel generator / diesel fire pumps and parking areas.

The site has been designed with a number of SuDs features including rainwater harvesting, permeable paving and the 900m^3 SuDs attenuation tank.

External activities onsite are limited to the temporary storage of wrapped bales. This minimises the potential ingress of rainwater and generation of leachate. The bale storage area will be predominantly empty, with an estimated usage of up to 20 days per year (to account for Bank Holiday weekends and national holidays). As such, when the area is vacant, surface water run-off will discharge via the attenuation tank to the docks. At such times that the area in use, drainage will be diverted to the Trade Effluent Drainage Network described below.

In addition, the drainage network serving the slag storage bunker and flue gas treatment areas is external. Any surface water from the slag area will be recycled and utilised for cooling water within the process with any excess directed to the Trade Effluent Drainage Network. Surface water from the flue gas treatment area is directed to the Trade Effluent Drainage Network at all times.

All other activities including unloading, pre-treatment and processing take place internally within the onsite buildings. The buildings provide both secondary and tertiary containment. Any spillages, leaks or incidents arising within the buildings will be effectively contained and captured within the building footprint.

Surface water discharge to the dock is at a flow rate of up to 100 l/s vi a pump station and rising main at discharge point W1 to the tidal estuary of Newport Docks.

Discharge of Process Effluent

Any effluent arising from the process plant including waste reception washdown waters, cooling system blowdown and boiler feedwater preparation plant reject will be collected within the Sedimentation Basin and treated at the onsite Waste Water Treatment Plant (WWTP) prior to discharge to the docks. The WWTP incorporates a combination of settlement, pH correction and a bio-disc filter to ensure parameters are in line with the emission limit values in the permit.

All domestic effluent arising from the plant will be treated at a dedicated packaged sewage treatment plant prior to discharge to the docks.

There are no foul sewers located within close proximity to the ABP dock site and the proposed drainage arrangements are in line with existing drainage arrangements for other industries on the ABP dock site.

Above ground drainage shall be designed in accordance with BS EN 12056.

All discharges to the docks will be via the single discharge point W1.

A draft drainage plan is provided in *Annex A – Figures*.

Fire Water

The following has been designed in the event of a fire:

- All fire water will be contained onsite;
- The drainage system can be isolated via a penstock valve; and
- All fire water is to be pumped and tankered away to a suitable water treatment facility.

Capacity for firewater retention is maintained through the combined volume of the entire drainage system including the attenuation tank, the sedimentation basin, the trade water treatment tanks and the Fuel Storage Bunkers.

In the event of an onsite fire, the penstock valve will be activated, preventing discharge to the docks. Once the attenuation system is full, the pump station will pump water to the fuel storage bunkers from where it will be tankered offsite for disposal. Drainage elsewhere within the buildings during a fire event is directly to the Trade Effluent Network (i.e. sedimentation building and treatment plant tanks), with any overflow directed back to the fuel storage bunkers.

Tanks and Bunds

All storage tanks will be installed with secondary containment and be designed to comply with the following standards and guidance requirements;

- Natural Resources Wales Pollution Prevention Guideline Note 2: Above Ground Oil Tanks (PPG2);

- Natural Resources Wales Pollution Prevention Guideline Note 11: Preventing Pollution on Industrial Sites (PPG11);
- Natural Resources Wales Pollution Prevention Guideline Note 26: Pollution Prevention in the Storage and Handling Drums and Intermediate Bulk Containers (IBC's);
- CIRIA C598: Chemical Storage Tank Systems – Good Practice; and
- CIRIA 736: Design of Containment Systems for the Prevention of Water Pollution from Industrial Sites.

All storage tanks associated with the process are detailed within Table 3.4 in Section 3.5 *'Raw Materials'.*

Roadways and External Areas
An internal roadway system has been designed to give safe access to all areas of the site.

Segregated pedestrian walkways and car parking areas have been provided to allow for safe access and egress of all personnel at site.

3.4 Description of the Process

The Applicant proposes to employ a conventional technology, namely inclined moving grate combustion as a cost effective means of recovering energy from waste feedstocks. Heat will be recovered via a boiler to raise steam and generate energy via a steam turbine.

The principal components of the process comprise the following:

- *Waste Acceptance and Reception:* Refuse Derived Fuel (RDF) will be delivered on a just in time basis to the Fuel Reception Building. RDF is typically delivered in bulk, loose and unloaded via walking floor HGV's directly into one of two Fuel Storage Bunkers where it is mixed via crane before being fed into the feed hoppers. RDF is typically processed within 36 hours of arrival onsite, the bunker holding capacity is equivalent to 2.1 days at 100% MCR.

  Additionally where required baled RDF is temporarily and periodically stored externally in the Feedstock Transit Area. This area has the capacity for an additional 2 days feed supply and would be utilized to support the plant over extended 'bank holiday' weekends.

- *Waste Handling & Pre-treatment:* A mobile shredder is utilized when required for debaling and size reduction. This is used within an unloading bay with the resultant shredded RDF discharged directly into the Fuel Storage Bunker. Three grab cranes are used over the bunkers to facilitate mixing of the waste and transfer RDF to the feed hopper. The Fuel Bunkers are split into two main areas, the front area for reception and mixing and the back area for mixing, each area with a dedicated crane.

- *Combustion*: The site will have a single incineration line comprising a reciprocating grate. RDF will be fed to the grate from the feed hopper via hydraulic ram. Primary combustion air is fed under the grate and secondary combustion air fed above the grate to ensure complete combustion. The reciprocating bars spread the RDF and cause it to travel down the grate at a controlled rate to ensure complete combustion.

- *Heat Recovery*: Heat is recovered from the hot flue gases produced in the combustion chamber via a five pass steam boiler, producing 105 T/hr of superheated steam at 41 bar pressure and 415°C .

- *Electricity Generation*: The superheated steam then passes to a single condensing steam turbine-generator to generate circa 20MWe (net) of electricity (24MWe gross) for export to the National Grid. Exhaust steam is condensed via an air cooled condenser prior to recirculation as feedwater for the boiler.

- *Flue-Gas Cleaning*: Flue gas cleaning and pollution control consists of Selective Non-Catalytic Reduction (SNCR) through urea injection within the boiler, hydrated lime injection for acid gas neutralisation and activated carbon powder injection for absorption and removal of heavy metals, dioxins, VOC and other harmful substances prior to a fabric filter for removal of particulates.

- *Residue Handling*: Bottom ash (IBA) (also referred to as slag) from the end of the grate is quenched and conveyed to a bunker storage area where it is mixed with boiler ash prior to export offsite for recovery. APC residue is exported for disposal as hazardous waste.

More detailed equipment specifications have been included within Section 3. A simplified process layout is provided in Figure 3.1 below. Additionally, a process flow can be found in Annex A.

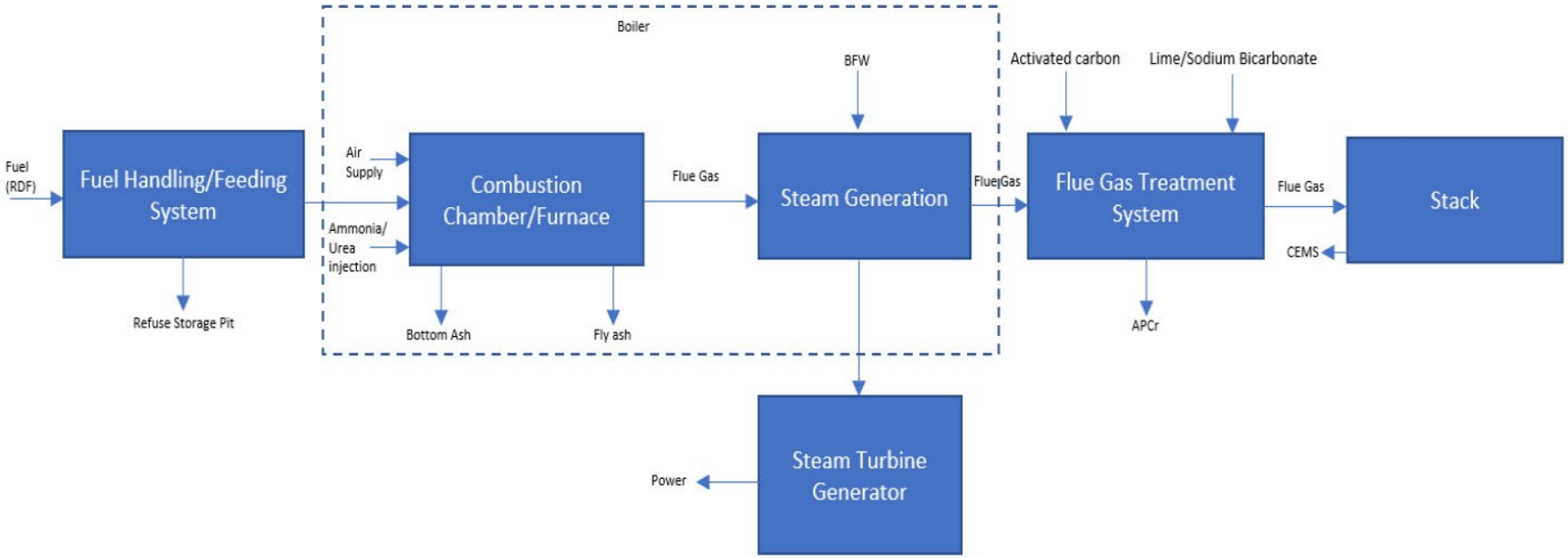

Figure 3.1: Simplified Process Schematic

3.5 Raw Materials

Waste Feedstocks

The Installation has been designed to process approximately 260,000 tonnes (at 11MJ/kg) of pre-prepared Refuse Derived Fuels.

Prior to processing, all RDF accepted on site will be subjected to stringent waste acceptance criteria in accordance with the site environmental management plan and associated waste pre-acceptance, acceptance and rejection procedures.

Table 3.2 below describes the feedstock specification as well as the maximum range.

Table 3.2: RDF Fuel Specification

Parameter	Unit	Maximum / Range	Comment
Net calorific value (as received)	MJ/kg	8 – 16	Design 11 MJ/kg
Each dimension	mm	500	All RDF
Sum of any two dimensions (i.e. length + width)	mm	725	All RDF
Rods (length x diameter)	mm	500 x 50	not more than 5% of as delivered weight; All RDF
Foils/sheets (length x width)	mm	400 x 400	All RDF
Tapes (length)	mm	500	All RDF
Ash content (dry)	% wt/wt	20	Per tonne
Metal content	% (dry)	4	Per tonne
Glass content	% (dry)	5	Per tonne
Earth Soil	% (dry)	5	Per tonne
Dust Percentage Grain Size <1mm	% (dry)	10	residue at the 1mm filter 90% material; Per tonne
Dust Percentage Grain Size <0.5mm	% (dry)	5	residue at the 0.5mm filter 95% material; Per tonne
Ceramics, stones, porcelain, sand, metals	% (dry)	1	Per tonne
Metallic aluminium (foils, composite films)	% (dry)	0.80	Per tonne
Moisture content	% wt/wt	40	Per tonne
Sulphur content (dry)	% wt/wt	0.6	Daily average
Chlorine content (dry)	% wt/wt	1	Daily average
Mercury (Hg) (as received)	mg/MJ	0.06	Daily average
Cadmium (Cd) (as received)	mg/MJ	5	Daily average
Sum of heavy metals (HM (as received)	mg/MJ	100	Daily average

A detailed list of European Waste Catalogue (EWC) codes of wastes that will be accepted by the Installation is provided in Table 3.3 below.

Table 3.3 Proposed Feedstock EWC Codes and Types	
Waste Code	Description
02	**AGRICULTURE/HUNTING/FISHING/FOOD PROCESSING**
02 01	**agriculture, horticulture, aquaculture, forestry, hunting and fishing**
02 01 03	plant tissue waste
02 01 04	waste plastics (except packaging)
02 06	**baking and confectionery industry**
02 06 01	materials unsuitable for consumption or processing
03	**WOOD/PAPER/CARD PROCESSING**
03 01	**wood processing and the production of panels and furniture**
03 01 01	waste bark & cork
03 01 05	sawdust, shavings, cuttings, wood, particle board & veneer other than those mentioned in 03 01 04
03 03	**pulp, paper and cardboard production and processing**
03 03 07	mechanically separated rejects from pulping of wastepaper & cardboard
03 03 08	wastes from sorting of paper & cardboard destined for recycling
04	**LEATHER/FUR/TEXTILE INDUSTRY**
04 02	**textile industry**
04 02 10	organic matter from natural products (for example grease, wax …)
04 02 21	wastes from unprocessed textile fibres
04 02 22	wastes from processed textile fibres
15	**PACKAGING, ABSORBENTS, WIPING CLOTHS, AND FILTERS**
15 01	**packaging (including separately collected municipal packaging waste)**
15 01 01	paper & cardboard packaging
15 01 03	wooden packaging
15 01 05	composite packaging
15 01 09	textile packaging
16	**OTHER WASTES FROM INDUSTRIAL PROCESSES**
16 01	**end-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-life vehicles and vehicle maintenance**
16 01 19	plastic
17	**CONSTRUCTION AND DEMOLITION WASTE**
17 02	**wood, glass, and plastic**
17 02 01	wood
19 12	**mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified**
19 12 01	paper & cardboard
19 12 04	plastic & rubber
19 12 07	wood other than that mentioned in 19 12 06
19 12 08	textiles
19 12 10	combustible waste (refuse derived fuel)
19 12 12	other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11*
20	**MUNICIPAL WASTES AND SIMILAR MATERIALS FROM COMMERCE AND INDUSTRY**

20 01	**separately collected fractions (except 15 01)**
20 01 01	paper & cardboard
20 01 11	textiles
20 01 38	wood other than that mentioned in 20 01 37
20 01 39	plastics
20 02	**garden and park wastes (including cemetery waste)**
20 02 01	biodegradable waste

Notwithstanding the EWC's codes stipulated in Table 3.3 above, RDF shall not be accepted at the site which has any of the following characteristics:

- Hazardous wastes;
- Radioactive wastes;
- Explosive / munitions;
- Consisting solely or mainly of dusts, powders, loose fibres or liquids;
- Defined as Infectious;
- Drummed waste; or
- Malodourous wastes.

Process Consumables

Table 3.4: Raw Materials Summary			
Material	Nature of storage	Location	Fate
Refuse Derived Fuel	Typically, 260,000 tonnes per annum Stored internally within fuel bunker or externally within wrapped bales	Internal	Incinerated (ash residues recycled off site)
Diesel	Used for the auxiliary burners Stored in a 117m^3 tank	External	Used as start-up and support fuel
Urea	Diluted Urea stored in a 40 m^3 bunded tank Consumption of 29 tonnes/hr (per tonne of waste processed)	External	Reacts with flue gas and discharged to atmosphere
Lime	188m^3 silo Consumption of 27 tonnes/hr (per tonne of waste processed)	External	Reacts with acid gases and discharged as APC residue from the filter All APC residue will be transferred off site and reprocessed.
Activated Carbon	52 m^3 silo Consumption of 28 tonnes/hr (per tonne of waste processed)	External	Discharged from the filters. All APC residue will be transferred off site and reprocessed.
Water Treatment Chemicals	Internal bunded storage tanks (caustic and sulphuric acid) 1.5m^3 each	Internal	Used within water treatment system and ultimately discharged to surface water drainage system.

3.6 RDF Reception

All vehicles will enter the site and report to the entry gate at the site entrance to weigh and record the delivered RDF in accordance to the sites waste acceptance procedures.

All incoming and outgoing delivery vehicles will be recorded via the weighbridge.

All vehicles delivering loose bulk RDF feedstock will be directed from the weighbridge to the Feedstock Reception Building. HGV walking floor vehicles will reverse into the unloading lane and unload directly into one of two Fuel Storage Bunkers. There are 3 unloading lanes per bunker, 6 in total.

The site has been designed to accept up to 6 deliveries per hour. Vehicles will only be unloaded when the roller shutter doors are closed. All waste will undergo a visual inspection during unloading with rejected material removed to the quarantine area.

Each feedstock bunker has the dimensions 33.08 m (l) x 15.5 m(w) x 6m (h), a volume of 2,508m^3.

On the basis of a plant throughput of 28.8 tonnes per hour with an assumed waste density of 300 kg/m^3 the design capacity of the bunkers is 51 hours. Waste will typically be stored for less than 3 days prior to processing. The bunkers are serviced by a crane grab system.

Each bunker is split into two defined areas; the front end for reception and mixing and the back area for feeding the hoppers.

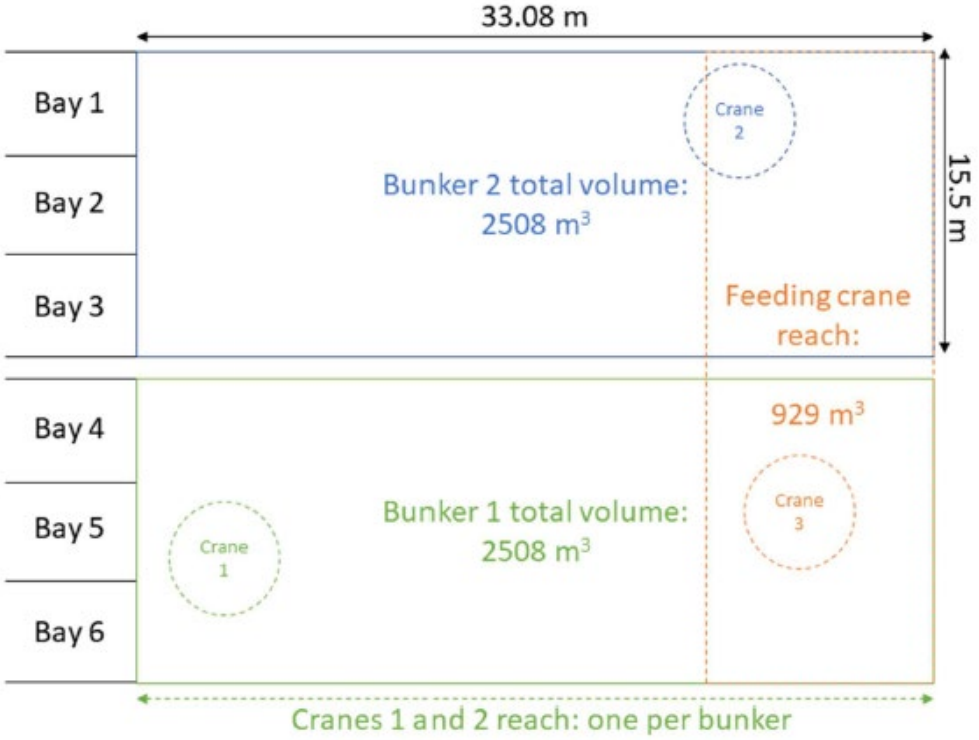

Figure 3.2: Plan view of Fuel Bunkers

The site will also accept baled RDF which will be stored externally within a dedicated 'Feedstock Transit Area'. This external storage will typically be only used during long weekends and national holidays to maintain a security of supply. The external storage area will typically only be utilised for up to 20 days a year.

