



Appendix 3.16

Materials and Waste Technical Note

Materials and Waste Technical Note

1.1 Introduction

- 1.1.1 This Technical Note has been produced to support an Environmental Statement (ES) which has been submitted pursuant to an appeal against an Enforcement Notice issued by the Vale of Glamorgan Council (VoGC) in September 2021 in relation to the Barry Biomass Facility ('Development' or 'Facility'). This scoping note considers whether the Development has potential to give rise to significant environmental effects in relation to the consumption of materials and the generation of waste.

1.2 Key Legislation, Policy and Guidance

National legislation

- 1.2.1 The following key legislation is relevant to waste management:

- Waste Framework Directive (2008/98/EC);
- The Waste (England and Wales) Regulations 2011 (as amended)¹;
- Environmental Protection Act 1990²;
- Pollution Prevention and Control Act 1999³;
- Environment (Wales) Act 2016⁴;
- Environment Act 2021⁵;
- The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017⁶ (as amended^{7,8}) ('EIA Regulations');
- Environmental Permitting Regulations (England and Wales) Regulations 2016 (as amended) ('EPR')⁹; and
- Well-being of Future Generations (Wales) Act 2015.

- 1.2.2 Some of the above legislation has been amended following the UK's departure from the EU.

Planning Policy and Guidance

- 1.2.3 The following key policy documents are relevant to the Development:

- Planning Policy Wales (Edition 11) (February 2021)¹⁰;
- Prosperity for all: A low carbon Wales (March 2019)¹¹;
- Towards Zero Waste – One Wales: One Planet, and associated sector plans (2010)¹²; and
- Technical Advice Note 21 – Waste (February 2014) ('TAN 21')¹³ and Practice Guidance¹⁴.

- 1.2.4 The Welsh Government's Towards Zero Waste strategy (2010) describes a long-term framework for resource efficiency and waste management to 2050. It stresses that the construction sector will be '*expected to reuse and recycle 90% of its wastes by 2025*'. A Circular Economy Fund has also been announced¹⁵ to '*help Wales reach the milestones of 70% recycling by 2025 and 100% recycling by 2050*'.
- 1.2.5 Technical Advice Note 21 defines 'recovery' as, "*... any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy.*" This was based on Article 3(15) Directive 2008/98/EC on waste and repealing certain Directives OJ 2008 L312/3.

Guidance

- 1.2.6 The IEMA's 'Guide to Materials and Waste in Environmental Impact Assessment' ('IEMA Guide'¹⁶ provide initial guidance on the key terms, concepts and considerations for assessing the environmental impacts and effects of materials and waste, as part of the wider EIA process.
- 1.2.7 The IEMA Guide defines the following terms:
- **Materials** - physical resources that are used across the lifecycle of a development. Examples include concrete, aggregate, asphalt, bricks, ballast, mortar, glass and timber.
 - **Waste** - the Guide references the definition set out by the Waste Framework Directive (Directive 2008/98/EC)¹⁷ as '*any substance or object which the holder discards or intends or is required to discard*'. This definition is commonly considered to exclude any substance or object that is subject to acceptable recovery (including reuse and recycling).

1.3 Existing Environmental Permit and Planning Conditions

- 1.3.1 In accordance with the EPR, an Environmental Permit ('Permit') was granted on 7th February 2018 and subsequently varied (Ref. EPR/AB3790ZB) (ES Volume III, Appendix 1.2). The Permit stipulates the necessary control measures relating to the acceptance, storage, processing and management of wastes at the Development. Sections 4.3.9 and 4.3.10 of the Permit Decision document (included at ES Volume III, Appendix 1.2) provide NRW's analysis of the Development in terms of:
- i) Efficient use of raw materials; and
 - ii) Avoidance, recovery or disposal with minimal environmental impact of wastes produced by the activities.
- 1.3.2 The Permit relies on a set of standardized generic conditions which them themselves refer to detailed site-specific management programmes, procedures and controls. These management programmes although forming part of the regulated controls on the Site, are 'live' documents that are required to be periodically updated and reviewed in light of any discrete changes in operations, management or environmental conditions. As such, these

documents evolve over the lifetime of the facility and adapt to reflect the changes in operations of the site.

- 1.3.3 In addition to general conditions which are relevant to waste, the following conditions are relevant to materials and waste:

“1.3 Efficient use of raw materials

1.3.1 The operator shall:

- (a) take appropriate measures to ensure that raw materials and water are used efficiently in the activities;*
- (b) maintain records of raw materials and water used in the activities;*
- (c) review and record at least every four years whether there are suitable alternative materials that could reduce environmental impact or opportunities to improve the efficiency of raw material and water use; and*
- (d) take any further appropriate measures identified by a review.*

1.4 Avoidance, recovery and disposal of wastes produced by the activities

The operator shall take appropriate measures to ensure that:

- (a) the waste hierarchy referred to in Article 4 of the Waste Framework Directive is applied to the generation of waste by the activities; and*
- (b) any waste generated by the activities is treated in accordance with the waste hierarchy referred to in Article 4 of the Waste Framework Directive; and*
- (c) where disposal is necessary, this is undertaken in a manner which minimises its impact on the environment.*

The operator shall review and record at least every four years whether changes to those measures should be made and take any further appropriate measures identified by a review.”

- 1.3.4 Condition 2.3 (Operating techniques) of the Permit states that:

“2.3.2 Any raw materials or fuels listed in schedule 2 table S2.1 shall conform to the specifications set out in that table.

