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# Seismic changes in power output

**Emerging energy-from-waste technologies that offer substantial increases in the efficiency of power output are opening up new commercial opportunities for waste management providers, *Peter Jones* reports**

In 2009, Waste2Tricity (W2T) was established as a "structured solutions provider" to the energy-from-waste (EfW) sector. The company's business plan is based on a simple premise: to apply the most efficient and economical technologies to achieve the effective conversion of scrap carbon to energy.

W2T works with partners and clients who want to utilise proven plasma gasification technology at the front end and proven internal combustion engines (ICEs) or gas turbines at the back end of their operations. In this process, waste enters a plasma gasification chamber and is turned into syngas by the application of very high temperatures in an oxygen starved environment. The syngas is cleaned and fed into an ICE or turbine. Finally, it goes through a transformer to generate electrical power.

At both front and back ends, this configuration has significant advantages over mass burn technology (MBT), the prevailing thermal EfW industry standard. At the front end, MBT solutions incinerate waste and produce emissions. The weight of ash produced can be as high as 25 per cent of the input. With plasma gasification, there is no fly ash and significantly fewer pollutant gases.

At the back end, MBT and other less advanced solutions deploy steam or Rankin cycles in place of ICEs or gas turbines. The conversion rate of energy gas to electrical power out of a steam cycle is approximately 23 per cent. The ICE or gas turbine conversion rate is around 35 per cent, an approximate 50 per cent uplift in the conversion rate.

W2T uses ICEs and gas turbines as they sit at the cutting edge of commercially available EfW technology. They fall squarely within what DECC terms advanced deployments of advanced conversion technology (ACT). Under DECC's revised banding proposals, ICEs and gas turbines will continue to receive double renewables obligation certificates (ROCs), whereas ROCs for MBT and other less advanced solutions will be more than halved.

The company's commitment to deploying ICEs significantly predates DECC's proposals, as efficient technology selection and the regulatory environment have always been key considerations. Anticipating the next technological shift, W2T is currently lobbying to have fuel cells included in DECC's ROC banding review as an ACT. We firmly believe that integration of hydrogen fuel cells at the back end will yield further substantial conversion efficiency uplift.

W2T recently secured exclusive UK rights for waste-derived hydrogen for AFC Energy's low-cost alkaline fuel cells, identifying this technology as the one which offers the highest conversion rate of hydrogen to electricity at the lowest possible cost. In this process, waste will enter a plasma gasification chamber to be turned into syngas. The syngas will be cleaned and processed and all of the energy gas will be converted into hydrogen, leaving the carbon dioxide in a captured state.

The hydrogen will then be fed into new-generation AFC Energy alkaline fuel cells in place of ICEs. W2T anticipates a fuel cell conversion rate of around 60 per cent, representing a 130 per cent increase on steam cycle technology and a 70 per cent increase compared to ICEs or gas turbines. We consider such efficiency to be sufficient to potentially restate the value of waste and thereby commoditise it into an energy feedstock.

W2T has dual commitments to deliver technology that is future-proofed and to develop programmes that will be proven, profitable and progressive. Currently the company is involved in two main deployment projects and a development programme which we believe will define the EfW market for the foreseeable future.

The first deployment project is with global gas supplier Air Products, which has secured planning consent to develop a 49MW, 300,000-tonne gasification EfW facility deploying gas turbines near Billingham on Teesside. Given the scale of the facility, it is estimated that the amount needed for investment would be several hundred millions of pounds. Air Products hopes to build up to five plants in the UK.

The second project is as part of a consortium to develop smaller-scale plasma gasification EfW facilities deploying ICEs. These facilities, with an output of around 17MW and throughput of about 80,000 tonnes, afford a growth opportunity in a market that Air Products' Teesside proposed investment makes a commercially viable and investable reality.

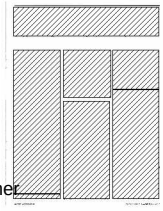
As the founding consortium member, W2T is currently spearheading talks with industry specialists about a proposal to structure the investment opportunity and co-ordinate the consortium's activities. The project life cycle is projected to be about five years and preliminary studies indicate costs in the region of £60 million.

## Ensuring compatibility

W2T's development programme runs in conjunction with AFC Energy. Having acquired exclusive rights to the AFC Energy technology for use with hydrogen derived by way of high-temperature gasification, W2T continues to work with AFC through its Beta testing phase to ensure maximum compatibility with EfW facilities. Both of the proposed deployment projects have the potential to integrate fuel cells.

Currently, W2T's focus is to continue to strengthen existing relationships and generate new ones via its involvement in deployment and development projects. Its revenue is derived from management fees and at the moment it has a solid pipeline. Over the longer term, it will look to maintain its involvement in the administration of projects while facilitating the deployment and integration of AFC fuel cells and deriving revenue from management fees, licence agreements and energy service companies providing a range of comprehensive energy solutions respectively. ■

*Peter Jones is chairman of Waste2Tricity*



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Energy from Waste: improving conversion rates