3 DEVELOPMENT PROPOSALS

3.1 Background

3.1.1 The Proposed Development comprises a 3-line Renewable Energy Centre with associated vehicular access.

3.1.2 The Renewable Energy Centre (REC) will employ an Advanced Conversion Technology (ACT) (gasification) a process which is supported by Government and is part of a number of renewable technologies being deployed in the UK. ACT / Gasification is a process to generate power and heat from Refuse Derived Fuel (RDF) together with other pre-treated wastes. RDF is a product which is pre-treated then shredded, dehydrated and / or compressed from municipal solid waste and industrial and commercial waste and when heated to very high temperatures breaks down to provide a gas which is utilised in a boiler to create steam which drives a steam turbine to produce electricity and heat. It is a clean, modern and hi-tech approach to producing energy, with a proven track record.

3.1.3 The development will have the capacity to process up to approximately 150,000 tonnes of waste per annum. As well as the RDF the feed stock will include using non-recyclable residual commercial and industrial waste (CIW) together with an element of municipal solid waste (MSW) i.e. residual waste where all the practicable recycling has been completed. Initial research has indicated that this material would comprise waste from across the wider Warwickshire area. The plant will not accept hazardous or clinical waste.

3.1.4 The power produced from this facility will have a capacity of 14.5MW/hr gross of electricity. The gasification technology employed at Hams Hall Energy Centre will involve a two-stage system, which initially gasifies the waste to produce synthetic gas. This gas is then transferred to a second stage where it is combusted in a high efficiency boiler to produce steam which drives a steam turbine to produce electricity. The process allows for efficient control of emissions and improved performance generally as an energy solution.

3.1.5 Gasification is classed as an Advanced Conversion Technology (ACT) as the biomass element of waste qualifies for Contract for Difference (CFD). CFDs provide long-term price stabilisation for low carbon plants, allowing investment to come forward at a lower cost of capital and therefore at a lower cost to consumers but enables advanced renewable technology to be developed.

3.2 Site Layout

3.2.1 The proposed site layout is illustrated on **Figure 3.1**. The REC will be constructed within the centre of the site with access and egress at Faraday Avenue to the south.

3.2.2 The REC is made up of the following principal elements:

- **A main building** – this will house the majority of the process plant and will have a number of silos to the rear and a flue stack to the east of the building, all waste material will be unloaded inside the building. At its highest point, the main body of the building will be 24m high and 87.96m long x 72.7m wide with a floor area of 5725m^{2,} see REC elevations illustrated on **Figure 3.2**. The flue stack contains a walk around platform for continual air quality monitoring access and consists of a metal framework. The stack will have a height of 52m and a diameter of 2.8m;

- **Waste Reception Bunker (located in main building)** - Wastes are deposited into an 8m deep waste bunker within the building, with a capacity of 820m^3 where shredding and separating takes place to prepare the fuel for the gasification process, and any ferrous material is taken out which will be removed for recycling;

- **Prepared Fuel Storage Bunker** – the prepared fuel will be deposited in storage bunker within the building (which has 4 days of waste storage thus complying with fire regulations and stopping build-up of heat from waste gasses), which has a capacity of c6,000m^3.

- **Turbine Room** – this will be a smaller separate building 15.6m high, with a base of 30m x 15m located at the most northern part of the site. A short section of pipe line will connect the main building and the turbine generator building;

- **Air cooled condenser fans** – have a height of 23.4m with a footprint of 39.62m x 15.76m;

- **Bottom Ash bunker** – the bottom ash is stored in a bunker measuring 10m x 12m x 5m with a capacity of 600m^3. This material is inert and can be reused as an aggregate or used for an engineering material in landfill. It complies with current European legislation;

- **Fly Ash Silo** – the fly ash silo framework stores the residue from the flue gas cleaning system and measures 10.5m x 5.15m and 19.5m high. The ash is removed in a safe manner by attaching an umbilical hose to a tanker and can be either reused /recovered or disposed of at licensed landfills. The handling, storage, treatment and reuse/disposal of this material is highly regulated;

- **Fire Water Tank** - a fire water tank would be included to the south of REC building. The tank has a 17m diameter and a height of 6.75m with a 1 million litre capacity;

- **Pump Room** – the pump house is next to the fire water tank and has a height of 3.2m with a footprint of 6.09m x 4.59m; and

- **Technical / Control room and Workshop** – will be located within the east side of the main building.

