## 2.0 Non-Technical Summary - Description of activity

Buchan Biogas (Peterhead) Grid Ref; NK 089 461, proposes the erection of an Anaerobic Digestion plant, ancillary equipment, on-site infra-structure and associated works for the purpose of generating renewable biogas and injecting the same into the intermediate pressure gas grid.

The activity will treat organic feedstock's in the form of energy crops and food waste; including municipal source segregated catering waste, classed as Category 3 animal by-products, processed to produce biogas and organic fertiliser. The facility will receive energy crops from local farms and food waste deliveries by tanker from a food waste pre-processing plant.

**Waste Acceptance**

The waste materials accepted onsite will be de-packaged and liquidised food waste from a pre-processing plant. This will arrive in tanker and be inserted directly into 50m$^3$ foodwaste reception tanks in a sub section of the reception hall building. This building will be separate from the rest of the reception hall with its own entrance and odour mitigation controls. This building will have an impermeable surface and a sealed drainage system which takes potentially contaminated drainage to a storage point on site. (see diagram of site layout) This de-packaged liquid foodwaste will never actually be exposed to the open atmosphere and will remain within sealed conditions. A single weighbridge will be used for 'in' and 'out' weightings. These foodwaste loads will be screened at the relevant external processing facility so there will not be a risk of rejected food waste loads onsite at Buchan Biogas.

Liquidised food waste will be delivered by tanker directly to 50m$^3$ container, these food wastes are never in contact with the open atmosphere.

**Feedstock Pre-treatment**

Agricultural feedstocks will arrive and be tested for dry matter % at the weighbridge with test kits. This will be performed as the supplier is payed depending on this dry matter content, if a load is rejected at this stage. It will just be a case of the lorry turning around and leaving the site. These are agricultural products and not classed as wastes.

Grass and crops will be delivered to the site and stored in sealed clamps to allow the production of silage to occur over time. Other non-foodwaste biomass will be delivered to the reception hall where it will be fed on to feedhoppers. Liquidised food wastes will be delivered directly from tanker to containers in the separate reception hall before being fed in to the pasteuriser, mixer and finally digester. These containers will be completely sealed and should not apply to 24-hour storage rule, however the foodwaste will be received at the same daily rate that it enters the AD process so unless there is an emergency it will not be stored onsite for more than 24 hours.

Feedstocks are entered to feed hoppers and cut down by a macerator that will reduce the particle size. This will then be pumped via a pipeline into the mixer where it will be mixed with any slurry and liquidised food waste. From the mixer all the feedstocks will be fed into the digesters at a rate of roughly 0.005$m^3$/s. Feeding system input will be planned and controlled so that it coincides with the rate of output from the overall digestion process. Silage will only be taken from the clamps as required so a steady input can be entered into the system, prioritising food waste if need be so it will be stored for as little time as possible.

**Feeding**

For a safe and efficient biological process, the substrate must be fed into the digester at regular intervals throughout the day. This feeding is measured and controlled automatically. The documentation is recorded through the computer system.

The amounts and intervals of the feeding can be adjusted and controlled by the operator.

Emergency switches are in place, as well as level indicators and feeding time controls for switching off units automatically to prevent overloading, overheating or such situations which could potentially cause hazards.

**Anaerobic Digestion**

After passing through the macerator, pasteuriser and mixer the conditioned silage will be pumped alongside food wastes into one of three digester tanks of capacity 5132 $m^3$ each. Anaerobic digestion (AD) occurs in concrete digester tanks with Double membrane cover with integrated biogas holder that can adjust depending on gas content. These concrete tanks are secure and provide the required temperature characteristics for the AD process. To allow the necessary biological stages to occur at a desirable rate the contents of the digester need to be mixed so they do not stratify. This is done by a large rotating "paddle" attached to a vertical axis. Liquids can be added as required to increase viscosity and enhance mixing.

The digesters will operate at a hydraulic retention time of c.56 days. The temperature in the digesters will be maintained at around 40oC, by re-circulating its contents through external heat exchangers, and the contents will be mixed using a rotating paddle on a vertical axis. The operating conditions will optimise the digestion process and ensure that the whole digestate will be fully stabilised in the digestion process to comply with the PAS110 requirements for stability.

The efficiency and safety of the anaerobic digestion plant depend on careful control of the biological process, therefore most of the management, control and analysis processes are associated with this function. An IS014001 standard environmental management system will be obtained and complied to within 18 months of operations commencing. This is further explained under the "Summary of the Management and Operations System" document submitted alongside this one.

Biogas Power (Operations) have a competent person with required WAMITAB level 4 qualifications and are contracted with the day to day running of the plant, for more information on the running of the plant please see "Summary of the Management and Operations System" document submitted alongside this one.

