

## **AN ANALYSIS OF DEVELOPING ENERGY SYSTEMS: AN OVERVIEW**

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Energy mixes are continuously evolving according to technological development, economics, society, energy demand and legislation. Environmental impact of future energy technologies must be addressed through a comprehensive framework to guarantee a sustainable development. For many centuries, the energy supply to the UK has been based on coal and natural gas. However, legislation and more environmental awareness are pushing towards greener and more stable energy supply, including, electricity from waste, bio-methane, unconventional natural gas and liquefied natural gas (LNG). These and other energy sources constitute the projected future of the UK energy supply.

The objective of this work is to develop a comprehensive framework based on the Life Cycle Assessment (LCA) methodology that can assist decision makers in the evaluation of the environmental burdens of developing energy sources and technologies. Hence, key technologies for the future UK energy mix are tackled. Firstly, advanced and conventional waste-to-electricity technologies, such as pyrolysis, plasma-gasification and combustion are analysed, within a framework of diverting waste from landfill and produce renewable energy. Then, the burden of biomethane production from waste is analysed: advanced thermal conversion and anaerobic digestion are compared according to current and future energy mixes. Fossil energy sources such as shale gas and LNG are also considered as they are expected to play an important role in the future UK energy mix.

This work demonstrates how the LCA framework can be used to draw guidelines for a future, aware, energy development. The outputs of this assessment provide valuable information to stakeholders and policy makers to be correctly informed, and can help in planning new policy legislations or tune the existing ones.