2.3.3 Waste shall only be accepted if:

- (a) it is of a type and quantity listed in schedule 2 table S2.2; and*
- (b) it conforms to the description in the documentation supplied by the producer and holder.*

2.3.4 *The operator shall ensure that where waste produced by the activities is sent to a relevant waste operation, that operation is provided with the following information, prior to the receipt of the waste:*

- (a) *the nature of the process producing the waste;*
- (b) *the composition of the waste;*
- (c) *the handling requirements of the waste;*
- (d) *the hazardous property associated with the waste, if applicable; and*
- (e) *the waste code of the waste.*

2.3.5 *The operator shall ensure that where waste produced by the activities is sent to a landfill site, it meets the waste acceptance criteria for that landfill.*

2.3.6 *Waste fuel shall not be charged, or shall cease to be charged, if:*

- (a) *the combustion chamber temperature is below, or falls below 850°C, or*
- (b) *any continuous emission limit value in schedule 3 table S3.1 is exceeded or*
- (c) *monitoring results required to demonstrate compliance with any continuous emission limit value in schedule 3 table S3.1 are unavailable."*

1.3.5 Condition 2.3.8 of the Permit requires that *"Bottom ash and APC residues shall not be mixed."*

1.3.6 Condition 3.1 (Emissions to water, air or land) of the Permit states that :

"3.1.3 Wastes produced at the site shall, as a minimum, be sampled and analysed in accordance with schedule 3 table S3.5. Additional samples shall be taken and tested, and appropriate action taken, whenever:

- (a) *disposal or recovery routes change; or*
- (b) *it is suspected that the nature or composition of the waste has changed such that the route currently selected may no longer be appropriate."*

1.3.7 Condition 6 of the 2015 Permission (Appendix 1.4 of the ES) required that *"No development shall take place until details of a scheme for the management of fly ash and bottom ash waste emanating from the site has been submitted to and approved in writing by the Local Planning Authority. The disposal of waste shall be carried in accordance with the approved scheme."* Condition 6 was discharged by VoGC on 18th May 2016 (2015/00031/1/CD).

1.4 Approach

- 1.4.1 This Note was primarily informed using information provided by the project team, Permit and Permit Decision Document (Appendix 1.2), the 2015 Permission.
- 1.4.2 Five key principles defined by the IEMA Guide for assessing whether the Development has potential for likely significant effects relating to waste and materials have been applied. These principles are set out in Table 1 together with an explanation of how the ES has responded to each principle.

Table 1: IEMA Guide's Key Principles for Materials and Waste Assessment

Key Principle	Comment
1. The consumption of materials, and the generation and disposal of waste, result in adverse environmental effects	The potential for adverse effects associated with the consumption of materials, and the generation and disposal of waste have been considered in this Note taking into account the existing Permit and Conditions in place.
2. Where materials are consumed, and waste is generated, it is acknowledged that – depending on how they are managed – indirect adverse effects may arise and would be assessed by the other EIA disciplines	Indirect effects associated with materials and waste are considered within the other technical topics of this ES (see Table 2). Indirect effects were also taken into account in scoping out topics. Further information on scoped out topics is provided in Chapter 3: EIA Methodology.
3. All EIA disciplines (not just those responsible for materials and waste) should continue to take responsibility for inspiring and incentivising the production and refinement of materials and waste data and information throughout the whole development lifecycle	The EIA team for this ES were engaged following construction of the Development and the Permit application. Raw materials and waste data and information is regulated by the Permit as described above and relevant waste legislation.
4. Whilst understanding full lifecycle sustainable resource management is an important part of reducing adverse environmental impacts, in practice, data availability may restrict a consideration of end-of-life impacts and, hence, it may be necessary to focus on the construction and operational phases.	The section below sets out aspects of waste and materials which are not considered further, either due to data availability or because the issues do not have potential to give rise to significant adverse effects.
5. The EIA process should seek to deliver outcomes that align with the highest tiers of the Waste Hierarchy , and the Proximity Principle ,	The Permit classifies the main purpose of the Development as the generation of energy and not disposal of waste. This is further supported as the Development falls within the definition of recovery stated by TAN 21 (para 1.2.4). The IEMA Guide

Key Principle	Comment
ultimately encouraging transitions towards a Circular Economy .	considers that waste recovery facilities drive arisings up the Waste Hierarchy, and therefore support the drive towards a Circular Economy.

1.4.3 The following descriptions of ‘sensitive receptors’ are provided within the IEMA Guide:

- **Materials** are, in their own right, sensitive receptors. Consuming materials impacts upon their immediate and (in the case of primary materials) long-term availability; this results in the depletion of natural resources and adversely impacts the environment.
- For **waste**, the sensitive receptor is landfill capacity. Landfill is a finite resource, and hence – through the ongoing disposal of waste – there is a continued need to expand existing and develop new facilities. This requires the depletion of natural and other resources which, in turn, adversely impacts the environment.

1.4.4 The IEMA Guide states *"whilst waste processing and recovery facilities may not be able to divert all received resources from landfill, these operations are a beneficiary of incoming feedstock, and are – ultimately – being used to drive arisings up the Waste Hierarchy. They, hence, create conditions that support the national and wider drive to a circular economy."*

1.4.5 The Facility is therefore considered to be part of a system that has the potential to reduce the magnitude of adverse impacts associated with waste generation and disposal.

