REPORT

Boston Alternative Energy Facility

Technical Note on the Carbon Recovery System

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Boston Alternative Energy Facility

Royal HaskoningDHV
Enhancing Society Together

Note

HaskoningDHV UK Ltd.
Industry & Buildings

To:	National Infrastructure Planning
From:	Alternative Use Boston Projects Limited
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Checked by:	Abbie Garry
Approved by:	Paul Salmon

Subject: **Boston Alternative Energy Facility Deadline 4 Submission – Technical Note on the Carbon Recovery System**

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1 Introduction

1.1.1 Within the Lincolnshire County Council (LCC) Statement of Common Ground (SoCG) (document reference 8.1, REP1-038), LCC requests details to be provided on the Carbon Capture system which will be used as part of the Boston Alternative Energy Facility (the Facility) and examples of similar systems which have been used in commercial applications. LCC also questions the amount of CO_2 captured and the ability to capture all of the CO_2 emitted. This note sets out some further details to answer these questions.

2 Carbon Capture System

2.1.1 The system proposed to be used is the ASCO Carbon Dioxide (CO_2) Capture system type 5000 Stack Gas Recovery (SGR), capturing up to 5000 kg/hr from each Energy from Waste (EfW) process line at up to 98% capture efficiency.

2.1.2 It is a system based on Amine scrubbing, which is a well proven and mature technology, used in many food-grade and lower grade CO_2 Capture systems globally. The system will be provided by ASCO CO_2, a Messer Group (previously Messer Griesheim Group) company, who specialise in advanced CO_2 production and recovery plants, particularly food grade CO_2 capture and re-use. Several lines have been delivered at the proposed scale and larger including 10,000 kg/hr SGR, with the largest plant delivered to date capturing 15,000 kg/hr of CO_2.

3 Example Plant – Sulden, Switzerland

3.1.1 ASCO CO_2 capture plants are currently located in Switzerland and Germany. The Applicant has recently visited the plant at Sulden in Switzerland, where the CO_2 capture system has been in operation on a milk powder production line on the exhaust from the boiler plant (photos provided in **Appendix 1** below). The CO_2 is captured, removed from the site and is used in the brewing industry, which has been ongoing for several years (circa 10 years). Each tanker load is evaluated for purity using a scanning spectrograph with a qualified operator / technician for each

device to detect impurities and a report is issued for each tanker load. If impurities are discovered, the quarantined gas is discharged to a spare tank for being upgraded or sold for general use. The Applicant intends to use the same system for food grade CO_2 as it is fed to tankers prior to transport to food customers.

3.1.2 At the time of writing, there are no such systems provided by ASCO CO_2 operating in the UK, as in the UK CO_2 is generally produced by larger plants e.g. fertiliser plants such as the CF Fertiliser units in Cheshire and on Tyneside (CF Fertilisers produces around 60% of the UK's CO_2[1]). At times this has led to shortages of CO_2 in the UK, e.g. when the price of gas as a fuel exceeded the company's purchasing norms, and production had to be shut down, or when all European and UK CO_2 producers shut down production for annual maintenance which aligned with annual holidays across Europe. However, there are many such systems in operation, both in Europe and globally based on the same Amine scrubbing/absorption technology and specifically the SGR system from ASCO CO_2.

4 Carbon Capture at the Facility

4.1.1 For the Facility captured CO_2 is planned to be stored in liquified form in high pressure tanks on site around the Carbon Capture, Utilisation and Storage (CCUS) plants location (shown as F4 on sheet 5 of the Indicative Generation Station Plans (document reference 4.9, APP-019)). The CO_2 will be taken from the plant, by specialist road tankers generally of circa 20 or maximum 44 tonnes (Te) gross weight with specialist Accord Dangerous Routier (ADR) tanker drivers. These will either be contracted via a logistics specialist or via use of an inhouse fleet which will deliver to contracted offtakes in the local food, agriculture/ horticulture industries. CO_2 has multiple uses across the food industries, for example:

- Boosting production of specialist vegetables and fruits in glass houses by 20-40%;
- Proving a protective atmosphere in modified atmosphere packaging (MAP) to extend shelf life of fresh food, fish, meat, salads, fruit and vegetables;
- In abattoirs, for use in the stunning and calming of poultry, pigs and cattle prior to humane slaughter; and
- Adding the sparkle (fizz) into soft drinks industry.

4.1.2 There are potentially many food producers locally to the Facility and within Lincolnshire who could benefit from a local supplier of CO_2, in addition to the national demand. This is due to the prominence of the agricultural sector within Lincolnshire e.g. CO_2 can be used to increase the yield of strawberries.

