The potential role for biomass as a long-duration store of energy

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In the UK there is an increasing requirement for long-duration energy storage (LDES) to accommodate seasonal and weather-related variations in wind and solar electricity generation. Government targets for the decarbonisation of the UK's energy system are leading to large-scale deployment of these renewable generation technologies to displace the use of fossil fuels for electricity generation and in the heat and transport sectors.

The study presented here has drawn on knowledge from public, private and academic-sector stakeholders to understand the potential role of biomass in delivering LDES for the UK, and whether this role can be sustained alongside the delivery of bioenergy with carbon capture and storage (BECCS) in the medium and long term.

Bioenergy infrastructure and supply chains, such as seasonally harvested crops, waste wood and forestry by-products, are recognised as currently delivering energy storage at scale. The study has explored the potential to use this characteristic to facilitate greater flexibility in the operation of heat, gas and electricity systems and markets.

All current use of biomass within the UK energy system is shaped by Government policy, incentives and regulation. A current focus for this UK Government policy is the delivery of negative emissions from large-scale BECCS operations. Flexible operation of bioenergy production, particularly on smaller capacity sites, is not currently promoted. However, this study has shown that such sites do have the potential to deliver both BECCS and other on-going system benefits, such as LDES.

The capital and operational costs of bioenergy production are well understood and already deliver cost-competitive commercial operations across a range of scales and locations with varying feedstocks and technologies. This knowledge could be used to deliver a lower-cost solution to the LDES challenge, complementing the other solutions currently being proposed for the UK energy system.