Avonmouth Bioresources Centre 11800

Energy Efficiency Plan

Purpose

Avonmouth Bioresources Centre (BC) is one of four biological sludge treatment centres operating within Wessex Water. These treatment activities are permitted under the Industrial Emissions Directive (IED), and therefore Avonmouth BC operates under an installation permit EPR/PP3734LK.

Under the Industrial Emissions Directive (2010) (IED), sites with installation permits are required to conform with Best Available Techniques (BAT) for Waste Treatment to prevent or reduce emissions and impacts on the environment. There are two BAT documents:

- BAT Reference Document BREF
- BAT Conclusions

BAT for waste installations and measures for waste operations overlap, therefore the Environment Agency has published guidance Biological waste treatment: appropriate measures for permitted facilities or "Appropriate Measures" (AMs) to cover these requirements. If a decision is taken not to follow the published AMs, this decision must be recorded and an alternative measure, that provides the same level (or better) of environmental protection should be implemented.

This Energy Efficiency plan has been developed in line with BAT, specifically BAT 23, Section 12.1 of AMs guidance and permit requirements.

This plan therefore details:

- Energy usage across the permitted operations on site.
- The approach taken to review and record whether there are suitable opportunities to improve energy efficiency of the activities
- Any further appropriate measures identified by such a review.

Scope

This document applies to the permitted activities stated within the installation permit PP3734LK and operated by Wessex Water Services Limited (WWSL). These activities include untreated (raw) sludge imports, untreated (raw) sludge thickening, anaerobic digestion, dewatering of both untreated (raw) and treated (digested) sludge and the associated activities of biogas collection and storage.

Biogas utilisation and the associated energy balance is undertaken by Wessex Water Enterprises Limited (WWEL) and is outlined in within WWEL's management system.

Policies

WWSL has several policies with regards to energy management outlining high level commitments, objectives and a strategy to achieve energy efficiency.

To achieve the objectives set out in these policies, WWSL has dedicated departments and teams. The Energy team within Wessex Water aims to provide a comprehensive commercial and regulatory energy service with their main eight aims being to:

- Ensure our energy payments are 100% accurate

- Procure the most competitive energy contracts
- Decarbonise our energy supply and promote Wessex Water's Net Zero 2030
- Take ownership and responsibility of the groups' energy data and systems
- Report and forecast the company's energy use
- Ensure compliance to all energy related legislation and regulation
- Increase our energy efficiency and energy savings
- Explore and develop new opportunities to further the above aims

WWSL also have a sustainability department focussed on making Wessex Water a truly sustainable water company. This department incorporates all aspects of sustainability including:

- energy use
- greenhouse gas emissions
- employee turnover
- health & safety
- asset performance
- customer service levels
- financial ratings

More detail on the relevant policies is specified below.

Environmental Policy (ENVPOL001)

WWSL operate according to an Environmental Policy (ENVPOL001) which details the company's commitments to become a truly sustainable company. To achieve this, the policy outlines several important objectives, the most relevant ones to energy efficiency and management are detailed below:

- reducing emissions to levels at which adverse impacts on the environment are avoided
- improving the efficiency of our use of natural resources, energy and other inputs
- complying with and, where possible better European, national, and local codes, consents and directives
- continually improving the environmental management of our activities

This policy goes on to outline the framework to achieve these directives and the teams within the business that hold responsibility for its successful implementation.

Carbon management policy (ENVPOL06)

In addition, WWSL also operate to a Carbon Management Policy (ENVPOL06). The purpose for this policy is to:

- ensure WWSL complies with applicable carbon management legislation and national guidance
- improve business sustainability by managing carbon emissions to the environment

with the company's sustainability vision being that its combined activities be carbon neutral, with minimal emissions of other atmospheric pollutants.

This document sets out that a carbon management plan will be maintained, based around the hierarchy of:

a) Avoiding emissions
b) Energy efficiency

c) Renewable energy from our own generation
d) Options lead by third parties (carbon offsets, renewable energy purchase)

It also details the company's commitment to reduce emissions at source where possible and to pursue alternatives to energy intensive activities and control measures over emissions. An active energy efficiency programme will be managed, and this will be fully integrated into the running of existing assets and the planning and design of capital schemes.

This policy is supported by the Carbon Management Strategy (ENVA02).

