

Researchers test energy solutions

A string of research initiatives in the Midlands is helping to harness biomass as a significant source of renewable energy ahead of crucial government decisions on power generation, says **Lynsey Melville**

The UK's 2007 Biomass Strategy states that "biomass has a central role to play in meeting EU targets for renewable energy by 2020". The UK government has some crucial decisions to make on future power generation. While political compromises may be needed on adoption of nuclear power, renewable energy sources must be central to policy.

DECC recently revealed that the proportion of electricity generated from renewable sources reached 6.6 per cent in 2009. As wind, solar and tidal sources are easily to visualise, they attract popular media focus. But biomass-generated energy, which overcomes the intermittency of higher-profile sources, contributed a market-leading 44 per cent of last year's renewables total, well ahead of longer-term government forecasts of 30 per cent.

The most recent European Biomass Association annual report shows good progress among its 27 member states. The UK is far from being in the lead. Even so, the 2007 strategy showed significant ambition, identifying biomass as a "very versatile" and as yet untapped resource that could be used across the energy spectrum for electricity, heat and transport as well as to produce other industrial materials.

DEFRA has supported major expansion in biomass use and sought to develop a competitive and sustainable market and supply chain by promoting innovation and technological developments. As well as being keen for biomass to deliver high energy yields, this approach seeks wider ecosystem benefits through best land use and sustainable growth in biomass-based energy developments.

Harper Adams University College specialises in farming, agricultural and related studies. The government and Advantage West Midlands have commissioned the college to run the West Midlands BioenergyWM programme. This is helping to develop a dedicated regional supply chain by bringing together bio-energy producers, processors, end users, consultants, manufacturers and local authorities.

As a result, a strong bio-energy infrastructure is emerging, resulting in successful self-sufficiency programmes. One of Severn Trent's sewage treatment plants now processes 4,000 litres of its own sludge daily using anaerobic digestion. The resulting

biogas fuels a combined heat and power (CHP) generator, making the plant self-sufficient in electricity. Harper Adams is currently installing a 350KWe waste-to-energy plant using its farm and food waste to generate renewable power through its CHP system meaning that the campus will become virtually self-sufficient in electricity.

The sustainable technologies team at Harper Adams has used its knowledge of activities in countries more advanced with biomass fuelling of decentralised energy networks to support UK companies. It has investigated forestry harvesting, whereby timber waste becomes valuable fuel, and assisted regional businesses such as Stafford's Talbott Heating Ltd. Talbott's new biomass-fuelled BG25 CHP unit uses an innovative continuous turbo-charged operation based on a self-sustained generating cycle fuelled by combustible recycled wood pellets.

Aston University recently strengthened its growing international position in bio-energy research with state of the art chemical engineering laboratories for its European Bioenergy Research Institute (EBRI). Focusing on biomass conversion technologies, EBRI's bio-thermal valorisation of biomass (BtVB) pyrolysis process uses a Pyroformer reactor combined with a fluidised bed gasifier to take a wide range of feedstock. This includes municipal and agricultural organic wastes as well as wood, sewage, sludge and even construction waste that is otherwise sent to landfill.

A "smart" conveyor detects the type of feedstock, adjusting reactor time accordingly. The approach potentially offers a world lead for cities like Birmingham, which could encircle its conurbation with strategically located BtVB-based plants consuming hundreds of thousands of tonnes of organic waste. This could deliver major quantities of CHP, with autogas for vehicles and biochar-based fertiliser as by-products.

Aston is also managing a £6.2 million project with 14 research organisations and nine companies to deliver a UK-centre of excellence in bio-energy and biofuel research. A further €3.73 million project is researching a new biofuel generation to reduce fossil diesel imports, while a £3 million collaborative project with the Indian Institute of Technology in Delhi is focusing

on developing mini power plants. Powered by renewable and waste sources, these could overcome unreliable energy supplies in rural India and help end fuel poverty.

Birmingham City University's new Centre for Low Carbon Research (CLCR) in the faculty of technology, engineering and the environment draws on its well-established expertise in low-carbon transportation, bio-energy technologies and intelligent buildings. The CLCR has sector-leading facilities including a dedicated, research-based laboratory and unique engine test cells. Used for automotive power train and biofuel research, these cells provide emission and particulate analysis systems as well as multiple gas analysers that conform to European standards.

The team is currently supporting Morgan's advanced LIFECar power train development and a dual-fuel programme for heavyweight diesel engines to run on biogas. The centre is developing a concept incorporating carbon dioxide-absorbing algae cultivation into a revolutionary self-sustaining anaerobic digestion (AD) biogas production process. Algae would be cultivated on nutrient-rich wastewater in a photo-bioreactor (PBR) which provides controlled environmental conditions to promote their growth. ■

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Talbott: innovative combined heat and power unit

