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# Proof of Evidence

## Lancashire Minerals and Waste Local Plan Inquiry

### Session 4

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For an on behalf of  
**ARROW**

**Objector no. 5159**

## **Issue: PC 58 - High Grade Sand and Gravel Provision PC 63 - Limestone Provision**

**ARROW Ref.:** 38 + 39

**Inquiry Ref.:** 5159/2/06 5159/2/07

**Plan ref.:** Para. 7.20, pages 60/21 + Policy 53, page 67

We object to change 58 since it seeks to extend provision for sand and gravel without any limiting criteria in terms of matching demand, proximity of supply, or the phasing of develop to ensure that there is not an unnecessary over provision. We also object to the use of the words 'not less than' in change 63. This is on the basis that it provides an absolute provision, rather than being able to minimise the level of provision in response to demand.

### **Sustainable resource conservation led policies**

We request that amendments are made to these changes, particularly change 58, to introduce a more sustainable resource-limiting approach to plan policies on sand and gravel provision. This is also important with regards to the protection of the environment and the countryside. The latest comments from the Government on this issue [see *appendix 1*] put emphasis on the need to have high standards of environmental protection. The first step in this approach must be to minimise the provision of quarrying to that actually needed to meet local demand.

There are a number of practical measures which we believe should be introduced to achieve this aim.

#### **In relation to Proposed Change 58, we suggest that:**

- a) It is made clear that development will be phased, though the use of planning conditions, to regulate the extraction of sand and gravel. This is a practical extension of the policy in paragraph 11(i) of MPG6. We suggest that an additional paragraph is inserted between para. 7.20F and 7.20G -

*"In order to ensure a steady supply of sand and gravel conditions to phase the release of sites will be applied. Areas will be released for working as and when they will be required. This will be done as part of a positive policy to conserve raw materials, and to ensure their efficient and effective use. In deciding when or whether to release an area for working, the Council will consider the need for that material, and the availability of sites better suited to meet demand. But overall the decision will be based on the need to ensure that the permitting and release of land for minerals extraction in Lancashire is carried forward in accordance with the principles of sustainable development. The level of release will be monitored to ensure that the production of sand and gravel meets local need, and that an excessive over or under provision of material does not arise."*

- b) There should be regular monitoring of the demand for sand and gravel in order to ensure that there is not an over provision. This would be part of the monitoring duties of the planning authority. This point is implemented by the last sentence in the new paragraph suggested above.

- c) Some form of 'proximity' principle should be introduced to limit the area which any one quarry can serve. We suggest that the following sentences are added to paragraph 7.20N -

*"Proposals for new working should, where possible, be located as close as possible to the market for the worked material. Where this is not possible sites should be located where they can have convenient access to the trunk road network."*

- d) There must be some form of limiting procedure to the provision of high quality sand and gravel,

rather than meeting demand, in order to provide an economic instrument to encourage a more efficient and sustainable use of this resource. This is partly done by the change suggested for point A above, but the limiting of provision must also have regard to the wider sustainability objectives for minerals development. To address this outstanding point we suggest that a new paragraph is inserted between paragraph 7.20C and 7.20D -

*"In considering sites for inclusion in the landbank the Council will have regard to the basic principles of sustainable development - that is the efficient working of the mineral, the use of sensitive working practices, the protection of the natural environment and the ability to sustainably reuse the site when working ceases. Proposals for new sites must meet these objectives, and ways of achieving them should be specified as part of any application for permission or for the release of parts of sites where release is phased by conditions."*

Point A is important to ensure that there is a steady supply of aggregates. It would also prevent the over-exploitation of local resources. Point B is a necessary part of the previous policy to ensure that the steady supply of aggregates is maintained to meet local need, or conversely to restrict future releases if there is already over-capacity. Point C tries to limit the transport impact generated by minerals development. Finally, point D seeks to require higher standards from new sites which are included as part of the landbank. It would be difficult to get much higher standards from those sites already permitted, but there is scope for improving practices in the future.

