Life Cycle Assessment (LCA) for Practitioners and Industrial Community:

GWP standards, carbon offsetting schemes, carbon footprint calculator and offsetting methodologies and techno-economic analysis (TEA)

Face-to-face workshop on 30 April 10 am-4 pm, (detailed programme to be confirmed)

This workshop aims to explore with stakeholders the policy landscape for the EBNet community, especially the drivers and incentives for carbon offsetting technologies. How do we define such technologies? What is the methodological landscape for **carbon footprint calculators**? How are calculated carbon footprints verified? Here, we will focus on ISO14064-65 on greenhouse gas validation and verification methodologies. We will also study the overlap and distinction between life cycle assessment (ISO14040-44) and greenhouse gas validation and verification methodologies (ISO14064-65), with the latter being the methodological backbone for **the carbon offsetting schemes.** After discussing the LCA and greenhouse gases validation and verification methodologies, we will focus on the UK's Green Gas Support Scheme in the context of biomethane injection into the gas grid. The models developed so far in the AI4AD project (https://www.surrey.ac.uk/research-projects/ai4ad-artificial-intelligence-enabling-future-optimal-flexible-biogas-production-net-zero) will be disseminated. These models are for GWP standardisation, for the UK anaerobic digestion systems and for techno-economic analysis. We'll demonstrate the uses of various software platforms including gPROMS and a bespoke Python-based platform being developed for predictive modelling and optimisation of anaerobic digestion whole-site decision-making. The key players in the field will be invited to contribute to developing a better understanding of the policy landscape and how waste processing industries can benefit from the UK and global regulatory systems.

The participants are requested to watch the LCA video with the coverage of practical problem-solving using LCA software, https://www.youtube.com/watch?v=TK-XTL2AMBk

The participants are expected to have a broad understanding of LCA and the above video could help with the understanding of how to go about doing an LCA study in practice.

Please read chapters 2, 4 and 6 from https://onlinelibrary.wiley.com/doi/book/10.1002/9781118698129 for LCA and TEA (also shown here). This prior knowledge will help in better engagement and interactions with the LCA/TEA community.

Expected Output: A policy white paper.

Background: The Process Integration and Sustainability Assessment working group is to create awareness on theme 3: Technology Interfaces of the EBNet https://ebnet.ac.uk/. Technology Interfaces cut across the other two themes of the EBNet: Pollutants and Media; and Biosciences for Engineering. The main driver for this theme is to translate the outcomes of environmental biotechnology into societal benefits. For this, systematic appraisal at a whole process flowsheet level as well as supply chain system level is necessary using a whole range of sustainability criteria. Many technical, environmental, social and economic considerations have to be taken into account and analysed using tools and methodologies, which are sometimes more standardized and at other times more fundamental. Process integration or process systems engineering tools stem from the idea of the highest efficiency flowsheet development with the maximum in-process recovery of energy and material resources so that the flowsheet is self-sufficient and least reliant on market externalities. The integrated process flowsheet is then inherently more economically viable than otherwise, where

the majority of the cost may be incurred from external heating, cooling, electricity and reagent supplies. Following the process integration principles, fundamental reactions through separation to utility system designs and optimisation are conducted. There are fundamental tools to help scale up and process integration to create a design with the highest economic margin and resource efficiency. In addition, sustainability assessment is necessary through life cycle assessment (ISO14040-44) and social responsibility analysis (ISO26000) to ensure that across the scales (temporal: life cycle; spatial: supply chain) the process is sustainable.

The working group on this very relevant and unique theme creates awareness of the tools and methodologies to optimise the unit process through to whole systems amongst the EBNet community. Applying these tools and methodologies will help researchers and practitioners convince industrial uptake of their technologies and help policymakers through evidence-based systematic decision analysis.

This Workshop also benefits from the participation of EP/Y005600/1: Artificial Intelligence Enabling Future Optimal Flexible Biogas Production for Net-Zero, researchers and investigators. They will present the findings obtained to date concerning LCA, net-zero/decarbonisation, carbon credits, and many other insights into digitalisation.

There is a maximum headcount of 40 delegates, so please register your interest as soon as possible.

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