3.2.3 In addition, the external site areas will include:

- Two weighbridges (both in and out) with an office measuring 4.85m x 3m x 2.95m high;
- Site entrance and circulation roads;
- 18 car parking spaces plus 2 disabled bays;
- Provision for 14 cycling spaces.

3.3 Process Description

3.3.1 The key stages of the REC process are described below.

3.3.2 The plant employs a two stage system that first gasifies (heats) the waste to produce a synthetic gas which is then transferred to a second stage where it is oxidised. Changing the waste to a gas fuel, means the combustion environment can be finely controlled, very low dioxins emissions and Nitrogen Oxides (NOx) emissions minimised which can achieve emissions levels that are compliant with Industrial Emissions Directive (IED) (Directive 2010/75/EU of the European Parliament and the Council on industrial emissions). Key Stages:

Waste Reception

3.3.3 Once accepted in to the site, vehicles delivering residual waste would draw up to and reverse into the Waste Reception Hall to the front of the main building. Once the vehicle is inside the Waste Reception Hall the fast acting doors will close; the Waste Reception Hall operates under negative pressure to draw in and contain odours with the air then fed into the ACT processing plant (gasification plant) so that it is 'cleaned' as part of the overall emissions control process before being released through the flue stack.

Fuel Bunker and Transport System

3.3.4 The residual waste is unloaded within the Waste Reception Hall. The residual waste in RDF form is unloaded directly by crane into the Fuel Bunker. However, all other residual wastes would first be deposited into the waste bunker before being transferred by crane into the shredder and then passed across a magnet whereupon any ferrous material will be removed. The recovered metals will be collected in a skip within the main building which will be periodically collected and sent for recycling. The prepared fuel is then stored in a bunker prior to entering the gasification process.

3.3.5 The overhead fuel crane will operate on a pre-programmed cycle and move around the fuel bunker to mix the residual waste to create a more homogeneous mixture. The crane will then deliver residual waste automatically to the fuel hopper to the ACT unit.

Thermal Conversion

3.3.6 The thermal conversion will take place in two stages. Firstly gasification of the fuel will be carried out in the gasification unit creating the synthetic gas. From this, the gas passes to the High-temperature Oxidation Unit where there is a complete combustion of Carbon Monoxide (CO), Total Organic Carbon (TOC) with a final production of a flue gas with low NOx content. The ash is discharged from the gasification unit at the end and taken for offsite disposal.

Heat Recovery Steam Generator (HRSG)

3.3.7 The HRSG that recovers the energy from the flue gas is connected to the high temperature oxidation unit that combines smoke-tube and water-tube boilers operated to control the outlet flue-gas temperature.

Energy Utilisation System

3.3.8 The boilers will deliver saturated or superheated steam to an energy utilisation system. The system will consist of a turbine with generator and an air cooled vacuum condenser with condensate pumps. Generated electricity will be connected to the Power

Company's distribution network. Condensate from the air-cooled condenser will be directed to the feed water tank of the boiler system by condensate pumps.

3.3.9 If required the turbine can be fitted with a suitable extraction point to enable steam, at the appropriate pressure, to be taken from the turbine for use by adjacent consumers.

Flue Gas Cleaning System

3.3.10 Having been generated in the dual stage gasification process and passed through the HRSG, the flue gas will enter a gas cleaning system. This will comprise a bag house filter, a storage silo for lime and activated carbon and a filter dust silo. In simple terms the lime and activated carbon will be injected at the inlet of the bag house filter and this will adsorb contaminants in the flue gas. The contaminants are in turn filtered out and disposed of off-site, with only clean gases discharged to the atmosphere.

Control and Monitoring System

3.3.11 The plant will be equipped with a control and monitoring system that will provide automatic control of the process during normal operating conditions and gives the opportunity for staff to monitor the different process sections. Of particular importance will be the logging of process details, including emissions.

