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Hot Issue and Burning Options in Waste Management: A Social Cost Benefit Analysis of Waste-to-Energy in the UK

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Municipal Solid Waste (MSW) should no longer remain a neglected source of energy in the UK. One tone of MSW is sufficient to generate about 0.65 MWh of electricity and 2 MWh of heat. However, using MSW as input in Waste to Energy (WtE) technology is also dependent upon the effectiveness of the waste management practice. MSW mainly consists of waste from households, small businesses, office buildings and institutions such as schools, hospitals and government buildings.

Municipal Solid Waste Management (MWSM) concerns the generation, separation, collection, transportation and disposal of waste, taking the public health, economics, and environmental aspects into account. Managing the link between economic growth and waste growth is vital to a successful waste management policy. The range of options for managing MSW is often presented in order of preference via 'waste hierarchy'. The UK follows a five step waste hierarchy placing prevention at the top followed by re-use, recycle/compost, energy recovery and disposal respectively as a part of its waste management policy.

The UK has relied on landfill as its primary method of waste management and many large holes left by mining and quarrying activities were utilized as ready landfill sites. The natural impermeable ground conditions often allowed the burial of waste with little liquid seepage and ground water pollution making landfilling a cheap option. However, there remain environmental concerns attached to landfiling of waste. In 2001, the methane emissions from landfills accounted for 25% and 2% of the UK's total methane and greenhouse gases emissions respectively.

The EU's landfill directive has set the target of reducing the amount of biodegradable municipal waste landfilled to 75% by 2010, to 50% by 2013 and to 35% by 2020 relative to 1995. Experience from other European countries such as Denmark and Austria show that WtE and recycling can co-exit as complementary activities. An assessment of the

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL economics, institutions and policies affecting WtE is, therefore, important for better understanding of this technology in the UK.

The construcution and operating cost of a WtE technology is relatively higher than other waste management options. The efficiency at which the plants operate coupled with the composition of waste stream and alternatives for both waste management and electricity generation also affect the costs. The sources of revenues are limited to gate fees , energy sales, recycling metal post incineration and combustion residuals. In the UK, gate fees account for about 70-80% of revenues while another 20-30% is from the sale of electricity. WtE plants also emit pollutants such as sulphur dioxide, lead and dioxins which may damage the health and the environment at high concentrations.

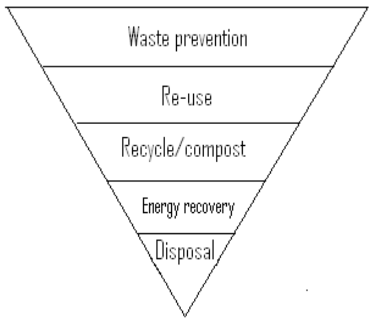

Figure 1: Waste hierarchy in the UK

Source: Adapted from DEFRA (2007)

However, each tonne of MSW used in the WtE plants would reduce the consumption of oil by one barrel and that of coal 0.26. WtE plants also contribute through reduction in emissions of greenhouse gases. The methane released landfills is 25 times more efficient in trapping heat as compared to carbon dioxide. The net change in greenhouse gas emissions from WtE can be assessed by considering the energy generation and waste management alternatives that it would replace.

WtE, as a low-carbon energy source, can contribute towards achieving the UK's renewable energy and climate change targets. Our results indicate that if the UK continues in the current waste management path and allocates its MSW as per 2005/06, By 2020, WtE will account for 0.64% of the total electricity demand and 6.5% of the total heat demand. This implies that, WtE will only provide 3.2% of the total renewable electricity needed to meet the Government's target of 20% renewable electricity target by 2020.

However, if the UK allocates its waste as per the targets set by the EU Directive, by the end of 2030, 3.1% of the total electricity demand and 32.4% of total heat demand can come from WtE. In other words, WtE will provide 7.2% and 15.5% of the Government's target for 20% renewable electricity. The results show a marked improvement in cost effectiveness of the waste management options if the UK allocates its waste as per the EU Directive. Moreover, under the high carbon price scenario, the social cost of modern coal power rises significantly as compared to a modern WtE plant.

WtE has significant potential benefits to offer for the UK but achieving improving the institutional and policy framework. The government will need to improve its waste strategy by managing the municipal, commercial and industrial waste together in order to minimize the number of policies, improve efficiency, and reduce transaction costs. The proliferation of WtE technology also depends upon the public perception which differs from country to country. Thus, public involvement in the waste planning process could reduce local opposition and foster balanced opinions on WtE. The weaknesses in the collection of landfill tax should be corrected and the operation of the landfill tax credit scheme (LTCS) should be made efficient.

WtE has the potential to be an effective waste management option and reduce the amount of waste sent to landfill. Also, by virtue of its biomass content, WtE can contribute to achieving the UK's renewable energy and climate change targets. However, it is also necessary to develop efficient delivery networks allowing the use of electricity and heat from combined heat and power WtE plants. Institutional improvement such as removing regulatory barriers in planning permission is needed in realizing the full benefits from WtE plants in the UK. Therefore, waste can be regarded as a resource that should not be wasted.

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