Bales will be delivered to site only when required and following visual inspection will be offloaded by telescopic handlers / front loaders. Any damaged or inadequately wrapped bales will be rejected. Storage of bales in the external Feedstock Transit Area will be in piles sized 450m^3 with a 6 m separation distance in line with NRW Fire Prevention and Mitigation Plan requirements. Individual baled storage will not exceed 5 rows of bales up to two bales in height. As such, the area has a total storage capacity of 2,250m^3 or the equivalent of 2 days hours feed supply[1]. External storage will be limited to a maximum of 10 days.

All waste inspections will take place in accordance with the sites waste acceptance procedures.

All waste will be stored in accordance with the site Fire Prevention and Mitigation Plan which is provided within *Annex D3 – Fire Prevention and Mitigation Plan.*

To avoid any odour emissions from the Fuel Reception Building, the building is kept at slight negative pressure, through a ventilation extraction system. Air from within the building is extracted into the intake of the primary combustion air fans and thermally destroyed. The extraction system has an air exchange ratio equivalent to of 3 'room changes' per hour. A back-up ventilation system incorporating activated carbon filtration is additionally installed in case of plant shutdown.

3.7 Waste Pre—treatment and Feed System

Loose RDF will typically not require any pre-treatment and will be homogenisation within the Fuel Bunkers through crane grab mixing.

A mobile shredder will be installed for loosing bales or to shred oversized fuel and will be placed in a relevant unloading lane to directly convey shredded RDF into the storage bunker. Shredding is estimated to be required for <10% of the fuel throughput.

Within the Fuel Bunkers two cranes will be utilised to move, mix, and stack the pre-shredded RDF. When the RDF is stacked on the east side of the bunker, cranes will feed the stacked waste from the storage bunker into the boiler feeding hopper at the higher level. The feeding hopper will call the cranes for RDF when needed. The cranes system has been designed with feeding the hopper as the priority and stacking and mixing as the secondary priority. Though the system is automatic, it will be possible to

1 Based on a nominal bale dimension of 1.2 m x 1.2 m x 1.2 m and weight of 1,020 kg per bale

operate the unloading cranes manually, allowing for clearance of the hoppers via crane in the case of any blockages and removal of oversize/reject materials where identified.

The Fuel Storage Bunkers are fitted with a dedicated fire detection and suppression system. Details of the fire detection and suppression system is provided within the FPMP.

The Feedstock Building, including the reception area, fuel storage bunker and feed hoppers, will be covered by a misting system which will be operated when required in order to control odour and dust emissions.

3.8 Combustion System

The site proposes to utilise conventional inclined moving grate combustion technology, both air and water cooled supplied by Mitsubishi Power Europe GMBH.

After being transferred onto the grate by the metered RDF 'pushers' and hydraulic ram, the RDF travels at a controlled rate down the grate through the reciprocating action of the grate bars, which also ensure an even spread of fuel within the combustion chamber.

The fuel feed rate is controlled through the speed and stroke length of the RDF pushers in the metering section, which in turn is calculated via a boiler thermal balance method from measurements of the following parameters:

- Steam outlet pressure and temperature;
- Steam flow;
- Feedwater temperature;
- Exhaust gas temperature;
- Ambient air temperature; and
- RDF mass flow (from weighing section of the belt conveyors).

There are three sections of moving grate, with sections 1 and 2 cooled by water and section 3 by air. Primary air is fed into the combustion chamber below the grate within 6 air zones, with secondary air injected above in 2 air zones to ensure complete combustion of the feedstock. Control of the combustion air is achieved through speed controlled fans and motor driven dampers for each air zone.

The grate system has a feed control rate of 70 – 110% of the thermal design basis, achieved by speed and stroke length of the pushers in the metering section.

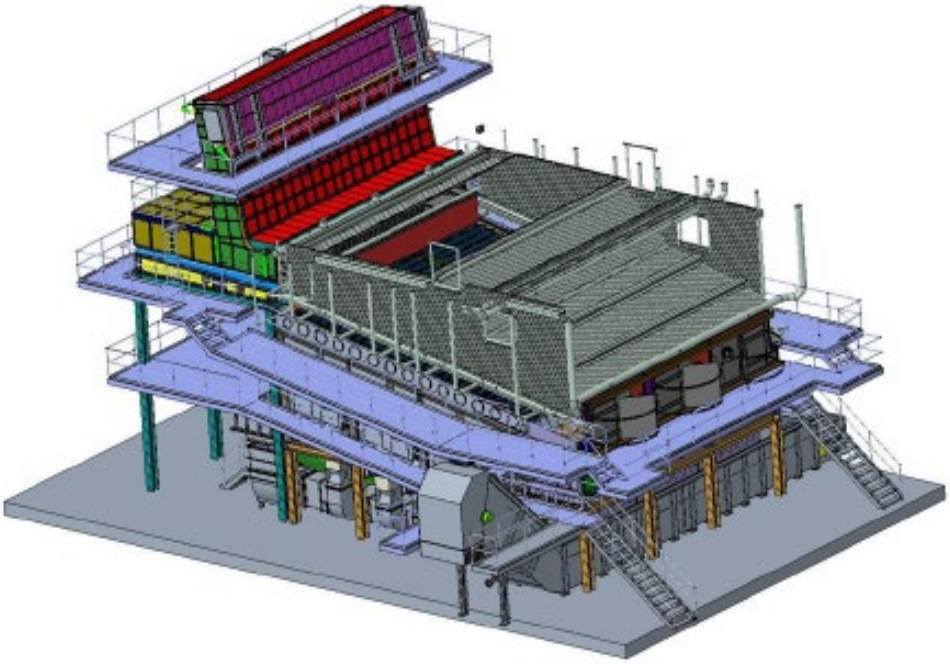

Figure 3.3 Grate and Combustion System Arrangement

Heat is recovered from the grate cooling systems via evaporator water walls behind the refractory lining and transferred to the main steam condensate return to the deaerator.

Table 3.5 below summarises details of the grate.

Table 3.5 Grate Details	
Grate Area	12.6 m^2
Grate width	10.43 m
Grate Length	10.8 m
Mechanical Load	331 kg/(m^2xh)
Thermal Load	736 kW/m^2
Grate Zone 1 & 2 / 16 rows	Water cooled
Grate Zone 3 / 11 rows	Air cooled

Thermal calculations have been performed across the design fuel LHV range throughout the boiler design operating range effectively ensuring compliance with statutory regulations including the 2 seconds minimum syngas combustion time above 850°C IED requirement.

The residence time calculations confirming compliance with the combustion temperature and retention time requirements of IED Ch.IV has been provided within *Annex B2 – Technical Information.*

Auxiliary Fuel (Diesel Oil) Burners

In order to comply and maintain IED Chapter IV 850°C / 2 second temperature and residence time requirements, the facility will have two auxiliary burners which will be used in the following operations:

- Start-up to create an environment of 850°C within the combustion system prior to fuel start; and
- To maintain a minimum of 850°C during normal operating conditions should the temperature fall because of loss of energy from the fuel supply.

Each burner has a maximum duty of 27 MWth and utilises compressed air as the fuel oil atomising medium during the short and infrequent periods of operation.

Slag / Ash Removal System

Riddling, slag and boiler ash is collected within a common concrete lined storage bunker. Riddling and slag from the grate are transported beneath the grate via water filled conveyors to the bunker. Boiler ash is quenched via water trough conveyor or humidifier prior to transportation to the bunker. This quenching both cools and prevents dust emissions during handling and storage. The bunker has a volume of 400m^3.

3.9 Steam Boiler

The boiler system has been specially designed to process the hot gases produced from the combustion of RDF waste and is of corner tube type with both vertical and horizontal passes. The net efficiency of the heat recovery boiler is 89.4% at maximum design capacity.

The boiler system has three vertical water passes followed by a horizontal section of super heater and evaporator coils and then two vertical passes including economisers and condensate pre-heating coils to produce superheated steam.

Boiler feedwater is pre-heated in the economiser, located within two sections in the 4th and 5th boiler pass. This then evaporates within membrane '*waterwalls*' located in the combustion chamber and radiant passes, producing saturated steam which flows to the steam drum. All evaporation takes place within the water walls. Saturated steam from the steam drum passes to the superheater where superheated steam is generated.

The boiler is fitter with a spray-type de-superheater to regulate the steam conditions and ensure steady steam flow. Under normal operating conditions, 100 % of the high pressure steam is expanded through the single condensing steam turbine with a maximum mass flow rate of 105 t/h at the outlet pressure of 42 bar, 417°C. The plant is fitted with a high pressure steam bypass which can be operated in the unlikely event that the steam turbine trips, which will direct the steam to the air cooled condenser directly.

Feedwater is provided to the boiler at 145°C from the boiler feedwater tank which incorporates a deaerator/heater. Provisions are in place to add make-up water from the water treatment plant if required.

Flue gas exits the boiler at 153°C after the condensate pre-heater and is directed to the downstream flue gas treatment plant.

The following table outlines the boiler performance design parameters.

Table 3.6 Boiler Performance	
Parameter	**Value**
Steam Flow	97.56 t/h (105 t/h max)
Drum Pressure	49.2 bar
Outlet Pressure	44 bar
Steam Outlet Temperature	417°C
Feed water Temperature	145°C
Air Temperature	15°C
Flue Gas Exit Temperature	153°C
Net Efficiency	89.4 % (including condensate pre-heater)
Thermal Capacity (output)	73.8 MW (78.92 MW max)
Thermal Capacity (net input)	84.4 MW (88.22 MW max)
Fuel LCV	11 MJ/kg (Range 8 – 16)
Draft Loss	9.2 mbar
Blowdown	1 %

Superheaters

The two boiler superheaters are of vertical convection type and comprise hanging U bend tube elements forming multi passages and two headers per superheater. The tubes are 57mm in diameter with cross pitch of 150mm which will reduce the risk of ash slagging and blockages. A two-stage external control attemperator will be fitted between the superheaters consisting of spray type de-superheaters.

The fitting of nickel-chromium cover plates to the first rows of superheater tubes will help to increase corrosion resistance and boiler tube lifespan.

Fly ash fouling on the vertical superheater and evaporation tube banks is removed through a mechanical 'knocking' tube cleaning system. This uses pneumatic hammers and the ash falls into the collection hoppers.

Economisers

The economiser sizing and design ensures the flue gas exit temperature doesn't fall below the dew point. Multiple economiser tube banks are formed of closely spaced continuous loop elements, each

connected by U bends forming an integral loop and welded at both ends to the terminal headers. Following the final economiser is a condensate pre-heater tube bank.

An additional automatically controlled waster-side economiser bypass will be fitted to ensure the final exhaust gas temperature is greater than 150°C as required for the downstream flue gas treatment system.

Boiler Feedwater

The deaerator is located within the boiler feedwater tank and is heated by the bleed steam supplied by the steam turbine (Bleed Line 1). The temperature is regulated to 145°C to control the deaerator operating pressure (4 bar). In addition, as temperatures are above 100°C, any air and hence oxygen in the feedwater is vented, which helps to minimise corrosion in the boiler.

To account for steam and condensate loss through blowdown, soot blowing, traps etc, make-up water from the towns water tank is introduced to the feedwater tank. Make-up water is first treated through the water treatment plant which comprises base-exchange softening, carbon filtration, reverse osmosis, electro-deionisation units and a mixed bed polisher. This water treatment plant has a capacity of 2.5 t/hr. Treated (demineralised) make-up water is fed to the blowdown system to be pre-heated by waste heat from the boiler blowdown prior to entering the deaerator/feedwater tank.

Feedwater is fed to the boiler economiser through high pressure pumps which are also used for boiler steam temperature control through two spray water type attemperator valves.

Water quality is continuously monitored at the economiser inlet, boiler steam drum, condensate pump and boiler high pressure steam delivery point for the following parameters; conductivity, sodium, silica, iron and copper. This information is used to control the dosage rate of boiler treatment chemicals (oxygen scavenger and alkalinity builder) injected into the boiler feed water between the deaerator/feedwater tank and the feedwater pimps.

Sootblowers

The boiler tubes are cleaned through use of steam sootblowers. These are installed between the economiser and condensate pre-heater tube banks and are both fixed and retractable. Steam for the soot blowers will be sourced from the boiler main superheated outlet line, via a pressure reducing station.

The use of sootblowers negates the requirement for manual cleaning of heat transfer surfaces and rodding of boiler ash hoppers.

Boiler blowdown

Continuous boiler blowdown removes impurities and solids to minimise scale, carryover and corrosion within the boiler. The rate of blowdown is controlled by continuous measurement of total dissolved

solids (TDS) in the blowdown water to minimise water use. Blowdown is fed to a heat recovery flash tank, pre-heating make-up water and allowing flash steam to be recovered to the deaerator tank.

Urea Injection (Selective Non- Catalytic Reduction (SNCR))

The NOx that is formed during the combustion process is abated using a Selective Non-Catalytic Reaction (SNCR) system. Urea is injected into the gas stream in the boiler first pass and mixed with the combustion products. NH_3 reacts selectively in the presence of oxygen and primarily reduces the nitrogen oxides (NOx) to molecular nitrogen (N_2) and water vapor (H_2O). Diluted urea is stored within an 50m^3 tank, providing a minimum of 4 days supply.

Please refer to Table 3.7 for the BAT justifications regarding the combustion and boiler system on site.

Table 3:7: Indicative BAT Requirements for the Combustion Systems and Boilers	
Minimise dioxin production by boiler design and operation	
Avoidance of slow rates of combustion gas cooling between 450 and 200°C.	• A system has been designed to ensure that flue gas is rapidly cooled (approximately 11.5 seconds) through the critical de novo synthesis temperature (around 170°C); • Boiler passes are progressively decreased in volume so that the gas velocity increases through the boiler; and • The design of the boiler ensures that boundary layers of slow moving gas are prevented.
Prevention of boiler fouling	The boiler has been designed with the following control methods to prevent fouling: • Uniform waste feeding and combustion rates; • Supply of uniform and homogeneous waste feedstocks; • High degree of control over combustion air; and • On-line cleaning (soot blowing) and off-line cleaning.
NOx reduction techniques may also help to minimise dioxin emissions.	NOx reduction is achieved through the use of SNCR in the first boiler pass. All NOx limits are within BAT ELV's.
Minimising releases to water from boilers	
Reducing boiler blow down	• Blowdown rate is controlled through continuous measurement of TDS to minimise water loss and make-up water requirement. • Blowdown is treated at the WWTP prior to discharge.
Reduction in water treatment and de-ionisation plant effluent.	• Streams are mixed together and treated in the Waste Water Treatment Plant (WWTP); and • The waste water system blowdown is then reused within the system.
Treatment of wash water and cleaning solutions.	• Any waste water will be collected in the effluent collection tank and treated in the WWTP.

3.10 Steam Turbine and Generator Set

The high pressure steam from the steam boiler is routed to the steam turbine-generator located in the Turbine Building. The thermal energy of the steam is converted into mechanical energy so that the turbine drives the generator.

The turbine will be condensing type with radial / axial exhaust. The two turbine bleeds will be directed to the feedwater heater and deaerator tank respectively. A gland steam condenser (heat exchanger) is included to prevent venting of gland steam to atmosphere. Condensed steam is discharged to the foul drainage system and exchanged heat recovered to preheat the condensate.

The performance parameters of the steam turbine-generator set at an ambient design air temperature of 15°C are summarised in Table 3.8 below.

Table 3.8 Steam Turbine-Generator Performance

Parameter	Value
Electrical Output	23 MW @ 11 kV 50 Hz
Steam Inlet Pressure	41 bar
Steam Inlet Temperature	415°C
Steam Flow	96.87 tonnes / hour
Bleed Steam 1	0.667 kg/s @ 4.72 bar, 201°C
Bleed Steam 2	2.53 kg/s @ 2.4 bar, 126°C
Exhaust Steam Pressure	0.1 bar
Exhaust Steam Temperature	45.8°C

Low pressure exhaust steam from the turbine is directed to the air cooled condenser (ACC) with the resultant condensate stored in the condensate storage tank. Condensate is sent to the deaerator via the surface condenser, gland steam condenser, LPPH sub-cooler and condenser and condensate pre-heater which uses boiler exhaust gas.

Under normal operation, 100% of the steam produced by the boiler is fed to the steam turbine, However in the event of a turbine trip the plant is fitted with a steam bypass. Bypassed steam would be transferred to the ACC directly. The bypass valve is fitted with steam cooling water injection and can provide safe shut-down in cases of emergency and be used for start-up purposes in the closed cycle without venting steam to atmosphere.

The turbine bypass system has been designed to have a capacity equal to the maximum boiler capacity.

Electrical Generation

The steam turbine is coupled to a 11kV 50 Hz generator via a double helical parallel shaft gear unit. The plant has been designed with a gross electrical output of 23.5MWe, of which the plants parasitic is load is typically 3MWe with approximately 20MWe available for export to the National Grid.

The generator itself is water cooled and connected to a closed dry cooling system, which also provides cooling for the oil system. Primary cooling can be either air or water and the secondary cooling is provided by the sites closed loop cooling water system.

Air Cooled Condenser

The ACC onsite operates under vacuum to condense exhaust steam from the turbine using axial air fans with variable speeds. The condensed water is then collected in bottom manifolds and drains via gravity to the condensate tank. The ACC is of A frame type and sized to provide continuous operation at 105 t/h steam flow, accommodating a full steam bypass of the steam turbine-generator via a pressure reducing station.

