



Celtic Renewables Grangemouth – Caledon Green Exemplar Plant

New PPC Permit Application – Non-technical Summary

1. Non-Technical Summary

This Non-Technical Summary supports the Celtic Renewables Grangemouth plc (CRG) application for a Pollution Prevention and Control Permit for a new biorefinery exemplar plant.

The site forms a 0.98ha parcel of land within Plot 7 of Earls Gate Park, approximately 1.4km to the west of Grangemouth town centre. Earls Gate Park occupies a total area of 12.3ha and is located to the south of Earls Road, east of Beancross Road and the M9 (Edinburgh to Stirling) and to the south and west of the operational Calachem site.

The Ordnance Survey grid reference of the approximate centre of the site is NS 91711 81133 (NGR 291711, 681133).

2. Celtic Renewables

Celtic Renewables is a start-up Company, widely regarded as one of the most innovative new sustainable renewables companies in the UK. Celtic Renewables Ltd (CRL) is the parent Company, founded in 2011, which has been based to date at Edinburgh Napier University. CRG, founded in 2017, is the site where the plant will be situated, and the site will be known as Caledon Green Exemplar Plant.

The process is a highly innovative adaptation of the century-old Acetone-Butanol-Ethanol (ABE) Fermentation process. The ABE process was once one of the largest fermentation industries in the world and operated globally at scale, but its popularity diminished due to the cost of using virgin crops as a raw material and the growing volumes of crude oil production accessible with new technologies. CRL has re-developed the process to utilise low value coproducts and residues as substrates, a pivotal commercial consideration that dramatically cuts the formerly prohibitive cost of raw material for ABE production.

The primary raw materials which will predominantly be used in the process at Caledon Green are pot ale and draff, co-products from whisky distillery processes, supplemented by another carbohydrate source, in this case grade B potatoes, deemed aesthetically unsuitable for the consumer market. These are then fermented using specific bacteria to produce high purity, high value products, namely acetone, butanol and ethanol. There is also a co-product from the process in the form of a wet cake, which is intended to be sold as a high protein animal feed.

The Caledon Green Exemplar Plant will establish the process at a commercial scale in preparation for replication at larger scale future plants located in Scotland and at key strategic locations worldwide.



3. The ABE Fermentation Process

The basic stages of the process that will take place at the Caledon Green installation are summarised below:

Step 1: The main feedstocks (Draff, Grade B potatoes) will be mixed to a predetermined recipe separately with pot ale and then macerated to prepare for processing.

Step 2: The various sugars present within the prepared media will then be fermented in an anaerobic bacterial fermentation process, ultimately producing the main targeted chemical products (acetone, butanol and ethanol), also termed “biosolvents.” Additionally, the process will produce a mixture of hydrogen carbon dioxide gases as a by-product from the fermentation process.

Step 3: The resulting fermented broth is processed through a solvent recovery (distillation) system to recover the solvent products (acetone, n-butanol and ethanol).

Step 4: After recovery of the solvents, the product from the bottom of the mash column, known as spent media, will be separated by centrifugation into a solids fraction and liquid fraction. The resulting solids fraction will be stored for a short period and the intention is that it will be sold as a high-protein animal feed product. The liquid fraction (centrate) will be sent to the Recovered water tank and can be either recirculated back into the process or alternatively removed from site via tanker to a licenced waste facility.

Step 5: All products produced will be stored on site awaiting pick-up by truck or road tanker. Storage of products on site will be minimal in terms of both volume and timescale.

4. Measures to Prevent Pollution

CRG have submitted an application for a PPC licence which outlines the measures and techniques in place to prevent pollution. This includes a more detailed description of the process and the equipment; an outline of the Management Techniques; details of how the materials on site will be handled; measures to reduce waste; and energy efficiency measures.

Modelling assessments have been carried out on noise, odour and air emissions which have shown no areas for concern. There are no direct emissions to water or land from the site. Environmental impact and risk assessments have been carried out and measures to prevent accidents are defined.

