BAT Assessment
WEPA UK Ltd, Bridgend Paper Mill, Llangynwyd, Bridgend, CF34 9RS (Permit Ref. EPR/EP3738NG)

On behalf of:
WEPA UK Ltd

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Contents

Figures

Tables

Photographs

Annexe A: Supporting Information

Annexe B: BATC Assessment - Production of Pulp, Paper and Board

Abbreviations

BAT	Best Available Technology
BATc	BAT Conclusions
BATNEEC	Best Available Techniques Not Entailing Excessive Costs
BIS	British Industry Supercharger
BREF	BAT reference documents
CFD	Contracts for Difference
CHP	Combined Heat and Power
EA	Environment Agency
EU	European Union
EAME	Earth & Marine Environmental Consultants Ltd
EEI	Energy Intensive Industries
ELV	Emission Limit Value
EPR	Environmental Permit
ETP	Effluent Treatment Plant
FIT	Feed in Tariff
GT	Gas Turbine
HRSG	Heat recovery steam generator
IED	Industrial Emissions Directive
IPC	Integrated Pollution Control
IPPC	Integrated Pollution Prevention and Control
LAPC	Local Air Pollution Control
LoW	List of Waste
MCPD	Medium Combustion Plant Directive

MW	Megawatt
NGR	National Grid Reference
NMVOC	Non-methane volatile organic compound
NRW	Natural Resources Wales
PPA	Power Purchase Agreement
REGO	Renewable Energy Guarantees of Origin
RO	Renewables Obligation
SAC	Special Area of Conservation
SBTi	Science Based Targets initiative

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1 Introduction

1.1 Background

This document has been prepared by WEPA UK Ltd ("WEPA") and its environmental consultant Earth & Marine Environmental Consultants Ltd ("EAME") in support of a bespoke permit variation application as required by the *Environmental Permitting (England and Wales) Regulations 2016* concerning current and proposed activities to be undertaken at the WEPA UK Ltd, Bridgend Paper Mill, Llangynwyd, Bridgend, CF34 9RS (the "Site").

1.2 Best Available Technology (BAT)

The EU's Industrial Emissions Directive (IED) takes an integrated approach to controlling pollution to air, water and land, and sets challenging industry standards for the most polluting industries. The IED aims to prevent and reduce harmful industrial emissions while promoting the use of techniques that reduce pollutant emissions and that are energy and resource-efficient.

BAT means the available techniques which are the best for preventing or minimising emissions and impacts on the environment. 'Techniques' include both the technology used and the way the installation is designed, built, maintained, operated and decommissioned.

BAT reference documents (BREFs) include BAT Conclusions (BATc) that contain emission limits associated with BAT, which must not be exceeded unless agreed by the relevant competent authority.

1.3 BAT Post EU Withdrawal

The UK is committed to maintaining environmental standards and continues to apply the existing successful model of integrated pollution control. The *EU Withdrawal Act 2018* maintains established environmental principles and ensures that existing EU environmental law will continue to have effect in UK law, including the IED and BAT Conclusion Implementing Decision made under it.

The UK government has introduced secondary legislation under the *EU Withdrawal Act 2018*, and further legislation in the devolved administrations where required, to ensure the domestic legislation that implements the IED (including the Transitional National Plan) can continue to operate.

The UK government has made secondary legislation to ensure the existing BAT Conclusions continue to have effect in the UK, to provide powers to adopt future BAT Conclusions in the UK and to ensure the devolved administrations maintain powers to determine BAT through their regulatory regimes.

The UK government will put in place a process for determining future UK BAT Conclusions for industrial emissions. This will be developed with the devolved administrations and competent authorities across the UK.

As of May 2024, no UK BAT Conclusions have been published.

1.4 BAT Guidance

The following BAT Guidance has been utilised/referenced within this report.

1.4.1 Production of Pulp, Paper and Board

- European Commission (2015). Best Available Techniques (BAT) Reference Document for the Production of Pulp, Paper and Board, Joint Research Centre Institute for Prospective Technological Studies (European Commission, 2015)

- European Commission (2014). 2014/687/EU: Commission Implementing Decision of 26 September 2014 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for the production of pulp, paper and board (notified under document C(2014) 6750) (European Commission, 2014)

1.4.2 Energy Efficiency

- European Commission (2021). Reference Document on Best Available Techniques for Energy Efficiency, February 2009, corrected version as of 09/2021 (European Commission, 2021)

Given the proposed process change outlined in *Section 2.2* reference has been made to the production of pulp, paper and board guidance (BREF/BATc) and the general energy efficiency guidance (BREF). WEPA appreciates that the current Combined Heat and Power (CHP) activity is listed as a standalone Part A(1) activity within Schedule 1 of the environmental permit but the activity is closely linked to the main Part A(1) activity i.e. the paper mill and converting facility.

2 Permitted Installation

2.1 Current Situation

WEPA UK Ltd operates a paper mill and converting facility, a Combined Heat and Power Plant (CHP) and an effluent treatment plant (ETP) at Llangynwyd in the Llynfi Valley in South Wales approximately 5km south of Maesteg and 10 km north of Bridgend. Situated in a semi-rural location, papermaking at the installation has been established since 1950. The installation is situated adjacent to the River Llynfi and the Nant Gwyn stream also runs through the site. The nearest area of designated sensitive habitat is the Merthyr Mawr Warren Special Area of Conservation (SAC) which is located approximately 6km south of the installation.

The installation is not deemed to have an impact on this site.

The mill uses virgin wood-pulp and broke (paper trimmings and scrap) as raw materials in the production of a range of hygienic paper tissue products. The mill operates two paper machines with its stock preparation and converting lines. The capacity of the installation is approximately 125,000 tonnes of paper product per annum.

Virgin fibre and broke are independently processed through low-consistency pulpers, which are designed to disperse the fibres in water and produce stock. Each stock line is then passed through basic cleaning systems before being mixed and fed to the paper machine. The ratio of virgin pulp to broke is strictly controlled to achieve specific product quality requirements. The mixed paper stock is fed to the papermaking machine which is designed to continuously produce a cohesive web of fibre, forming a wet sheet of paper tissue. Once the initial wet sheet is formed the paper is passed through the drying section which is made up of a series of steam heated cylinders to dry the paper. At the end of the drying process, the continuous paper sheet is wound onto a reel. When the reel is full the sheet is spliced onto the next reel so that continuous paper production is achieved without stopping to change from one reel to the next.

