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ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

ENDLESS ENERGY LIMITED

ENDLESS ENERGY FACILITY

RAW MATERIALS

SEPTEMBER 2018

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TABLES

1 INTRODUCTION

1.1.1 A range of raw materials are required for a number of specific uses at the Keighley Clean Energy Facility. This report identifies and quantifies those raw materials that are to be used at the site.

1.1.2 Endless Energy Limited recognises that the process of selecting raw materials can present an opportunity to control emissions at source. Endless Energy Limited has closely examined the range of possible raw material options that are available and have chosen those that allow the most efficient plant operation and minimisation of the potential environmental impacts. Endless Energy Limited will maintain a list of raw materials used at the facility and their properties.

1.1.3 This report identifies the fate and use of those raw materials. It details the amounts of those materials that are stored on site and used annually and notes any harmful effects they may have and the potential for alternative materials to be used.

1.1.4 Endless Energy Limited is committed to minimising the amount and type of raw materials used at the facility and will evaluate opportunities to achieve improvements routinely through its Environmental Management System (EMS) which will be accredited to ISO14001. Through its EMS, Endless Energy Limited has procedures for the regular review of new developments within the field of raw materials, and for the implementation of any suitable materials or practices with an improved environmental profile. The EMS also provides for quality-assurance procedures for controlling the impurity content of raw materials.

1.1.5 This report sets out the measures that will be employed to minimise raw material use at the site and the review process to identify improvements that would enable the site to improve or retain efficiency and effectiveness in terms of the raw materials treatment processes and costs.

1.1.6 Endless Energy Limited's proposals with regard to raw material use are considered to constitute the Best Available Technique.

2 RAW MATERIAL STORAGE AND USE

2.1.1 Raw materials to be used at the site are listed in Table 1, which shows where in the process they are used and the approximate annual consumption.

2.1.2 Table 2:1 also identifies the hazardous properties associated with those raw materials and provides a commentary on whether less hazardous materials might be available for use. Brief details are provided regarding storage.

2.1.3 All materials will be stored in appropriate containers and liquids will be provided with secondary containment; potentially polluting liquids will be stored in appropriate tanks or containers on impermeable surface with bunds that are constructed to provide capacity for 110% of the largest container or 25% of the total of all containers held within the bund, whichever is the larger quantity. All filling and emptying points will be held within the bunds.

2.1.4 Most materials will be stored inside the buildings. Lime and powdered activated carbon (PAC) will be stored in sealed silos located over the impermeable pavement.

2.1.5 The Environmental Management Plan will include procedures for the unloading and storage of raw materials to minimise the risks of spillage, misconnections or other incidents that might lead to a fugitive release. For example:

- drums and IBCs must have the lid properly fitted when not in direct use;
- prior to deliveries, checks must be made on the available capacity of tanks or silos on site, to prevent over filling; and
- unloading must be supervised by an experienced member of staff.

2.1.6 In this way leaks and spills will minimised and will be contained should they occur, reducing the risks from raw material storage and use.

2.1.7 Records will be kept regarding the quantity of raw material on site at any one time and the location of storage.

2.1.8 Storage areas will be clearly defined and incompatible materials will be kept in separate areas to prevent reactions occurring. Appropriate labelling will be used where required to minimise the risk of inappropriate mixing of materials.