1.4.6 The Development is fully constructed, although was not operational at the time of writing (July 2022) and is therefore not consuming significant volumes of materials or generating waste at present. This is relevant as there is no available data on actual raw material consumption or waste generation. This Note is based on information provided by the operator.

1.4.7 Table 2 outlines the main impacts (changes) and effects (consequences) of materials consumption and waste disposal as defined by the IEMA Guide and where indirect effects are assessed elsewhere within the ES. This note addresses the ‘adverse effects’ and also considers environmental effects arising from the storage and handling of waste.

Table 2: Main impacts and effects of materials consumption and waste disposal (IEMA Guide)

Direct impacts	Adverse effects	Indirect impacts	Location within ES
<i>Materials</i>			
Consumption of resources	Depletion of resources, resulting in the temporary or permanent degradation of the natural environment.	Release of greenhouse gas emissions (through transportation, operational process and other emissions). Water consumption. Visual impacts, noise, vibration, disruption to traffic and other potential causes of nuisance	Chapter 7: Climate Change and Greenhouse Gases, Chapter 8: Noise and Vibration, Chapter 9: Air Quality, Chapter 10: Population and Human Health and Volume II: LVIA

		Human health, e.g. if conflict minerals are used.	(Water consumption has been scoped out)
<i>Waste</i>			
Generation and disposal of waste	Reduction in landfill capacity. Unsustainable use or loss of resources to landfill that results in the temporary or permanent degradation of the natural environment.	Release of greenhouse gas emissions (through transportation , operational process and other emissions).). Ecological impacts (e.g. offshore disposal of dredged arisings). Visual impacts, noise, vibration, disruption to traffic and other potential causes of nuisance.	Chapter 7: Climate Change and Greenhouse Gases Chapter 8: Noise and Vibration, and Volume II: LVIA (Ecology and Traffic have been scoped out)

1.5 Potential Effects – Construction and Decommissioning

Materials

- 1.5.1 Construction of the Development required the use of a range of natural and man-made materials. During construction, a Project Environmental Plan (PEP) was approved by VoGC under Condition 28 of the 2015 Permission which required a Construction Environmental Management Plan (CEMP) to be implemented. The PEP set out the environmental control measures that would be in place during construction and included good practice measures relating to resource management (section 5.6 of the PEP, included as Appendix 6.2 of the ES).
- 1.5.2 No data is available on the types or volumes of materials that were consumed during construction of the Development. However, with reference to the IEMA Guide, the materials used on Site are unlikely to have been greater than 1-5% of the regional baseline availability at the time. As such, no significant effects are likely to have occurred. Also, reasonable efforts would have been made to reduce raw material consumption and ensure materials were used efficiently through implementation of the PEP.

Waste

- 1.5.3 The Development is fully constructed. Prior to construction, the land was surfaced with a mixture of hardcore and compacted earth, with some areas of concrete with little vegetation evident on the Site. Waste streams arising from construction would have mainly comprised inert waste such as crushed concrete from the removal of existing hardcore. Excavation works would also have generated quantities of soil and rubble. Information on waste arisings was not available for review.
- 1.5.4 During construction, the management of waste was controlled through a PEP and waste legislation in force at the time. Section 5.1 of the PEP sets out the environmental control measures that were to be in place during construction including a Site Waste Management Plan (SWMP) although this was not available for review.

- 1.5.5 Assuming a SWMP was effectively implemented, the measures set out in the PEP and relevant legislation / guidance were adhered to, it is reasonable to conclude that the generation of waste from construction of the Development would not have resulted in any significant environmental effects.
- 1.5.6 The volumes and the types of wastes generated during construction would not have been of a scale where significant impact on waste management infrastructure is likely to have occurred.

Decommissioning

- 1.5.7 The Facility will be operated in accordance with the requirements of the Permit throughout its operational lifetime (discussed further below). In the event of the definitive cessation of activities at the Facility, an application will be submitted to NRW to surrender the Permit. A detailed Site Closure Plan will be agreed with NRW prior that minimises the risk of pollution from all activities associated with any future site closure (decommissioning). The Appellant would ensure that appropriate measures are in place as part of the Site Closure Plan to avoid any pollution risk. This is likely to include consideration of the Waste Hierarchy and opportunities for the re-use or recycling of materials.
- 1.5.8 Whilst waste would be generated, future re-use and opportunities are uncertain and therefore have not been assessed. However, assuming any future decommissioning occurs in line with legislative and Permit requirements in force at the time, it is reasonable to conclude that there would be no significant effects.

1.6 Potential Effects - Operational

Materials

Consumption of Materials

- 1.6.1 Table 3 summarises the quantities of materials estimated to be used by the operational Development per annum and per hour. This information has been provided by the operator in April 2022. The Facility does not use raw material as a fuel feedstock as wastes accepted onto Site for processing can comprise only non-hazardous, mixed waste wood. The quantities and quality of waste wood that can be received at the Site are subject to control through the Permit. The quantity of waste wood that can be received is subject to control through the 2015 Permission.