The installation includes a CHP Plant with a net thermal input of less than 50MW which supplies the entire steam demand of the papermaking operation and approximately 50% of the electrical power of the mill. When the CHP is aggregated with the paper machine hood burner rating it becomes a Part A(1) combustion activity. The CHP plant is natural gas-fired with the capacity for supplementary gas oil firing. The plant comprises two Gas turbines with a single 37m stack and a shell boiler with a 30m stack.

The plant has been operational since 1995 and is now operated by WEPA UK Ltd. The permit was transferred from SCA Hygiene Products Tissue Limited to WEPA UK Ltd

(formerly Northwood and Wepa Limited) on 18th June 2013. Emissions to air are strictly controlled, including particulates and oxides of carbon, sulphur and nitrogen.

2.2 Proposed Variation Application

This permit variation application proposes the following changes to the current permitted installation:

- **Installation** of two new gas-fired boilers within a standalone boiler house with associated fuel supply and stacks (within a shared/combined windshield).
- **Removal** of the existing Combined Heat and Power (CHP) unit and associated stacks (emission points A1 and A2). The units will be decommissioned and removed once the new gas-fired boiler house is commissioned.
- **Addition** of four specific (non-hazardous) List of Waste (LoW) Codes (03 03 08 – wastes from sorting of paper and cardboard destined for recycling, 15 01 01 – paper and cardboard packaging, 19 12 01 – paper and cardboard and 20 01 01 – paper and cardboard) to allow the receipt, storage, and processing of wastepaper within the existing processes. This change is not considered in this report.

The proposed variation application does not require any additional land and/or change to the existing permit boundary.

3 Boiler BAT Assessment

3.1 Introduction

There are three main reasons for the proposed process change from CHP to gas-fired boilers.

3.1.1 Age of the CHP

The existing CHP was planned in 1993 under planning permission P/93/1116/FUL (Cogeneration Scheme Comprising 2 Gas Turbines, 2 Fired Boilers, 2 Stacks of 37 metres[1]. and Ancillary Plant, 0.2 Ha.) and installed in 1995. Therefore, the installation and associated equipment (and technology) are at least 29 years old.

The installation therefore predates the 2010 Industrial Emissions Directive (IED) and the 1996 (revised in 2008) Integrated Pollution Prevention and Control (IPPC) Directive. The activity was first assessed under Part I of the *Environmental Protection Act 1990* (i.e. under the Integrated Pollution Control (IPC) regime and Local Air Pollution Control (LAPC) regimes.

The change from EPA 1990 to IPPC also changed the requirement/standard from Best Available Techniques Not Entailing Excessive Costs (BATNEEC) to Best Available Techniques (BAT).

The condition and reliability of the existing system have become an issue for the business as evidenced by the high-voltage breaker power supply failure in 2023 that resulted in catastrophic damage to GT2 when grid power fed back through the breaker after a power outage tripped the CHP.

WEPA needs to secure the energy supply for the mill for mid and long-term, with a view to the current condition of the existing equipment reducing the risk of catastrophic failure on the CHP plant and auxiliary components.

3.1.2 Environmental Performance of the Existing CHP

In part due to its age and technology, it has become clear (both internally within WEPA and during NRW discussions) that the performance of the ageing CHP did not meet current BAT emission standards as outlined with the current BREF/BATc guidance.

1 This is an error on the planning portal, it should be 1 x 37m stack for gas turbines and 1 x 30m for the shell boiler.

A selection of comments from NRW compliance reports is outlined in **Table *3-1***.

Table 3-1: *NRW Compliance reports*

Ref.	Date	NRW Comments
CAR_NRW0037135	13/11/2020	Current 250 mg NOx/m^3 ELVs are well above the expected emissions performance for a CHP. A BAT review of the CHP needs to be undertaken as emissions are currently well above NOx BAT levels associated with available techniques (wet or dry NOx control). WEPA should also note that the CHP boiler should also be subject to a BAT review for NOx emissions, with indicative BAT in the region of 100-110 mg/m^3.
CAR_NRW0039397	31/12/2021	Wet NOx control is 90% complete with pure water supply installed and commissioning of thesystem expected shortly.
CAR_NRW0043493	31/12/2023	A high-voltage breaker power supply failure due to inadvertent isolation of the battery charging system supply has resulted in catastrophic damage to GT2 when grid power fed back through the breaker after a power outage tripped the CHP. Consequently, GT2 wet NOx control upgrade will not be completed, and the only compatible replacement hire GT could not be retrofitted with wet NOx control. A new standalone GT/HRSG unit was to be procured with dry low NOx technology and have 20% hydrogen capability. However, following the implementation of the UK Government British Industry Supercharger(BIS) scheme WEPA now proposes to install new package boilers replacing the CHP, which will be decommissioned.

The environmental performance of the ageing CHP is an issue that needs to be rectified.

3.1.3 Prevailing Market and Legislative Conditions

On 1st April 2024, the Department for Business and Trade officially launched the British Industry Supercharger (BIS) scheme. This initiative aims to not only lower operational costs for key Energy Intensive Industries (EII) in the UK, but also align with international market conditions.

The BIS, which is expected to be worth between £320 million and £410 million in total savings to heavy industry businesses next year, aims to bring energy costs for key industries in line with other major economies, thereby levelling the playing field for UK businesses. Industries set to benefit from the scheme include steel, metals, chemicals, cement, glass, and paper.

The BIS has introduced three new schemes:

- **Energy Intensive Industries (EII) Renewable Levy Exemption Scheme** – this will waive costs for eligible firms related to renewable energy policies, including Feed in Tariff (FIT), Contracts for Difference (CFD) and Renewables Obligation (RO). The result is an increase in the subsidy under the existing EII Renewable Levy Exemption scheme from 85% to 100% aid intensity (Department for Business & Trade, 2024). This was implemented from 1st April 2024.

- **Capacity Market Charges Exemption** – A new, full (100 %) indirect exemption from the costs associated with the GB Capacity Market. This was implemented from 1st April 2024.

- **Network Charging Compensation Scheme** – There will also be a 60% reduction in network charges, defined as the costs industrial users pay for their electricity supply. The Department of Business and Trade believes that this scheme will save eligible companies around £14/MWh on their electricity bills. This will be funded by a levy on all licensed GB electricity suppliers known as the EII Support Levy. Through this, each supplier will be charged with a specific levy rate for a set duration, generating funds used to reimburse EIIs for a portion of their expenses. To calculate the necessary funds that need to be raised via the levy, EIIs will have to provide evidence of the acquired network charges. This is to be implemented from 1st April 2025.

According to the UK Government, this is the average estimated saving and will mean a British energy-intensive business ends up paying about the same in electricity costs as its competitors in countries in the EU (Department for Business and Trade, 2024).

