Sustainable Store Replication

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1. INTRODUCTION

Around 3% of the UK total energy consumption comes from the retail food industry accounting for 1% of the UK’s total GHG emissions [1]. Since more than 85% of these emissions come from buildings, retail stores companies are likely to improve their building efficiency to reduce their carbon footprint. Retail stores possess thousands of stores and thus have to introduce large scale projects to reduce their emissions. The thesis is based on a case study conducted with a retail food company and studies the replication of zero carbon store (ZCS) achieved through bio-methane CHP. The analysis is divided in three main parts. The first one focuses on the exploration stage of the replication; the second one is a study of a specific region of the company and the last part evaluates the potential of sustainable store across the whole business.

2. METHODOLOGY

The methodology is divided in three main parts.

3. EXPLORATION RESULTS

Results show that CHP & district heating is the most cost effective design for a sustainable supermarket. However, its implementation depends greatly on third parties and is not easy to replicate. For a store with a heat to power ratio below 0.5 a CHP & ORC configuration should be used; otherwise it is not worth using a heat recovery system.

Apart from the heat to power ratio, the other store parameters (energy intensities, location and size) do not influence the technological solution but it might change the CHP capacity and/or operational strategy.

The most cost effective ZCS projects are the ones implemented in stores with:
- high heat to power ratio
- high energy intensities
- large surface floor area
- DNO with high power import prices

4. REGIONAL ANALYSIS RESULTS

The regional analysis shows that ZCS enable the company meeting a regional target and so validate the regional strategy. However, the regional context imposes new limits to ZCS projects and the preferred configuration might be altered to enable the region to be cost effectively decarbonised.

5. 2020 PROJECTION RESULTS

The food retailer company estimates being able to purchase about 450 GWh of bio-methane by 2020. With this figure in mind, projections show that only 26.5% of reduction can be achieved and 71 GWh of wind electricity are needed to make sure the organisations 30% target is reached.

6. Conclusion

Further work is needed to assess locally the different UK regions where these ZCS projects would be most relevant. Nonetheless, key results show ZCS projects are a cost-effective manner to reduce the emissions of a large organisation. This is mainly due to the fact that electricity prices in the upcoming years will continue to rise and it will be more economical to produce electricity on-site if the fuel can be purchased at an adequate cost.

References