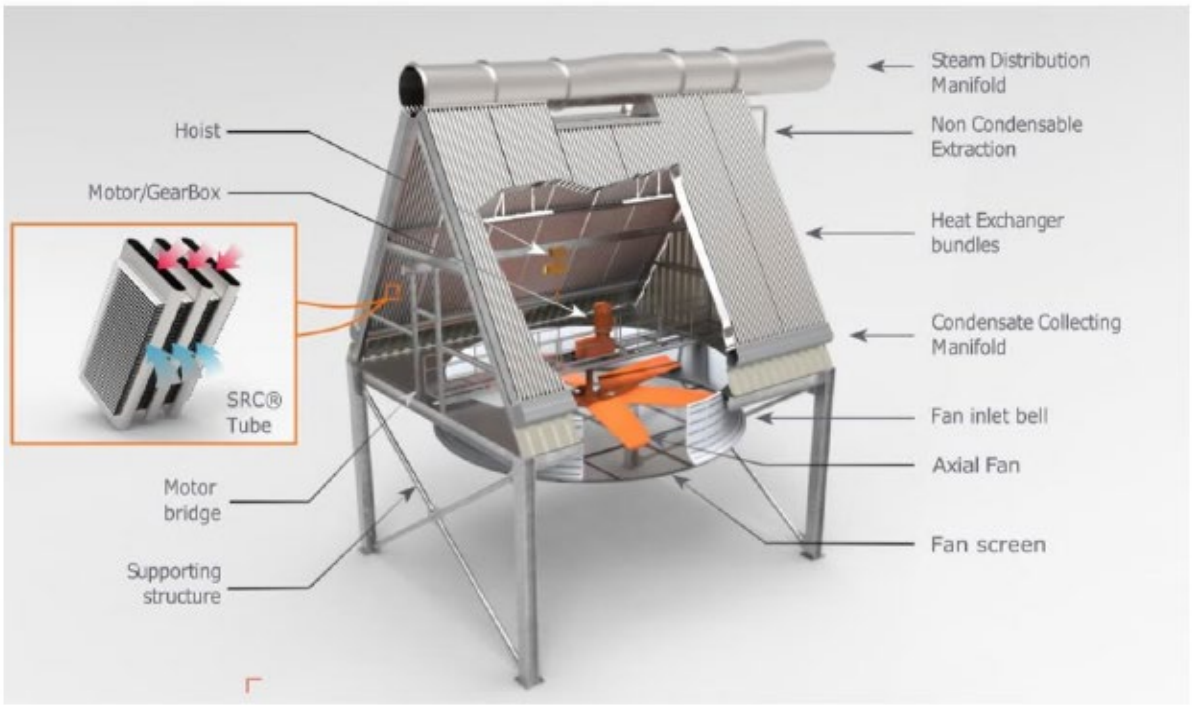

Figure 3.4 ACC

3.11 Flue Gas Treatment

The flue gases generated by the combustion process exit the boiler via the economiser unit and enter the downstream cleaning system. The flue gas treatment system comprises a dry scrubber with reagent injection to neutralise acid gases and adsorb heavy metals and dioxins followed by a baghouse filter prior to discharge to atmosphere via a 50 m high stack (emission point A1).

The plant has been designed to ensure compliance with the Industrial Emissions Directive (IED) Chapter IV Emission Limit Values (ELVs) and the Waste Incineration BREF BAT Conclusions ELVs.

Dry Scrubber System

The flue gases enter the dry reactor scrubber tower at the base of the reactor and flow upwards at a controlled velocity through an internal restriction. Lime and powdered activated carbon (PAC) injection is undertaken at the base of the tower. The injection lance assembly is connected to both the lime silo and PAC silo blowing systems. Both reagents enter the reactor tower at a controlled rate and velocity.

Solids within the gas stream will become coated with the reagents. Lime chemically reacts with SO_2, HCl and HF and neutralises these acid gases within the flue gas, while mercury and dioxins adsorb to the surface of the carbon.

The reactor provides the necessary reaction and retention time (approximately 4 seconds) before the flue gases enter the filter.

Lime and PAC silos, sized 188m^3 and 52m^3 respectively, are located next to the base of the scrubber and fed via conveyors with metering systems to the silo blower at the base of the reactor tower.

Baghouse

A fabric filter system comprising six compartments collects the particulate matter from the flue gases exiting the dry scrubber. This comprises a mixture of used reagents and entrained fly ash. Reagents are recirculated through the reactor tower and APCr is transported via conveyor to the enclosed storage silo prior to removal from site via dry ash tanker.

Cleaning of the fabric filter bags is automatically and sequentially enacted while the plant is online through compressed air injection. Compressed air is injected into a row of filter bags creating an over-pressure which stops filtration and causes abrupt inflation which dislodges the dust cake which falls to the below hoppers before transport to the APCr silo.

The APCr silo has a capacity of 250m^3 providing 4 days storage.

Stack & ID Fan

Treated flue gases exit the baghouse and are discharged to atmosphere via the 50 m high stack (A1). An induced draft fan (ID fan) is installed externally at the base of the exhaust stack. This maintains negative pressure throughout the boiler system ensuring no escape of emissions or ash from the system.

All emissions from the stack (A1) will be monitored using a fully compliant MCERTS accredited Continuous Emissions Monitoring System (CEMS) on the exhaust stack.

The CEMS will be IED complaint and monitor HCl, HF, NOx, NH_3, O_2, SO_2, VOC, particulates, H_2O, temperature, pressure and flow. TOC will be analysed by a Flame Ionisation Detector. The plant will have a standby backup CEMS system in the event that the duty CEMS are out of action.

3.12 Waste Water Treatment Plant

Wastewater collected from the process drains, including steam trap drains, floor washings, make-up water treatment plant, blowdown system and sampling systems is directed to the effluent drain tank where it is treated prior to discharge.

Treatment comprises a combination of settlement, pH correction and bio-disc filter to reduce contaminants to appropriate concentrations. Infrastructure associated with the waste water treatment plant comprises:

- 2 x underground tanks (20m^3);
- 2 x mixing tanks (4m^3);
- Sulphuric acid storage tank (1.5m^3) and dosing system;
- Caustic storage tank (1.5m^3) and dosing system;
- Sieve screen; and
- Packaged biological treatment plant (Biodisc).

Treated wastewater, including process effluent, treated domestic effluent and surface water run-off from the external bale storage area (when is use), is then discharged to the docks in line with the emission limit parameters outlined within the permit.

3.13 Controls and Environmental Management System

The site shall be operated in accordance with corporate standards and procedures as part of a wider Environmental Management System. The system will be designed to meet the requirements of ISO14001:2015.

All aspects of the operation will be managed in accordance with a formal Environmental Management and Working Plan. The plan will define all activities throughout the lifecycle of the treatment process (i.e. pre-acceptance, acceptance, reception).

The Environmental Management and Working Plan will be structured to meet the requirements of the Environmental Permitting Regulations and associated pollution prevention guidance.

The EMS will be designed to ensure:

- The identification of all foreseeable environmental impacts and risk that the Operators activities pose to the environment.
- Prevention or minimisation of any identified risks to practical minimum.
- Legal Compliance assurance.
- Identification of risks of pollution including those arising from operations, maintenance, accidents, incidents, non-conformances and complaints, and how these will be minimised.
- Activities at the site will be managed in accordance with the management system, which will be subject to continuous review, audit and improvement. Specific detailed management

system reviews will take place if there is a significant change to the activities, following an accident or if a non-compliance is found.

- Furthermore, the whole management system will be subject to annual external audit by competent third parties.
- The key aspects of the EMS for the site will include:
  - Preventative maintenance;
  - Operator requirements;
  - Training and Competence;
  - Emergency response and incident management; and
  - Monitoring, measurement and reporting.

The environment management system and procedures will be written to ensure that the environmental risk and impact of the normal running of the site activities are documented and minimised.

The EMS will be fully developed, implemented and in operation at the time of plant commissioning and permit issue and a copy of the management system will be kept at a convenient location on site.

It is acknowledged that at this stage the EMS is not fully developed.

A completed Environmental Management System will be fully developed prior to operations commencing on site.

Suggested Pre-Operation Condition 1

The operator shall submit a detailed site working plan that incorporates all aspects of the proposed installation whilst under both normal and abnormal (OTNOC) conditions to the satisfaction of the Natural Resources Wales, prior to the commencement of operations of the new facility.

This working plan shall form part of a wider formal Environmental Management System that meets with recognised

Site Maintenance

All maintenance activities on site will be carried out in accordance to the manufacturers' recommendations and will be integrated within the company's environmental management system.

The key aspects of the maintenance management programme will include:

- A programme of Planned Preventative Maintenance (PPM) is undertaken to ensure ongoing management and replacement of key plant and equipment rather than waiting for the equipment to fail and the maintenance of any critical environmental equipment.
- The inspection and maintenance schedules that the manufacturer recommends are adhered to, including any period of recommended shut-down.
- Predictive maintenance (e.g. assessment of vibration from bearings in motors) is carried out to prevent any catastrophic breakdown.
- Real time data collection and plant condition monitoring.

The detailed management system operated by the site will include procedures for ensuring that adequate maintenance is undertaken at the site.

The maintenance programme will ensure that all equipment or infrastructure that is deemed essential in the prevention of pollution to the environment (e.g. hard-standing, bunds, abatement plant etc.) or the prevention of local nuisance impacts (e.g. noise abatement equipment etc.) is maintained and kept in good operating condition.

All maintenance activities for critical pollution control equipment (abatement etc.) will form a key part of the management system that will be established prior to the commencement of operations at site.

During planned periods of maintenance, if any of the following situations arise, waste will cease to be charged until normal operations can be restored:

- Continuous monitoring shows that emissions are exceeding any ELVs due to failure of the abatement systems or CEMS are out of service for a total of 4 hours;
- The cumulative duration of the periods of abnormal operation over 1 calendar year has reached 60 hours; or
- The continuous emission monitors are unavailable.

The planned period of abnormal operation will end at the earliest of the following:

- When the failed equipment is repaired and brought back into normal operation;
- When the operator initiates a shutdown of the combustion activity;
- When a period of four hours has elapsed from the start of the period of abnormal operation; or
- When, in any calendar year, an aggregate of 60 hours has been reached for planned periods of abnormal operation.

3.14 Operator Competence

The facility will be fully automated to the point that all process activities will be PLC controlled and SCADA monitored. The installation will have on-line monitoring which can be administered remotely to ensure the process is optimised and operating correctly.

Notwithstanding the above, the site will be staffed at all times by the Operations team. The primary role of day staff is to ensure and oversee plant loading operations, fuel transfers and management.

Additional activities will include general site housekeeping and administration activities. Additional staff attending the site will be visiting engineers from the equipment manufacturers who are adequately trained to perform their duties at site. The operator will maintain written operation instructions for all plant and monitoring equipment present on site.

All personnel working at the facility will be trained in the necessary sections of the EMS and Working Plan and any associated Procedures. All staff working for and on the behalf of the site will be suitably

trained and competent (e.g. professional maintenance engineers, electricians, equipment operators etc.).

The Operations Team will employ on a full-time basis a site manager / technically competent person who holds the necessary qualifications.

No operations (pre-conditional or otherwise) that involve the acceptance, handling or processing of any wastes will take place without a technically competent person being employed by the Operator.

Operational Times
The site will be operated on a continuous 24/7 basis in accordance to the agreed operational and planned maintenance outage schedule.

Additional activities will include general site housekeeping and administration activities. The site will maintain written operation instructions for all plant and monitoring equipment present on site.

All personnel working at the facility will be trained in the necessary sections of the Working Plan and associated Procedures.

Fuel deliveries will take place between the hours of 07:00 – 19:00 Monday to Saturday and 08:00 – 16:00 Sundays.

3.15 Site Security

The site will incorporate the relevant security measures including:

- A perimeter fence which will be inspected periodically to ensure that the site security has not been compromised;
- CCTV monitoring of the external and internal areas of the Installation;
- External on-line monitoring and administration of the waste-to-energy process from a remote location;
- All personnel and vehicles entering the site are strictly controlled and managed; and
- No vehicles or personnel will be allowed access to the facility without prior authorisation.

3.16 Accidents and Emergencies

Fire Protection Strategy
The specification of the plant includes the inclusion of a fire detection and alarm system that has been designed in accordance with the relevant legislation including the Regulatory Reform (Fire Safety) Order 2005 and Building Regulations 2010 (as amended).

The fire protection strategy for the Installation includes the following fire mitigation and suppression measures as required by the plant insurers comprising:

- An automatic fire detection and alarm system;
- An automatic sprinkler system;

- Automatic waste bunker water cannons;
- An appropriately sized fire water tank and pumps;
- Automatic suppression system (deluge water spray);
- A suitable number of manual break-glass call points; and
- Fire extinguishers throughout the plant and in the control and electrical room areas.

In addition, appropriate first aid fire-fighting equipment will be provided throughout the site;

Planning inspection, maintenance and testing procedures will be established and used to ensure that all fire protection systems can be operated effectively.

All fire safety equipment, installations and systems will be routinely tested by competent third parties and in accordance to fire safety and insurance requirements.

All escape routes will be designed as per the building regulations and Fire and Service Rescue Acts.

The Applicant will be carrying out a DSEAR study as part of the detailed design stage of the project. Any ATEX requirement as a result of this study shall be implemented into the design and control of the Installation.

The design of the plant will also be the subject of a HAZOP study. Again, any additional plant requirements that arise from this assessment will be fully implemented as part of the detailed design process.

Fire Prevention and Mitigation Plan

The site has developed a Fire Prevention and Mitigation Plan that complies with Natural Resources Wales Guidance Document 16 *'Fire Prevention & Mitigation Plan Guidance – Waste Management'.*

The Fire Prevention and Mitigation Plan relates to the storage of all fuel product and provides the necessary information on site infrastructure, storage locations, storage practices, monitoring equipment and emergency response procedures.

The Fire Prevention & Mitigation Plan is included as part of *Annex D3 – Fire Prevention & Mitigation Plan.*

Accident Management Plan

The Applicant has developed a draft Accident Management Plan based around the specific risks associated with the site operations.

The key aspects of the Sites Accident Management Plan are:

- Reviewed by the Site Management annually and as soon as practicable after an accident.
- Considers hazards presented by:

  - Emergency shut-down procedures;
  - Actions in case of fire/explosion;
  - Actions in case of fire/emergencies;
  - Contaminated firewater;
  - Failure of any equipment;
  - Failure of abatement plant;
  - Spillages and uncontrolled release;
  - Plant or equipment failure (e.g. over-pressure of vessels and pipework, blocked drains);
  - Vandalism; and
  - Flooding.
- Identify events or failures that could damage the environment;
- Assesses the likelihood and the potential environmental consequences from accidents at the site.
- Proposes action to minimise the potential causes and consequences of accidents.

In the event of an accident, NRW will be immediately informed and necessary measures to limit the environmental impact of the accident will be carried out, as well as measures to prevent further possible accidents.

The draft Accident Management Plan has been included in *Annex D2 – Accident Management Plan.*

Specific emergency response procedures will be developed by the Operator in conjunction with the plant manufacturer. These procedures will be completed prior to operations commencing at the site.

Incident Reporting

The reporting of incidents and non-conformities will form a key component of the companies Environmental Management System. Identified non-conformities under the system include, but are not limited to the following:

- Uncontrolled leaks and spillages of any materials with the potential to cause pollution to the environment (hydraulic fluid / oils, unabated dust emission to atmosphere);
- Non-compliance to any permitted condition or consent limit (emissions excursions, missing of reporting deadlines, breach of any permitted consent limits);
- Internal Audit findings (legal non-compliances, EMS procedural breaches, system non-compliances);
- External and Internal Complaints; and
- Whenever a plant malfunction, breakdown or failure, or any near miss occurs.

The company's EMS will undergo periodic external audit and review to ensure that both compliance and continuous improvement is achieved. The EMS requires that all identified incidents and non-conformities will be investigated and closed out.

All plant and equipment will be PLC controlled, monitored and alarmed using a 'SCADA' / Distributed Control System (DCS) system, thus ensuring that continuous plant diagnostics can be facilitated.

Furthermore, the site management system will have documented procedures and registers to:

- Ensure that any members of the public/residents are alerted and informed if a significant plant issue arises (fire, explosion etc);
- Record, report and investigate any internal or external complaints to ensure that any necessary measures are taken to prevent, or where that is not possible to minimise, the causes; and
- Inform any members of the public about the nature of the site, key contacts and sources of further information.

4. EMISSIONS & THEIR ABATEMENT

4.1 Emissions to Air

Point-source Emissions to Air

All point source emissions from the plant will be through a single 50m high stack and are detailed in the table below. This table provides details of the predicted emissions parameters, concentrations and source.

All concentrations from the plant will be in line with those ELV's specified in the Industrial Emissions Directive (IED) as shown in Table 4.1 below.

Table 4.1: Emission Parameters for the Energy Recovery Facility

Parameter	Emission Parameters
Stack Height	50
Temperature (°C)	148
Actual flow rate (Am^3/s)	71.3
Oxygen content (%v/v dry)	8.0
Moisture content (%v/v)	15.5
Normalised Flow Rate (Nm^3/s)	50.9 (a)
Emission Concentration (mg/Nm^3) (a)	
PM_{10}	5
TOC	10
HCl	6
HF	1
CO	50
SOx	30
NOx	120
Dioxins and Furans	6×10^{-8}
Group I (Cd, Tl)	0.02
Group II (Hg)	0.02
Group III (Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V)	0.3
NH_3	10
PAH (as Benzo(a)pyrene)	9.0×10^{-5}
PCBs	3.6×10^{-9}
(a) At 11% O_2, 273.15K, 101.3 mb, dry	

Detailed emission modelling to full IED requirements has been carried out as part of this Application.

All details are provided within the *Annex C1 –Air Quality Assessment and HHRA.*

A full commissioning and acceptance programme will be carried out by the operator and the technology supplier as part of the plant installation and handover. The exact nature of the commissioning programme is currently unknown; however, it will be structured around the needs of the permit.

This programme will be devised by the installation contractor in conjunction with the operator and agreed with NRW as part of a pre-operation condition.

The following table summarises the BAT justifications regarding the emissions from site.

Table 4.2 BAT Justification for Emissions to Air	
Indicative BAT	**Justification**
Emissions identification and benchmark comparison	The emissions benchmarks in the Sector Guidance Note can be met.
Vent & chimney height dispersion capacity and assessment of emitted substances fate in the environment	An impact assessment has been carried out and is referenced in Section 7 of this document.
Visible particulate plumes	Controlled by the particulate abatement system (bag filter system).
Visible condensed water plumes	There will be no visible plume from the facility under a majority of climatic conditions.
Particulate matter	Controlled by the particulate abatement system (bag filter system).
NOx - Primary Measures	
Fuel selection	Diesel used for start-up burners
Combustion chamber design	This is compliant with IED and represents BAT.
Air control – primary and secondary	Both primary and secondary combustion air is highly controlled
Temperature control	Temperature control is a key aspect of the control system
NOx – Secondary measures	
Flue gas recirculation	FGR is not considered necessary, NOx limits can be met without FGR. Grate cooling achieves similar 'Low NOx' emission.
SNCR	Urea injection will be used and is considered BAT.
SCR	SCR is not required as NOx limits can be met with SNCR and Grate cooling.
Acid gases and halogens	
Primary acid gas measures	The waste feed will exclude hazardous waste and will not contain significantly chlorinated or halogenated components. Each supplier is governed by the fuel specification and supply contract.
Secondary acid gas measures	Lime and PAC injection will be used in order to control acid gases.
Alkaline reagent selection	Lime has been chosen because it is readily available, has a very good removal rate, significantly less material is required than traditional systems, it can be directly injected into the combustion chamber and is highly efficient.