The gas collector in the roof of the digester operates at up to 5 millibar of pressure, providing several hours of storage capacity for the biogas. As an ongoing procedure the temperature, pH level, dry matter content, loading rate and retention time is monitored and controlled. Additionally, there is daily analysis of the chemical buffer capacity, consistency and organic acid concentrations of the substrate by carrying out daily sampling. Visual checks and sampling of the substrate is done by the operator, and further analysis is carried out by a laboratory service. Adjustment of the mixing intervals and maintenance/checks of some units is also done by the operator. The biogas produced from the digesters will be collected at the top of the digesters. Continual gas detection linked to pressure sensors and SCADA monitoring system which will to identify if any leak i.e. pressure drops occur. Personnel on site will also all wear personal gas alarm systems.

**Biogas and Emissions**

The majority of biogas created on site is being upgraded to biomethane and injected to the grid. This is at the top of the SEPA hierarchy for biogas use. Any other use of biogas described below is to support and allow this upgrading and injection process. Biogas upgrading technology used (Purac) is BAT and injection of biomethane to grid should be considered BAT as it is much more energy efficient as opposed to burning biogas for electricity.

Some Biogas produced from the digesters can be directly used to fuel CHP unit which can then heat and power various processes required on site, primarily pasteurisation and the biogas clean-up process. Biogas will pass through an active carbon filter before the upgrade plant as well as the CHP to remove $H_2S$ avoid $SO_2$ emissions after combustion

A single excess gas flare will be installed capable of burning biogas at a rate of up to 1500 Nm3/hr.

**Purac biomethane upgrading plant**

Most Biogas produced is to be injected into the gas grid as methane so needs to be stripped of $CO_2$ at the Purac upgrading plant.

Injection of biomethane into the grid is at the top of SEPA's hierarchy of biogas use. To create the biomethane some kind of clean up technology is required. The technology chosen by the Operator and Buchan Biogas is Amine Scrubbing and can be considered BAT as it has the smallest methane spillage of all clean up plant technologies available. It is more expensive than other technologies but retrieves the most and the purest biomethane. This is BAT as the technology produces the purest biomethane for introduction to the UK national grid which has strict regulations on the quality of gas allowed. See report on amine

scrubbing technology and comparison with others in submitted document – *Purac Description SGC270.pdf.*

This will be done using a process known as Amine Scrubbing or "CApure™" (commercial name). Amines are compounds that naturally bind with $CO_2$ and consist of Carbon and Nitrogen, an amine water solution is used to separate $CO_2$ from methane.

The CApure process recovers more than 99.9% of the biomethane present in the raw biogas. The process separates the $CO_2$ from the biogas by a process of chemical adsorption. The selective organic solvents used in this process are so efficient that the end product can contain more than 99% methane and is suitable for vehicle fuel or to be injected into the natural gas grid. As the final product is so pure there is often no requirement to enrich with propane. Siloxane removal is extremely efficient with contents of less than 0.05 mg/Nm$^3$, which is the lowest detectable level for today's instruments. (BAT)

Unlike other technologies the CApure process is highly tolerant of changes to the raw gas composition resulting from changes in feedstocks. This suits the aims and flexibility Buchan Biogas wish to achieve and will result in less flaring events or pressure releases.

**Digestate separation and storage**

Digestate will be produced which will be to the PAS110 standard which requires routine monitoring and can be considered BAT. This means that the digestate can be spread to the fields which grow the crops for some of the feedstocks. For the optimization of the handling of the bio-fertiliser produced, an automated separation is installed to divide the digestate into a liquid and solid fraction. The liquid is pumped to the storage tanks and the solids are collected by farm trailers. During the separation process the digestate leaves the third digester and is separated through a mechanical separator. The solids are stored in a covered shed for collection and the liquid is pumped into the three digestate storage tanks for tinkering offsite and spreading at a later date.

**Odour Control**

To minimise any odours coming from the installation where possible all potential sources of odour will be contained. Odour abatement in the process building will be carried out via local extraction direct from source of odour. This air is extracted and then passed through carbon filters. The Reception Hall food waste handling section will be a contained building with this air extraction system. Doors to the buildings will only opened for vehicular access/egress The provisions in place demonstrate BAT and follow the hierarchy of control regarding odour set out by SEPA. The doors are needed for the access of vehicles but there will be a level of negative pressure present due to the air extraction mentioned above. For more details regarding this process see Odour Management document.

**Drainage**

The site will have an impermeable surface throughout where there is any risk of contaminated spillages and a sealed drainage system where there is a risk of contamination. Effluent emissions from the anaerobic digestion plant will be redirected back into the process via the waste effluent tanks. There are no process effluents from the facility to either surface

water or sewer. The only water directed to the SUDs system is clean surface water. The pipe layout PDF drawing submitted to SEPA details this.