It is important to note that the BIS scheme did not consider during any of the consultation processes the relationship between the proposed measures, EEIs and the fact that many of these organisations are captured and operate under *Environmental Permitting (England and Wales) Regulations 2016* and hence are required to meet the BAT standard.

3.2 BAT Standard

The first stage in the process is to define the current relevant BAT standards relevant to the activity.

The BATc guidance for the production of pulp, paper, and board (European Commission, 2014) outlines the following BAT standards concerning energy consumption and efficiency.

BAT 6 – In order to reduce fuel and energy consumption in pulp and paper mills, BAT is to use technique (a) and a combination of the other techniques given below.

(a) Use an energy management system that includes all of the following features: (i) Assessment of the mill's overall energy consumption and production; (ii) Locating, quantifying and optimising the potentials for energy recovery; (iii) Monitoring and safeguarding the optimised situation for energy consumption [Generally applicable].

(c) Cover the steam and power demand of the production processes as far as possible by the cogeneration of heat and power (CHP). [Applicable for all new plants and for major refurbishments of the energy plant. Applicability in existing plants may be limited due to the mill layout and available space].

The BATc standard provides the following description:

Technique (c): Simultaneous generation of heat and electrical and/or mechanical energy in a single process, referred to as a combined heat and power plant (CHP). CHP plants in the pulp and paper industry normally apply steam turbines and/or gas turbines. The economic viability (achievable savings and payback time) will depend mainly on the cost of electricity and fuels.

It is important to note that the BATc guidance has not been revised and updated since 2014.

3.3 Carbon intensity

Carbon intensity is a measure of how clean electricity is. It refers to how many grams of carbon dioxide (CO_2) are released to produce a kilowatt hour (kWh) of electricity. Electricity that's generated using fossil fuels is more carbon intensive, as the process by which it's generated creates CO_2 emissions. Renewable energy sources, such as wind, hydro or solar power, produce next to no CO_2 emissions, so their carbon intensity value is much lower and often zero.

As part of the WEPA Operational Efficiency Programme, WEPA wants to become climate neutral by 2040 and has set a 1.5°C compatible target by 2030 at the Science Based Targets initiative (SBTi) (Science Based Targets Initiative, 2024). This target provides for a reduction of -52,5 % CO_2eq by 2030 in Scopes 1, 2 and 3. WEPA's climate targets are flanked by continuous efficiency improvements and the increasing use of renewable energies.

As part of the WEPA investment process decisions are evaluated through a mandatory sustainability assessment that considers carbon emissions. A summary of the process is provided in **Annexe A** and is summarised below (**Table *3-2***).

Table 3-2: *Carbon assessment or process change*

Item	Current CHP	Proposed Boilers	Information
Gas used in current CHP	272,578 MWh/a	-272,578 MWh/a	Gas saved after CHP removal.
Steam from HRSG	130,528 MWh/a	137,979 MWh/a	Additional gas is required for steam generation compared to the current situation.
Grid import power	71, 462 MWh/a	136, 186 MWh/a	Additional grid imports due to the removal of the CHP generation.
Scope 1 Gas	62,611 CO2 t/a	38,249 CO_2 t/a	
Scope 2 Electricity	14,507 CO2 t/a	27,646 CO_2 t/a	
Total	**77,118 CO2 t/a**	**65,894 CO_2 t/a**	

The proposed switch from the CHP to the new boilers equates to a saving of 11,223 CO_2 t/a, this is a 15% reduction from the current operational baseline.

In addition to the proposed boiler installation, WEPA is actively discussing a Power Purchase Agreement (PPA) with RWE for the supply of 100% renewable energy ensuring Renewable Energy Guarantees of Origin (REGO). The aspiration is to achieve a baseload PPA agreement for renewable green electricity in FY2024. Once implemented this would further reduce the carbon emissions by 27,646 CO_2 t/a which is a further 36% reduction from the current operational baseline.

WEPA is considering various joint venture proposals for a solar implementation project (12 MW). There is no agreed implementation date, but the aspiration is FY2027. This

would save a further 2,519 CO_2 t/a which equates to a further 3% reduction from the current operational baseline.

This switch from fossil fuels to renewables within the UK energy market has been significant since the BATc guidance was issued in 2014. Between 2014 and 2022 the generation of electricity from renewable sources has increased 109 % (**Figure *3-1***).

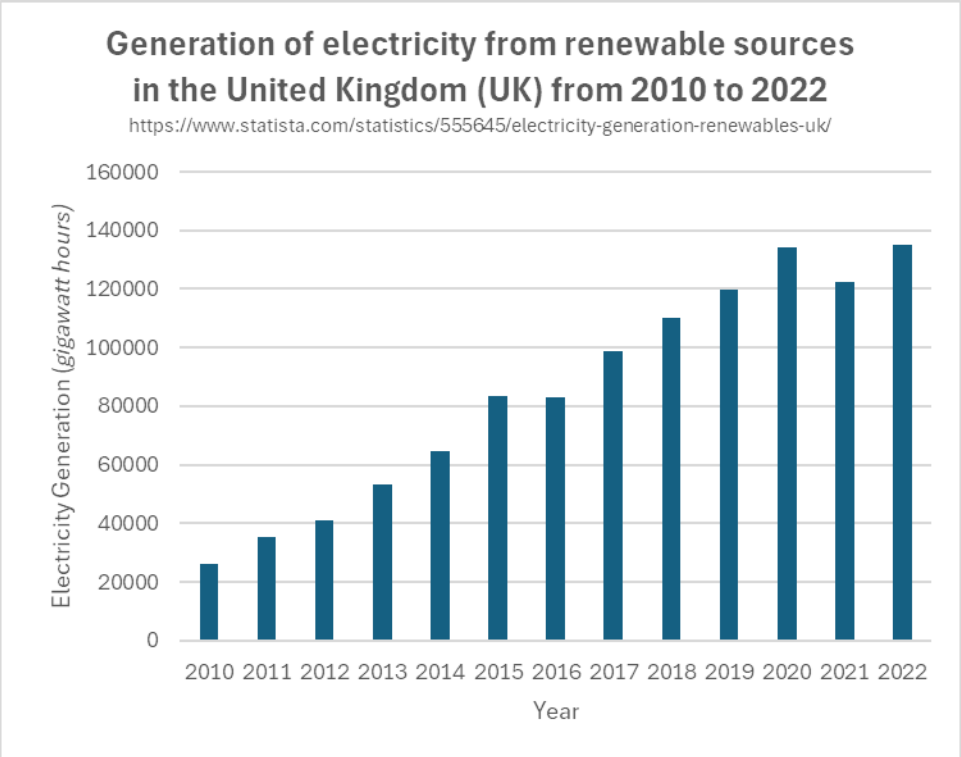

Figure 3-1: *UK renewable generation rates (2010 - 2022)*

Summary: There are clear carbon reduction benefits from switching to the proposed boilers (for steam generation only) especially when combined with the imminent 100% supply of REGO electricity. The reduction in fossil fuel use aligns with the company's sustainability commitments and the UK Government's Net Zero goal of 2050 implemented through the *Climate Change Act 2008*.