Acid gas control: cost/benefit study	As this installation is a newly built facility, all measures employed are BAT, for this reason a cost benefit study on the merits of primary and secondary measures is not required. Careful consideration has been made during the design stage of this project to ensure that releases of acid gases and halogens are well managed by appropriate primary and secondary measures. All incoming RDF is contracted to a specification that prevents high sulphur and chlorine conditions.
Carbon Dioxide	All measures to increase energy efficiency will also reduce CO_2 emissions.
Carbon monoxide and VOCs	CO is not significantly influenced by the conventionally employed abatement techniques. Reduction of both CO and VOCs is achieved by control of combustion conditions in the boiler.
Dioxins and Furans	The primary method of reducing the emissions of dioxins is through the combination of incoming waste feedstock control, careful control of the conditions in the combustor and abatement. Boiler residence time is controlled to minimise de-novo formation. PAC injection will remove dioxins and furans from the gas phase, followed by bag filters which will provide efficient particulate abatement.
Metals	PAC gives reliable and effective heavy metal (e.g. mercury) reductions, and for the majority of metals particulate abatement is the main means of ensuring that releases are minimised.

4.2 Emissions to Controlled Water

There will be no direct process emissions to controlled water arising from the Installation.

Uncontaminated clean surface water runoff captured from roof drainage and external roadways / car parking areas will be discharged via an attenuation tank traps to the docks.

Surface water run-off from other external areas of the site will pass through Class 1 interceptors before discharge via the attenuation tank to the docks. Surface water SuDs features onsite include a rainwater harvesting tank, permeable paving and the attenuation tank (900m^3). Surface water will be discharged from the tank at a flow rate of up to 100 l/s via a pump station and new rising main to the tidal estuary of Newport Dock.

Domestic effluent will be treated at an onsite packaged biological sewage treatment plant prior to discharge to the dock.

Any effluent arising from the process plant including washdown waters, boiler blowdown etc will be collected in the Sedimentation Basin and treated at the onsite Waste Water Treatment Plant (WWTP) prior to discharge to the docks or removal offsite via tanker. The WWTP incorporates a combination

of settlement, pH correction and a packaged biological (bio-disc) filter system to ensure parameters are in line with the permitted emission limit values.

During periods where the external baled storage area is not being utilised, surface water run-off will be discharged via the attenuation tank to the docks. During use, potentially contaminated run off form the bale storage area will be diverted to the WWTP.

External storage of slag onsite is within a concrete lined bunker. Surface water from this area is recirculated for cooling purposes. Any water not utilised for this purpose is directed to the WWTP.

Above ground drainage shall be designed in accordance with BS EN 12056.

There will be one discharge point to the docks, W1. All emissions to the dock will be in line with NRW requirements.

The Site Drainage System is shown in *Annex A – Figures*.

4.3 Emissions to Sewer

There are no proposed emissions to foul sewer.

Table 4.3 below summarises the BAT justification for emissions to water and emissions to groundwater.

Table 4.3 BAT Justification for Emissions to Water	
Indicative BAT	**Justification**
Water use	Water use will be minimised and recycled where possible.
Contamination identification and fate analysis	Sampling, monitoring and analysis will be carried out, once the installation is operational, in agreement with NRW.
Filtration	Wastewater is subject to biofiltration prior to discharge and all surface water run-off is discharged via interceptors and the attenuation tank. No further filtration necessary.
Off-site treatment	No off-site treatment.
Benchmark comparison - Control of emissions to meet EQS and WID requirements	IED Chapter IV requirements do not apply.
BAT Justification for Emissions to Groundwater[2]	
Identification of List I substances	n/a
Identification of List II substances	n/a
Prior Investigation	Discussed in the Site Condition Report
Surveillance	n/a

[2] There are no emissions to ground water

4.4 Emissions to Land

There will be no emissions to land arising from the Installation.

4.5 Odour

Due to the design of the building structure and the fully enclosed processing activities, there is very little potential for offsite odour emissions and impacts to arise from the site. Furthermore, the fundamental design of the facility has a hierarchy of odour control and abatement measures to ensure that the potential for odour impacts are eliminated.

Vehicles delivering RDF to the facility will be enclosed minimising potential impact during transport. Entry to the Fuel Building is via automated fast acting roller shutter doors to minimise fugitive emissions releases. Vehicles are required to reverse into he reception hall and discharge fuel directly into the fuel bunkers. The vehicles will only discharge the waste when the roller shutter doors are closed.

To avoid any odour emissions from the Fuel Building (encompassing the reception hall and storage bunkers), the building is kept at slight negative pressure through the extraction of air to the primary combustion system. Any odorous compounds within the air are then thermally oxidised within the combustion process. Under normal operation the air exchange ratio covering the reception area, bunker areas and hopper area will be around 3 times per hour.

The process itself has no significant potential for odours as the combustion system thermally oxidises any odorous compounds.

During periods where the plant is in shut down, such as for maintenance on equipment related to the air extraction system (e.g. the ACC or ID fan) this air ventilation and odour treatment system will not be operational. A number of contingencies have been developed.

- Over short periods the plant will continue operation on by-pass mode without interrupting waste handling and ventilation.
- During planned stoppages, waste deliveries will be diverted and buffer storage consumed prior to the outage. During unplanned stoppages, waste deliveries will be diverted as soon as possible.

It is acknowledged that in either of the above scenarios, a limited quantity of waste will remain. As such a back up ventilation and odour treatment facility, comprising a ventilation unit with activated carbon filter cartridges will be in place.

The only external site activity is the temporary storage of baled RDF. Potential for odour emissions from this activity is limited due to the following measures.

- No odorous baled materials will be accepted onsite;

- All externally stored bales are required to be well wrapped (6 layers) and a site inspection is undertaken twice daily.
- Any damaged, poorly wrapped or odorous bales are immediately removed and placed internally for processing.
- The external storage of bales is only anticipated to only take place approximately 20 days a year to ensure fuel security during periods of national holidays and other short term delivery disruption.

Additionally waste storage times onsite are kept as low as possible, up to 3 days internally and 10 days externally.

Although there is very little potential for odour emissions from site due to the control measures described above, an Odour Management Plan has been produced as part of the sites Environmental Management System. Please refer to *Annex D4 – Odour Management System* for more information.

Table 4.4: Odour Management Summary

Tier	Reference	Description
1	Inventory Control	The Installation will process a maximum of 260,000 tonnes per annum of RDF. The site will be operated such that there is internal capacity of 2 days operation and an additional 2 days supply stored externally only when required on a temporary periodic basis. The site will be managed in a manner that prevents wastes being accepted into the site in the event that the site is inoperable. All wastes accepted on site will be required to be pre-declared and be deemed acceptable by the site manager prior to the transportation and delivery to site. All waste accepted on site will be inspected on arrival to ensure compliance with the agreed *'Waste Declaration Form'* and do not have any malodourous properties. The delivery and processing of waste is undertaken internally and will not produce any odour emissions. External waste storage is limited to within wrapped bales thereby minimising potential odour escape and only stored for a maximum of 10 days.
2	Enclosed Building	Entry to the Fuel Reception Building is via automated fast acting roller shutter doors. Vehicle unloading / loading only takes place within the Reception Hall when the roller shutter doors are closed. Additional misting sprays van be fitted within the building if required.
3	Controlled Extraction System	To avoid any odour emissions from the Fuel Reception Building, the building is kept at slight negative pressure. An air extraction system will be in place resulting in odorous air within the building being

		utilised as primary combustion air and the thermal destruction of any odorous compounds. A back up ventilation system including activated carbon filtration will be in place in the event of any shut down in the combustion process.

Although no odour from the plant is anticipated, odour shall be routinely monitored at points around the site boundary and observations shall be noted in the site diary and/or on a daily monitoring document.

In the unlikely event that there is any discernible odour detected at the site boundary and the odour is judged to be 'moderate' (i.e. odour Intensity Rank 3), then the Site Manager will be notified immediately, and the olfactory survey will continue to attempt to determine the source and extent of the odour plume, as follows:

- A suitable location downwind of the site and potentially sensitive receptor at which the odour plume is unlikely to extend will be selected for assessment;
- Survey will continue toward the facility until a site-related odour is perceived; and
- Assessment points perpendicular to the plume axis and equidistant from the site will then be monitored, subject to access requirements.

The main aim of monitoring will be to test if any odours emitted from the site will be causing the nearest receptors nuisance. In scenarios where nuisance is being caused then operations will be suspended until the conditions improve. The Site Manager may deem it necessary to find the precise source of the odour and attempt to eliminate it or neutralise it immediately.

The following table shows the BAT justification for odour prevention on site.

Table 4.5: BAT Justification for Odour	
Indicative BAT	**Justification**
Containment	
The Operator should maintain the containment and manage the operations to prevent its release at all times.	Entry to the Reception Hall is via electrically controlled roller shutter doors and waste unloading only takes place when the roller shutter doors are closed. Air extraction within the Fuel Reception Building maintains a slight negative pressure to prevent escape of potentially odours air. Extracted air is utilised as primary combustion air resulting in the thermal destruction of odorous compounds prior to release to atmosphere.
Assessment and Management	
For existing installations, the releases should be modelled to demonstrate the odour impact at sensitive receptors. The target should be to minimise the	N/A Not an existing installation.

Table 4.5: BAT Justification for Odour	
Indicative BAT	Justification
frequency of exposure to ground level concentrations that are likely to cause annoyance.	
For new installations, or for significant changes, the releases should be modelled and it is expected that the Operator will achieve the highest level of protection that is achievable with BAT from the outset.	Dispersion modelling has been undertaken for combustion gases from the facility. Odour is considered low risk and is controlled by the onsite measures therefore no formal odour modelling is considered necessary however an odour management plan has been produced. A preliminary odour dispersal study (using USEPA Screen 3) has been undertaken by the EPC contractor for the back up ventilation and activated carbon system, concluding no nuisance impact either onsite or at nearby receptors. This is detailed in the Odour Management Plan provided in Annex D4.
Where there is no history of odour problems then modelling may not be required although it should be remembered that there can still be an underlying level of annoyance without complaints being made.	N/A.
Where, despite all reasonable steps in the design of the plant, extreme weather or other incidents are liable, in the view of the Regulator, to increase the odour impact at receptors, the Operator should take appropriate and timely action, as agreed with the Regulator, to prevent further annoyance (these agreed actions will be defined either in the Permit or in an odour management statement).	N/A.
Where odour generating activities take place in the open, (or potentially odorous materials are stored outside) a high level of management control and use of best practice will be expected.	External activities are limited to short term storage of baled RDF. Potential for odour is carefully controlled through management of bales. All bales are wrapped and inspected on a twice daily basis. Any damaged or potentially odorous bales are immediately removed and stored internally for immediate processing. Bales are stored for a maximum of 10 days.
Where an installation releases odour but has a low environmental impact by virtue of its remoteness from sensitive receptors, it is expected that the Operator will work towards achieving the standards described in this Note, but the timescales allowed to achieve this might be adjusted according to the perceived risk.	N/A.
Specific Odour control techniques	
Enclosing odorous areas (applicable to all).	All appropriate areas will be enclosed.

Table 4.5: BAT Justification for Odour	
Indicative BAT	**Justification**
Enclosing odorous waste all the way to the furnace (ACI, CWI).	All appropriate areas will be enclosed.
Confining waste to designated areas (all).	Designated areas designed into the layout.
Ensuring that putrescible waste is incinerated within an appropriate timescale (MWI, CWI, ACI, SSI).	Storage times on site are minimised. No putrescible wastes will be processed on site.
Refrigeration of such waste which is to be stored for longer than an appropriate timescale (CWI, ACI).	N/A.
Regular cleaning and (for putrescible wastes) disinfection of waste handling areas (all).	All areas will be regularly inspected, cleaned and maintained.
Design of areas to facilitate cleaning (all).	Facility is new and designed to ease cleaning.
Ensuring that the transport of waste and ash is in covered vehicles, where appropriate (all).	All vehicles will be covered.
Ensuring good dispersion at all times from any release points (all).	Release points have been designed aided by modelling to ensure adequate dispersion. The location and height have been optimised.
Preventing anaerobic conditions by aeration, turning of waste and short timescales (SSI, MWI).	Storage times are minimal internally (3 days) and waste is continuously mixed within the storage bunker. External storage of RDF bales may be for up to 10 days.
Chlorination of waters being returned to STW or in storage (SSI) drawing air from odorous areas at a rate which will ensure that odour is captured (all) and treating such extracted air prior to release to destroy the odours - see below.	N/A.
The use of these techniques should obviate the need for odour masking or counteractants.	No masking agents or counteractants have been specified at the plant.
Treatment of Odour	
The use of odorous air e.g. air from the waste handling area or air displaced from tanks, as furnace air is an ideal way of treating odours. The quantity of contaminated air that can be handled this way is obviously limited by the needs of the furnace. A disadvantage is the need to consider provision for odour control when the incinerator is not operating.	Odorous air is not anticipated to be a problem. Air from the Fuel Reception Building is utilised as primary combustion air for the grate thereby thermally destroying any odorous compounds prior to discharge to atmosphere
Biofilters.	Biofilters will neither be used nor required.
Scrubbing for odour control.	Scrubbing for odour control will not be required.

Table 4.5: BAT Justification for Odour	
Indicative BAT	Justification
Carbon filters.	The back up ventilation system includes carbon filtration and will be utilised at any time that the plant is not in operation.
For a new plant it would normally be the case that the imposition of conditions achieving BAT also secures that no significant pollution (including odour) is caused.	The proposed plant has no potential for significant odour pollution.

4.6 Noise Impacts

The design of the Installation has taken into account the potential impacts on the environmental and neighbouring receptors with regards to noise.

The plant and building have been designed to abate and control noise, odour and fugitive emissions. The building is fully enclosed and nominally kept under partial negative pressure with all doors closed during operation.

The processing plant and associated equipment has been designed in accordance with best practice and to ensure that internal noise does not present an issue to the employees at the site under the Control of Noise at Work Regulations and to ensure that noise breakout does not lead to noise nuisance at the identified sensitive receptors.

A noise assessment in accordance with statutory noise guidance has been carried out, including modelling shown in *Annex C4 – Environmental Noise Assessment.* The report concludes that the noise impacts will have an insignificant effect on existing residential receptors due to appropriate design, mitigation and intervening distances to the nearest residential receptors.

Noise Abatement Measures

All key components identified in the table below have been specified to meet a noise specification such that the occupational noise exposure limits as defined by the EC Physical Agents Directives and their regulations (Control of Noise at Work Regulations) are met.

As required by the above regulations the site has specified an internal occupational noise climate (i.e. internal building plant noise level) to be at the below the first action level of 85dB $L_{epd.}$ This will be achieved by the equipment manufacturers through the use of acoustic enclosures around all internal noise generation equipment.

Due to the level of noise control engineering that has been designed into the plant and the sound insulation that will be provided by the building fabric, there is limited potential for the internal installed equipment to create a noise nuisance at any neighbouring receptors.

The identified noise generating plant and equipment associated with the Installation have been identified in the table overleaf.

Table 4.6 Identified Noise Sources and Abatement						
Equipment	Description	Location of Source	Nature of Noise	Duration of Noise	Abatement Fitted	Significant Impact at Receptor
Reception and feedstock handling	Internal and external vehicle noise, hydraulic and fan plant noise	External to Reception Building and within Feedstock Transit Area	Intermittent vehicle engine noise	Intermittent	The majority of activity takes place within the enclosed Fuel Reception Building. All external mobile plant are fitted with white noise reverse alarms. Vehicle deliveries will only take place during daytime only.	No, majority of activities will be carried out internally Buildings are treated to prevent noise break out. No deliveries or external activities will be carried out during night time periods.
Combustion and Boiler System	Fan and burner noise	Internal	Continuous tonal plant noise.	Continuous	All combustion plant is fitted with acoustic treatment and draws the combustion air from internal sources.	No, the building is treated and sealed to prevent noise outbreak.
Steam Turbine	Plant noise	Internal	Continuous tonal plant noise.	Continuous	Fully enclosed inside building.	No, the building is treated and sealed to prevent noise outbreak.
Air Cooled Condensers	Fan noise	Internal within dedicated enclosure	Continuous tonal plant noise.	Continuous	Acoustically treated	No, the air-cooled condenser fans are acoustically treated.
Stack	Tonal exhaust noise from stack	Elevated	Continuous tonal noise – fitted with attenuation	Continuous	ID outlet will have a silencer within the stack in order to be inaudible at the Installation Boundary.	No, the stack will be acoustically treated.

Table 4.7 below shows the BAT justification for noise prevention on site.

Table 4.7: BAT Justification for Noise	
Indicative BAT	**Justification**
Maintenance • Plant • Equipment • Fans • Bearings • Vents • Building Fabric • Other	Appropriate preventative maintenance will be provided for the various elements of the installation. This will ensure no deterioration of plant or equipment that would give rise to increases in noise.
Control Techniques and comparison with BAT indicative thresholds	Control techniques will be in line with BAT. The noisiest equipment is housed in acoustic enclosures and / or within separate appropriately signed and controlled acoustic housings.
Reasonable Cause for Annoyance – Sensitive Receptors/Complaints?	The facility will not give rise to reasonable cause for annoyance. In the unlikely event that complaints are received measures described in the integrated management system will be put in place.
Noise Survey	A noise assessment in accordance with statutory noise guidance has been carried out, including detailed modelling shown in *Annex C4 – Environmental Noise Assessment.*

4.7 Fugitive Emissions

The plant has been designed to ensure that odour, vapour and fugitive emissions do not cause an impact at offsite sources.

An air extraction system will be in place for odour and dust control within the Fuel Reception Building incorporating both the Reception Hall, bunkers and fuel handling system. In addition, a high level misting system is installed which will be operated if required.

Bottom ash is quenched prior to storage thereby minimising the potential for dust emission. Similarly boiler ash, which is stored in a common bunker with the bottom ash, is lead through a humidifier prior to storage to dampen it.

Table 4.8 shows the BAT justification for preventing fugitive emissions from the proposed development.

