Biogas for sustainable communities: Case studies

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The technology of anaerobic digestion (AD) has been historically used as a waste treatment option for processing strong organic wastes. However, its potential for biogas recovery from waste material makes it one of the most attractive renewable energy options. The resulting biogas can be used directly for heating and lighting, in CHP engines for electricity production, or purified to biomethane and injected to the grid. Various renewable heat and green gas incentives further contribute to the uptake and expansion of the technology. The advantage of AD is that it can be scaled up or down based on the specific in-field conditions and waste availability, and as such, it can provide a wide range of benefits regardless of how economically developed the country is.

This talk will cover several examples of the implementation of AD, ranging from the basic, fixed dome model used in rural India, examples of community-scale and on-farm AD digesters used in Europe, and finally industrial, large-scale reactors used in the UK. It will include the issues of scaling and the multiple benefits obtained regardless of the scale. The size of reactors is proportionate to the amount of waste available and ultimately the output biogas being produced. Furthermore, the total scale of investment dictates the monitoring of the process and the end use of the produced gas. The household and community scale reactors usually opt for the onsite use of biogas for heating, but they often achieve lower than optimal biogas yields. However, the case studies in this talk will also cover good examples of industrial-scale reactors owned by one of the largest utility companies in the UK. They provide an excellent example of how pairing wastewater treatment with AD can result in electricity self-sufficient sites, where the electricity produced from biogas can not only meet their own operational needs but also be sold back to the public grid for profit. Furthermore, once when the technical know-how within the wastewater treatment sites has been established, further development of the AD portfolio is enabled, with multiple stand-alone independent AD plants built for a range of feedstocks. In addition to the profit obtained from biogas utilisation, these sites make a profit from charging gate fees for the received waste and from sales of remaining digestate as fertiliser. This makes a highly profitable business model which, despite high initial investment, can become a significant income generator for a utility company, converting waste into a valuable resource.

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