3.4 Air quality

In 2020 the WEPA CHP emissions of NOx were in the region of 250 mg/Nm^3 i.e. well above the required Emission Limit Value (ELV) and well above the expected performance for a CHP.

The proposed new boilers will meet the Medium Combustion Plant Directive (MCPD) (Official Journal of the European Union, 2015) requirement of 100 mg/Nm^3 NOx (natural gas). The fall in emissions represents a significant reduction in annual emissions.

Short-term exposure to concentrations of NO_2 can cause inflammation of the airways and increase susceptibility to respiratory infections and allergens. NO_2 can exacerbate the symptoms of those already suffering from lung or heart conditions. In addition, NOx can have environmental impacts. Deposition of nitrogen to the environment both directly as a gas (dry deposition) and in precipitation (wet deposition) can change soil chemistry and affect biodiversity in sensitive habitats.

NOx can react with other air pollutants e.g. Non-methane volatile organic compounds (NMVOCs) to form ground-level ozone. Ozone is a gas which is damaging to human health and can trigger inflammation of the respiratory tract, eyes, nose and throat, as well as asthma attacks. Ozone can also have adverse effects on the environment through oxidative damage to vegetation including crops.

Summary: The replacement of the ageing CHP will lead to a significant reduction in NOx emissions. The ADMS 6.0 dispersion model has been used to predict ground-level concentrations of the oxide of nitrogen (NOx) and nitrogen dioxide (NO_2) released into the atmosphere from the proposed new boilers. The principal conclusion of this assessment is that emissions to the atmosphere at their emission limits from the proposed two new boilers give rise to predicted ground-level pollutant concentrations (process contributions, PC) that are not of concern to human health or ecosystems. The impacts are predicted to be insignificant.

3.5 Economics (CHP versus a Gas Boiler)

The capital cost of any CHP plant depends on its size and type. However, several issues should be considered concerning costs:

- In general, a CHP plant is more efficient than a simple power plant when the heat output is used effectively.
- Where CHP power generation produces heat that subsequently remains unused, the plant is effectively operating in the open cycle mode and therefore, probably, at a lower efficiency than the competing external power station.
- The plant will operate at its greatest energy efficiency, thereby maximising savings, when it is maintained as close as possible to its maximum load i.e. if all the output is used.

- As the size of a CHP plant increases, capital and installation costs, expressed as £/kW, fall. The maintenance of CHP units is more expensive than conventional boilers. Careful assessment and consideration of maintenance costs are essential when calculating savings, as they can amount to 30% or more of the gross cost savings from CHP operation.

- Although a plant sized to meet maximum electrical demand will produce the greatest savings in purchased electricity, it may end up operating at part load – and thus less efficiently and economically – for a greater part of the time.

- Energy Intensive Industries (EII) Renewable Levy Exemption Scheme – this will waive costs for eligible firms related to renewable energy policies, including Feed in Tariff (FIT), Contracts for Difference (CFD) and Renewables Obligation (RO). The result is an increase in the subsidy under the existing EII Renewable Levy Exemption scheme from 85% to 100% aid intensity. This was implemented from 1st April 2024.

Summary: The introduction of the BIS, which is expected to be worth between £320 million and £410 million in total savings to heavy industry businesses next year, aims to bring energy costs for key industries in line with other major economies, thereby levelling the playing field for UK businesses. This scheme fundamentally alters the financial considerations when comparing CHP and a standard boiler installation.

3.6 Hydrogen Economy

The UK Government committed to a Hydrogen Net Zero Investment Roadmap in 2023 (updated in February 2024) (Department for Energy Security & Net Zero, 2024). In December 2023, the UK Government announced the largest number of commercial-scale green hydrogen production projects at once anywhere in Europe, awarding support to projects representing 125MW of production capacity through the first Hydrogen Allocation Round (HAR1). At the same time, it opened the second Hydrogen Allocation Round (HAR2) with a capacity aim of up to 875MW.

Locally in Wales H2 Energy Europe, a developer of large-scale green hydrogen eco-systems, announced in December 2023 the award of Government funding for its 20MW electrolytic hydrogen production facility at the port of Milford Haven, the first of its kind in South Wales. The UK aims to establish up to 10GW of low-carbon hydrogen production by 2030, with at least half of production anticipated to come from electrolytic hydrogen, drawing on the scale-up of UK offshore wind, other renewables and nuclear energy (H2 Energy, 2024).

In addition, Sofidel in South Wales, has stated that it will replace 50% of their current (natural) gas boiler consumption with hydrogen at their Port Talbot paper mill.

WEPA has selected replacement boilers that are hydrogen ready. The boilers have been sized big enough for 60% hydrogen use without any changes to the burners or boiler design. WEPA appreciates that there are c. 10% output loss when firing on hydrogen, however, even at 90% output the boilers will produce enough for WEPA's current and predicted demand.

Summary: The selection of hydrogen-ready equipment will allow WEPA to be flexible within future energy markets whilst allowing the Company to meet its sustainability commitments and contribute to the UK Government's Net Zero goal of 2050.

3.7 Conclusions

The BATc guidance for the production of pulp, paper, and board (European Commission, 2014) is clear that In order to reduce fuel and energy consumption in pulp and paper mills, BAT is to cover the steam and power demand of the production processes as far as possible by the cogeneration of heat and power (CHP).

However, since the introduction of the BATc guidance in 2014 there have been several drivers, both economic and environmental, that means CHP may not be the best environmental option (for WEPA) in 2024. Justifications for the deviation from BAT include:

- **Carbon Intensity** – There are clear carbon reduction benefits from switching to the proposed boilers (for steam generation only) especially when combined with the imminent 100% supply of REGO electricity. The reduction in fossil fuel use aligns with the company's sustainability commitments and the UK Government's Net Zero goal of 2050 implemented through the *Climate Change Act 2008*.

- **Air Quality** – The replacement of the ageing CHP will lead to a significant reduction in NOx emissions. The ADMS 6.0 dispersion model has been used to predict ground-level concentrations of the oxide of nitrogen (NOx) and nitrogen dioxide (NO2) released into the atmosphere from the proposed new boilers. The principal conclusion of this assessment is that emissions to the atmosphere at their emission limits from the proposed two new boilers give rise to predicted ground-level pollutant concentrations (process contributions, PC) that are not of concern to human health or ecosystems. The impacts are predicted to be insignificant.

