Energy from waste and the circular economy

Net-zero and resource efficient by 2050

UNIVERSITY OF BIRMINGHAM

EXECUTIVE SUMMARY

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- We need a circular economy approach to increase recycling rates, conserve resources and cut CO_2 emissions. However, our main methods of waste disposal, landfill and incineration, emit large amounts of greenhouse gases and squander valuable resources.
- Energy from Waste (EfW) plants that recover energy in the form of electricity and, crucially, exploit their waste heat are needed to dispose of the residual waste in a more efficient way. We then need a shift to include technologies like anaerobic digestion (AD), pyrolysis and gasification plants that can turn waste in to chemical feedstocks and fuels rather than electricity.
- This can be done by building a network of local and regional Resource Recovery Clusters (RRCs) with combinations of EfW and recycling technologies, and co-located with businesses and industries that use the Cluster's energy networks, waste streams, fuels and products.
- We recently carried out a policy commission looking into Energy from Waste and the Circular Economy. In our final report, we recommend many detailed reforms but believe that meeting this challenge depends critically on three major innovations: building a network of local and regional Resource Recovery Clusters; creating a national Centre for the Circular Economy, and launching an R&D Grand Challenge to develop small-scale circular carbon capture technologies.

Introduction

The UK lacks the capacity to deal with all the waste it produces and exports millions of tonnes overseas. But now countries in the Far East are banning unwanted shipments from developed countries and tariffs are being introduced in European countries such as the Netherlands.

For some, the answer is clear: we need a 'circular economy' with much higher levels of recycling, which both conserves resources and cuts CO_2 emissions. If we achieve that, they argue, we won't need energy-from-waste (EfW) plants, which are mostly incinerators that generate only electricity, because we won't have any rubbish left to burn. Worse, they claim, the very existence of incinerators discourages recycling, so we must get rid of them.

We entirely agree that everything must be done to raise recycling rates. But the choice is not binary. Changing large infrastructure systems takes time, and there are newer EfW technologies like anaerobic digestion (AD), and pyrolysis and gasification plants, which could play an integral part in the circular economy. And however high we manage to raise recycling rates – currently stuck at about 45% – there will always be some residual waste. In some ways, this may not be a problem but an opportunity.

We believe some EfW will always be necessary but that it must be made more circular and lower emitting. And we are convinced that with the right changes in policy the industry can plot a path to become zero-emission and resource-efficient by 2050. With far higher recycling rates, it will be a smaller industry than today but potentially more valuable. It will certainly be more integrated with recycling systems and local economies.

National policy reforms must include a more Scandinavian approach to capturing heat, major public investment in infrastructure and strengthened support for R&D and venture capital stage technologies. Together this would greatly improve resource efficiency; start to decarbonise heat, one of our toughest challenges; and set EfW on course to reach net-zero by 2050.

Birmingham Policy Commission

The Energy Research Accelerator (ERA) and the Birmingham Energy Institute have organised a policy commission to examine the state of play, barriers, challenges, and opportunities for Energy from Waste (EfW) to form part of the regional energy circular economy in the Midlands.

Commissioners

- **Lord Teverson (Chair)**
- Dr David Boardman, Deputy Director, Birmingham Energy Institute (University of Birmingham)
- Adam Chase, Director, E4tech
- Dr Matthias Franke, Head of the Department of Recycling Management, Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT, Germany
- Professor Martin Freer, Director of the Birmingham Energy Institute (University of Birmingham) and Energy Research Accelerator
- Professor Andreas Hornung, Director/Chair in Bioenergy, Fraunhofer UMSICHT/University of Birmingham
- Peter Jones, Director, Ecolateral
- Daniel Mee, Systems Architech, Energy Systems Catapult
- Matthew Rhodes, Chair, Energy Capital
- Adrian Smith, Corporate Director, Place, Nottinghamshire County Council
- Professor Patricia Thornley, Director, European Bioenergy Research Institute (EBRI), Aston University
- Dr Helen Turner, Director, Midlands Innovation
- Dr Stuart Wagland, Senior Lecturer in Energy and Environmental Chemistry, Centre for Climate and Environmental Protection, Cranfield University