Table 4.8: BAT Justification for Fugitive Emissions	
Indicative BAT	**Justification**
Dust controls	
Covering of skips and vessels	There will be no open skips or vessels at the facility which could give rise to fugitive emissions.
Avoidance of outdoor or uncovered stockpiles (where possible)	External storage is limited to wrapped bales of RDF for short periods of time. No damaged or loosely wrapped bales will be stored externally at any time.
Where dust creation is unavoidable, use of sprays, binders, stockpile management techniques, windbreaks and so on	N/A.
Regular wheel and road cleaning (avoiding transfer of pollution to water and wind blow)	Due to the nature of the operations, problems with wheel contamination are not expected to be significant. All areas of the site will have hardstanding.
Closed conveyors, pneumatic or screw conveying (noting the higher energy needs), minimising drops. Filters on the conveyors to clean the transport air prior to release	Feed systems are simple and enclosed.
Regular housekeeping	The site staff will be fully trained and regularly audited through the EMS to ensure that housekeeping measures are appropriate to the nature and scale of the activities and that there is minimum possibility of uncontrolled emissions.
The recycling of by-products	All waste will be removed from site by covered vehicles or enclosed tanker.
Enclosed containers or sealed bags used for smaller quantities of fine materials	Small volumes of materials for maintenance etc. shall be stored in appropriate containers / sealed so as to prevent fugitive emissions.

Table 4.8: BAT Justification for Fugitive Emissions	
Indicative BAT	Justification
Mobile and stationary vacuum cleaning	Mobile and stationary vacuum cleaning will be used if necessary.
Closed storage with automatic handling system	All storage is closed and transferred using an automated handling system.
Sealed charging system	The charging system is fully enclosed.
VOC control measures	N/A.

4.8 Waste Generation and Management

Types and Amounts of Waste

The combustion process will not inherently produce significant quantities of waste.

The main solid by-products produced from the operation of the facility will be:

- Bottom Ash (a mixture of riddling, slag and boiler ash); and
- APC Residue (Air Pollution Control (APC) residues).

Bottom ash comprising riddling and slag from the combustion system will fall to the ash conveyor at the base of the grate where it will be quenched prior to storage within the concrete lined ash bunker. Boiler ash is collected and conveyed to the same common bunker via a humidifier. Bottom ash is then transported offsite for recovery.

APC residue is collected within the hopper at the base of the bag house and conveyed to an enclosed ash silo prior export offsite via enclosed dry powder tanker.

Table 4.9 below shows a tabular summary of site wastes.

Table 4.9: Waste Summary					
Waste	EWC Code	Approx. Quant (tonnes/yr)	Source	R / D Code	Environmental Fate
Bottom Ash	10 01 15	36,800	Combustion Grate	R5 (Off site recycling)	Reused as a re-cycled aggregate
APCr	19 01 05* / 19 01 13*	11,200	Bag house	R5 (Off site recycling)	Exported off site to an appropriate waste disposal facility

All waste produced at the site will be sampled and analysed. Additional samples will be taken if the disposal or recovery route changes or it is suspected that the nature or composition of the waste has changed such that it may no longer be appropriate for its environmental fate.

Throughput of Waste

All wastes will be sourced from commercial and industrial sources and will be Refuse Derived Fuel (RDF) that meets with the plant's agreed waste feedstock specification.

The Installation has been designed to process approximately 260,000 tonnes per annum of non-hazardous RDF.

The plant has been designed to at a minimum meet the required efficiency standard of 0.65 and will be classified as an R1 facility under Annex II of the Waste Framework Directive and will operate with a thermal efficiency in line with recognised BAT.

Waste Storage

The design of the installation has taken into account the potential impacts on the environmental and neighbouring receptors.

Table 4.10 summarises the BAT justification for the proposed storage of wastes on site.

Table 4.10: BAT Justification for Storage on Site

Indicative BAT	Justification
Subsurface structures	N/A.
Appropriate surfacing and containment or drainage facilities for all operational areas, taking into consideration collection capacities, surface thicknesses, strength/reinforcement; falls, materials of construction, permeability, resistance to chemical attack, and inspection and maintenance procedures; • have an inspection and maintenance programme for impervious surfaces and containment facilities; • unless the risk is negligible, have improvement plans in place where operational areas have not been equipped with: – an impervious surface – spill containment kerbs – sealed construction joints – connection to a sealed drainage system	• Surfacing has been designed in accordance with the design standards for similar installations. All joints are appropriately sealed. • The surfacing is designed to ensure that it is of the appropriate strength, reinforcement and thickness to withstand the heavy traffic which will pass over it during operations. • The installation will have an extensive maintenance programme in place which will include provision for the inspection of all appropriate plant and structures. • The detailed inspection of the impervious surfaces and containment will be in line with the construction engineer's recommendations. • Routine inspections will be undertaken on a daily basis by site personnel as part of the daily site checks. Since this is a new installation BAT will be demonstrated from commencement of operations.
Above-ground tanks	• Above ground bulk storage tanks containing liquids will be appropriately constructed to ensure they are impermeable.

Table 4.10: BAT Justification for Storage on Site	
Indicative BAT	Justification
	• Supervised deliveries will ensure that the risk of contamination of surface water is negligible. All tanks and facilities containing potentially contaminative substances will be installed with secondary containment and be designed to comply with the following standards and guidance requirements; • Natural Resources Wales Pollution Prevention Guideline Note 2: Above ground Oil Tanks (PPG2). • Natural Resources Wales Pollution Prevention Guideline Note 11: Preventing Pollution on Industrial Sites (PPG11). • Natural Resources Wales Pollution Prevention Guideline Note 26: Pollution Prevention in the Storage and Handling Drums and Intermediate Bulk Containers (IBC's) • CIRIA C958: Chemical Storage Tank Systems – Good Practice; • CIRIA R164: Design of Containment Systems for the Prevention of Water Pollution from Industrial Sites.
Storage areas (IBCs, drums, bags etc.) Storage areas should be located away from watercourses and sensitive boundaries, (e.g. those with public access) and should be protected against vandalism. Storage areas should have appropriate signs and notices and be clearly marked-out, and all containers and packages should be clearly labelled. Where spillage of any stored substance could be harmful to the environment, the area should be appropriately kerbed or bunded. The maximum storage capacity of storage areas should be stated and not exceeded, and the maximum storage period for containers should be specified and adhered to. • Appropriate storage facilities should be provided for substances with special requirements (e.g. flammable, sensitive to heat or light) and formal arrangements should be in hand to keep separate packages containing incompatible substances (both "pure" and waste). • Containers should be stored with lids, caps and valves secured and in place - and this also applies to emptied containers.	All non-bulk storage (IBCs etc.), where used, shall be stored within the fully contained building. In the event of a release it is not possible for the materials to enter the surface water drainage system.

Table 4.10: BAT Justification for Storage on Site	
Indicative BAT	Justification
• All stocks of containers, drums and small packages should be regularly inspected (at least weekly). • Procedures should be in place to deal with damaged or leaking containers.	

5. ENVIRONMENTAL MONITORING

5.1 Emissions to Air

All emissions to atmosphere (as identified within Table 4.1) will arise from the main plant stack.

The plant will have continuous emissions monitors (CEMS) located on the exhaust flue of the plant (Emission Point A1).

The CEMS system will monitor the stack emissions and provide data reporting. The system features a single-point extraction and includes monitors for CO, O_2, NOx, SO_2, ammonia slip and dust.

The CEMS will be IED/WID compliant and continuously monitor, HCl, NO, NO_2, N_2O, NOx, NH_3, O_2, SO_2, CO, VOC, particulates, H_2O, temperature, pressure and flow. TOC will be analysed by a Flame Ionisation Detector. HF will be assessed through the surrogate monitoring of HCl.

The dust monitor provides added flow, stack pressure and temperature. All analysers are provided with remote control, calibration & maintenance.

The continuous monitoring equipment will operate on a 24-hour basis and will include the facility for on-line monitoring of the gas concentrations and provide for any out-of-tolerance indications to be monitored by remote staff.

Additional HCL and SO2 gas analysers (one of each) will be installed between the boiler economisers and FGT system, to allow calculation of the RDF feedstock chlorine and sulphur content, and as an input signal to the FGT control system for the control of hydrated lime injection.

All CEMS equipment and associated platforms and sampling ports installed on site will meet the requirements of the Natural Resources Wales Technical Guidance Note M2. All CEMS equipment shall be MCERTS approved.

Procedures will be created for monitoring undertaken at the site. These procedures will conform to M1 and M2 guidance and those required by the operator monitoring and assessment scheme and are incorporated into the sites EMS system.

The CEMS will be used such that:

- The values of the 96% confidence intervals of a single measured result at the daily ELV shall not exceed the following percentages:
  - Carbon Monoxide – 10%
  - Sulphur Dioxide – 20%
  - Oxides of Nitrogen (NO and NO_2) – 20%
  - Particulate Matter – 30%

  - Total Organic Carbon – 30%
  - Hydrogen Chloride – 40%
- Valid half-hourly average values or 10-minute averages shall be determined within the effective operating time from the measured values;
- Where is it necessary to calibrate or maintain the monitor resulting in data not being available for a complete half hour period, the half-hourly average or 10-minute average shall in any case be considered valid if measurements are available for a minimum of 20 minutes or 7 minutes during the half-hour or 10-minute period respectively;
- Daily average values shall be determined as the average of all valid half-hourly average or 10-minute average values within a calendar day; and
- No more than ten daily average values per year shall be determined not to be valid.

5.2 Emission to Controlled Water

There will be no direct process emissions to controlled water arising from the Installation.

Surface water run-off is discharged via the attenuation tank to the docks.

It is proposed to undertake periodic visual compliance monitoring to ensure that this discharge to surface water is free from contaminants. Visual inspection will take place as part of the sites daily inspections.

Monitoring of treated waste water from the WWTP prior to discharge to the docks will be undertaken at the frequency and of the parameters required to ensure accordance with the permit and will be designed to comply with EA/NRW M18 Guidance.

5.3 Emissions to Sewer

There are no emissions to sewer, therefore no monitoring is required.

5.4 Emissions to Land

There are no process emissions to land arising from the facility, as such no monitoring is required.

5.5 Monitoring Frequency

The process will be subject to a range of process monitoring which has been designed to comply with the requirements of the EA M1, M2 and IED Guidance.

Table 5.1 Monitoring Frequency

Emission Point	Parameter	Monitoring Frequency	Methodology
A1	• Oxides of Nitrogen • Carbon Monoxide • Particulate Matter • Hydrogen Chloride • Carbon Monoxide	• Continuous daily & ½ hour average for all parameters	MCERTS certified CEMS equipment

	• Sulphur Dioxide • Ammonia • Total Organic Carbon • Temperature • Oxygen Concentration • Water		
A1	• Particulate Matter • Total Organic Carbon • Hydrogen Chloride • Hydrogen Fluoride • Carbon Monoxide • Sulphur Dioxide • Oxides of Nitrogen • Toxic Metals • Dioxin & Furans • Dioxin like PCB's • VOCs • Specific Individual PAH's • Ammonia	• Periodic (6 monthly) all parameters	EA Monitoring Guidance M1/M2 compliant extractive sampling
W1	• Visual Inspection	• Periodic	
	Parameters to be determined	To be determined	EA Monitoring Guidance M18

Records will be kept of all monitoring carried out at site. The records will be made as soon as practicable and will be retained for at least 6 years from the date the records were made.

6. BAT APPRAISAL

6.1 Technology Appraisal

There is a number of potentially suitable Energy from Waste (EfW) technologies which have been considered for the application Site. Although all of the technologies reviewed are capable of treating refuse derived fuels, a majority have been rejected on ground of environmental impact, operational cost or efficiency.

Moving grate combustion has a number of advantages for waste incineration for a number of factors:

- Capable of dealing with waste streams that are not necessarily homogeneous;
- High temperatures to achieve 850°C for 2 seconds retention time in combustion chamber;
- Allows continuous feed disposal;
- Fully automated and thus ensuring safe operation even at extreme temperatures;
- Inclined moving (riddling) grate configuration increases mechanical turbulence to optimise destruction of wastes;
- An increase of mechanical turbulence to optimise destruction of wastes;
- Thermal oxidation of combustion gases within the secondary combustion chamber; and
- Proven, reliable technology with typically modular design allowing ease of installation and future maintenance.

A summary of the advantages and disadvantages of the available combustion technologies is included in Table 6.1.

The processes proposed for this facility have been selected against detailed criteria which are based on the application of BAT, both to the particular process operation and to the combined process as a whole.

The objectives for the process were established as follows:

- To provide a combustion technology that can produce energy from waste;
- To reliably achieve the emission limit values (ELVs) stipulated in Chapter IV of the IED and the latest iteration of the Waste Incineration BREF BAT conclusions;
- To achieve a high degree of plant availability and reliability;
- To offer a cost effective and financially low risk solution for the generation of renewable power; and
- To utilise conventional unit operation techniques and technologies which meet the above aims and are established as BAT.

The design principles for the process were therefore defined as follows:

- To provide equipment with a suitable level of robustness and redundancy for the process duty and the inherent risk associated with that duty;
- To utilise conventional technologies to avoid the business and reliability risks associated with appliances which are not yet commercially proven or widely available;

- To utilise primary NOx control combined with SNCR Urea Injections and dry flue gas treatment system; and
- To achieve excellent acid gas removal utilising dry or semi-dry injection (high acid gas removal efficiency).

Table 6.1: BAT Comparison for Combustion Technologies				
BAT Criteria	Moving Grate (MG) Combustion	Fluidised Bed Combustion	ATT	
			Gasification	Pyrolysis
Waste	Untreated (or partially treated) municipal waste is main application.	Generally only suitable for reasonably homogenous material. Can be operated at scale however generally with lower operational efficiency than moving grate systems.	Highly homogenous feedstock required. Numerous examples of operating and processing difficulties on RDF and residual wastes.	Highly homogenous feedstock required. Pyrolysis not typically suited at scale proposed. Preferred system for smaller modular waste treatment and chemical recycling plants – not considered further.
Emissions	Abated emissions meet IED, lower levels are achieved by many plants.	Lower temperature leads to low NOx levels, but abatement will still be required to guarantee IED.	Abated emissions meet IED, and lower levels are achievable.	Technology not suitable at scale.
Residue Generation	Produces bottom ash (<3% carbon) and air pollution control (APC) residues.	Produces larger volumes of residues for disposal. Known issues with slagging. Higher parasitic loads than moving grate combustion.	Raw material consumption is lower than conventional incineration options and hence residue production is lower. Produces bottom ash (<5% TOC/3% LOI) and APC residues.	Technology not suitable at scale.
Odour	Odour management typically avoids nuisance.	Odour management typically avoids nuisance.	Odour management typically avoids nuisance. Due to pre-treated feedstock less likely to be odour producing than untreated municipal waste.	Technology not suitable at scale.

Table 6.1: BAT Comparison for Combustion Technologies				
BAT Criteria	Moving Grate (MG) Combustion	Fluidised Bed Combustion	ATT	
			Gasification	Pyrolysis
Raw Materials	Depends on flue gas treatment option selected.	Higher OPEX and Maintenance costs due to fluidisation sand requirements.	Selection of appropriate flue gas treatment minimises raw material consumption. Typically, less than conventional incineration options.	Technology not suitable at scale.
Noise	With appropriate abatement noise can successfully be controlled.	Similar to Moving Grate combustion systems.	Additional plant associated with OFA, bed recirculating systems can lead to higher noise levels than conventional systems, however with appropriate abatement noise can successfully be controlled.	Technology not suitable at scale.
Accidents	Proven technology with a large number of operational facilities. Similar accident potential as for other incineration options, mainly related to loss of storage of FGT reagents, supplementary fuel and residues.	Some operational experience, with mixed performance. Similar accident potential as for other incineration options, mainly related to loss of storage of FGT reagents, supplementary fuel and residues.	Operated on a smaller scale to conventional incineration options. Increased accident potential from storage of oxygen and pressurised oxygen delivery systems*.	Technology not suitable at scale.

Electricity Generation

A condensing steam turbine and generator system has been determined as BAT for the project for the following reasons:

- Higher electrical generation efficiency than ORC systems;
- Higher reliability for sustained high power output;
- High power to weight ratio;
- Allows configuration for reliable CHP configuration ensuring the plant is 'CHP ready' in the event of any viable offtakers.

Internal combustion systems, such as a gas turbine or a spark ignition gas engine are not suitable for conventional incineration processes utilising steam boilers.

Flue Gas Clean-up Technologies

The flue gas cleanup requirements for combustion systems are relatively minimal due to the combustion of the gases at relatively high temperatures.

NOx reduction is achieved primarily through the use of Selective Non-catalytic Reduction (SNCR). The SNCR system comprises the injection of urea into the first pass of the boiler. SNCR additionally has the benefit of inhibiting dioxin formation and is considered BAT for the facility.

Flue gas recirculation is not required in order to achieve the required NOx emissions and avoids potential additional operational expenditure issues associated with the operation of additional fans, flues and corrosion issues associated with the recirculation of untreated flue gases.

Acid gas removal is achieved by the use of a dry or semi-dry scrubbing system, utilising a lime based reagent.

Dry scrubbing techniques compare favorably with wet scrubbers and generally achieve the best acid gas removal efficiencies. They also eliminate any water effluent treatment requirements and allows for use with other reagents such as activated carbon for the absorption and removal of heavy metals, dioxins, VOC and other harmful substances.

Dry Flue Gas Treatment (FGT) has become the predominant solution for modern flue gas facilities. The basic FGT consists of a filtration unit combined with an injection of dry sorbent. The actual acid gas neutralisation takes place in the duct and on the surface of the filter bags.

Benefits of dry FGT over wet scrubbing systems include;

- Low Investment Cost;
- Simplicity of design and operation;
- Proven ability to meet stringent emission limits;

- Small physical footprint;
- Lower parasitic loads;
- Flexible operation with regards to temperature and capacity; and
- Easy stabilisation of dry residues.

Other options such as sodium bicarbonate could also be used in the process in a similar manner, however it is higher in purchase cost and has a limited supply base.

The Installation will have a fabric filtration system which is designed to have the capacity to remove dust particles within anticipated emission limit values of the Industrial Emission Directive.

6.2 The Industrial Emissions Directive (IED) and Best Available Technology (BAT) Compliance

Chapter VI of the IED describes all aspects of management and operation of a process as well as the environmental impact but allows for the Member State to vary the requirements of the IED where there is good reason. The following tables outline the IED technical requirements that apply and a justification of how they have been met.

The boiler combustion conditions ensure full oxidization at temperatures above 850°C for periods in excess of 2 seconds.

The flue gas treatment equipment scrubs out the acid gases, NOx, particulates and dioxins and furans to ensure that the emission levels do not exceed the ELVs detailed in Annex VI of the IED.

The ash discharged from the moving grate base also experiences temperatures in excess of 850°C for approximately 30 minutes. A level of combustion will be achieved such that the requirements of the IED will be met.