In relation to change 63 we suggest that the words 'an additional' be replaced with 'further material to meet demand up to a maximum of'. The purpose of this change is to ensure that the Council have the ability to permit lower levels of development in order to meet the sustainability objective of MPG6, and at the same to minimise the impact of limestone extraction by limiting the overall land take.

## **Issue: Landraising**

**ARROW Ref.:** 27

**Inquiry Ref.:** 5159/1/28

**Plan Ref.:** Policy 84, p130,

We object to the landraising proposals in Policy 84 on the same grounds as to the general landfilling objections outlined in objection 26 (5159/1/27) on page 2 of our 'Session 3' proof. All landraising proposals should conform to the same criteria outlined for landfilling.

There are two issues with regard to landraising. There is the general 'land disposal' issue which is identical for landfill. But in addition we have the second issue that is created by the intrusion into the landscape of a mound of waste. Points (i) to (v) of Policy 84 are sufficient to consider the second 'landscape impact' issue. Point (vi) is not sufficient to address the specific issues created by the depositing of waste in the environment.

We request that the same general land-disposal criteria are applied to Policy 84 as we are seeking to apply to Policies 77 and 78:

- The authority will not permit the development of a landraise site within a sub-regional area of the County unless it can be demonstrated that the waste cannot be managed through measures to promote avoidance, minimisation, reuse and recycling.
- No recyclable waste should be deposited, and the fill material must be rendered as biologically and chemically inert as practicable.
- The authority will not permit the development of landraising above groundwater aquifers, or within 2,000m (500m for non-hazardous wastes) of a major watercourse or drinking water supply abstraction point, housing (or land designated for housing use) or protected nature sites.
- The disposal of waste from outside the County will not be permitted unless it can be demonstrated that there are no alternative waste management options to deal with the waste.
- As part of any landraising development an environmental and human health risk assessment must be provided, taking into account the effects of discharges from the site during operation and post-closure stabilisation. Where risks are identified, proposals for the elimination or mitigation of the hazard must be provided.

These changes would ensure that there is a co-ordinated approach to landfill and landraise proposals.

## **Issue: General development and waste minimisation**

**ARROW Ref.:** 28

**Inquiry Ref.:** 5159/1/29

**Plan Ref.:** Policy 85, p134

We object to these proposals as they are totally inadequate. Policy 85 should be deleted and instead ALL policies should include some aspect of the three criteria highlighted in the policy. In its current form we also believe that the policy would be difficult to enforce because it fails to reference the wider national sustainability and sustainable waste management strategy guidance.

It is our opinion that the County Council are taking a too passive approach to the implementation of waste minimisation and recycling measures. Policy 85 is, in effect, a wish list which relies on developers taking the initiative to supply the required information and act 'responsibly'. The whole basis of this plan, in our interpretation, is to provide adequate disposal capacity, and no effort has been taken to ensure that alternatives to disposal are developed - for example identifying 'materials recovery facility' (MRF) sites for the reprocessing and recycling of wastes.

In our proof for the 'round table' session we identified the process we believe the County Council should have gone through to identify the need for sites in the plan. Extracting those points relevant to waste minimisation and recycling, we believe that the Council:

1. Should have undertaken a search to find a sites within each district where transfer stations could be located for the reception and bulking up of segregated municipal, commercial and industrial waste. The purpose of such transfer stations will be to bulk up waste for shipment to processing facilities so reducing transport impacts.
2. Should have identified a number of sites across the County where material recovery facilities could be developed for the sorting and processing of a significant proportion of the municipal, commercial and industrial waste streams. The purpose of this is to provide the capacity to carry out as much of the processing as could be achieved in order to 'add value' to the recycled materials, and ensure that jobs and wealth are generated within Lancashire.
3. Should have developed policies with respect to the handling and use of materials in demolition and construction, both within sites and for materials that are taken off sites, ensuring that as much material as possible is reclaimed.
4. Should have required that local planning authorities have regard to the production, collection and reprocessing or disposal of waste under the EC Framework Directive on Waste. To achieve this the Minerals and Waste Local Plan should direct local planning authorities to demand a statement from developers on the precise proposals for how waste will be handled on the site, and where it will be disposed of.
5. As part of the overall strategy, should have developed a policy to encourage – in tandem with the strategies of local plans (and future UDPs) – the regeneration and renewal of industrial sites in order that local industry could develop cleaner production systems.