Table 3: Quantities (Process Inputs)

Process	Per Annum (tonnes)	Per Hour (kg/h, unless otherwise stated)
<i>Inputs</i>		
Waste wood throughput tonnage (wet)	72,000 dry 86,400 (wet)	10,800
Water	33.37	0.8 t/h
Urea (40% conc solution)	2,400	300
Hydrated Lime	536	67
Activated Carbon	26	3.3
Limestone	136	17
Salt	4	0.5
Diesel	160 (litres)	20
Anti-scalant Chemicals	De-minimis	0.0

- 1.6.2 A stated above, the Facility is designed to accept and process approximately 72,000 dry tonnes of mixed waste wood per annum. The incoming waste will consist of ‘fuel grade’ mixed waste wood as defined by BS PAS 111: Waste Wood Processing¹⁸. Fuel grade (Grade C) waste wood, is not of sufficient quality to be able to be recycled into wood products such a chip board and OSB board sector, and therefore is most suited for energy recovery.
- 1.6.3 All waste wood is sourced and supplied from approved processors under a 19-12-07 code ‘Wood other than that mentioned in 19 12 06ⁱ’. Fuel feedstock would be provided from two South West Wood Products (SWWP) sites located in Newport and Swansea. Both of these facilities are contracted for the long term supply of fuel for the Facility and are the two largest regional mixed waste wood providers in the locality of the Facility.

ⁱ EWC 19 12 06 is defined as ‘Wood containing dangerous substances’ and hazardous waste only if dangerous substances are present above threshold concentrations.

Figure 1: Typical Grade C Waste Wood Fuel



Potential for Effects

- 1.6.4 The feedstock is a fuel grade waste wood being recovered for energy recovery, therefore no 'virgin' raw materials will be used by the Facility.
- 1.6.5 The operator is required to take appropriate measures to ensure that raw materials and water are used efficiently in the activities under Condition 1.3.1 of the Permit. Under this condition they are also required to review whether there are suitable alternative materials that could reduce environmental impact or opportunities to improve the efficiency of raw material and water use.
- 1.6.6 The operator is also required to report raw material usage under the Permit conditions, including the consumption of urea/ammonia, activated carbon and lime used per tonne of waste burned. This raw material usage information is submitted to NRW to assess whether there have been any changes in the efficiency of the air pollution control plant and other abatement processes.
- 1.6.7 The other input raw materials used by the Development listed in Table 3 are not considered to be used in a scale that would result in significant effects in terms of the depletion of natural resources, or the degradation of the natural environment.

1.7 Operational Waste

Waste Arisings

- 1.7.1 The gasification process does not inherently produce significant quantities of waste. Table 4 summarises the quantities of waste expected to be generated by the operational Development (based on information provided by the operator in April 2022). Table 1 from

the Site Environment Management Plan (below) sets out how each waste stream would be stored and transferred off-site for reuse or recycling.

Table 4: Waste Quantities (process outputs)

Waste type	Per Annum (tonnes)
Wood	88
Metals	88
Non-combustibles (e.g. glass/aggregates/used bed material)	400
Fly Ash	2,384
Air Pollution Control Residue	1,544
Domestic waste (mixed general waste)	<2
Oils and Chemicals	<5

Table 1: Table of Transferred Wastes

Waste Type	EWC Code	EWC Description	Site Management	Disposal Route
Mixed General Waste (office and general wastes) – Non Hazardous	19-12-12	Other wastes (including mixtures of materials)	Stored in segregated waste skip (on concrete hardstanding)	Transferred off site for recycling
Waste Oils and Greases	13-02-05	Turbine Oil	Stored in barrels / drums and stored internally within maintenance shed prior to offsite transfer	Transferred off site for recycling
Bottom Ash	10-01-15	Bottom ash	Stored in segregated waste skip (on concrete hardstanding)	Transferred off site for reuse
Fly Ash (Air Pollution Control Residues)	19-01-05*	Filter cake from gas treatment	Stored in segregated waste skip (on concrete hardstanding)	Transferred off site for reuse
Oversized Particles	20-03-01	Mixed waste (non-haz)	Stored in segregated waste skip (on concrete hardstanding)	Transferred off site for reuse
Metals	02-01-10	Metal – scrap	Stored in segregated waste skip (on concrete hardstanding)	Transferred off site for reuse
Used Bed Material	10-01-15	Bottom ash	Stored in segregated waste skip (on concrete hardstanding)	Transferred off site for reuse

Notes:

“Bottom ash” is termed “fly ash” in Table 4. Fly ash would be re-used subject to testing.

“Oversized particles” are captured under “Wood” in Table 4.

“Fly Ash (Air Pollution Control Residues)” is termed “APCR” in Table 4. Disposal routes assumed to be hazardous landfill as worst case for the purposes of this Note.

- 1.7.2 The waste streams generated by the Facility are described below. All of the above materials are classified as wastes in accordance with the List of Wastes (LOW) Regulations 2005, which transpose the European Waste Catalogue (EWC) into domestic legislation, and provide codes for all hazardous and non-hazardous wastes.
- 1.7.3 All wastes being transferred on Site must be consigned to an appropriately qualified carrier in line with waste legislation.
- 1.7.4 The two principal types of solid by-products produced from the operation of the gasification facility are:
- Fly ash; and
 - Air Pollution Control Residues (APCR)
- 1.7.5 Both ash waste streams will be subject to testing and analysis to determine the correct waste classification prior to export offsite for recycling or disposal.