4.1.3 At present it is proposed that the Facility captures up to 25% of the emitted CO_2 from two of the EfW lines. Under continuous improvement (as required by an Environmental Management System[2]), as contracts for offtakes of the captured CO_2 emerge and are agreed, the Applicant intends to add to the CO_2 capture systems to potentially capture up to 98% of the emitted CO_2

[1] *Department for Business, Energy & Industrial Strategy, Press Release: Government secures agreement to ensure CO_2 supplies, (21/09/21)*
[2] *The Environmental Permit will require an Environmental Management System to be in place for the operational Facility, through the requirement of Best Available Techniques (BAT).*

from all three of the EfW lines, in the future, using proven (in Europe) modular, technology. Chapter 21 of the Environmental Statement uses a basis of 5,000 kg/hour of CO_2 per line, this is a worst case scenario of 23% of CO_2 capture for two EfW lines.

5 The Need for Carbon Capture

5.1.1 Due to the recent concentration on reduction in emitted CO_2 there has only been a long-term requirement for CO_2 mostly around the brewing industry, MAP and abattoirs. This historically has been supplied by the two main fertiliser plants in the UK. The fragility caused by this paucity of suppliers in the marketplace, has yet again been exposed when logistics and market forces have interrupted production of the main product, with CO_2 being traditionally a useful by-product rather than a main product. When these conditions have occurred there has been an immediate lack of CO_2 in the UK marketplace. This has also been exacerbated by the reduction in lorry drivers in the UK, together with post Brexit pressures. With the UK now having legislation enacted to be Net Zero by 2050[3], there is now both commercial pressures and a legal requirement to reduce CO_2 emissions, forcing UK developers to consider adopting proven, mature and/or new novel techniques. There are two hubs of CCUS, one in the North west centred on Cheshire and Liverpool region, and one centred on Humberside; both of which will capture Carbon Dioxide and liquify it, and pump it via pipeline into now empty oil reservoirs. These schemes will cost billions of pounds and take many years to plan, construct and put into operation, some aspects are new and novel and unproven, whereas the technology proposed at this Facility is mature, already in the market place in Europe for several years (a least 10 years) and could be built and in operation within four years of the Development Consent Order being granted and delivering to a food market both locally and further afield.

3 The Climate Change Act 2008 (2050 Target Amendment) Order 2019 amended the Climate Change Act 2008, to enshrine in to law a commitment that the net UK carbon account for the year 2050 is at least 100% lower than the 1990 baseline (i.e. net zero).

Appendix 1 Images of Sulden CCUS plant – on Boiler exhaust CCUS plant.

External view ASCO Sulgen

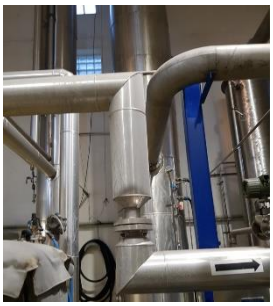
General view inisde plant

Gen view of Internal pipework

View of control panel

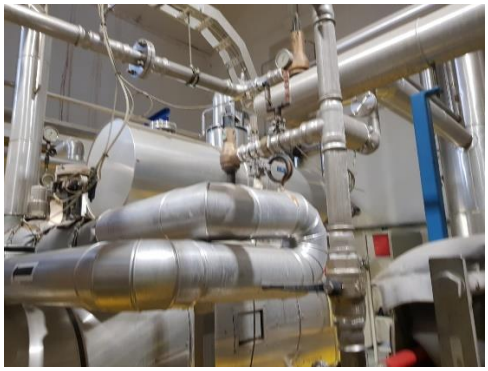
View of one screen

view of 3 columns in background



View of process pumps

General view of reboilers for scrubbing fluid



General view of plate heat exchangers

Primary CO2 compressor

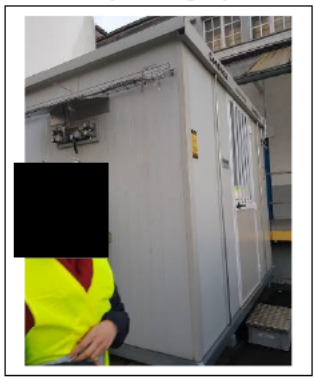
2nd stage gas compression

CO2 Tank Farm - 200 Te

Tank discharge fittings

Detail of tanker connection point

View of Spectrograph station



View of tank farm and discharge stack