Table 6.2: Chapter IV Compliance - SPECIAL PROVISIONS FOR WASTE INCINERATION PLANTS AND WASTE CO-INCINERATION PLANTS	
IED technical requirement	**Justification**
Article 41 – 45	NA
Article 46 Control of Emissions (1) Waste gases from waste incineration plants and waste co-incineration plants shall be discharged in a controlled way by means of a stack the height of which is calculated in such a way as to safeguard human health and the environment.	Significant ground level pollution will not arise as a result of this installation. Section 4 and 7 of this application discuss this in detail. Atmospheric Dispersion Modelling and Human Health Risk Assessment have been completed by the applicant.
(2) Emissions into air from waste incineration plants and waste co-incineration plants shall not exceed the emission limit values set out in parts 3 and 4 of Annex VI or determined in accordance with Part 4 of that Annex. If in a waste co-incineration plant more than 40 % of the resulting heat release comes from hazardous waste, or the plant co-incinerates untreated mixed municipal waste, the emission limit values set out in Part 3 of Annex VI shall apply.	All Chapter IV IED Emission Limit Values will be met by the Installation.
(3) Discharges to the aquatic environment of waste water resulting from the cleaning of waste gases shall be limited as far as practicable and the concentrations of polluting substances shall not exceed the emission limit values set out in Part 5 of Annex VI.	There are no waste water discharges resulting from the gas cleaning process. The exhaust gases will be cleaned using dry processes, namely lime/activated carbon injection and fabric filters. There will be no aqueous gas cleaning effluents.
(4) The Emission Limit Values shall apply at the point where waste waters from the cleaning of waste gases are discharged from the waste incineration plant or waste co-incineration plant. When waste waters from the cleaning of waste gases are treated outside the waste incineration plant or waste co-incineration plant at a treatment plant intended only for the treatment of this sort of waste water, the emission limit values set out in Part 5 of Annex VI shall be applied at the point where the waste waters leave the treatment plant. Where the waste water from the cleaning of waste gases is treated collectively with other sources of waste water, either on site or off site, the operator shall make the appropriate mass balance calculations,	N/A There are no waste water discharges resulting from the gas cleaning process. The exhaust gases will be cleaned using dry processes, namely lime/activated carbon injection and fabric filters. There will be no aqueous gas cleaning effluents.

Table 6.2: Chapter IV Compliance - SPECIAL PROVISIONS FOR WASTE INCINERATION PLANTS AND WASTE CO-INCINERATION PLANTS	
IED technical requirement	**Justification**
using the results of the measurements set out in point 2 of Part 6 of Annex VI in order to determine the emission levels in the final waste water discharge that can be attributed to the waste water arising from the cleaning of waste gases. Under no circumstances shall dilution of waste water take place for the purpose of complying with the emission limit values set out in Part 5 of Annex VI.	
(5) Waste incineration plant sites and waste co-incineration plant sites, including associated storage areas for waste, shall be designed and operated in such a way as to prevent the unauthorised and accidental release of any polluting substances into soil, surface water and groundwater. Storage capacity shall be provided for contaminated rainwater run-off from the waste incineration plant site or waste co-incineration plant site or for contaminated water arising from spillage or fire-fighting operations. The storage capacity shall be adequate to ensure that such waters can be tested and treated before discharge where necessary.	There will be an environmental management system (EMS) in place to include procedures to manage waste delivery and reception. Hazardous waste will not be accepted at the Installation. Roadways, floor and store surfaces will be designed and constructed so as to prevent any emissions to groundwater, surface water and soil. The majority of waste handling activities and the main processes will take place inside the process buildings. External activities onsite are limited to periodic and temporary external storage of wrapped RDF bales on a dedicated area of impermeable hardstanding with sealed drainage. All fire water will be contained onsite via kerbs, the buildings themselves and the drainage system and tankered away to a suitable water treatment facility. The site surface water drainage systems for uncontaminated surface water run-off pass through interceptors and an attenuation tank prior to discharge off site.
(6) Without prejudice to Article 50(4)(c), the waste incineration plant or waste co-incineration plant or individual furnaces being part of a waste incineration plant or waste co-incineration plant shall under no circumstances continue to incinerate waste for a period of more than 4 hours uninterrupted where emission limit values are exceeded. The cumulative duration of operation in such conditions over 1 year shall not exceed 60 hours.	The plant will be operated with a CEMS which will be linked into the controls system. In the unlikely event of CEMS failure, a full replacement CEMS is held onsite which can be utilised in replacement of the duty CEMS unit.

Table 6.2: Chapter IV Compliance - SPECIAL PROVISIONS FOR WASTE INCINERATION PLANTS AND WASTE CO-INCINERATION PLANTS	
IED technical requirement	**Justification**
The time limit set out in the second subparagraph shall apply to those furnaces which are linked to one single waste gas cleaning device.	
Article 47 Breakdown In the case of a breakdown, the operator shall reduce or closedown operations as soon as practicable until normal operations can be restored.	The feed system for the process is automated and in the event of temperature loss or departure from operating conditions the process will automatically shut down in a controlled manner.
Article 48 Monitoring of Emissions (1) Member States shall ensure that the monitoring of emissions is carried out in accordance with Parts 6 and 7 of Annex VI.	Monitoring will meet all the requirements of Article 48. The plant is designed to have continuous emissions monitors (CEMS) located on the exhaust stack of the plant (Emission Point A1). The CEMS will be IED Ch IV complaint and monitor HCl, CO, NOx, NH_3, O_2, SO_2, VOC, particulates, H_2O, temperature, pressure and flow. TOC will be analysed by a Flame Ionisation Detector.
(2) The installation and functioning of the automated measuring systems shall be subject to control and to annual surveillance tests as set out in point 1 of Part 6 of Annex VI.	The plant will be operated with a CEMS which will be linked into the controls system. In the unlikely event of CEMS failure, a full replacement CEMS is held onsite which can be utilised in replacement of the duty CEMS unit. Please see section 5.1 for more details.
(3) The competent authority shall determine the location of the sampling or measurement points to be used for monitoring of emissions.	The exact positions of all sampling points will be agreed with Natural Resources Wales prior to commencement of operation.
(4) All monitoring results shall be recorded, processed and presented in such a way as to enable the competent authority to verify compliance with the operating conditions and emission limit values which are included in the permit.	Reporting format will be agreed with Natural Resources Wales prior to commencement of operation and will reflect the requirements of the permit. CEMS will be backed up by non-continuous check monitoring to comply with the IED.
(5) As soon as appropriate measurement techniques are available within the Union, the Commission shall, by means of delegated acts in accordance with Article 76 and subject to the conditions laid down in Articles 77 and 78, set the date from	Should such a technique become available, it will be adopted as required.

Table 6.2: Chapter IV Compliance - SPECIAL PROVISIONS FOR WASTE INCINERATION PLANTS AND WASTE CO-INCINERATION PLANTS	
IED technical requirement	**Justification**
which continuous measurements of emissions into the air of heavy metals and dioxins and furans are to be carried out.	
Article 49 Compliance with the Emission Limit Values The emission limit values for air and water shall be regarded as being complied with if the conditions described in Part 8 of Annex VI are fulfilled.	The plant has been designed to comply with the specific ELV's stipulated by Part 8 of Annex VI of the IED. The reference conditions in the exhaust gas will be Temperature 273 K; Pressure 101.3 kPa, 11% oxygen; Dry Gas.
Article 50 Operating Conditions (1) Waste incineration plants shall be operated in such a way as to achieve a level of incineration such that the total organic carbon content of slag and bottom ashes is less than 3 % or their loss on ignition is less than 5 % of the dry weight of the material. If necessary, waste pre-treatment techniques shall be used.	The waste streams will be treated so the recoverable organic fraction will be removed by upstream processing. Bottom ash will therefore comply with the 3% TOC / 5% LOI limits. Testing will be undertaken quarterly for the first year and annually thereafter to demonstrate this. The design, which incorporates a combustion chamber, ensures that the minimum temperature of 850°C is met at the final point of combustion whenever waste is being fed, and the residence time of combustion gases at or above this temperature is >2s. The EMS includes procedures for the checking of waste composition and removal of contaminants.
(2). Waste incineration plants shall be designed, equipped, built and operated in such a way that the gas resulting from the incineration of waste is raised, after the last injection of combustion air, in a controlled and homogeneous fashion and even under the most unfavourable conditions, to a temperature of at least 850°C for at least two seconds. Waste co-incineration plants shall be designed, equipped, built and operated in such a way that the gas resulting from the co-incineration of waste is raised in a controlled and homogeneous fashion and even under the most unfavourable conditions, to a temperature of at least 850 °C for at least two seconds.	Combustion conditions in the combustion chamber and temperatures within the boiler ensure that both the waste and the resultant gas meet a temperature of 850°C for at least 2 seconds.

Table 6.2: Chapter IV Compliance - SPECIAL PROVISIONS FOR WASTE INCINERATION PLANTS AND WASTE CO-INCINERATION PLANTS	
IED technical requirement	Justification
If hazardous waste with a content of more than 1% of halogenated organic substances, expressed as chlorine, is incinerated or co-incinerated, the temperature required to comply with the first and second subparagraphs shall be at least 1100°C. In waste incineration plants, the temperatures set out in the first and third subparagraphs shall be measured near the inner wall of the combustion chamber. The competent authority may authorise the measurements at another representative point of the combustion chamber.	
(3) Each combustion chamber of a waste incineration plant shall be equipped with at least one auxiliary burner. This burner shall be switched on automatically when the temperature of the combustion gases after the last injection of combustion air falls below the temperatures set out in paragraph 2. It shall also be used during plant start-up and shut-down operations in order to ensure that those temperatures are maintained at all times during these operations and as long as unburned waste is in the combustion chamber. The auxiliary burner shall not be fed with fuels which can cause higher emissions than those resulting from the burning of gas oil as defined in Article 2(2) of Council Directive 1999/32/EC of 26 April 1999 relating to a reduction in the sulphur content of certain liquid fuels, liquefied gas or natural gas.	The combustor will be fitted within two auxiliary fuel oil burners to ensure combustion temperature reaches 850°C prior to waste introduction. The auxiliary burners will be fired on diesel oil..
(4). Waste incineration plants and waste co-incineration plants shall operate an automatic system to prevent waste feed in the following situations: (a) at start-up, until the temperature set out in paragraph 2 of this Article or the temperature specified in accordance with Article 51(1) has been reached; (b) whenever the temperature set out in paragraph 2 of this Article or the temperature specified in accordance with Article 51(1) is not maintained; (c) whenever the continuous measurements show that any emission limit value is exceeded due to disturbances or failures of the waste gas cleaning devices.	Fuel is transferred from the Fuel Storage Bunkers to the grate hopper where the feed rate is controlled via metering a metering system. This is an automated system. The feed system will have automatic shutdown to prevent waste feed if the temperature in the combustor at the final point of combustion is <850°C, or if emission limit values, obtained via the CEMS, look to be breached.

Table 6.2: Chapter IV Compliance - SPECIAL PROVISIONS FOR WASTE INCINERATION PLANTS AND WASTE CO-INCINERATION PLANTS	
IED technical requirement	Justification
Article 51 Authorisation to change operating conditions	No requests to change operating conditions will be required.
Article 52 Delivery and reception of waste (1) The operator of the waste incineration plant or waste co-incineration plant shall take all necessary precautions concerning the delivery and reception of waste in order to prevent or to limit as far as practicable the pollution of air, soil, surface water and groundwater as well as other negative effects on the environment, odours and noise, and direct risks to human health.	All waste will be received directly into a purpose designed Reception Hall. All pollution abatement and prevention methodologies are detailed in this main application document.
(2) The operator shall determine the mass of each type of waste, if possible according to the European Waste List established by Decision 2000/532/EC, prior to accepting the waste at the waste incineration plant or waste co-incineration plant.	The site will only receive non-hazardous refuse derived fuels. The range of waste codes from the List of Wastes (England) Regulations 2005 that will constitute this prepared fuel is included in Section 3.5 of the application. This will be weighed at the weighbridge. Unsuitable material and material that is hazardous, or contains unwanted materials, will not be accepted. All materials charged into the incinerator will be via a metering system including weighted conveyors.
(3) Prior to accepting hazardous waste at the waste incineration plant or waste co-incineration plant, the operator shall collect available information about the waste for the purpose of verifying compliance with the permit requirements specified in Article 45(2).	No hazardous waste will be accepted into the plant. All wastes will be non-hazardous refuse derived fuel only.
(4) Prior to accepting hazardous waste at the waste incineration plant or waste co-incineration plant, at least the following procedures shall be carried out by the operator:	No hazardous waste will be accepted into the plant. All wastes will be non-hazardous refuse derived fuel only.

Table 6.2: Chapter IV Compliance - SPECIAL PROVISIONS FOR WASTE INCINERATION PLANTS AND WASTE CO-INCINERATION PLANTS	
IED technical requirement	**Justification**
Article 53 Residues (1) Residues shall be minimised in their amount and harmfulness. Residues shall be recycled, where appropriate, directly in the plant or outside.	It is a new installation so a waste minimisation audit is yet to be carried out. This will be done in compliance with the permit condition specified. Bottom ash will be recycled for use as aggregate where appropriate.
(2) Transport and intermediate storage of dry residues in the form of dust shall take place in such a way as to prevent dispersal of those residues in the environment.	Bottom ash from the moving grate is immediately quenched for storage prior to export. Boiler ash is transferred through a humidifier for dampening prior to storage in a common bunker with the bottom ash. APC residue is removed from the filter hoppers and collected in an enclosed silo.
(3) Prior to determining the routes for the disposal or recycling of the residues, appropriate tests shall be carried out to establish the physical and chemical characteristics and the polluting potential of the residues. Those tests shall concern the total soluble fraction and heavy metals soluble fraction.	Chemical analysis will be undertaken regularly.

Other requirements (former WID compliance requirement not specifically stated under the IED) **Technical Competence** **Former WID Article 6 (8)** The management of the incineration or the co-incineration plant shall be in the hands of a natural person who is competent to manage the plant.	The operator will employ on a full time basis a site manager / technically competent person who holds the necessary qualifications. The operator will also meet all the other requirements of operator competence as stipulated in the Environmental Permitting Regulations. There will be named individuals with the relevant qualifications to supervise the operation of this facility.
Former WID Article 11 (3) The residence time as well as the minimum temperature and the oxygen content of the exhaust gases shall be subject to appropriate verification, at least once when the incineration or co-incineration plant is brought into service and under the most unfavourable operating conditions anticipated.	During the plant's first year of operation we would seek to discuss with NRW the need for a validation study to measure residence times through the combustor at above 850°C. Oxygen, moisture and temperature measurements will be made via the CEMS as well as spot sampling and analysis.
Former WID Article 11 (4) The continuous measurement of HF may be omitted if treatment stages for HCl are used which ensure that the emission limit value for HCl is not being exceeded. In this case the emissions of HF shall be subject to periodic measurements as laid down in paragraph 2(c).	HF will be assessed through surrogate monitoring of HCl.
Former WID Article 11 (5) The continuous measurement of the water vapour content shall not be required if the sampled exhaust gas is dried before the emissions are analysed.	Water vapour is continuously monitored to correct emissions for dry gas conditions.
Former WID Article 11 (6) Periodic measurements as laid down in paragraph 2(c) of HCl, HF and SO2 instead of continuous measuring may be authorised in the permit by the competent authority in incineration or co-incineration plants, if the operator can prove that the emissions of those pollutants can under no circumstances be higher than the prescribed emission limit values.	CEMS will be provided for continuous HCl and SO_2 measurement, allowing calculation of HF through surrogate monitoring of HCl.
Former WID Article 11 (7) The reduction of the frequency of the periodic measurements for heavy metals from twice a year to once every two years and for dioxins and furans from twice a year to once every year may be authorised in the permit by the competent authority provided that the emissions resulting from co-incineration or incineration are below 50 % of the emission limit values determined according to Annex II or Annex V respectively and provided that criteria for the	After one year of operation sampling and measurement of heavy metals will be reduced from twice a year to once every two years as well as sampling and measurement for dioxins and furans will be reduced from twice a year to once a year, once it is demonstrated that the emissions are shown to be 50% of those stated in Annex V.

requirements to be met, developed in accordance with the procedure laid down in Article 17, are available. These criteria shall at least be based on the provisions of the second subparagraph, points (a) and (d). Until 1 January 2005 the reduction of the frequency may be authorised even if no such criteria are available provided that: L 332/100 EN Official Journal of the European Communities 28.12.2000 (a) the waste to be co-incinerated or incinerated consists only of certain sorted combustible fractions of non-hazardous waste not suitable for recycling and presenting certain characteristics, and which is further specified on the basis of the assessment referred to in subparagraph (d); (b) national quality criteria, which have been reported to the Commission, are available for these wastes; (c) co-incineration and incineration of these wastes is in line with the relevant waste management plans referred to in Article 7 of Directive 75/442/EEC; (d) the operator can prove to the competent authority that the emissions are under all circumstances significantly below the emission limit values set out in Annex II or Annex V for heavy metals, dioxins and furans; this assessment shall be based on information on the quality of the waste concerned and measurements of the emissions of the said pollutants; (e) the quality criteria and the new period for the periodic measurements are specified in the permit; and (f) all decisions on the frequency of measurements referred to in this paragraph, supplemented with information on the amount and quality of the waste concerned, shall be communicated on a yearly basis to the Commission.	
Former WID Article 13 (3) The incineration plant or co-incineration plant or incineration line shall under no circumstances continue to incinerate waste for a period of more than four hours uninterrupted where emission limit values are exceeded; moreover, the cumulative duration of operation in such conditions over one year shall be less than 60 hours. The 60-hour duration applies to those lines of the entire plant which are linked to one single flue gas cleaning device.	The plant will be operated with CEMS which will be linked into the controls system. In the unlikely event of the duty CEMS failure, standby CEMS will be available on site.

Former WID Article 13 (4) The total dust content of the emissions into the air of an incineration plant shall under no circumstances exceed 150 mg/m^3 expressed as a half-hourly average; moreover, the air emission limit values for CO and TOC shall not be exceeded. All other conditions referred to in Article 6 shall be complied with.	The applicant does not request the abnormal emission limit value for particulates available under Article 13(4). In the unlikely event of CEMS failure on one of the streams, backup CEMS will be available onsite. In the case of long term CEMS breakdowns, replacement units (temporary or permanent) will be provided.

The following BAT Justification is based on the Waste Incineration BREF BAT Conclusions document published in December 2019.