- **Economics** – The introduction of the BIS, which is expected to be worth between £320 million and £410 million in total savings to heavy industry businesses next year, aims to bring energy costs for key industries in line with other major economies, thereby levelling the playing field for UK businesses. This scheme fundamentally alters the financial considerations when comparing CHP (the 2014 BAT Standard) and a standard natural gas fired boiler installation.

- **Future Fuels** – The selection of hydrogen-ready equipment will allow WEPA to be flexible within future energy markets whilst allowing the Company to meet its sustainability commitments and contribute to the UK Government's Net Zero goal of 2050.

4 Waste Paper BAT Assessment

4.1 Introduction

The addition of the four non-hazardous waste codes (03 03 08, 15 01 01, 19 12 01 and 20 01 01) in the environmental permit will allow the WEPA facility to:

- accepted specific specified waste materials on to site;
- store specified waste materials on the site (within designated areas); and
- allow the use of the specified materials within the existing permitted processes.

4.2 BAT Standard

The first stage in the process is to define the current relevant BAT standards relevant to the proposed activity.

The BATc guidance for the production of pulp, paper, and board (European Commission, 2014) outlines the following BAT standards concerning energy consumption and efficiency.

BAT 12. In order to reduce the quantities of wastes sent for disposal, BAT is to implement a waste assessment (including waste inventories) and management system, so as to facilitate waste reuse, or failing that, waste recycling, or failing that, 'other recovery', including a combination of the techniques given below.

(a) Separate collection of different waste fractions (including separation and classification of hazardous waste).

(b) Merging of suitable fractions of residues to obtain mixtures that can be better utilised.

(c) Pretreatment of process residues before reuse or recycling.

(d) Material recovery and recycling of process residues on site.

(e) Energy recovery on- or off-site from wastes with high organic content.

(f) External material utilisation.

(g) Pretreatment of waste before disposal.

BAT 52. In order to minimise the amount of solid waste to be disposed of, BAT is to prevent waste generation and to carry out recycling operations by the use of a combination of the techniques given below (see general BAT 20).

(a) Fibre and filler recovery and treatment of white water

(b) Broke recirculation system

(c) Recovery of coating colours/recycling of pigments

(d) Reuse of fibre sludge from primary wastewater treatment

The description for part (b) is Broke from different locations/phases of paper making process is collected, repulped and returned to the fibre feedstock.

4.3 Internal Use of Broke

The facility already complies with BAT 12(c) and BAT 52 (b) using an internal broke recirculation system that captures, treats and recycles broke back into the paper manufacturing process (**Photograph *4-1***).

Photograph 4-1: *External broke collection and processing system*

This process of capture, treatment and recycling occurs throughout the process **Photograph *4-2*** and **Photograph *4-3*** and at multiple stages.

Photograph 4-2: *Broke capture and recycling*

Photograph 4-3: *Broke capture and baling*

4.4 External Use of Broke

The proposed variation requests the addition of externally derived broke as an input into the system. Given the nature of the proposed materials (i.e. they align with the internal required standards) the materials can be used directly as an input material.

The proposed handling and storage of the materials is outlined within the Fire Prevention Management Plan (FPMP) (Ref. **023-1944 WEPA UK Ltd FPMP REV00**) that is aligned to NRW guidance (NRW, 2017), the BAT standard.

4.4.1 Waste Framework Directive

Although the UK left the EU in 2020 the principles of the Waste Framework Directive (WFD) (European Parliament and of the Council, 2008) are fully embedded within the UKs waste management systems including the waste hierarchy (**Figure *4-1***).

Figure 4-1: *Waste hierarchy*

The foundation of waste management is the five-step waste hierarchy, established in the WFD that establishes an order of preference for managing and disposing of waste. The proposed import and use of broke aligns with the requirements of the WFD and the current underlying waste management legislation currently operating in the UK.

4.4.2 Circular Economy in Wales

A circular economy keeps resources and materials in use for as long as possible and avoids all waste. This will mean moving away from a 'linear economy' which assumes a constant supply of natural resources, or the take-make-use-dispose culture based on the extraction of resources, the production of goods and services, and the disposal of post-consumer waste.

The topic of sustainability cannot be thought through without the circular economy principle. Conserving valuable resources through long and efficient use and using them

as sustainably as possible is what circular economy means to WEPA. This is an essential part of WEPA's 4+1 Sustainability Strategy (**Figure *4-2***).

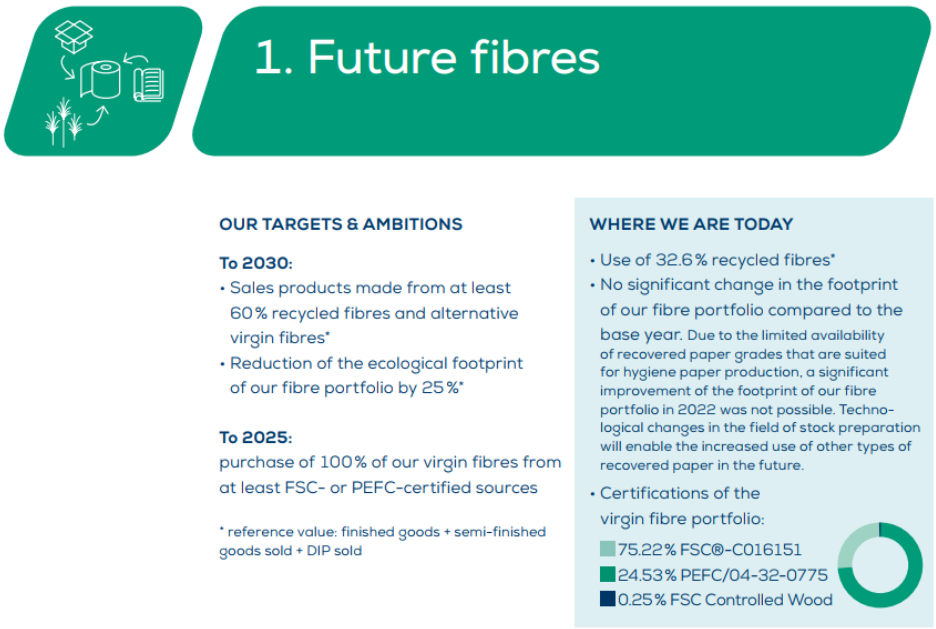

Figure 4-2: *Targets from WEPA Sustainability Report 2022*

In doing this the company looks at the entire process: from the purchase of fibres and production and packaging of our products to recycling and disposal. WEPA is guided by the idea of the cycle in all process steps and driven to rethink our processes. It is also particularly important to us to close raw material cycles and to use existing ones in a more environmentally friendly way considering the entire life cycle of the raw materials. As part of this we consistently rely on the cascade use of raw materials.

