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Positioning Paper – CO2 Recovery from Biogas

Executive Summary:

Proposed long-term solution to the CO2 supply crisis

- Periodic liquid CO_2 supply shocks since 2006, resulting from closures and maintenance stops of the large ammonia production plants due to the volatile economics of ammonia production and energy costs.
- Latest shortage was due to the shutdown of Ince and Billingham ammonia plants due to negative margins resulting from the recent gas price hike.
- CO_2 is used in the food and drink + numerous industrial businesses, many of which will face temporary shutdowns or incur significant extra costs, having a negative knock-on effect to other industries and supply chains.
- Injection of £10's of millions for 3 weeks of supply is a temporary fix, and will not solve the root problem. The permanent solution is to stimulate investment in UK-based replacement capacity for the capture/production of liquid CO2.

- CO_2 recovery from Anaaerobic Digestion plants injecting biomethane into the national gas network is proven and existing, and could be scaled up quickly.
- A small number of the 100+ biomethane plants in the UK are already producing circa 50-60,000 tonnes/year of liquid CO_2. It is estimated that 40-50 additional sites are suitable for CO_2 capture/production, in addition to others in the pipeline. This could provide well over 50% of the annual liquid CO2 demand.
- Main challenge is the cost of the capital investment in plant for CO_2 recovery v.s. potential short term return.

- With our knowledge and experience, backed by a government subsidy towards capital investment of around £600k to £800k per site, together we could deliver a robust long term solution to this continuing problem.

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Detailed Description:

On 16th September 2021, CF Industries announced an immediate, indefinite shutdown of its' ammonia plants (at Ince and Billingham), citing unsustainable high natural gas costs. These 2 plants produce approximately 50% of the raw CO2 gas used for the production of food & beverage grade liquid CO2 in the UK. Liquid CO2 is used extensively in the food and beverage industry, as well as numerous industrial applications, which will cease to operate when CO2 supplies runs out. CO2 supply disruptions have been ongoing since 2006, following permanent closure of the Severnside ammonia facility (and the associated CO2 recovery plant). Since then, ammonia shutdowns have become more frequent and more severe, leading to the 2018 summer shortages and now the unexpected and catastrophic shutdowns of the past few weeks. All of these events have had a severe negative impact on the availability and price of liquid CO2 in the UK, with a cost to industry in the millions.

The recent announcement, by the government, to prop up these ammonia plants on a temporary basis, although helpful, does nothing to solve the underlying cause of this problem. As resources become even scarcer and energy costs rise, this volatility can be expected to increase in amplitude and length, and will not be solved by 3 weeks of financial grants to the ammonia industry. The only way to solve the root cause of this issue is to develop a more stable production base for liquid CO2 to supplement and/or replace much of the CO2 production capacity associated with UK ammonia production. Biogas plants offer such a solution. CO2 recovery from biogas production, where renewable bio-methane is being injected into the natural gas grid, is a viable alternative. There are currently 8 to 10 of these plants already operating in the UK, producing an estimated 50,000 to 60,000 tonnes of liquid CO2 per year. In addition, there are an estimated 40 to 50 existing sites which are suitable for CO2 recovery, and a number of sites currently under construction or in planning which are also suitable. In total, it is feasible to increase the capacity of CO2 recovery from Biogas in the UK to well over 240,000 tonnes per annum, which is roughly equivalent to 50% of the UK demand for liquid CO2.

The main challenge facing the installation of more CO2 recovery from Biogas is the (lack of) economies of scale. Because these plants are significantly smaller than the typical ammonia based CO2 capture plants, the capital investment component of the project is very heavy, making it difficult for businesses to earn an acceptable return on this investment. Based on our experience and knowledge of these installations, we believe that a subsidy toward capital investments (an estimated total subsidy package of GBP 20-30 million spread across 30 to 40 sites) would be more than enough to stimulate development of these sources, and provide a permanent and economical solution to the current problem at hand. In addition,

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by stimulating investment in CO2 recovery from AD/Biogas facilities, the additional CO2 revenues and profits would ensure a more robust AD/biogas industry; CO2 prices would remain stable, compared to the massive fluctuations caused by imports and extended supply chains (and much lower than the expected price increase figures currently projected by the government); Development of local supply chains would increase supply reliability and enable the UK to become self-sufficient while reducing distribution miles and tankers on the road.

Since 2006, the traditional industry has had a chance to solve this problem, but has failed to do so. Now it is time to put a permanent and lasting solution in place for the customers and users of liquid CO2. With a small amount of support to bridge the lack of economies of scale, CO2 recovery from AD/biogas can provide a lasting solution which is reliable, “green” and supports UK industry across the board. Your consideration is appreciated.