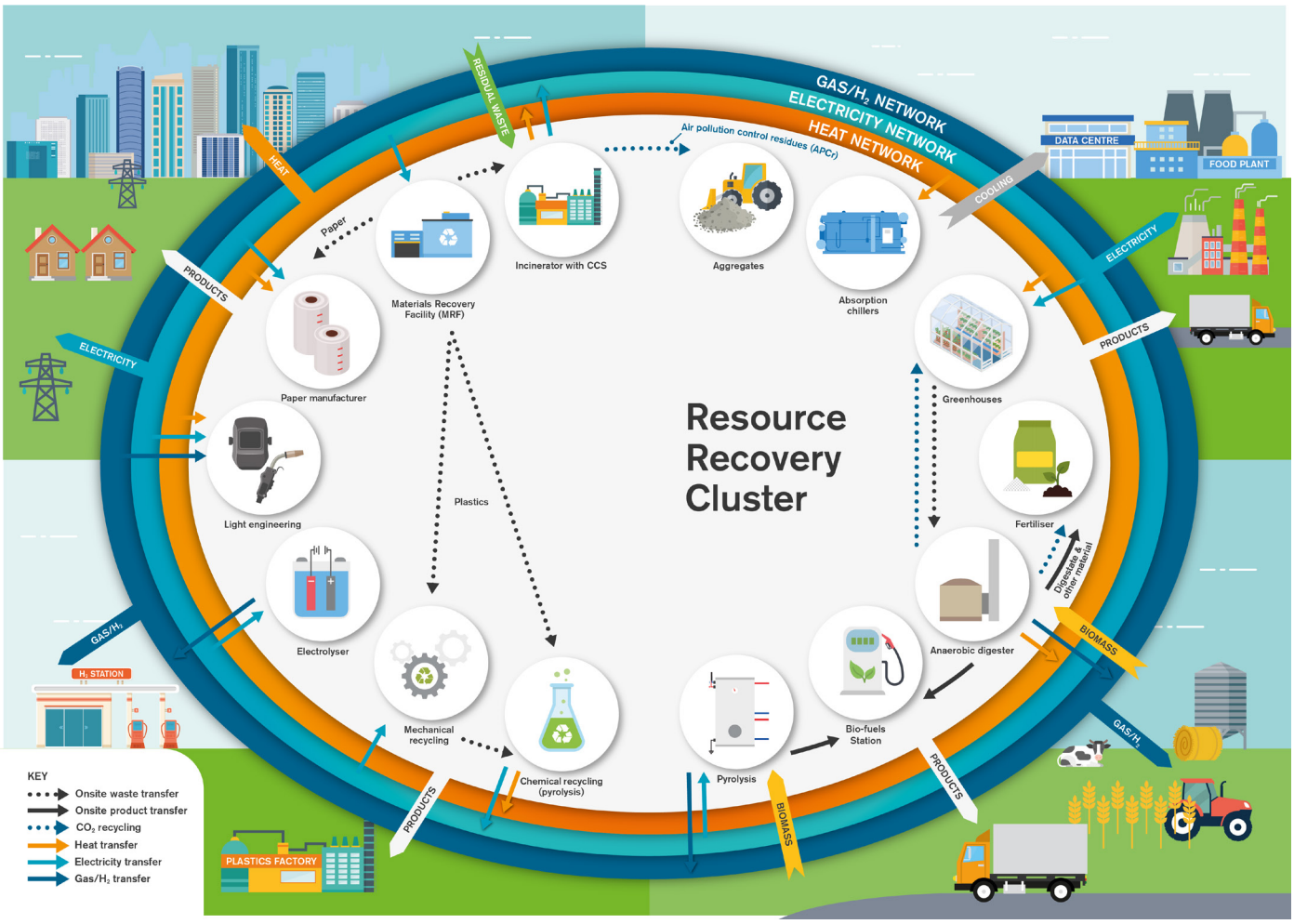

Figure 1: The Resource Recovery Cluster

Policy recommendations

We urge the government to:

Heat

- Ban the building of new incinerators except those which make full use of their waste heat, incinerator bottom ash (IBA) and air pollution control residues (APCr) residues, and a rising proportion of their CO_2.
- Introduce an efficiency ratchet, which would oblige operators to meet rising efficiency standards by target dates.
- Introduce 'green gas obligation' similar to the Renewable Transport Fuel Obligation (RTFO) scheme so that suppliers have to ensure a rising proportion of their gas comes from low-carbon sources.
- Increase support for district heating networks tenfold. Current funding stands at £320 million plus £270 million announced in the last budget. The IPPR calculate that, if this was raised to £3 billion, it would lever in private investment of £22 billion, enough to supply 10% of UK heat by 2030.
- Offer the HNIP funding approach to any Resource Recovery Clusters established around existing electricity-only incinerators.
- End the uncertainty about the RHI and renew or replace it.

Circularity

- Standardise and level up the separation of waste streams at source and make good on the waste strategy's promise to fund local authorities to provide seaparate collections.
- Introduce fiscal measures to shift the balance from virgin to recycled materials, and move waste streams up the waste hierarchy. The proposed tax on any plastics containing less than 30% recycled material would be a good start, but the same approach should be extended to a much wider range of materials.
- Introduce business rate (or other tax) relief for companies relocating to new Resource Recovery Clusters provided they demonstrate both circularity and carbon reduction.
- Introduce 'renewable fertiliser obligation' – modelled on the RTFO – which would oblige suppliers to incorporate a rising proportion of non-fossil fertiliser in their sales.

Support for local authorites

- Task upper tier and strategic regional authorities to lead infrastructure assessment and planning for Resource Recovery Centres.
- Revise the National Planning Policy Framework to ensure local authorities have powers to impose conditions around circularity and greenhouse gas emissions on developers of waste and recycling facilities.
- Support local authorities in developing Resource Recovery Clusters.
- Fund councils to map the area around each incinerator, particular those remote from sources of heat and cooling demand, for land that might be available and suitable for new Resource Recovery Clusters.
- Where mapping shows potential, provide financial support to help develop the first few Resource Recovery Clusters.
- Support councils to solve the problem of contact cliff-edges, where towards the end of a heat network operator's contract it becomes uneconomic to take on new connections.

Technology

- Launch an R&D grand challenge for small-scale carbon capture and reuse so that 100% of CO_2 from an EfW plant can be econmoically captured and turned into useful products.
- Fund R&D in high-priority areas. In biogas this should include research into yield improvement, digestate upgrading and centralised gas injection. In pyrolysis and gasification the main priority is to mount full-scale demonstrators. Developing small-scale, economic technologies that capture all the CO_2 emissions of EfW plants is exactly the sort of challenge the government's new ARPA-style 'blue skies' funding agency is intended to tackle.
- Reinstate ETI-style venture capital support for waste technology companies facing the valley of death – such as pyrolysis and gasification – which could be run as competitions. The ETI was highly successful, for example, in bringing down the price of offshore wind, but its public-private funding model meant that the resulting IP was kept in private hands. We favour a model that produces communal knowledge, which may imply a higher proportion of public funding or a different approach to tax relief.

Industry

- Oblige industries that manufacture hard-to-recycle products to produce roadmaps showing how they will reach 'net-zero and resource-efficient' by 2050. Sectors would include mattresses, tyres, paint, nappies, and electrical and electronic. This should form part of a broader strategy to impose Extended Producer Responsibility (EPR) across the economy.
- Oblige all companies making LCA claims in marketing or other communications to publish at a minimum the 'goal and scope note' of their analysis. This sets out the objectives, boundaries, methodology and assumptions of the analysis, and identifies the datasets used. This would allow others to understand and challenge the claims made, while keeping proprietary data confidential.

Local and regional authorities

- Local authorities may be weakened and need central government to restore their financial and human resources. But until then they can still play a significant role. Even with existing powers, councils and regional authorities could and should promote the introduction of Resource Recovery Clusters through planning policy and strategy, and by integrating waste and energy planning within their organisation.

Further information

You can find out more about the Energy from Waste policy commission and read the full report by visiting www.birmingham.ac.uk/efwcirculareconomy.

Contact

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