Residual Waste as an Energy Resource :

Contributing to Sustainable Resource Management

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Integrated & Sustainable Waste Management

- MSW plus commercial/industrial wastes
- The waste hierarchy
- Dry recyclables
- Biodegradable fraction(s) … garden (+kitchen) wastes
- Residual waste stream(s)…70% – 50% by 2020 ?
  - Recovery or disposal ?
  - A hierarchy of efw ?
- Wastes as resources (6EAP, new WFD, Thematic Strategies)
- 2006 review of England's Waste and Energy Strategies

Residual Waste

- Wastes not targeted for separate collection (kerbside, banks)
- Wastes not segregated by households (low participation)
- Contaminated wastes (including composites)
- Residues from collection and/or sorting and/or processing (skills)
- Other wastes : contaminated wood, household hazardous
- Residual MSW + residual commercial and industrial wastes
- “No reasonable prospect of the waste being recycled/composted”

Residual Waste : Recent Statements

"The use of residual waste treatment options involving recovery, including energy from waste solutions, will have an integral role in treating the waste we cannot 'design out, re-use or recycle"

Criteria for Securing Waste PFI Credits, May 2006

"Given that the RRL project is intended to deal with residual waste I reiterate my earlier conclusion that it would not serve to crowd out recycling/composting or other options further up the hierarchy but rather displace landfill as a means of disposal"

DTI consent letter for Belvedere efw plant (Riverside Resource Recovery Limited, June 2006

"EfW is a legitimate and sustainable technology for the treatment of residual waste"

"The correct test is that 'residual' waste should be regarded as only that waste which cannot be recycled or composted"

Inspector's Report on Belvedere, June 2006

EU Context

- Primacy of environment and health
- Climate Change
- Resource-based policies
- Life Cycle *thinking*
- New definitions of recycling and recovery
- Quality standards for facilities
- Energy from residual waste, based on efficiency equation

England: recycling + composting targets

	Recycling (%)		Energy from residual waste	
	WS2000	WS2006	WS2000	WS2006
2005/06	25		15	
2010	30	40	15	13
2015	33	45	33	22
2020		50		25

Underpinned by statutory Local Authority BVPIs for recycling and composting
Recycling and composting figures are for household waste (c.90% of municipal waste).
Energy from residual waste figures are based on recovery figures for municipal waste - Landfill Directive is concerned with biodegradable municipal waste (also LATS).
2,000+ new facilities @ £7-10-30 billion ?

Landfilling C+I waste : 53% in 2002, 37% in 2010, 36% in 2015, 35% in 2020

Europe:energy from waste and recycling

	efRw m.tonnes	%	Recycling %	Landfill tax € per tonne
Austria	0.88	9.8	59.8	87
Denmark	3.28	52.9	37.6	74
France	11.25	28.1	24.5	7-9
Germany	13.18	21.9	41.8	0
Italy	3.47	7.4	25.0	10-50
Netherlands	5.18	30.9	45.4	84
Spain	1.86	6.1	20.5	10 (Catalonia)
Sweden	3.13	38.4	38.2	31
UK	3.17	7.2	11.1	26 (51 by 2010)

Care should be taken with definitions of MSW between Member States

Data is for c.2002/03

Source : SLR Consulting Limited, CEWEP, Eurostat

Energy Supplies

- **Coal : historical heritage, ageing power stations, imports, LCPD**
  main use = electricity

- **Gas : gasification, North Sea, imports, security, higher prices**
  main uses = heating and cooking, electricity

- **Oil : Middle East dominant, North Sea, security, higher prices**
  main use = transport

- **Nuclear : wastes, safety, costs**
  main use = electricity

- **Renewables : wind, solar, wave, biomass, waste**
  main uses = electricity, heating

Energy Issues 2006

- Oil price increases in 2005/06 + knock-on effects
- Reliance on oil, gas and coal imports
- Nuclear power = 19% of electricity in 2004
- Gas = 40% of energy/electricity in 2004
- Renewables : slow development (despite PPS22), scale ?
- R&D : new technologies, DE, micro, carbon sequestration/storage
- MSW incineration = 3.67million tonnes (+ 0.7) in 2005, (0.35% of electricity)

An Energy Gap in 2015/2020 ?

- Coal-fired power stations : 37% 'opted' out of LCPD from 2008

(clean coal imports, clean coal technologies, new build ?)

- Nuclear power = 4% of electricity after 2020 ?

(cost, safety, waste, proliferation. 2019 for first new build (of 10) ? £20 billion ?)

(no 'uranium' bullet as an energy solution)

- Gas = 80% imports by 2020 ?

(geopolitics of supply, CCGT, can be stored)

- Renewables, new technologies, low-carbon, micro-generation, CSS, DE ?

(will they deliver by 2015/2020 ?)

- MSW, 10 m tonnes by 2020 ? 2 million tonnes of RDF by 2010 ?

(10-17% of electricity ?)

- Cost (£50 billion ?), timescales, land use planning

An Energy Gap in 2015/2020 ?

	Capacity (MW)		Gross supplied (TWh)	
	2000	2015/20	2000	2015/20
Coal	35,000	22,000	34%	12%
nuclear	12,000	2,500	23	7
Gas	24,500	50,000	35	68
EfRw	440	>700	9	25
RDF	neg	?	neg	10-17% ?