Table 6.3 WI BREF BAT Conclusions Comparison

BAT Reference	BAT Conclusion	Justification
Environmental Management Systems		
BAT 1	In order to improve the overall environmental performance, BAT is to elaborate and implement an environmental management system (EMS) that incorporates the features outlined within the BREF guidance and in addition for incineration plants: xxi) waste stream management; xxiii) residues management plan; xxiv) an OTNOC Management Plan; xxv) an Accident Management Plan; xxvi) a Dust Management plan (if relevant) xxvii) an Odour Management Plan; xxviii) a Noise Management Plan.	RDF Energy will have an Environmental Management System in place that incorporates the features provided within the BREF document.
Monitoring		
BAT 2	BAT is to determine either the gross electrical efficiency, the gross energy efficiency, or the boiler efficiency of the incineration plant as a whole or of all the relevant parts of the incineration plant. BAT-AELs for new plant efficiency are as follows: • Gross electrical efficiency – 25 – 35 % • Gross energy efficiency – 72 – 91 %	The guaranteed (supplier warranted) gross electrical efficiency of the plant is 27.6% and the boiler efficiency is 89.4% and is in line with the relevant sector BAT-AEL. The operational efficiency of the plant is expected to be in excess of 30% and will be greater than supplier warranted figures.
BAT 3	BAT is to monitor key process parameters relevant for emissions to air and water including those given in the Guidance.	Emissions to air will be monitored by CEMS as described in the permit application. In addition, in accordance with the BREF Guidance:

		• Flue-gas from the incineration of waste will be continuously monitored for flow, oxygen content, temperature, pressure and water vapour content; and • Combustion chamber will be continuously monitored for temperature There will be no emissions to water from flue gas cleaning as the proposed system uses dry techniques. There is no bottom ash treatment carried out on site.
BAT 4	BAT is to monitor channelled emissions to air with at least the frequency given below and in accordance with EN standards. If the EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality. • Continuous – NOx, NH_3, CO, SO_2, HCl, HF, VOCs, Particulate, Hg • Bi-annual – Metals, PBDD/F, PCDD/F, dioxin-like PCBs • Annual – N_2O, Benzo{a}pyrene	CEMS will monitor the relevant emissions to air detailed within the guidance. The industry is still in discussion with the UK regulators regarding the implementation of the requirement to monitor mercury continuously. The waste accepted on site will have a low mercury content, therefore periodic monitoring is considered suitable. Periodic testing of the fuel will provide confirmation of substance levels which are not continuously monitored.
BAT 5	BAT is to appropriately monitor channelled emissions to air from the incineration plant during OTNOC	Emissions to air will be monitored appropriately during abnormal emissions.
BAT 6	BAT is to monitor emissions to water from FGC and/or bottom ash treatment with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	There will be no emissions to water from flue gas cleaning as the proposed system uses dry techniques. There is no bottom ash treatment carried out on site.
BAT 7	BAT is to monitor the content of unburnt substances in slags and bottom ashes at the incineration plant with at least the frequency given below and in accordance with EN standards. ELV's are: • TOC: 1 – 3% • LOI: 1 – 5%	TOC's or LOI will be monitored once every three months in accordance with the guidance. It is anticipated that the ELV's will be met.

BAT 8	For the incineration of hazardous waste containing POPs, BAT is to determine the POP content in the output streams (e.g. slags and bottom ashes, flue-gas, waste water) after the commissioning of the incineration plant and after each change that may significantly affect the POP content in the output streams.	n/a – no hazardous waste is incinerated.
General Environmental and Combustion Performance		
BAT 9	In order to improve the overall environmental performance of the incineration plant by waste stream management (see BAT 1), BAT is to use all of the techniques (a) to (c) given below, and, where relevant, also techniques (d), (e) and (f). a) Determination of waste type b) Pre-acceptance procedures c) Acceptance procedures d) Waste tracking system e) Waste segregation f) Compatibility verification	The sites EMS will be complete with details on the following: • The waste that can be processed on site; • Pre-acceptance procedures; • Waste acceptance procedures; • A waste tracking system and inventory; and • Waste segregation.
BAT 10	In order to improve the overall environmental performance of the bottom ash treatment plant, BAT is to set up and implement an output quality management system (see BAT 1).	n/a – there is no bottom ash treatment plant on site.
BAT 11	In order to improve the overall environmental performance of the incineration plant, BAT is to monitor the waste deliveries as part of the waste acceptance procedures (see BAT 9 c) including, depending on the risk posed by the incoming waste, the elements given in the guidance.	The waste acceptance procedure will include the monitoring of waste deliveries for: • Weighing of the waste deliveries; • Visual inspection; and • Periodic sampling of waste deliveries and analysis of key properties/substances (e.g. calorific value, content of halogens and metals/metalloids).
BAT 12	In order to reduce the environmental risks associated with the reception, handling and storage of waste, BAT is to have both: • impermeable surfaces with adequate drainage; and • adequate storage capacity.	Waste reception, and the majority of waste handling and storage will take place internally within the Fuel Reception Building on impermeable surfaces with sealed drainage. External storage of waste is limited to wrapped bales and upon a dedicated area with impermeable hardstanding and sealed drainage for short periods of time. No waste will be accepted on site unless the site has adequate waste storage capacity.

		This will be achieved by: • The maximum waste storage capacity being clearly established on site; and • Regular monitoring of the waste stored on site against the maximum allowed storage capacity.
BAT 13	In order to reduce the environmental risk associated with the storage and handling of clinical waste, BAT is to use a combination of the techniques given in the guidance.	n/a – no clinical waste is accepted on site.
BAT 14	In order to improve the overall environmental performance of the incineration of waste, to reduce the content of unburnt substances in slags and bottom ashes, and to reduce emissions to air from the incineration of waste, BAT is to use an appropriate combination of : • waste blending and mixing; • advanced control systems; • optimisation of incineration process (n/a to existing furnaces)	Waste blending and mixing is achieved within the Fuel Storage Bunkers via the crane system. The plant will be controlled by an advanced DCS control system which will optimise and control the process with special attention to combustion, abatement, flue gas treatment and monitoring.
BAT 15	In order to improve the overall environmental performance of the incineration plant and to reduce emissions to air, BAT is to set up and implement procedures for the adjustment of the plant's settings, e.g. through the advanced control system (see description in Section 5.2.1), as and when needed and practicable, based on the characterisation and control of the waste (see BAT 11).	The plant will be controlled by an advanced DCS control system which will optimise and control the process with special attention to combustion, abatement, flue gas treatment and monitoring.
BAT 16	In order to improve the overall environmental performance of the incineration plant and to reduce emissions to air, BAT is to set up and implement operational procedures (e.g. organisation of the supply chain, continuous rather than batch operation) to limit as far as practicable shutdown and start-up operations.	Procedures will be in place to limit shut-down and start-up operations as far as practically possible.
BAT 17	In order to reduce emissions to air and, where relevant, to water from the incineration plant, BAT is to ensure that the FGC system and the waste water treatment plant are appropriately designed (e.g. considering the maximum flow	The flue gas cleaning system and waste water treatment plant are appropriately designed for the facility, will be operated within the design range and maintained to ensure optimal availability.

	rate and pollutant concentrations), operated within their design range, and maintained so as to ensure optimal availability	
BAT 18	In order to reduce the frequency of the occurrence of OTNOC and to reduce emissions to air and, where relevant, to water from the incineration plant during OTNOC, BAT is to set up and implement a risk-based OTNOC management plan as part of the environmental management system (see BAT 1) that includes all of the elements within the guidance.	An abnormal operation risk based management plan will be produced as part of the EMS in accordance with the guidance.
Energy Efficiency		
BAT 19	In order to increase the resource efficiency of the incineration plant, BAT is to use a heat recovery boiler.	A steam boiler will be used on site and is considered BAT. The resultant steam is then passed to a steam turbine and generator set which produce electricity.
BAT 20	In order to increase the energy efficiency of the incineration plant, BAT is to use an appropriate combination of the relevant techniques below: b) reduction of flue gas flow c) minimisation of heat loss d) optimisation of boiler design e) low temperature flue gas heat exchangers f) high steam conditions (i.e. >45 bar, 400°C) g) co-generation of heat & electricity h) flue gas condenser i) dry bottom ash handing (use of cooling air for combustion)	In accordance with the guidance, the following techniques are used to increase energy efficiency: • Reduction of the flue-gas flow; • Minimisation of heat losses; • Optimisation of the boiler design; and • High steam conditions.
Emissions to Air		
BAT 21	In order to prevent or reduce diffuse emissions from the incineration plant, including odour emissions, BAT is to: • store solid and bulk pasty wastes that are odorous and/or prone to releasing volatile substances in enclosed buildings under controlled subatmospheric pressure and use the extracted air as combustion air for incineration or send it to another suitable abatement system in the case of a risk of explosion;	An air extraction system will be in place resulting in odorous air within the building being utilised as primary combustion air and any odorous compounds being thermally destroyed by the combustion system. In the event of a shutdown where no incineration capacity is available, no more waste deliveries will be accepted on site. If any waste stored on site exceeds the maximum storage times on site, the waste will be removed off site. Additionally, a back up ventilation system incorporating activated carbon filtration will be in place.

	• store liquid wastes in tanks under appropriate controlled pressure and duct the tank vents to the combustion air feed or to another suitable abatement system; • control the risk of odour during complete shutdown periods when no incineration capacity is available, e.g. by ▪ sending the vented or extracted air to an alternative abatement system, e.g. a wet scrubber, a fixed adsorption bed; ▪ minimising the amount of waste in storage, e.g. by interrupting, reducing or transferring waste deliveries, as a part of waste stream management (see BAT 9); ▪ storing waste in properly sealed bales.	This is considered BAT for the site.
BAT 22	In order to prevent diffuse emissions of volatile compounds from the handling of gaseous and liquid wastes that are odorous and/or prone to releasing volatile substances at incineration plants, BAT is to feed them to the furnace by direct feeding.	n/a – no gaseous and liquid wastes are processed on site
BAT 23	In order to prevent or reduce diffuse dust emissions to air from the treatment of slags and bottom ashes, BAT is to include in the environmental management system (see BAT 1) the following diffuse dust emissions management features: • identification of the most relevant diffuse dust emission sources (e.g. using EN 15445); • definition and implementation of appropriate actions and techniques to prevent or reduce diffuse emissions over a given time frame.	There is no treatment of slags and bottom ashes on site. Bottom ash from the combustion system is quenched to prevent dusty emissions during storage in a lined concrete bunker prior to export offsite.
BAT 24	In order to prevent or reduce diffuse dust emissions to air from the treatment of slags and bottom ashes, BAT is to use an appropriate combination of the techniques given in the guidance.	There is no treatment of slags and bottom ashes on site. Bottom ash from the combustion system is quenched to prevent dusty emissions during storage in a lined concrete bunker prior to export offsite.
BAT 25	In order to reduce channeled emissions to air of dust, metals and metalloids from the incineration of waste, BAT is to use one or a combination of the techniques given below: a) Bag filter;	Particulate is controlled by the bag filter system. Activated carbon (dry sorbent injection) is used which gives reliable and effective heavy metal (e.g. mercury) reductions, and for the majority of metals particulate abatement is the main means of ensuring that releases are minimised.

	b) Electrostatic precipitator; c) Dry sorbet injection; d) Wet scrubber; e) Fixed/Moving bed adsorption BAT-AELS are as follows: • Dust: <2 – 5 mg/Nm^3 daily average • Cd+Tl: 0.005 – 0.02 mg/Nm^3 average over sampling period • Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V: 0.01 – 0.3 mg/Nm^3 average over sampling period.	This is considered BAT for the plant and the BAT-AEL's will be met.
BAT 26	In order to reduce channeled dust emissions to air from the enclosed treatment of slags and bottom ashes with extraction of air (see BAT 24 f), BAT is to treat the extracted air with a bag filter (see Section 5.2.2).	n/a – there is no treatment of slags and bottom ashes on site.
BAT 27	In order to reduce channeled emissions of HCl, HF and SO_2 to air from the incineration of waste, BAT is to use one or a combination of the techniques given below. a) Wet scrubber b) Semi-wet absorber c) Dry sorbent injection d) Direct desulphurisation e) Boiler sorbent injection	Acid gas removal is achieved by the use of a dry scrubbing system, utilising a lime based reagent. This is considered BAT for the plant.
BAT 28	In order to reduce channeled peak emissions of HCl, HF and SO_2 to air from the incineration of waste while limiting the consumption of reagents and the amount of residues generated from dry sorbent injection and semi-wet absorbers, BAT is to use (a) or both techniques below: a) Optimised & automated reagent dosage; b) Recirculation of reagents BAT-AELS for new plant are as follows:	Reagent dosage will be automated based on continuous monitoring and recirculation of reagents is undertaken. This is considered BAT for the plant and the BAT-AEL's will be met.

	• HCl: <2 – 6 mg/Nm^3 daily average • HF: <1 mg/Nm^3 daily average or average over sampling period • SO_2: 5 - 30 mg/Nm^3 daily average	
BAT 29	In order to reduce channeled NOx emissions to air while limiting the emissions of CO and N_2O from the incineration of waste and the emissions of NH_3 from the use of SNCR and/or SCR, BAT is to use an appropriate combination of the techniques given below: a) Optimisation of incineration process b) Flue gas recirculation c) SNCR d) SCR e) Catalytic filter bags f) Optimisation of SNCR/SCR design g) Wet scrubber BAT-AELS are as follows: • NOx: 50 - 120 mg/Nm^3 daily average (note 180 mg/Nm3 where SCR not applicable) • CO: 10 - 50 mg/Nm^3 daily average • NH_3: 2 - 10 mg/Nm^3 daily average	The NOx that is formed during the combustion process is abated using a the primary technique of optimisation of the incineration process and a Selective Non-Catalytic Reaction (SNCR) system. This is considered BAT for the plant and the BAT-AEL's will be met.
BAT 30	In order to reduce channeled emissions to air of organic compounds including PCDD/F and PCBs from the incineration of waste, BAT is to use techniques (a), (b), (c), (d), and one or a combination of techniques (e) to (i) given below: a) optimisation of incineration process b) control of waste feed c) on-line and off-line boiler cleaning d) rapid flue gas cooling e) dry sorbent injection f) fixed/moving bed adsorption	The primary method of reducing the emissions of dioxins is by careful control of the conditions in the combustor. Boiler residence time is controlled to minimise de novo formation. PAC injection will remove dioxins and furans from the gas phase, followed by bag filters which will provide efficient particulate abatement. In addition, in line with BAT the following techniques will be used: • Optimisation of the incineration process;

	g) SCR h) Catalytic filter bags i) Carbon sorbent in wet scrubber BAT-AELS are as follows: • TVOC: <3 - 10 mg/Nm^3 daily average • PCDD/F: <0.001 – 0.004 ng I-TEQ/Nm^3 average over sampling period • PCDD/F + dioxin like PCBs: 0.001 – 0.006 ng WHO-TEQ/Nm^3 daily average	• Control of the waste feed; • On-line and off-line boiler cleaning; and • Dry Sorbent Injection. This is considered BAT for the plant and the BAT-AEL's will be met.
BAT 31	In order to reduce channeled mercury emissions to air (including mercury emission peaks) from the incineration of waste, BAT is to use one or a combination of the techniques given below: a) Wet scrubber (low pH – 1) b) Dry sorbent injection c) Injection of special, highly reactive carbon d) Boiler bromine addition e) Fixed/moving bed adsorption BAT-AEL is as follows: Hg: 5 – 20 ug/Nm^3 daily average or average over sampling period	Activated carbon (dry sorbent injection) is used which gives reliable and effective heavy metal (e.g. mercury) reductions, and for the majority of metals particulate abatement is the main means of ensuring that releases are minimised. This is considered BAT for the plant and the BAT-AEL's will be met.
Emissions to Water		
BAT 32	In order to prevent the contamination of uncontaminated water, to reduce emissions to water, and to increase resource efficiency, BAT is to segregate waste water streams and to treat them separately, depending on their characteristics	Uncontaminated clean surface water runoff captured from roof drainage and external roadways will be discharged via an attenuation tank to the docks (W1). Surface water run-off from other external areas of the site will be collected via interceptors within the attenuation tank prior to discharge to the docks. Surface water run-off from the Slag Storage Bay will be recirculated onsite and used as cooling water with any overflow diverted to the onsite Waste Water Treatment Plant (WWTP). Surface water run-off from the FGT area is diverted directly to the WWTP.

		When the external Feedstock Transit Area is in use for storage of bales (likely only up to 20 days er year), any surface water from this area will be directed to the WWTP. Any effluent arising from the process plant including washdown waters, boiler blowdown etc will be collected in the sedimentation basin and treated at the onsite WWTP prior to discharge to the docks (W2). The WWTP incorporates a combination of settlement, pH correction and a bio-disc filter to ensure parameters are in line with the emission limit values in the permit. All domestic effluent arising from the plant is treated at an onsite package treatment plant and discharged to the docks. Water streams are collected and treated separately and this is considered BAT for this site.
BAT 33	In order to reduce water usage and to prevent or reduce the generation of waste water from the incineration plant, BAT is to use one or a combination of the techniques given below: a) Wastewater free FGC techniques b) Injection of waste water from FGC c) Water re-use/recycling d) Dry bottom ash handing	A dry scrubbing system is proposed for flue gas cleaning which does not generate waste water.
BAT 34	In order to reduce emissions to water from FGC and/or from the storage and treatment of slags and bottom ashes, BAT is to use an appropriate combination of the techniques given below, and to use secondary techniques as close as possible to the source in order to avoid dilution.	A dry scrubbing system is proposed for flue gas cleaning which does not generate waste water. There is no treatment of slags and bottom ashes on site. The site will undertake the primary process outlined in the BREF which is to optimise the incineration process and FGC systems in order to reduce organic compounds within the ash.
Material Efficiency		
BAT 35	In order to increase resource efficiency, BAT is to handle and treat bottom ashes separately from FGC residues.	Bottom ash and APC Residues are handled separately.

BAT 36	In order to increase resource efficiency for the treatment of slags and bottom ashes, BAT is to use an appropriate combination of the techniques given below based on a risk assessment depending on the hazardous properties of the slags and bottom ashes. a) Screening & sieving b) Crushing c) Aeraulic separation d) Recovery of metals e) Ageing f) Washing	n/a – there is no treatment of slags and bottom ashes on site.
Noise		
BAT 37	In order to prevent or, where that is not practicable, to reduce noise emissions, BAT is to use one or a combination of the techniques below: a) Appropriate location of buildings and equipment b) Operational measures c) Low-noise equipment d) Noise attenuation e) Noise-control equipment/infrastructure	A noise impact assessment has been carried out as part of the permit application which demonstrates that the noise impacts from site will have an insignificant effect on existing residential receptors due to the appropriate design, mitigation and intervening distances to the nearest residential receptors. All operational measures provided within the guidance will be carried out with noise attenuation being used where necessary.

BAT

The following BAT demonstration is a summary based on the sector guidance note EPR 5.01. This details all of the indicative BAT requirements insofar as they apply to this process.