Energy efficiency measures

Ensuring efficient energy use begins during the design and build process of the site. New plant and equipment suitability is reviewed, and material selection is considered; this process includes a review of the energy and efficiency ratings to ensure the ongoing carbon and financial operational costs are minimised once the plant is commissioned. The considerations made may include

- Minimising required pumping distances
- Fitting sufficient insulation to minimise heat losses
- Reviewing opportunities to re-use waste products (such as heat or water)
- Selecting the best available technology for the task by ensuring efficient motors and drives

Once the design and material selection has been confirmed, the tendering and procurement teams will look to purchase the necessary equipment and engage with relevant contractors with sustainability in mind.

During the operational phase of the plant, Wessex Water employs Energy Savings Opportunity Scheme (ESOS) audits. The objective of an ESOS audit, is to survey the existing assets, location and their respective operation, and identify opportunities to reduce energy consumption and reduce the overall carbon footprint. Previous energy audits within on the sludge treatment centre have identified the use of LED lighting for areas that are used 24 hours, % dry solids density monitors to reduce unnecessary pumping, and the installation of VSDs on electrical drives on pumps and other equipment.

In addition to these ESOS audits, there are several key operational actions implemented directly on-site to ensure energy use is optimised and kept to a minimum wherever possible. These include:

- Maximising biogas production using anaerobic digestion, within site capability
- And thereafter, maximising biogas usage, and minimising PVRV releases and flaring.
    - Biogas will be used through upgrading to biomethane and exporting to the gas network, and/or processing with on-site combined heat and power engines (CHPs) to substitute grid power supply usage and recover heat to continue the digestion process.
- Implementing a leak detection and repair programme (LDAR) to identify sources of biogas leaks and develop actions plans to address.
- Minimising process disruption and maintaining process stability thereby preventing the energy requirements associated with intervention (such as additional antifoam dosing)
- Operating run/dwell timers on mixers, where there's minimal impact to the process
- Pump performance monitoring

- Minimising motor losses and pressure losses through routine maintenance of transfer pipework
- Implementing a planned preventative maintenance (PPM) schedule to ensure asset performance and functionality
- Online telemetry monitoring of critical assets for stability, excessive use and performance
- Monitoring for leak detection on water and sludge pumping systems
- When replacing assets, higher energy efficient motor and drives are considered wherever possible; this would undergo a management of change.

Further, the company implements a scheme named 'Eureka' where employees are encouraged to identify any potential energy savings, cost savings, compliance improvements or customer service improvements above and beyond those listed above, on a regular basis. These are then reviewed and after successful implementation, staff may be rewarded to recognise the value added.

An alternative to the above, is the innovation forum which aims to understand and develop how Wessex Water values innovation and technology within the business and to promote the wider application and dissemination of research projects to benefit the forward progress of the company. This forum provides a way of securing funding to contribute towards innovative projects.

Avonmouth Energy Usage and Benchmarking

Figure 1 below, schematically shows an energy balance for the energy used and exported from Avonmouth BC.