4.5 Conclusions

The internal and external use of suitable broke material streams is fully compliant with the BAT requirements and the wider societal drive to improve sustainability.

Annexe A: Supporting Information

Annexe A - Carbon Assessment

Switch from CHP to Natural Gas Boilers

			Units	Data Source
T60 GT Efficiency	Exhaust Temperature after GT	510	°C	WEPA Internal Systems
	Specific heat capacity air	1.221	kJ/(kg K)	WEPA Calculation
		0.34	kWh/(t K)	WEPA Calculation
	Exhaust mass flow to HRSG	77.5	t/h	WEPA Internal Systems
		21.5	kg/s	WEPA Internal Systems
	Temperature level after HRSG and Economiser to CHP stack	180.0	°C	WEPA Internal Systems
	Steam production	8,672	kW	WEPA Internal Systems
		13.7		WEPA Internal Systems
	Power generation	4,300	kW	WEPA Internal Systems
	Electric efficiency	23.7%	%	WEPA Internal Systems
	Gas demand	18,109	kW	WEPA Internal Systems
	Thermal efficiency	47.9%	%	WEPA Internal Systems
	Total efficiency	71.6%	%	WEPA Internal Systems

			Units	Data Source
Input data	On site CHP power generation	64,724	MWh/a	WEPA Internal - IBPV02 12M
	Grid import power	71,462	MWh/a	WEPA Internal - IBPV02 12M
	Total gas consumption	345,917	MWh/a	WEPA Internal - IBPV02 12M
	Solar generation with 12 MWp plant	12,410	MWh/a	Supplier's yield prognosis
	CHP electric efficiency	23.7%	%	Local energy management
	CHP thermal efficiency	47.9%	%	Local energy management
	Boiler efficiency	94.60%	%	Permanent boiler (worst case)
	Scope 1 CO2 factor gas 2024	0.181	t/MWh	Group sustainability system
	Scope 2 CO2 factor grid electricity 2024	0.203	tCO2eq/MWh	Group sustainability system

(Specific electricity emission factor WEPA group)

		Current CHP	Proposed Boilers	Units	Information
Assessment	Gas used in CHP	272,578	-272,578	MWh/a	Proposed = Gas saved after CHP closure
	Steam from HRSG	130,528	137,979	MWh/a	Proposed = Additional gas for steam generation
	Grid Import Power	71,462	136,186	MWh/a	Proposed = Includes additional grid import

Results	**Scope 1 from Gas**	62,611	38,249	CO2 t/a
	Scope 2 from Electricity	14,507	27,646	CO2 t/a
	Total CO2 (Scope 1 and Scope 2)	**77,118**	**65,894**	CO2 t/a

	Year			% Change in CO2 Emissions (Current Situation)
CO2 Savings after CHP shutdown	2024	11,223	t/a	**-15%**
CO2 Savings from 100% green grid electricity (REGO based)	2024 #1	27,646	t/a	**-36%**
CO2 Savings from 12 MWp solar project	2027 #2	2,519	t/a	**-3%**

Notes:

#1 - WEPA is currently in discussion with RWE regarding a 100% Renewable Energy Guarantees of Origin (REGO) Power Purchase Agreement (PPA). The aspiration is to achieve a baseload PPA agreement for renewable green electricity in FY2024.

#2 - WEPA is considering various joint venture proposals for a solar implementation project (12 MW). There is no agreed implementation date but the aspriration is FY2027.

Annexe B: BATC Assessment - Production of Pulp, Paper and Board

Annexe B: *Establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for the production of pulp, paper and board (2014/687/EU)*

Ref.	BAT Conclusions	Compliance with BAT conclusions
1.1.1	**Environmental Management System** BAT 1. In order to improve the overall environmental performance of plants for the production of pulp, paper and board, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features: a. commitment of the management, including senior management; b. definition of an environmental policy that includes the continuous improvement of the installation by the management; c. planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment; d. implementation of procedures paying particular attention to: i. structure and responsibility ii. training, awareness and competence iii. communication iv. employee involvement v. documentation vi. efficient process control vii. maintenance programmes	The WEPA Mill operates an Environmental Management System (EMS) which is fully integrated throughout the installation and certified to ISO14001: 2015. The Operator will update its existing EMS, in accordance with ISO14001, to include all new plant and equipment. General techniques to reduce environmental risks are described in the main installation report. **Compliance with BAT is Maintained.**

Ref.	BAT Conclusions	Compliance with BAT conclusions
	viii. emergency preparedness and response ix. safeguarding compliance with environmental legislation e. checking performance and taking corrective action, paying particular attention to: i. monitoring and measurement (see also the Reference Document on the General Principles of Monitoring) ii. corrective and preventive action iii. maintenance of records iv. independent (where practicable) internal and external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; f. review of the EMS and its continuing suitability, adequacy and effectiveness by senior management; g. following the development of cleaner technologies; h. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life; i. application of sectoral benchmarking on a regular basis.	
1.1.2	**Materials management and good housekeeping** BAT 2. BAT is to apply the principles of good housekeeping for minimising the environmental impact of the production process by using a combination of the techniques given below.	Locations of storage tanks and containment measures for (process) chemicals are outlined in the Main Installation Report. The Management Techniques are described in the Main Installation Report. Good housekeeping will ensure that

Ref.	BAT Conclusions	Compliance with BAT conclusions
	a. Careful selection and control of chemicals and additives b. Input-output analysis with a chemical inventory, including quantities and toxicological properties c. Minimise the use of chemicals to the minimum level required by the quality specifications of the final product d. Avoid the use of harmful substances (e.g. nonylphenol ethoxylate-containing dispersion or cleaning agents or surfactants) and substitution by less harmful alternatives e. Minimise the input of substances into the soil by leakage, aerial deposition and the inappropriate storage of raw materials, products or residues f. Establish a spill management programme and extend the containment of relevant sources, thus preventing the contamination of soil and groundwater g. Proper design of the piping and storage systems to keep the surfaces clean and to reduce the need for washing and cleaning	environmental risks are reduced (as far as is reasonably practicable). Safety Data Sheets are provided for the new water treatment chemicals (associated with the boilers). **Compliance with BAT is Maintained.**
1.1.2	BAT 3.	Not applicable
1.1.3	BAT 4.	Not applicable
1.1.3	BAT 5. In order to reduce freshwater use and generation of wastewater, BAT is to close the water system to the degree technically feasible in line with the pulp and paper grade manufactured by using a combination of the techniques given below. a. Monitoring and optimising water usage b. Evaluation of water recirculation options	All waste and process water will be reused in the process (where possible). Excess wastewater from these sources will be discharged to the Effluent Treatment Plant. No increase in production will result due to the proposed process change.