Fly Ash

- 1.7.6 Fly ash is produced from within the gasification chamber from the combustion of the fuel feedstock. Fly ash is collected from the boiler, multicyclone and economiser systems within the fluidised bed combustion process.
- 1.7.7 Fly ash is removed from the process and is transported for storage in an enclosed silo via enclosed water-cooled conveyors. Fly ash from other parts of the process (e.g. boiler ash from boiler passes) is also transported in this way.
- 1.7.8 Fly ash will normally be classified as non-hazardous waste. Monitoring of fly ash will be carried out in accordance with the requirements of the Permit.
- 1.7.9 The silo holds 100 tonnes of fly ash is emptied approximately every 10 days to 2 weeks. The silo is sealed and therefore fugitive emissions to atmosphere are reduced. The fly ash can either be removed via skip or powder lorry and is transported off site to be disposed of in the appropriate manner. This represents Best Available Techniques (BAT) for the sector and ash handling, as stated in Sector Guidance Note IPPC S5.01.

Air Pollution Control Residues (APCR)

- 1.7.10 APCR, is the solid output of the flue gas treatment equipment installed at the Facility which includes the following:
- Limestone and urea injection (SNCR) into the combustion chamber;
 - Selective Catalytic Reduction (SCR);
 - Lime and Powdered Activated Carbon (PAC) injection into the scrubber; and
 - Bag house filter to remove particulates, complete with APCR ash tank.
- 1.7.11 The APCR is removed from the process in much the same way as fly ash and is kept separate and stored in a dedicated silo. The silo can hold approximately 70 tonnes of APCR and will be emptied approximately every 10 days to 2 weeks.

- 1.7.12 From here the ash is deposited in 1 tonne sealed bags and removed from the Site by lorry. As the APCR is categorised as hazardous, the ash will be transported for disposal at an appropriate hazardous waste landfill.
- 1.7.13 Analysis of APCR on behalf of the operator (during commissioning) has identified that the material is alkaline and predominantly composed calcium, with chlorides, sulphur and traces of metals such as titanium and magnesium. Initial waste classification assessment (WM3) determined the APCR confirms that the waste is classified as 'hazardous'. This will be the assumed classification unless ongoing laboratory analysis and classification in the future indicates otherwise.

Wood, Metals and Non-combustibles

- 1.7.14 All oversize wood and fuel products are returned to the waste processor for further shredding and recycling. Ultimately the wood will be reprocessed and in all likelihood will be returned to the Site for the production of renewable energy.
- 1.7.15 All ferrous and non-ferrous metals removed by the screening tower are collected for local recycling, ultimately being processed at the nearby Port Talbot steel works site.
- 1.7.16 Inert non-combustible materials from the fuel feedstock would also be collected for collection and recycling where possible, for example glass, aggregates and used bed material (subject to testing as appropriate).

Other waste sources

- 1.7.17 The Facility also generates some other waste sources including the following:
- Domestic / office general wastes; and
 - Specialist oils and chemicals wastes arising from turbine and water treatment plant maintenance.
- 1.7.18 All domestic waste arisings are removed by contract cleaners and recycled where possible or disposed of in accordance with regulatory requirements.
- 1.7.19 All specialist oil and chemical wastes are removed directly by the maintenance contractors and recovered in accordance with regulatory requirements.
- 1.7.20 Condensate would be subject to disposal to foul sewer through the trade effluent process.

Embedded Management Measures

General

- 1.7.21 Table 2.2 from the Site Environment Plan (shown below) defines the procedures in place at the Facility that are relevant to waste. The procedures BUK-EO1 to EO8 are detailed in the Site Environment Plan, subject to control under the Permit, and are not repeated in the ES.

Table 2.2: SWP Procedure & Guidance Map

Reference No:	Title	Purpose
BUK-E01	Waste Pre-Acceptance	This procedure defines the upstream screening, checking and pre-acceptance of all incoming waste prior to its arrival on site.
BUK-E02	Waste Acceptance	This procedure outlines the onsite controls and considerations that need to be applied when waste materials arrive on site for processing.
BUK-E03	Waste Rejection	This procedure outlines the waste rejection process for all non-conforming wastes that cannot be processed on site. Acceptance of non-conforming wastes will be a direct breach of the permitted conditions of the sites Environmental Permit.
BUK-E04	Off Site Waste Transfers	This procedure provides the necessary information to enable the assessment and off site transfer of non-conforming or untreatable waste streams.
BUK-E05	Waste Reception and Storage	This procedure outlines the waste reception, storage processes for all incoming waste.
BUK-E06	Environmental Records	This procedure defines the necessary Environmental Permit and Waste Records that are required to be managed by the site to ensure compliance.
BUK-E07	Environmental Management and Monitoring Programme	This procedure provides an overview of all of the necessary environmental monitoring, management procedures and controls to ensure compliance with the Permit.
BUK-E08	Infrastructure Management and Monitoring Programme	This procedure provides an outline of the inspection and cleaning requirements for the site.
BUK-E09	Accident Management Plan	This procedure refers to the sites emergency plans and response requirements.
BUK-E10	Fire Prevention Plan	This procedure refers to the sites fire prevention measures.

1.7.22 Key aspects of above management procedures are summarised below.

Fuel Feedstock (waste) acceptance and storage

- 1.7.23 Under the conditions of the supply contract, all incoming fuel feedstock is required to meet a strict specification. Conformance to the specification will be demonstrated through ongoing fuel sampling carried out daily in accordance with the agreed Ofgem fuel measurement and sampling (FMS) protocols and the inspection and monitoring programme (approved by the Permit).
- 1.7.24 Under the terms of the contract, all fuel feedstock suppliers are required to provide independent sampling and approval of fuel feedstock.
- 1.7.25 All fuel feedstock delivery vehicles are required to report to the weighbridge at the Site entrance to weigh and record the fuel feedstock, in accordance with the procedures stated in the Site Environment Plan as set out in paragraph 1.7.19 . All vehicles will be directed from the weighbridge to the Fuel Storage Building via electrically operated, fitted roller

shutter doors (which are required to be closed when not in use). Fuel Feedstock will then be deposited directly into the reception area of the Fuel Storage Building.