3.4 Material Delivery and Despatch

3.4.1 On arrival, waste vehicles will report to the weighbridge where waste documentation, waste carrier certificates and transfer notes will be checked to ensure compliance with the Duty of Care Regulations and the sites Environmental Permit. Vehicles containing any non-conforming waste will be quarantined and managed in accordance with the site's Permit. The quantity of waste the vehicles carry will then be assessed by passing them over the weighbridge.

3.4.2 It is anticipated that feedstock from the wider area would fulfil the requirement to operate the REC. This is however subject to available local contracts and is currently under review.

3.4.3 The waste will be split into three types; Tier 1 from the major waste companies which would account for approximately 60% of the waste entering the plant; Tier 2 would consist of waste from local operators and would account for 30% waste and Tier 3 where 10% of the waste would come from spot market. Economic and contractual obligations will play a large factor in the distance waste is travelled to the site hence by this nature waste will not be transported over long distances. Although waste from Tier 1 would be transported from major waste organisations it would still arrive from the wider M42 / M6 corridor area. The tiers represent different size operators as opposed to the distance the waste is brought into the site from, therefore, the distance will be self-limiting owing to transport cost.

3.4.4 It is anticipated that waste will be delivered to the site via refuse collection vehicles (RCVs) which will typically be 18 – 22 tonne vehicle (gross weight), or in large articulated

bulk haulage vehicles from nearby waste transfer stations under a Duty of Care Waste Transfer Note.

3.4.5 The REC is expected to generate up to 88 heavy goods vehicles (HGVs) trips per day, (44 In and 44 Out) , plus trips associated with 20 staff.

3.4.6 Vehicular access to the REC will utilise existing access to the south west of the site leading from Faraday Avenue and Junction 9 of the M42 motorway.

3.4.7 Upon entering the site all vehicles will be directed north to circle around the back of the site to the manned office / gatehouse at the eastern side of the building. Two barriers here control access to the building. Staff and visitors will be directed towards the car park located immediately on the site's south western boundary. Users will exit the site via the same route.

3.4.8 A separate barrier system will be provided for HGV movements, with separate barriers provided for vehicles entering and exiting the site. A weighbridge will be located in front of each barrier which will be located either side of a security office. Further details are provided within **Chapter 7 Traffic and Transport**.

3.5 Grid Connection

3.5.1 The Applicant has held discussions with Western Power Distribution (the responsible DNO) and an application has been submitted. Once this has been returned a point of connection can be assessed.

3.6 Surface Water Management

3.6.1 A sustainable drainage strategy, involving the implementation of SuDS, is proposed for managing the disposal of surface water runoff from the proposed development on the site. It is considered that the use of infiltration devices for site drainage is not appropriate for the site due to impermeable soils.

3.6.2 Proposals comprise a pipe system and a tank in order to attenuate surface water runoff and, as the brownfield runoff rates are unknown, it is proposed to restrict runoff to greenfield rates. It is proposed that the surface water from the designed network will discharge to the existing off-site public sewer located approximately 100m to the south east of the site.

3.6.3 A preliminary surface water drainage strategy is shown on the Indicative Surface Water Drainage Strategy Plan, Drawing No. K116/03, within **Appendix 8.1** Flood Risk Assessment.

3.6.4 The proposed drainage strategy would ensure that surface water arising from the developed site would be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account.

3.7 Design Approach (building materials and colour)

3.7.1 Many industrial sites are designed with a typical 'form follows function' approach. From the outset it was deemed important that the external appearance of the plant should be appropriate for the area.

3.7.2 In terms of architectural detailing and materials, both follow a similar palette and consist of mainly a coloured cladding system.

3.7.3 Due to the REC plant building being a large mass, it was important to use a smooth lightweight architectural cladding system that would achieve the functional needs, as well as aesthetic ones too. A simple palette of materials was proposed consisting of a neutral grey-green colour and represented in bands becoming increasingly pale towards the top of the building. The aim of the introduction of the banding is to reduce the perceived massing of the building. The stack will be faced in a muted grey metal which will sit and almost blend into the typical overcast skyline of the UK. External equipment will be faced in a grey coated metal to blend into the colour palette of the main plant.