Ref.	BAT Conclusions	Compliance with BAT conclusions
	c. Balancing the degree of closure of water circuits and potential drawbacks; adding additional equipment if necessary d. Separation of less contaminated sealing water from pumps for vacuum generation and reuse e. Separation of clean cooling water from contaminated process water and reuse f. Reusing process water to substitute for fresh water (water recirculation and closing of water loops) g. In-line treatment of (parts of) process water to improve water quality to allow for recirculation or reuse The BAT-associated wastewater flow at the point of discharge after wastewater treatment as yearly averages are: 1.5 – 10 m^3 / t for RCF paper mills without deinking.	The existing permit allowances and the current on-site effluent treatment plant has sufficient capacity to receive and treat the projected flows. The existing Effluent Treatment Plant is compliant with BAT. During the previous permit application (Neptune) the wastewater discharge was 4.4 m^3 / t. **Compliance with BAT is Maintained.**
1.1.4	**Energy consumption and efficiency** BAT 6. In order to reduce fuel and energy consumption in pulp and paper mills, BAT is to use technique (a) and a combination of the techniques given below. a. Use an energy management system that includes all of the following features: i. Assessment of the mill's overall energy consumption and production ii. Locating, quantifying and optimising the potentials for energy recovery iii. Monitoring and safeguarding the optimised situation for energy consumption b. Recover energy by incinerating those wastes and residues from the production of pulp and paper that have high organic content and calorific value, taking into account BAT 12	Discussion concerning switch from CHP (BAT) to boilers (derogation from BAT) is within the main report. **Compliance with BAT is Achieved.**

Ref.	BAT Conclusions	Compliance with BAT conclusions
	c. Cover the steam and power demand of the production processes as far as possible by the cogeneration of heat and power (CHP) d. Use excess heat for the drying of biomass and sludge, to heat boiler feedwater and process water, to heat buildings, etc. e. Use thermo compressors f. Insulate steam and condensate pipe fittings g. Use energy efficient vacuum systems for dewatering h. Use high efficiency electrical motors, pumps and agitators i. Use frequency inverters for fans, compressors and pumps j. Match steam pressure levels with actual pressure needs	
1.1.5	BAT 7.	Not Applicable
1.1.6	**Monitoring of key process parameters and of emissions to water and air** BAT 8. BAT is to monitor the key process parameters according to the table given below. I. Monitoring key process parameters relevant for emissions to air Pressure, temperature, oxygen, CO and water vapour content in flue-gas for combustion processes (Continuous) II. Monitoring key process parameters relevant for emissions to water Water flow, temperature and pH (Continuous)	Continuous monitoring of the combustion processes will be implemented in-line with BAT. Continuous monitoring of the emissions to water (W1) will continue to be implemented, no changes are required. **Compliance with BAT is Maintained/Achieved.**
1.1.6	BAT 9. BAT is to carry out the monitoring and measurement of emissions to air, as indicated below, on a regular basis with the frequency indicated and according to EN standards. If EN standards are not available, BAT is to use ISO, national or other	The Operator will install suitable automated monitoring systems (AMS) for measurement of NOx at the required air

Ref.	BAT Conclusions	Compliance with BAT conclusions
	international standards which ensure the provision of data of an equivalent scientific quality. a. continuous monitoring of NOx	emission release points. As required, these will hold MCERTS certification. **Compliance with BAT is Maintained/Achieved.**
1.1.6	BAT 10. BAT is to carry out the monitoring of emissions to water, as indicated below, with the indicatedfrequency and according to EN standards. If EN standards are not available, BAT is to use ISO, national orother international standards that ensure the provision of data of an equivalent scientific quality.	No changes have been made to the discharge and its associated characteristics. **Compliance with BAT is Maintained.**
1.1.6	BAT 11.	Not Applicable
1.1.7	**Waste management** BAT 12. In order to reduce the quantities of wastes sent for disposal, BAT is to implement a waste assessment (including waste inventories) and management system, so as to facilitate waste reuse, or failing that, waste recycling, or failing that, 'other recovery', including a combination of the techniques given below. a) Separate collection of different waste fractions (including separation and classification of hazardous waste) b) Merging of suitable fractions of residues to obtain mixtures that can be better utilised c) Pre-treatment of process residues before reuse or recycling d) Material recovery and recycling of process residues on site e) Energy recovery on- or off-site from wastes with high organic content f) External material utilisation g) Pre-treatment of waste before disposal	All waste produced in the installation is closely monitored and disposal routes, including, re-use and recycling, are selected through a process of option appraisal. A waste minimisation program will be used as a systematic approach to minimise the amount of waste and will be integrated into the operation of the plant. A comprehensive system will be used to maintain a record of the quantity, nature, origin, destination, frequency of collection, mode of transport and treatment method of any waste which is disposed of in accordance with the relevant regulations. As part of the EMS waste minimisation audits are carried out routinely. **Compliance with BAT is Maintained.**

Ref.	BAT Conclusions	Compliance with BAT conclusions
1.1.8	BAT 13. In order to reduce nutrient (nitrogen and phosphorus) emissions into receiving waters, BAT is tosubstitute chemical additives with high nitrogen and phosphorus contents by additives containing low nitrogenand phosphorus contents.	No changes to existing systems. **Compliance with BAT is Maintained.**
1.1.8	BAT 14. In order to reduce emissions of pollutants into receiving waters, BAT is to use all of the techniques given below. a) Primary (physico-chemical) treatment b) Secondary (biological) treatment	No changes to existing systems. **Compliance with BAT is Maintained.**
1.1.8	BAT 15.	Not Applicable
1.1.8	BAT 16. In order to reduce emissions of pollutants into receiving waters from biological wastewater treatment plants, BAT is to use all of the techniques given below. a) Proper design and operation of the biological treatment plant b) Regularly controlling the active biomass c) Adjustment of nutrition supply (nitrogen and phosphorus) to the actual need of the active biomass	No changes to existing systems. **Compliance with BAT is Maintained.**
1.1.9	**Emissions of Noise** BAT 17. In order to reduce the emissions of noise from pulp and paper manufacturing, BAT is to use a combination of the techniques given below. a) Noise-reduction programme b) Strategic planning of the location of equipment, units and buildings c) Operational and management techniques in buildings containing noisy equipment	The Operator has carried out a full Noise Impact Assessment. The results show that the predicted noise rating levels are acceptable. **Compliance with BAT is Maintained/Achieved.**