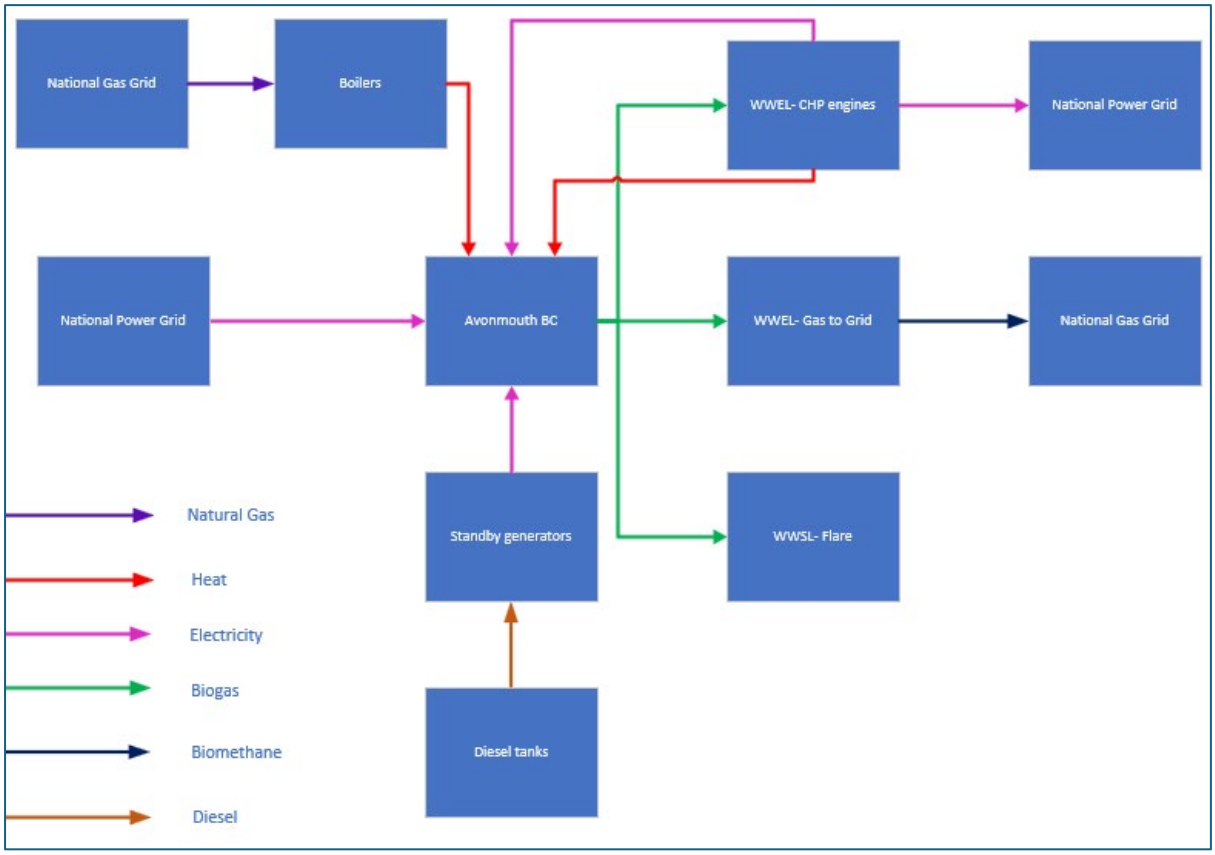

Figure 1- Energy balance schematic for Avonmouth BC

Energy is used on site for the following activities:

- Tank mixing
- Sludge and water/liquor pumping
- Sludge thickening
- Chemical dosing (polymer and antifoam)
- Anaerobic digestion and associated components, including biogas storage and transfer
- Dewatering of both untreated (raw) and treated (digested) sludge and associated assets
- Office and domestic uses
- External lighting

The tables below show the breakdown of energy consumption and production from Avonmouth BC over the previous 3 years.

Fuel	Consumption (kWh)		
	2022	2023	2024
Electricity Imported	13,823,438.00	14,163,972.00	11,068,547.00
Electricity Generated (CHP)	22,444,370.92	20,120,804.25	21,833,868.01
Displaced (CHP)	21,186,170.40	18,877,286.64	20,821,464.01
Parasitic (CHP)	926,136.31	899,935.21	938,981.80
Export (CHP)	332,064.20	343,582.40	73,422.20
Natural Gas	40,305,721.78	40,450,813.31	39,925,639.70
Biogas	40,913,352.86	36,513,232.56	42,368,142.02
Boiler heat	132,041,100.00	170,739,700.00	244,292,000.00

Sub Process	Consumption (kWh)		
	2022	2023	2024
Belt Dryer	51,442.58	50,413.53	37,055.64
Bio Dryer	159,167.70	131,878.36	111,612.32
Consolidation 1	11,226.20	9,207.01	7,133.21
Consolidation 2	309.00	327.94	265.00
Digestion	1,015,181.47	971,370.94	875,511.87
Lime Plant 1	444,388.99	388,944.92	376,025.66
Lime Plant (Bio Dryer)	20,135.81	28,945.91	116,270.80
Lime Plant 2	44.00	50.00	218.44
Raw GBT	167,457.86	155,712.88	114,197.79
SAS GBT	50,335.72	32,061.54	34,099.67
Secondary Digester	1,156,855.35	974,935.35	808,717.66
Sludge Thickening	1,168,882.21	1,117,087.36	1,121,346.65

Based on the energy balance above, for Avonmouth BC, the following have been identified as ongoing, continuous actions required to further optimise and ensure efficient energy usage.

- Minimise flare usage
- Monitor diesel usage
- Review and continue to monitor energy usage to identify potential issues early

Revision History

Issue	Date	Description	Prepared by
1	November 2025	First issue	J. Bezer C.Dewhirst