Emissions

- **Climate Change**
  - CO_2 similar to, but offsets methane from, landfill
  - offsets CO_2 from fossil fuels
  - carbon policies and targets
- **Environmental Protection and Human Health (1990-2000)**
  - Dioxin emissions from MSW in UK down 52% to 1% of total (0.5% in 2003, 2% from one EA study in 2004)
  - Dioxin emissions in MSW in Germany down 33% to <1%
  - Dioxin emissions in Germany down 400Tu to 0.5
  - WID dioxin limit down 225 to 0.1 ng 1-TEQ/m^3 = 99.9%
- **Technology exists + tight emission limits + regulation + HPA**
- **Public perception and communication**

Delivery

- PPS10 + ‘live’ Guidance
- RSS + WMS + ‘live guidance’
- Stakeholder engagement and localism/local circumstances (SCI)
- Planning gain and community gain
- Appropriate scale + fit with decentralised (DE) generation
- Contract specifications + time scales + gate fees
- Resource Recovery Parks + CHP

Energy from Waste in the UK

NIMBY

NOTE

ABH

LULU

NOOS

NIOBE

NOPE

NOABY

BANANA

(METHANE and LANDFILL)

NIMEY

NIMTOO

YIMBY

Funding

- Capital Funding : PFI and/or PPP, PB, ECA, alternatives ?
- Revenue Funding : PRNs (combustible packaging, glass until 2007), IBA, ROCs (90% biomass, CHP, not mixed waste)
- Drivers : waste growth, infraction proceedings, LATS
- R&D : WIP New Technologies, DTI Technology, Defra WRP
- Government + Council Tax : ring-fencing
- Private sector + risk apportionment

Funding

Waste Infrastructure Development Programme (WIP)

- **to deliver '2,000' new waste facilities by 2020 (£10 billion ?)**

- **small, low value infrastructure (HWRC, MRF, landfill)**
  (grants, LAs and/or companies, Prudential Borrowing)

- **intermediate infrastructure (MBT, AD, etc)**
  (PFI credit support - £40m cap removed May 2006)

- **energy from (residual) waste**
  (project finance with or without PFI credit support)
  (until 09.2000 PFI focussed on incineration, then recycling + cap of £25m, 10.2003 focus on waste hierarchy + £40m)

(also see OGC and OFT reports of May 2006)

Funding

Waste Infrastructure Development Programme (WIP)

"Cross-border as well as cross-tier integrated working calls for regional strategic partnering models linked to regional procurement strategies that can avoid the duplication inherent in single authority procurement. This will give rise to opportunities for private sector construction Programme Managers to assist waste Partnerships procure infrastructure within PFI, DBFO, DBOM, DB, OM models using private sector debt and equity and/or public finance, as appropriate"

Standards and Protocols

- WID = tight limits and controls for incineration and co-incineration
- The Principal/Primary Objective for waste as a fuel (including MHT)
  - RDF - SRF - RRBF = merit order = a product
  - statutory fit-for-purpose product standards
  - efficiency criteria (including CHP)
  - recovery is a certainty not a possibility
  - market appetite and positive market prices
  - without endangering human health and the environment
  - agreed protocols for auditing and monitoring

A Hierarchy of energy from waste ?

- Criteria
  - source segregation
  - or mixed residual waste
  - energy recovery 'technology neutral'
  - calorific value + energy efficiency (60/65% in December Draft WFD)
  - tools : LCA, HIA, SIA, SEA
  - without endangering the environment and/or human health
  - permitting regime (WML and/or PPC)
  - technology issues (including control of emissions)
  - costs
  - appropriate scale + decentralised (DE) generation
  - land use planning
  - integration with demand : housing (including fuel poverty), commercial
  - planning gain and community gain
  - security and diversity of energy supplies at affordable prices

A Hierarchy of energy from waste ?

- Some thoughts

  - energy efficiency

  - source segregated biomass (energy crops, waste wood, biowaste)
    - anaerobic digestion
    - power generation
    - co-combustion
    - biofuels
  - appropriate scale CHP (80% + efficiency + decentralised generation + RDF 'feeders')
  - MBT/MHT : dry recyclables, + a fuel product (2 mtpa by 2010 ? 26 by 2020 ?)
  - gasification (plasma arc ? use of syngas ? hydrogen fuel cells ?)
  - co-combustion of mixed residual waste (less NIMBY ?)
    - industrial boilers
    - power stations
    - cement kilns
  - electricity from residual waste (25% efficiency up to 34% ?)
  - new technologies (still to be proven)

  - mass burn incineration without energy recovery
  - energy from landfill gas

A Hierarchy of energy from waste : emissions

Publications by ERM and Dominic Hogg in 2006

- Impact of greenhouse gas emissions : CO2, methane
- Quantifying fossil and/or organic carbon
- Energy as electricity and/or heat
- Recycling better overall
- Residual waste v. gas : electricity = 20% more, CHP = 20% less
- Broadly similar to hierarchy as out lined

LATS 2010 + 2013 : to meet or not to meet ?

NAO Report of July 2006 (70% sample)

- 5 WDAs 'unlikely' to meet targets
  - + 1 ? + 1 efw ?, +1 MBT ?
- 16 WDAs face 'challenging timetables'
  - + 3 efw ?, + 5 MBT ?
- 5 WDAs 'highly likely' to meet targets
  - 3 + 1 efw , 2 + 4 MBT ?
- 19 WDAs 'have already' met targets
  - 16 efw, +1 MBT ?

Conclusions

- Integrated and sustainable resource management
  - sustainable consumption and production strategy
  - resource efficiency + energy efficiency
  - wastes as resources - including energy : 'joined-up' thinking
- Protection of environment and health
  - scientific evidence and public awareness
- Balance between waste management options
  - challenging, but achievable targets
- Focus on residual waste
  - incineration + co-incineration + MHT to divert waste from landfill
  - a hierarchy of energy from waste options based on efficiency, scale *et al*
- Leadership : national, local, commercial, investors

Thank You

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