Ref.	BAT Conclusions	Compliance with BAT conclusions
	d) Enclosing noisy equipment and units e) Use of low-noise equipment and noise-reducers on equipment and ducts f) Vibration insulation g) Soundproofing of buildings h) Noise abatement	
1.1.10	BAT 18. In order to prevent pollution risks when decommissioning a plant, BAT is to use the general techniques given below. a) Ensure that underground tanks and piping are either avoided in the design phase or that their location is well known and documented. b) Establish instructions for emptying process equipment, vessels and piping c) Ensure a clean closure when the facility is shut down, e.g. to clean up and rehabilitate the site. Natural soil functions should be safeguarded, if feasible. d) Use a monitoring programme, especially relative to groundwater, in order to detect possible future impacts on site or in neighbouring areas. e) Develop and maintain a site closure or cessation scheme, based on risk analysis, that includes a trans- parent organisation of the shutdown work, taking into account relevant local specific conditions.	Measures for decommissioning are as previously proposed. No changes are required. **Compliance with BAT is Maintained.**
1.2.1	BAT 19.	Not Applicable
1.2.2	BAT 20.	Not Applicable
1.2.2	BAT 21.	Not Applicable

Ref.	BAT Conclusions	Compliance with BAT conclusions
1.2.2	BAT 22.	Not Applicable
1.2.2	BAT 23.	Not Applicable
1.2.2	BAT 24.	Not Applicable
1.2.2	BAT 25	Not Applicable
1.2.2	BAT 26.	Not Applicable
1.2.2	BAT 27.	Not Applicable
1.2.2	BAT 28.	Not Applicable
1.2.2	BAT 29.	Not Applicable
1.2.3	BAT 30.	Not Applicable
1.2.4	BAT 31.	Not Applicable
1.2.4	BAT 32.	Not Applicable
1.3.1	BAT 33.	Not Applicable
1.3.2	BAT 34.	Not Applicable
1.3.2	BAT 35.	Not Applicable
1.3.2	BAT 36.	Not Applicable
1.3.2	BAT 37.	Not Applicable

Ref.	BAT Conclusions	Compliance with BAT conclusions
1.3.3	BAT 38.	Not Applicable
1.3.3	BAT 39.	Not Applicable
1.4.1	BAT 40.	Not Applicable
1.4.2	BAT 41.	Not Applicable
1.5.1	**Materials management** BAT 42. In order to prevent the contamination of soil and groundwater or to reduce the risk thereof and in order to reduce wind drift of paper for recycling and diffuse dust emissions from the paper for recycling yard, BAT is to use one or a combination of the techniques given below. a) Hard surfacing of the storage area for paper for recycling b) Collection of contaminated run-off water from the paper for recycling storage area and treatment in a wastewater treatment plant (uncontaminated rainwater e.g. from roofs can be discharged separately) c) Surrounding the terrain of the paper for recycling yard with fences against wind drift d) Regularly cleaning the storage area and sweeping associated roadways and emptying gully pots to reduce diffuse dust emissions. This reduces wind-blown paper debris, fibres and the crushing of paper by on-site traffic, which can cause additional dust emission, especially in the dry season e) Storing of bales or loose paper under a roof to protectthe material from weather influences (moisture, microbiological degradation processes, etc.)	All broke materials are stored on hardstanding and transferred from incoming HGVs into an industrial tent (prior to processing. Full details are outlined within the FPMP (Ref. 023-1944 WEPA UK Ltd FPMP REV00). **Compliance with BAT is Achieved.**

Ref.	BAT Conclusions	Compliance with BAT conclusions
1.5.2	**Waste water and emissions to water** BAT 43. In order to reduce freshwater use, wastewater flow, and the pollution load, BAT is to use a combination of the techniques given below. a) Separation of the water systems b) Counter-current flow of process water and water recirculation c) Partial recycling of treated wastewater after biological treatment d) Clarification of white water	The internal recycling of broke is already part of the current systems. This variation includes the provision for externally derived materials to be used as input materials. No changes are required to the wastewater treatment systems. **Compliance with BAT is Maintained.**
1.5.2	BAT 44. In order to maintain advanced water circuit closure in mills processing paper for recycling and to avoid possible negative effects from the increased recycling of process water, BAT is to use one or a combination of the techniques given below. a) Monitoring and continuous control of the process water quality b) Prevention and elimination of biofilms by using methods that minimise emissions of biocide c) Removal of calcium from process water by a controlledprecipitation of calcium carbonate	The internal recycling of broke is already part of the current systems. This variation includes the provision for externally derived materials to be used as input materials. No changes are required to the wastewater treatment systems. **Compliance with BAT is Maintained.**
1.5.2	BAT 45. In order to prevent and reduce the pollution load of wastewater into receiving waters from thewhole mill, BAT is to use a suitable combination of the techniques specified in BAT 13, BAT 14, BAT 15, BAT16, BAT 43 and BAT 44.	No changes are proposed or are required to the wastewater treatment systems. **Compliance with BAT is Maintained.**
1.5.3	BAT 46.	Not Applicable
1.6.1	BAT 47. In order to reduce the generation of wastewater, BAT is to use a combination of the techniques given below.	The facility uses an automatic water management system from the manufacturer. This system provides adequate

Ref.	BAT Conclusions	Compliance with BAT conclusions
	a) Optimum design and construction of tanks and chests b) Fibre and filler recovery and treatment of white water c) Water recirculation a) d) Optimisation of showers in the paper machine	storage capacity for broke and whitewater and is closely monitored to ensure that spillages and overflows do not occur. **Compliance with BAT is Maintained.**
1.6.1	BAT 48.	Not Applicable
1.6.1	BAT 49.	Not Applicable
1.6.1	BAT 50.	Not Applicable
1.6.2	BAT 51.	Not Applicable
1.6.3	BAT 52. In order to minimise the amount of solid waste to be disposed of, BAT is to prevent waste generation and to carry out recycling operations by the use of a combination of the techniques given below (see general BAT 20). a) Fibre and filler recovery and treatment of white water b) Broke recirculation system	The facility utilises an internal broke recycling system. The variation is to allow the import and use of external broke within the situation. **Compliance with BAT is Maintained.**
1.6.4	BAT 53. In order to reduce the consumption of thermal and electrical energy, BAT is to use a combination of energy efficient techniques.	Basic measures for the improvement of energy efficiency have been previously implemented. **Compliance with BAT is Maintained.**