- 1.7.26 Air is extracted from the Fuel Storage Building and directed to the intakes of the main combustion air system to maintain dust below the occupational exposure level. There are no direct or uncontrolled releases from the Fuel Storage Building to the outside environment (aligned with the 2015 Permission and the Permit).
- 1.7.27 The Fuel Feedstock storage area within the Fuel Storage Building has an approximate storage volume of 2,000m³. It is equipped with internal water mist dust suppression and control systems to maintain an internal environment that meets occupational exposure requirements. All vehicle doorways are designed to be fast acting and configured to automatically close either upon entry or exit of the Fuel Storage Building. The Fuel Storage Building is equipped with heat sensing cameras, flame detection and a deluge system to ensure that any fire or localised hotspot can be identified and resolved in advance of a runaway thermal event occurring. All fire prevention measures on-Site are specified to meet the requirements of the Fire Prevention and Mitigation Plan.

Fuel Feedstock Processing

- 1.7.28 The Fuel Storage Building is equipped with a push floor which provides intermediate storage and transport of the Fuel Feedstock. The walking floor consists of several metal conveyors, which are driven by hydraulic actuators. The metal conveyors pull the Fuel Feedstock to the conveyor transport system. To ensure that any residual contamination within the Fuel Feedstock is removed, the conveyor system is equipped with a ferrous and non-ferrous metal separator to remove any metals contained within the Fuel Feedstock. Using an overband magnet and eddy current separator, metals are segregated into dedicated containersⁱⁱ. The Fuel Feedstock will pass over a screen where both oversize and undersize Fuel Feedstock is collected within separate containers. Screened Fuel Feedstock is transported to the gasifier metering bins and the gasifier.

Management of Ash (Handling, Storage and Dust Mitigation)

- 1.7.29 The Development is equipped with a sealed mechanical ash system for the continuous collection and transport from each discharge point of the process to a multi-day storage tank. The Installation has two ash systems:
- The first system handles the ash from the boiler, multi-clone and the economiser; and
 - The second system removes and store the ash from the air pollution control devices.
- 1.7.30 All aspects of the ash handling system are sealed and equipped to the main extraction and baghouse filtration system to prevent any uncontrolled releases to atmosphere. Both ash hoppers are fitted with a rapid unloading and conditioning system to empty the ash storage tank into sealed articulated vehicles for removal from Site. Both ash collection hoppers are equipped with fabric filter vent that filters the air of particulate prior to venting to atmosphere, limiting the environmental exposure. The storage system is complete with supports,

ⁱⁱ All removed ferrous and non-ferrous metals are collected for local recycling, ultimately being processed at the nearby Port Talbot steel works site. Port Talbot handles circa 6.6 million tonnes of cargo per annum (www.abports.co.uk/locations/port-talbot/.)

fluidising nozzles to enhance mass flow and an isolation slide gate valve to facilitate the controlled unloading and discharge into sealed ash collection trailers. An ash wetting system is included to condition the fly ash and suppress fugitive dust during the normal unloading operation from the storage bin.

- 1.7.31 All aspects of the site pollution and abatement systems are managed in accordance with the Permit conditionsⁱⁱⁱ and in accordance with an approved dust and emissions management programme approved by NRW as part of the Permit management activities.

Management of Other Wastes

- 1.7.32 Except for specialist oil and chemical wastes, all waste streams set out above will be stored in dedicated covered skips and containers. All skips and containers will be managed under contract and are controlled in accordance with the Permit requirements and relevant waste legislation including s.34 of the Environmental Protection Act 1990.
- 1.7.33 All oil and chemical wastes are limited to planned and scheduled maintenance activities; they are a small volume and limited to less than 2m³ at any one time. All maintenance wastes are stored in sealed containers and removed from Site by the maintenance contractors for treatment and/or disposals. All such wastes will be managed entirely by contracted and approved third parties.

Abnormal Operation Management Measures

- 1.7.34 Under emergency conditions, the fire protection measures will ensure that any fire will be controlled and extinguished within four hours; therefore, minimising potential off-site impacts to sensitive receptors. It is stipulated, as a requirement of the Fire Prevention and Mitigation Plan, that all liquid waste and polluted runoff emissions arising from an emergency fire event are controlled, contained and retained on-Site.

1.8 Potential Effects - Operation

Waste Prevention

- 1.8.1 In line with the Waste Hierarchy, the first objective is to avoid producing waste at all. The principal waste streams produced by the Facility are fly ash and APCR. Waste production at the Facility will be minimised by achieving a high degree of burnout of the ash in the combustion chamber, which results in a material that is both reduced in volume and in chemical reactivity.
- 1.8.2 Condition 3.1.3 and associated Table S3.5 of the Permit specify limits for total organic carbon (TOC) of <3% in bottom ash (including boiler ash) (referred to as 'fly ash' in this Note). The amount of APCR will be minimised through optimising the performance of the air emissions abatement plant. The operator will comply with this Permit Condition to demonstrate that good combustion control and waste burnout is being achieved in the combustion chamber and waste (ash) generation is being avoided where practicable.

ⁱⁱⁱ The requirements of the Environmental Permit and Sector BREF stipulate that all fugitive emissions are captured, controlled and filtered such that they are fully contained and managed.