3.7.4 A tree belt was integrated on the southern boundary to screen visible elements and enhance the visual environment.

3.8 Construction Duration

3.8.1 Subject to the grant of planning permission, it is anticipated that the construction of the proposed REC would commence in 2017. Construction on site is expected to last for 24 months, after which there would be a commissioning period. Furthermore, construction would normally take place during the hours of 0700 to 1800 (Monday to Friday) and 0800 to 1300 (Saturday). No construction would take place on Sundays or bank holidays.

3.9 Operating Hours

3.9.1 The REC will operate continuously; 24 hours a day, 7 days per week. Operational staff would be required to operate the Plant on a 3 shift pattern (each of 8 hours). During weekdays the facility will be open for deliveries between the hours of 07:00 and 19:00 and between the hours of 07:00 and 14:00 on Saturdays. There will be no waste received on Sundays. It is expected that HGVs importing and exporting materials from the site will do so evenly throughout the 12 hour period and there is unlikely to be a peak in movements associated with these operations.

3.9.2 Maintenance of the REC would take place twice yearly which would necessitate the ceasing of operations for a two week period in the summer and a week during the winter period. These times would be programmed to coincide with the manufacturer's shutdown periods. Across the resultant 49 weeks of scheduled operation, ad-hoc maintenance and other generation drop-out periods associated with grid-synchronisation and the processing of non-homogenous Refuse Derived Fuel may result in the need for short-term shut-downs. The availability is therefore expected to be approximately 90% (i.e. 44 weeks per annum).

3.9.3 The facility is expected to be available to receive deliveries of waste on weekdays and on Saturday mornings. The Plant will operate during Bank Holidays but shall not receive waste deliveries. This is facilitated by the on-site waste storage inside the building which has been designed to ensure sufficient capacity to continue operations without delivery for up to four days.

3.10 Construction and Environmental Management

3.10.1 Environmental control measures will be imposed to minimise adverse environmental effects during construction and the assessments presented in this ES have been undertaken on the basis that these measures will be implemented. A Construction Environmental Management Plan will be prepared and adopted and will include sections on: noise, vibration, air quality, water quality, surface quality (prevention of contamination of ground surface), site transportation and traffic management, visual intrusion and waste management. The appointed contractor will also be required to register with the Considerate Construction Scheme.

3.10.2 Lorries will be fully sheeted over and pass through a wheel washing installations (hose down area) prior to departure.

3.10.3 Waste will be generated during all stages of the construction works. A Site Waste Management Plan will be prepared and all relevant contractors will be required to seek to minimise waste arising at source and, where such waste generation is unavoidable, to maximise its recycling and reuse potential. Recycling of materials will primarily take place off-site where noise and dust are more easily managed.

3.10.4 All construction activities, which have the potential to generate significant amounts of noise and/or vibration and will be undertaken during daytime periods (see **Chapter 10 Noise** for further information relating to construction noise).

3.11 Scheme Benefits

3.11.1 The benefits of the REC include:

- Proven technology with outstanding operational and environmental performance and very low emissions;
- Conversion of pre-treated waste into renewable energy, displacing landfill and fossil fuels;
- Reducing greenhouse gas emissions;
- Job creation across a variety of skills and levels of expertise with employment opportunities for local people;
- Transforming an allocated vacant plot within an existing industrial site and enhancing with landscape planting;
- Production of lower cost renewable energy with the potential to create connections to local energy businesses/end-users via underground cable;
- Clear progression in the transition to a low-carbon economy with grid carbon offset; and
- Compliance with Government policy and the Industrial Emissions Directive (IED) to provide sustainable, renewable energy production close to use.

3.12 Employment

3.12.1 The proposed REC will create a number of job opportunities during the construction phase of the development and once operational this will provide up to 20 employment opportunities, which will comprise of 18 FTE's directly employed on site with a further seven people providing services from local specialist businesses. Jobs will be across a

variety of skills and levels of expertise and there will be employment opportunities for local people.

3.12.2 There will be a number of job opportunities created by the proposed industrial warehouse to the front of the site.

3.13 Consents

3.13.1 In addition to planning permission, other consents will be required to enable the Proposed Development to proceed. Of particular importance to this development is the need for an Environmental Permit from the Environment Agency that will control all operations associated with the plant based upon various risk assessments. Information presented in this ES will be used in the preparation of the Permit.