Table 6.4: BAT Justification Summary	
Indicative Requirement	**BAT justification**
Incoming waste and raw materials management	
Waste code	The proposed technology uses non-hazardous refuse derived fuel. The waste codes from the List of Wastes (England) Regulations 2005 are identified in Table 3.5.
Pre-treatment	Where requires before combustion, the RDF feedstocks are subject to pre-treatment onsite including de-baling and shredding.
EMS	RDF Energy will operate to an environmental management system (ISO14001) which will ensure that procedures are in place for fuel input and raw material management. All necessary operating procedures will be in place and documented and stored within the company EMS. RDF Energy will aim for certification of the renewable energy facility to ISO 9001:2008, ISO 14001:2015 within the first year of operation.
Odour control	All waste reception and processing is undertaken within an enclosed Feedstock Building. Entry to the Reception Hall is via electrically controlled fast acting roller shutter doors so that no air will escape. The vehicles will only discharge the waste when the roller shutter doors are closed. The Fuel reception Building is kept at slight negative pressure. All air within the building is extracted into the combustion system. The process itself has no significant potential for odours as the combustion system thermally oxidises any odorous compounds. Should the plant experience shutdowns where air cannot be drawn into the combustion system, a back-up ventilation system with activated carbon filtration will be enacted. External activities are limited to temporary storage of wrapped RDF bales. Careful management of this area including regular inspection and removal of any damaged bales minimises odour generation from this activity. During periods of planned shutdown, the feedstock within the storage system will be run down prior to the shutdown. All doors will remain closed as far as practicable. Fuel stores will only start to be increased again slightly in advance of the planned recommencement date. If there are extended periods of unplanned shutdowns deliveries will be diverted to other suitably permitted facilities. For longer unplanned shutdowns the feedstock will be removed from site.
Fire fighting	The feedstock is not volatile or easily combustible. An automatic fire detection and alarm system, an automatic sprinkler system and an automatic suppression system will be installed on site.

Table 6.4: BAT Justification Summary	
Indicative Requirement	**BAT justification**
	All fire water will be contained within the site drainage system and fuel bunkers. All fire water will then be tankered away to a suitable water treatment facility. A Fire Prevention and Mitigation Plan is included in *Annex D3 – Fire Prevention & Mitigation Plan*. The Fire Prevention & Mitigation Plan relates to the storage of all waste onsite and provides the necessary information on site infrastructure, storage locations, storage practices, monitoring equipment and emergency response procedures.
Storage of fuel and treatment chemicals	Treatment chemicals will be stored in drums, tanks or bags (whichever are required for the quantity needed to be held in storage). These will be stored in the building and on hardstanding, within bunded areas that can contain 110% of the largest drum or 25% of the total storage capacity, whichever is the greater.
Preventing rainwater contamination	External activities are limited to the periodic and temporary storage of RDF bales. These are required to be well wrapped (6 layers) to prevent ingress of rainwater and is carefully managed through regular inspection. All external RDF storage is upon impermeable hardstanding with any run-off from this area while in use captured within the trade effluent drainage network and treated at the onsite WWTP prior to discharge to the docks.
Incoming waste covered	All incoming waste will be delivered in covered vehicles.
Litter avoidance	It is not anticipated that litter will be a problem. If litter does arise a litter patrol will be initiated at the end of each working day.
Maximisation of homogeneity of feed	Homogeneity of the waste is achieved by mixing within the Fuel Storage Bunkers. A fuel specification is in place which stipulates the parameters that must be achieved.
Inspection and removal	The waste acceptance procedures include the validation of a load against the pre-acceptance documentation. Loads may be inspected at the weighbridge and during unloading within the Reception Hall. A waste rejection procedure is in place for unsuitable loads/part loads/items within a load.
Feed transfer	Pre-treated RDF is transferred from the Fuel Storage Pit to the feed hopper of the grate via crane and then to the grate via a metering system allowing a controlled rate of continuous feed to the incinerator. The control system automatically controls the feed of feedstock to the incinerator.
Control of dust emissions	The waste will neither be dry or friable (i.e. the moisture content will be sufficiently high so to avoid excessive dust) therefore dust generation is unlikely. The waste is delivered and processed within an enclosed building kept at slight negative pressure and transferred to the grate via enclosed conveyors so dust generation is further minimised. The Fuel Reception Building is additionally fitted with misting spray.

Table 6.4: BAT Justification Summary	
Indicative Requirement	**BAT justification**
	External storage of waste is limited to wrapped bales, careful management of this aspect including immediate removal of any damaged bales will minimise potential emissions from this activity. Bottom ash residue is quenched prior to storage and APC residues are stored within an enclosed silo. All ash residues will be removed from the facility in enclosed vehicles.
Waste Charging	
Automatic waste feed prevention system	The installation is provided with a control system that automatically controls the feed of waste to the combustion systems. At start-up waste cannot be fed to the grate until the required operating conditions are reached. The feed system for the process is automated and in the event of temperature loss or departure from operating conditions the process will automatically shut down in a controlled manner.
Furnace interlock	The waste feed system is interlocked with the combustion conditions to prevent feed taking place when combustion is inadequate or other parameters are not within limits.
Airtight charging design, with interlock for chute or hopper	The transfer of waste to the grate is controlled by a metering system which is interlocked with the control systems measuring the process output parameters. The hydraulic ram feed system ensures an airtight design. In the event of the combustor deviating from its normal operating conditions, the control system will automatically alter the waste feed rate to ensure optimum conditions are achieved.
Charging rate and firing diagram, throughput rate, optimised combustion, waste residence time	Firing diagrams have been produced for the system design and are included in Annex B2. The plant has been designed to operate at design net fuel CV of 11 MJ/kg and throughput of 28.8 tph. Control systems are employed to ensure optimum combustion conditions are achieved and all waste residence time is sufficient to ensure complete combustion.
Municipal Waste / RDF	The combustion system has been designed for purpose. Conventional ram feed mechanism will be employed with a low-level alarm in the feed hopper. Isolation doors prevent fire transfer up the chute are double doors/cooled by the water cooling system. The charging system is sealed. The automatic crane fed feed system ensures consistent and necessary supply of feed to the combustor from the fuel bunkers.. This is an automated system and prevents furnace overload.
Furnace Requirements	
Legislative WID Requirements	The flue gas produced from the combustion of non-hazardous waste is maintained at temperatures above 850 °C for at least 2 seconds.

Table 6.4: BAT Justification Summary	
Indicative Requirement	BAT justification
	CFD modelling of the combustor has been undertaken to demonstrate that residence times are above 850°C in excess of 2 seconds (*provided in Annex B2*). Following commissioning of this installation, the results will be validated. No waste that contains a significant chlorinated or otherwise halogenated component is accepted. This is to ensure that halogen content cannot exceed 1% (as chlorine). The combustion process is controlled to ensure combustion of RDF in excess oxygen. Two diesel oil fired auxiliary burners are present.
Validation of combustion conditions	Thermal calculations of the combustor will be undertaken to demonstrate that residence times above 850°C in excess of 2 seconds. This will inform the design of the combustor. Testing using plug flow methodologies will be undertaken by the operator as part of the commissioning process.
Measuring oxygen levels	Measurement of oxygen is taken by extractive measurement in the stack as part of the emissions monitoring package to allow sample data to be converted to standard conditions.
Combustion Control	There are numerous temperature measuring positions throughout the thermal process which ensure correct combustion conditions at all times including control of primary and secondary air.
Dump stacks and by-passes	There will not be any dump stacks or by-passes on the combustion or boiler system during normal operation at the installation.
Flue gas recirculation	Secondary NOx control via SNCR will be employed rather than FGR.
Cooling systems	Cooling will be provided by an air-cooled condenser. The purpose of the condenser is to condense the steam by dissipating low grade heat to the atmosphere. The condensate recovered is returned to the deaerator and makes up the majority of the boiler feed water. There will be no cooling towers required; therefore, there will be no use of biocides in any cooling water systems and no release to land.
Boiler design	The boiler design has been chosen to prevent as far as possible the formation of dioxins and furans. The boiler, connecting duct work and economiser sections are designed to minimise the residence time of gases. This is in order to minimise the formation of dioxins and furans by de-Novo synthesis.
Environmental Performance Indicators	Key process performance indicators will be devised in discussion with NRW prior to commencement of operation of the facility.

6.3 Resource Efficiency and Climate Change

Basic Energy Efficiency Measures

The plant and ancillaries have been designed to operate with a high level of energy efficiency. Key energy efficiency measures that have been included within the design of the plant are as follows:

- All plant and equipment will be individually monitored and controlled using a SCADA monitoring system and PLC controls, optimised for efficiency of operation;
- All heat generated by the plant will be recovered and used for the generation of electricity;
- All aspects of the plant are controlled in real time to ensure maximum thermal efficiency and operational control;
- All plant energy data will be monitored and recorded and targeted to ensure optimal plant performance; and
- As part of the company's environmental management system, targets will be set regarding the increased thermal efficiency of the plant and the potential export of heat to neighbouring facilities.

Development of KPI's

The Operator will establish Key Performance Indicators (KPIs) when site electricity generation figures are available. The composition of the waste materials in the process will not vary greatly over the life of the plant. Should any site equipment or technology be replaced, efforts will be made to replace the unit with one which is more energy efficient, if available.

The Operator will create KPIs based on monitoring data from how much energy is used to run the site and whether this can be reduced. Within six months of operating the Applicant will produce a report detailing the energy uses at the site and where energy use improvements, if any, can be made.

Basic Design Principles

The Installation has been designed to ensure that all potential electrical energy is generated and supplied to the grid. A summary of the basic measures has been provided below:

- Wherever possible the plant utilises the waste heat to generate steam, which is used to generate electricity;
- All parasitic loads of the plant will be provided by the generated electricity, and hence the net energy imports are required to power and operate the plant;
- All pipelines and thermal processes are lagged and insulated to ensure that heat loss is minimised and prevented;
- The steam turbine specified for the plant has a high electrical and thermal efficiency;
- All ancillary plant (fans and motors) have been specified with high efficiency electrical motors and variable speed drives;
- The plant is controlled by PLC and optimised to ensure maximum efficiency and minimal operation of ancillary components where required;
- The Installation uses high efficiency electrical generation technology (i.e. steam turbine).
- Waste heat will be used for internal uses where possible i.e. preheating combustion air etc;
- The overall energy efficiency of the compares well with the minimum 25% efficiency target stipulated for incineration processes; and
- The plant will be maintained at steady capacity to avoid downtime.

Raw Materials and Water Usage

- The plant has been designed to ensure that all residues are reused or recycled; and
- The net water use meets the sector average (250 – 1100kg per tonne of material processed).

Avoidance, Recovery and Disposal of Waste

- All feedstock delivered to the site will be subject to an acceptance and pre-acceptance process that should ensure that the potential for inappropriate feedstock delivery is minimised;
- The site has a detailed inspection process to avoid unsuitable wastes to be introduced to the process; and
- The safe storage of rejected loads has been provided within and procedures will be in place for dealing with such loads to ensure that they are safely stored and dispatched for onward disposal. The storage times will be minimised.

An Energy Balance has been provided within *Annex B1.*

6.4 CHP-Ready Assessment

The plant has been configured to maximise power generation only and has not been configured for CHP mode operation at this time. The turbine has the capacity to be modified to operate in a CHP mode and steam could be diverted to heat exchangers if required (CHP-ready), however the likely operating mode will be power only.

At present there are no immediate high value heat neighbours which provide an economically viable heat export opportunity. Therefore, a CHP-R Assessment is not considered necessary.

This situation will be reviewed on a periodic basis and the feasibility re-appraised.

6.5 BAT Comparison

An assessment of the applicable indicative BAT requirements (as stated by EPR Guidance Note 5.01 Incineration) for the sector has been carried out. The following indicative BAT measures are considered to be met by the process.

Operations

- Very high levels of housekeeping will be employed throughout the site;
- All vehicles will be loaded and unloaded internally and on sealed concrete hardstanding and engineered containment;
- The majority of RDF feedstocks are stored internally, with external storage limited to wrapped bales on a temporary basis;
- The building will be maintained under negative pressure;
- Segregated water systems have been incorporated into the design of the plant to minimise the contamination of rainwater; and
- All building doors will be self-closing.

Waste Charging

- All feedstock into the combustion system will be on automatic feed systems to prevent waste feed at start-up:
  - Until the required temperature has been reached;
  - Whenever the required temperature is not maintained; and
  - Whenever the continuous monitors show that any emission limit value is exceeded due to disturbances or failures of the purification devices.
- Waste charging will be interlocked with combustion conditions so that charging cannot take place when:
  - The temperatures and airflows are inadequate;
  - Any flue gas cleaning bypasses are open;
  - Where the continuous monitors show that the emission limit values are being exceeds for a period of time in excess of the limits set within IED; or
  - Monitoring results required to demonstrate compliance with emission limit values are unavailable.
- The charging process has been designed to be sealed and all pressure controls have been designed to avoid escape of fumes or excess air flows; and
- The charging rates will be maintained at the optimum feedstock design rate of 28.8 tonnes per hour.

Legislative Requirements

- The gases resulting from the combustion process will be maintained at above 850ºC for at least 2 seconds;
- The combustion temperature and residence time and the oxygen content of the stack gases have been validated under the most unfavourable operational conditions;
- Ash produced by the plant will comply with the IED/WID 3% TOC requirements; and
- The installation will not give rise to significant ground level air pollution as demonstrated by Section 7 '*Environmental Impact'*.

Emissions to Air

- Fabric filters will be used to provide reliable abatement of particulate matter to below 5mg/m^3;
- Filters with multiple compartments will be used, which can be individually isolated in case of individual bag failures. There will be sufficient of these to allow adequate performance to be maintained when filter bags fail, i.e. design will incorporate capacity for meeting emission limits during online maintenance;
- The plant is fitted with SNCR (Urea Injection) to control and abate NOx formation;
- The gas is cooled quickly to avoid de novo synthesis of dioxin between 450ºC and 200ºC;
- Dry scrubbing systems incorporating lime and PAC injection neutralise acid gases and remove heavy metals; and
- All indicative IED ELV's will be met.

Odour Emissions

Odour will be minimised through the following measures:

- Containing waste to designated areas;
- Ventilation Systems will be installed in the Feedstock Reception Building;
- Extracted air will be utilised as primary combustion air, with odorous compounds thermally destroyed;
- Ensuring that no putrescible waste is processed at the plant;
- Regular cleaning of waste handling areas;
- The design of all waste handling areas facilitates cleaning;
- Drawing air from feedstock areas at a rate which will ensure that any odour present is captured;
- A back up ventilation system with activated carbon filtration will be installed for use in the event of unplanned shutdowns.

7. IMPACT TO THE ENVIRONMENT

7.1 Impacts to Air

An assessment has been carried out to determine the potential air quality impacts associated with the proposed development at Newport. The assessment has utilised the AERMOD 7 dispersion model.

Scope of the Assessment

Operational impacts associated with the combustion sources have been assessed using a dispersion model to predict the impact at ground level utilising five years of meteorological data from Rhoose (Cardiff Airport) (2014 to 2018).

This assessment has considered the impact on human health and sensitive habitat sites.

This modelling presented within *Annex C1 –Air Quality Assessment and HHRA.*

7.2 Sensitive Human Health Receptors

Specific receptors have been identified where people are likely to be regularly exposed for prolonged periods of time (e.g. residential areas). The location of the discrete sensitive receptors is presented in Table 7.1 below.

Table 7.1: Human Health Receptors

ID	Receptor	Type	Easting	Northing
R1	Lighthouse Road	Residential	330048	183533
R2	Duffryn High School	School	330037	184853
R3	Edney Way	Residential	329973	185261
R4	Maesglas Crescent	Residential	330113	185752
R5	Wolseley Street	Residential	331425	186235
R6	St Michael Street	Residential	331843	186770
R7	Spytty Lane	Residential	333355	186762
R8	New Dairy Farm	Residential	330640	183949
R9	Spytty Park	Residential	333816	186267
R10	Lysaght	Residential	332752	186506
R11	George Street	AQMA/Residential	331384	187450

The results of the air quality assessment have indicated that the impact of the facilities emissions on local air quality would be not significant with respect to human health.

Please refer to *Annex C1 –Air Quality Assessment and HHRA* for more information.

7.3 Impact on Sensitive Habitat Sites

The EA/NRW H1 guidance states that the impact of emissions to air on vegetation and ecosystems should be assessed for the following habitat sites within 10 km of the source:

- Special Areas of Conservation (SACs) and candidate SACs (cSACs) designated under the EC Habitats Directive[3];
- Special Protection Areas (SPAs) and potential SPAs designated under the EC Birds Directive[4]; and
- Ramsar Sites designated under the Convention on Wetlands of International Importance[5].

Within 2km of the source:

- Sites of Special Scientific Interest (SSSI) established by the 1981 Wildlife and Countryside Act;
- National Nature Reserves (NNR);
- Local Nature Reserves (LNR);
- Local wildlife sites (Sites of Interest for Nature Conservation, SINC and Sites of Local Interest for Nature Conservation, SLINC); and
- Ancient woodland.

The location of the local habitat sites is presented in Table 7.2 below.

Table 7.2: Sensitive Habitat Receptors

Receptor	Designation
Severn Estuary	Ramsar, SAC, SPA, Ramsar site & SSSI
River Usk	SAC &SSSI
Gwent Levels – St Brides	SSSI
Newport Wetlands	SSSI & LNR
Duffryn Pond	SINC
Julian's Gout Land	SINC
Gwent Wetland Reserve	SINC
Marshall's	SINC
Afon Ebbw River	SINC
Numerous Ancient Woodland	Ancient Woodland

The results of the air quality assessment have indicated that the impact of the facilities emissions on local habitat sites is not significant compared with existing background conditions and relevant critical levels and critical loads.

3 Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.
4 Council Directive 79/409/EEC on the conservation of wild birds
5 Ramsar (1971), The Convention of Wetlands of International Importance especially as Waterfowl Habitat.

An ecological interpretation of the AQA has been undertaken to support this conclusion and is provided in *Annex C1 –Air Quality Assessment and HHRA*.

7.4 Global Warming Potential

The global warming potential of the plant has been calculated using the EA H1 Annex H methodology and has been summarised and included in *Annex B3 – Global Warming Potential (GWP).*

In accordance with the H1 methodology the Global Warming Potential (GWP) is 16,868 (tonnes CO_2 equivalent per annum).

7.5 Impacts to Land

There are no impacts to land relating to this permit application.

7.6 Impacts to Controlled Waters

There are no impacts to controlled waters relating to this permit application.

Discharges to the dock comprise:

- Uncontaminated surface water run-off which is discharged via interceptors and the attenuation tank; and
- Treated effluent streams from the WWTP.

All emissions to the docks from W1 will be in line with the emission limit values stipulated within the permit.

7.7 Impact to Sewer

There are no impacts to sewer relating to this permit application.