1.8.3 The generation of other waste streams at the Facility would be minimised through the Site Environment Management Plan and Environmental Management System in line with the waste hierarchy.

Re-use/Recycling Waste

1.8.4 Table 1 from the Site Environment Management Plan (above) details the waste types that would be generated by the Facility, site management measures and route for re-use/recovery.

1.8.5 There are a range of potential re-use opportunities for non-hazardous fly ash¹⁹ including:

- Use in concrete, e.g. as filler or lightweight filler aggregate, and cementitious component in concrete;
- Use in cement manufacture, e.g. added as a raw material into kiln feed or added to Portland cement;
- Ceramic tiles and brick-making;
- Paints, plastics, rubber and similar;
- Lightweight filler in bitumen-bound materials, e.g. foamed bitumen or asphalt;
- Hydraulically bound mixtures in pavement construction, e.g. capping, sub-base and road base, and ground stabilisation and
- Lightweight filler for use in grouts.

1.8.6 Classification of fly ash for its subsequent use is controlled by waste legislation rather than the Permit. Before re-use of the material can be determined, rigorous sampling and continued assessment of the waste streams will be undertaken to ensure that the material is suitable for re-use. The process for the classification, subsequent use and disposal of ash arisings from the Site would be controlled by relevant waste legislation.

1.8.7 Subject to testing which confirms the material is non-hazardous (as indicated to date), fly ash would be taken to a facility in Waunarydd, Swansea, operated by Treatment Hub Ltd for re-use as recycled aggregate material. This would reduce waste generated by the Development and would be in line with Circular Economy principles. The re-use of incineration ash products for the production of aggregates also significantly reduces the environmental impact associated with the production of cementitious construction materials.

1.8.8 Other waste generated by the process, e.g. metals, domestic waste, would be recycled off-site as far as practicable. Non-combustibles would be transported off-site for re-use as aggregates where practicable.

Waste Wood for Energy Recovery

1.8.9 All waste wood feedstocks accepted at the Site will be prepared to meet the requirements of Waste Wood Grade C (Fuel Grade) materials as defined by BSI PAS 111 Processing Waste Wood.

1.8.10 Wood entering the waste stream is placed into four grades, A, B, C and D, according to its general suitability for certain end uses. Since implementation of the Landfill Directive and in

accordance with the objectives of both TAN 21 and Article 4 of the Waste Framework Directive, the disposal of 'fuel grade' PAS 111 Grade C waste wood to landfill is not considered to align with policy or the objectives of the waste hierarchy. Grade C wood typically cannot be recycled and therefore the accepted best practice, as outlined in PAS 111 is for use as energy recovery, as opposed to landfill.

- 1.8.11 Grade C mixed waste wood is a certified 100% renewable fuel that meets the definition of biomass⁴⁸ as defined by Ofgem in the context of the Renewables Obligation Order 2015 and the Renewable Energy Directive.
- 1.8.12 The Facility processes waste wood which would otherwise require treatment or disposal via other means. The most likely fate of the waste wood to be processed at the Facility is combustion in a biomass plant elsewhere, or landfill. Use in an alternative biomass plant elsewhere would result in comparable greenhouse gas emissions, which may be higher or lower depending on the distance from the source.
- 1.8.13 If the wood was sent to landfill, then a portion of the carbon in the wood (known as the Decomposable Degradable Organic Carbon (DDOC)) content would break down anaerobically, forming landfill gas. Landfill gas is a mixture of carbon dioxide and methane. Some of this would be captured and used to generate energy, however, a portion will likely be lost to the atmosphere. Methane is a particularly potent greenhouse gas, with a Global Warming Potential (GWP) 28-36 times higher than carbon dioxide over 100 years²⁰. If the waste wood were to be disposed in landfill rather than used for energy recovery, additional greenhouse gas emissions would occur.
- 1.8.14 The use of waste wood at the Facility to produce renewable energy directly displaces grid generated electricity so therefore has an indirect environmental benefit in terms of greenhouse gas generation.

Waste Disposal

- 1.8.15 APCR from flue gas treatment is classified as 'hazardous waste' and will therefore be sent for disposal to a landfill site permitted to accept such wastes, or to an appropriately permitted facility for hazardous waste treatment. The operator has confirmed that as a worst-case this material would be disposed of in landfill in Newport. However, treatment / recovery options for APCR are being actively pursued.
- 1.8.16 To ensure that the APCR is adequately characterised, pre-operational condition PO4 in the permit requires the operator to provide a written plan for approval detailing the ash sampling protocols which has been approved by NRW. Table S3.5 requires the Operator to carry out an ongoing programme of monitoring in terms of sampling.
- 1.8.17 The volume of waste streams that would be disposed of in landfill, including APCR, would be insignificant in terms of capacity. The process for the classification, subsequent use and disposal of ash arisings from the Site would also be controlled by relevant waste legislation.
- 1.8.18 In their Permit Decision Document, NRW stated *"We are satisfied that waste from the Installation that cannot be recovered will be disposed of using a method that minimises any impact on the environment. Permit condition 1.4.1 will ensure that this position is maintained."*

Environmental Effects

- 1.8.19 Annex 1 summarises the key measures that would be in place to control the release of wastes from the Site. Under normal operations and in accordance with the Permit, all emissions relating to the control of wastes are managed such that there will be no direct or indirect releases to the environment. Therefore there will be no environmental or human health impacts associated with waste generated.
- 1.8.20 Under abnormal situations, i.e. in the event of a silo filter or unloading valve blockage or failure, then the impacts will be very localised and contained on site.
- 1.8.21 Under emergency conditions, i.e. major site fire, fire protection measures will ensure that any fire will be controlled and extinguished and that any offsite impacts are minimised. It is stipulated as a requirement of the Fire Prevention and Mitigation Plan that all liquid waste and polluted runoff emissions arising from an emergency fire event are controlled, contained and retained on site.
- 1.8.22 Taking into account the above, no significant environmental effects are expected from the waste generated by the Development.