**Operation & Management**

The operation of the plant is carried out from an onsite control room and it is fully automated and controlled by a central computer management system. All the data is collected and analysed to ensure the safe and efficient running of the plant.

The plant operates to a management system which incorporates an Operations and Maintenance Manual that details the overall operating procedure for the facility, a planned preventative maintenance schedule, employee training, performance analysis and complaints reporting and investigation. This is in line with the guidance requirements as detailed in Getting the Basics Right. A full summary of the Environmental Management System will be submitted with this document. – *Summary of Management System.pdf.*

**Identification of important and sensitive receptors**

Nearby noise and odour sensitive receptors have been identified as the residential dwellings to the north and north east on the A950 and off the B road to the south of the site. And also the adjoining industrial site. These are mapped in more detail the *Peterhead AQ modelling report_14_4_16.pdf* document.
The nearest residential property is located 100m to the North and North East of the proposed AD facility boundary just off the A950. Further residential properties are located opposite and on Tortorston Drive further North. Experience from similar processes at other sites, and considering the distances between the proposed plant and the nearest noise sensitive locations it is anticipated that the noise and odour impact will be below the guideline limit levels. This is demonstrated by the modelling report referenced above and submitted to SEPA. The potential noise contribution from the equipment and plant associated with the proposed AD installation at the target receptors will be below 55dB (A) during the day and 45dB(A) during the night. This is analysed further in environmental noise and odour assessments submitted alongside this document. Mitigation techniques as well as operational procedures to try and avoid any odour and noise problems are described.
Below is a diagram of the site location and the nearest sensitive receptors which have been taken into consideration in all assessments. The arrows point out the closest sensitive receptors which are both just south of the A950.

. The buildings to the South and West are industrial units. Earth bunding and a tree line will be built between the plant and sensitive receptor as is considered BAT. This will provide significant visual and audio screening.

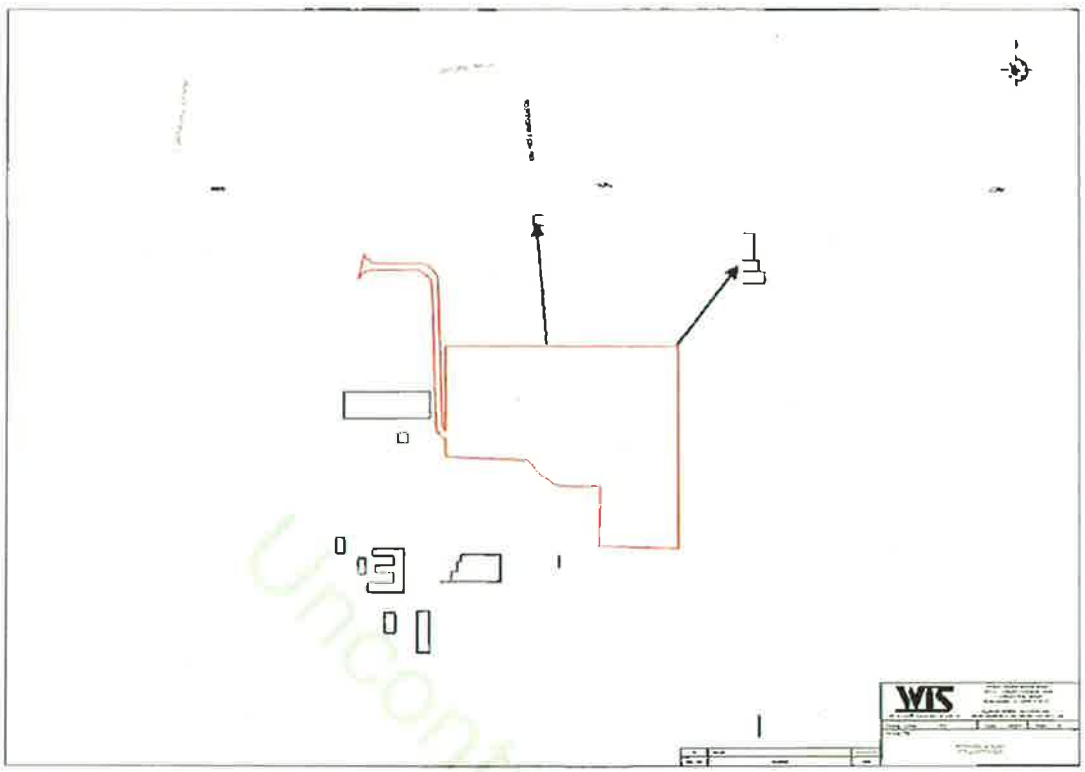

**Diagram 1 – Site Location**