Table 2:1 Raw Materials							
Raw Material	**Required Stage**	**Chemical Composition**	**Typical Usage per Annum**	**Quantity Stored on Site at One Time**	**Use of material**	**Hazardous Properties**	**Assessment of use / Reduction**
Quicklime (95%)	Employed at the Flue Gas Cleaning Plant as part of operations	CaO	1,400t/yr	70m³ Stored: Silo 80 m^3 gross total	A component at the Flue Gas Cleaning Plant. Quick lime will be taken from a silo by mechanical extraction devices, and transported to the feeding point of a pneumatic/mechanical conveying pipe by means of speed-controlled dosing screws. At the injection point it will be intensively mixed with the flue gases and entrained under continuous reaction with the flue gas pollutants and neutralise acid gases.	Generation of dust. Irritating to respiratory system and skin. Risk of serious damage to eyes	Use of lime is minimised by recirculating a proportion of the air pollution control residues from the filter bags. The lime particles are reactivated and returned to the intake to utilise any unreacted lime. Although sodium bicarbonate could be used as a less hazardous alternative this would entail higher costs. It may also reduce efficiencies, as it requires a slightly higher temperature for treatment to be fully effective Lime has therefore been selected as BAT for this site and should not pose a risk given proper handling and storage.
PAC (Powdered Activated Carbon)	Employed at the Flue Gas Plant as part of operations	C	38t/yr	70m³ Stored: Silo 80 m^3 gross total	Introduced into the gas cleaning plant in a similar manner to lime. Metals and VOCs adsorbed onto the surface of the carbon particles	Generation of Dust	Activated carbon is effective at removing a range of pollutants. No alternative raw materials

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					and therefore removed from the gas stream.		are as effective across the same range.
Water	Boiler water make up	H_20	25,000m^3/yr	Process Water is stored in a raw water tank of 100m^3 before being demineralised. Demineralised water is stored in a water tank of 80 m^3 that acts as a buffer tank to ensure that demineralised water is continuously available to recharge the boiler. The Facility is designed with a waste water pit to store used process water. This water is then reused within the process for bottom ash quenching.	The main use of mains water will be boiler water make up. Small quantities of water will also be used for cleaning.	No risks	Water use is minimised on site. Air pollution control relies on dry processes. Cooling and condensation of steam is via air cooled condensers. Boiler blow down and other waste water is directed to the bottom ash quench. Bottom ash is allowed to stand and drain and the water collected is recirculated.
Water	Sanitation	H_20	Included in the	Wastewater is transferred to the	The site office and administrative areas will be fed by mains water	Risks to human health from	Water efficient sanitation equipment can be

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			25,000m^3/yr quoted above.	decantation pit. The decantation process will remove sewage, enabling the water to be reused within the process for bottom ash quenching	for the purpose of amenity and sanitation.	chemicals and organisms within sewage. Risks also posed to aquatic life.	chosen – including toilets and taps
Water	Fire fighting	H_20	Included in the 25,000m^3/yr quoted above.	Water for firefighting is stored within a 800m^3 water tank.	Water within the firewater tank will be used for onsite firefighting.	Firewater contains compounds that can pollute surface water and groundwater. Chemicals are harmful to human health and toxic to aquatic life.	
Ammonia	Flue gas treatment	NH_3	800 t/yr ammonia 25%	35m^3 Stored: Tank	Ammonia is used in the SNCR unit to reduce NO_X in flue gas emissions.	Contact with the eyes can cause serious long-term damage. The solution is corrosive and skin contact may cause burns. Concentrated solutions can release dangerous amounts of ammonia vapour	An NO_X reduction system employed at the site will be a dry SNCR (Selective Non-Catalytic Reduction) process using dry urea as reagent. This system is simpler and more efficient than a wet system using aqueous urea or ammonia. Use is minimised by continuous monitoring of

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						into the air. This presents a significant hazard if inhaled.	ammonia and NO_X in the flue gases with automatic adjustment of the injection system. Relevant staff will be trained in the safe handling of this material which is stored and transported in a sealed system.
Gas Oil	Process Start-up	Petroleum Hydrocarbon + Additives	60t	Stored: Tank with bund capable of holding 110% of the contents of the tank.	Use as fuel for the black start diesel generator.	Potential for toxic effects if released to the aquatic environment. May contaminate ground and soils.	Natural gas may be used for black start. Servicing of plant carried out in accordance with manufacturer's recommendations.
Lubricating Oil	Plant Maintenance	Petroleum Hydrocarbon + Additives	15 tonnes	2000 litres Stored: suitable can	Used for plant maintenance.	Prolonged or repeated contact with skin may cause mild irritation and possibly dermatitis. Mildly irritating to eyes. Waste oils may be carcinogenic.	Essential to proper operation of plant, no alternative available. Servicing of plant carried out in accordance with manufacturer's recommendations.
Hydraulic oil	Plant maintenance	Petroleum Hydrocarbon	8 tonnes	2000 litres Stored: suitable	Used in plant maintenance	Dangerous to aquatic life	Essential to proper operation of some