1.9 Conclusion

- 1.9.1 This appraisal has not identified any significant environmental effects arising from the Development in relation to waste generation or materials consumption. These effect have therefore not been considered further in the ES.
- 1.9.2 NRW in their Permit Decision Document stated:

Materials – *“we are satisfied that the appropriate measures will be in place to ensure the efficient use of raw materials and water within the Installation.”*

Waste – *“we are satisfied that the waste hierarchy referred to in Article 4 of the Waste Framework Directive will be applied to the generation of waste and that any waste generated will be treated in accordance with this Article. We are satisfied that waste from the Installation that cannot be recovered will be disposed of using a method that minimises any impact on the environment. Permit condition 1.4.1 will ensure that this position is maintained.”*

Annex 1: Measures for the prevention of releases of waste from the Development

Source	Nature of Release	Nature of potential impact	Control Measure	Potential for environmental effect
Incoming Waste Deliveries	Uncontrolled releases from waste delivery vehicles	Localised releases of respirable wood dust from the Site	All fuel delivery vehicles are equipped with sheeted (walking floor trailers) and sealed. All vehicles are from a single contracted waste supplier and no open sided vehicles are permitted to deliver to Site.	None – There would be not uncontrolled releases from delivery vehicles to arise at Site due to management procedures in place.
Delivery of Fuel Feedstocks	Uncontrolled releases escaping from the fuel storage building	Localised releases of respirable wood dust from the Site.	All fuel deliveries take place within the fuel storage building. The building is equipped with fast acting roller shutter doors to ensure that no fugitive releases can occur during fuel deliveries. Fuel storage building is equipped with extraction and dust mitigation to prevent any airborne dust emissions from the building.	None – there are no dust releases from the main fuel storage building.
Dust escape from fuel storage building	Dust emissions being tracked out of the fuel storage building by delivery vehicles and Site mobile plant	Localised releases of respirable wood dust from the Site	As above. In additional the Site maintains continuous onsite maintenance and cleaning activities to ensure that no wood dusts are allowed to collect or become windswept form the Site.	None – there are no dust releases from the main fuel storage building.
Failure of dust extraction and mitigation systems	Dust extraction and mitigation systems leading to escape from opening doors and high-level building vents	Short term and localised releases – from building doors only. Vents are subject to dust extraction and mitigation systems.	Failure of main extraction systems is indicative of main plant failure. In such circumstances, all waste deliveries would cease and building would be locked down.	None – no releases would occur. All buildings sealed until main extraction and combustion systems operable

Source	Nature of Release	Nature of potential impact	Control Measure	Potential for environmental effect
Failure of ash and APCR silo vents and filters	Vent filter failure leading to the release of hazardous and non-hazardous ash products to the environment	Short term and localised releases from silo's only.	All filtration systems are linked to the plant DCS system and would alarm in the event of failure. In the event of an alarm, all ash transfers would cease and the filter plant repaired with immediate effect. Plant forms part of planned maintenance activities.	None – all releases prevented very minor releases would occur.
Failure of ash and APCR silo unloading valves	Valve failure leading to the spillage of hazardous and non-hazardous ash products to the environment	Short term and localised releases from silo's only. Immediately cleared up and prevented	A blockage or failure in the unloading valves would be detected by the plant DCS. In the event of an alarm, the valve would be immediately repaired and or replaced. Any spillages would be immediately contained, swept up and controlled. Plant forms part of planned maintenance activities	None – all releases prevented very minor releases would occur.
Spillage during ash unloading	Uncontrolled releases from ash collection vehicles	Localised releases of hazardous and non-hazardous ash from the unloading activities at the Site / off-site	All ash collection vehicles are equipped with a sealed delivery system that prevents escape during transport and loading.	None – Under normal operation the potential for uncontrolled releases is considered negligible.
Uncontrolled releases of other wastes	Spillage or leakage of other non-hazardous solid wastes (domestic wastes, metals and screenings) to the environment	Very localised releases of non-hazardous solid wastes. Immediately cleared up and removed	Any local spillage of localised solid wastes immediately cleared up and contained.	None
Uncontrolled releases of hazardous liquids	Spillage and leakage of oils and chemicals during maintenance	Localised containment of liquid wastes within bunded / secondary	Any local spillage will be contained in the infrastructure of the Site and not released to the environment. Leakages	None – No releases will occur. The storage of all hazardous liquids are

Source	Nature of Release	Nature of potential impact	Control Measure	Potential for environmental effect
		containment or drainage systems	into the surface water drainage systems can be isolated and contained and removed from Site. In accordance with the Permit, all liquids in containers, whose emission to water or land could cause pollution, shall be provided with secondary containment (unless the Operator has used other appropriate measures to prevent or where that is not practicable, to minimise, leakage and spillage from the primary container).	within dedicated sealed and contained areas with no potential for off-Site release.

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