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		+ Additives		can			machinery. Use will be minimised by correct servicing of plant to reduce the risks of leaks.
Diesel	Plant Operation	$C_{12}H_{23}$	60 tonnes	$80m^3$ Stored: Tank with bund capable of holding 110% of the contents of the tank.	Used for auxiliary burners and operation of mobile plant.	Irritates the skin, eyes and respiratory tract. Possible carcinogen.	Current best option for fuelling mobile plant. Options to be kept under review. Natural gas could be used as an alternative but sufficient supply/pressure cannot always be guaranteed from the National Grid.
Chemicals for Boiler Water Treatment Phosphate Oxygen scavenger	Preparation of boiler water	Phosphate Carbo hydrazide	5 t/yr 5 t/yr	250 kg bag 200l can	Softening and conditioning of boiler water	Potential irritants. Possibly toxic to aquatic life.	Essential to proper operation of plant, preventing a build-up of salts within the boiler. No alternative available.
Ion exchange resin	Preparation of boiler water	HCl NaOH	30 t/yr 20 t/yr	Brought to site when required	Reduce hardness of boiler water	Irritates the skin, eyes, digestive tract and respiratory tract.	Essential to proper operation of plant, preventing a build-up of salts within the boiler. No alternative available.
Acid	Waste water	HCl	3t/yr	2 tonnes stored in	Neutralise waste water prior to	Corrosive	Neutralisation necessary

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	treatment			IBCs with bunding	discharge to sewer		where alkaline conditions occur as a result of contact with bottom ash.

3 JUSTIFICATION FOR THE CONTINUED USE OF ANY SUBSTANCE FOR WHICH THERE IS A LESS HAZARDOUS ALTERNATIVE

3.1.1 For the most part less hazardous materials are not available. Hazards posed are taken into account when deciding which materials are to be used on site, amongst a number of other factors including efficacy and cost.

3.1.2 The raw materials selected are considered to constitute BAT for the site at the present time. Raw material use will be reviewed at least once every four years and less hazardous materials will be substituted where they become available and have been proven to be efficacious and cost effective.

4 MINIMISATION OF RAW MATERIAL DEMAND

4.1.1 In order to meet the relevant BAT requirements Endless Energy Limited will look to maximise the efficient use of raw materials and other substances at the facility across each of the different stages in order to minimise the gaseous, liquid and solid emissions.

4.1.2 The minimisation of raw materials is directly related to their effective management and the identification of further minimisation opportunities through regular auditing.

4.1.3 Endless Energy Limited will carry out a waste minimisation audit at least every 4 years, including a water efficiency assessment. The audit will be carried out in accordance with the relevant guidance.

5 INDICATIVE BAT REQUIREMENTS FOR RAW MATERIALS SELECTION

5.1.1 In accordance with indicative BAT requirements for raw materials selection, Endless Energy Limited will undertake a number of measures to ensure the raw materials selection continues to be regarded as BAT. These measures are discussed below.

5.1.2 Endless Energy Limited will maintain a list of raw materials and their properties. This will be kept on site for reference.

5.1.3 Endless Energy Limited will have procedures for the regular review of new developments in raw materials and to introduce the use of materials with an

improved environmental profile. This will be specified in the management plans for the site and will be part of the drive for continuous improvement in environmental performance.

5.1.4 Endless Energy Limited will have quality-assurance procedures in place for controlling the impurity content of raw materials. This ensures that all materials are fit for purpose and the toxicity of residues is minimised. Clear specifications will be developed for all raw materials and will be communicated to the suppliers.

5.1.5 Should issues arise regarding the use of any raw material, Endless Energy Limited will complete any necessary longer-term studies required to identify less polluting options and will consider making any material substitutions identified.

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