These five points, while seeking the same objectives as point (i) to (iii) in Policy 85, address specific issues which the planning authorities have a duty<sup>1</sup> to consider. We also seek to define the objectives of waste minimisation and recycling policy in terms of practical steps rather than vague and general statements.

At this late stage it would be very difficult to completely revise the plan to meet the requirements of this objection. Therefore as a compromise we are willing to consider the redrafting of Policy 85 to

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<sup>1</sup> Under the 'relevant objectives' of the EC Framework directive on Waste. See paragraphs 2 and 4 of Schedule 4 of the Waste Management Licensing Regulations 1994, and paragraphs 1.50 to 1.56 of DoE Circular 11/94, "*The Framework Directive on Waste*".

consider waste prevention, minimisation and recycling in a more detailed manner. We suggest that Policy 85 is deleted, and instead Policy 87 should be redrafted as follows:

**POLICY 85: DEVELOPMENT AND WASTE MANAGEMENT**

*The management of waste in the County should be carried out in accordance with the principles of sustainable development. In accordance with these principles of sustainable development, waste should be:*

- *Prevented at source;*
- *Minimised or reduced to the lowest possible level;*
- *Reclaimed or recycled by methods that do not cause environmental damage or harm to human health;*
- *Disposed of by the most environmentally benign options.*

*In accordance with these principles:*

- (a) *Proposals to develop sites for the transfer of waste in order to reduce transport impacts will be considered where this can be accommodated within the existing roads network, and where it would not cause adverse effects by virtue of noise, odour or dust on nearby land uses.*
- (b) *Proposals for the development of materials recovery facilities to handle waste arising within urban areas, or within the sub-regions of the County, will be considered where:*
  - (i) *it would not cause adverse effects by virtue of noise, odour or dust on nearby land uses;*
  - (ii) *processing of degradable, odorous or dusty waste takes place within an enclosed building and appropriate abatement systems are provided to deal with emissions;*
  - (iii) *if possible, processing of the waste should take place on the same site in order to minimise the need for transport of waste materials.*
- (c) *Sites for the permanent or temporary processing of construction waste will be considered where this can be accommodated within the existing roads network, and where it would not cause adverse effects by virtue of noise, odour or dust on nearby land uses.*
- (d) *Where the composting or anaerobic digestion of wastes is proposed, it should be located where it would not cause adverse effects by virtue of noise, odour or dust on nearby land uses, and where it would have no adverse effects on ground or surface water.*
- (e) *As part of any development, the local planning authorities should have regard to the production and storage of waste materials, and seek to ensure that this is carried on in a manner which enables the easy segregation and storage of materials for recycling.*
- (f) *As part of the redevelopment of derelict sites, local planning authorities should have regard to the processing and recycling of waste materials and seek, where possible, to ensure the reuse of materials within the same site.*
- (g) *Planning authorities should give favourable consideration to the redevelopment of industrial sites as part of proposals to reduce waste arisings, or facilitate the introduction of more efficient process equipment.*

*Local planning authorities will not permit applications which do not adequately address these requirements.*

## Issue: Incineration of waste

**ARROW Ref.:** 29

**Inquiry Ref.:** 5159/1/30

**Plan Ref.:** Policy 95/96, p147/150; para. 14.34-14.56, p146-151; Policy 103, p160

### 29. Incineration of waste

**Plan refs. Policy 95/96, p147/150; para. 14.34-14.56, p146-151; Policy 103, p160**

We object to the inclusion of policies on incineration in the plan since:

- it has not been demonstrated that incineration need be adopted as part of the overall waste strategy;
- it has not been demonstrated that incineration is a 'sustainable' form of waste management;
- it has not been demonstrated that incineration will provide any greater benefits than efforts to improve the recycling and reuse of waste;
- it has not been proven that incineration can be carried out without prejudicing other waste recycling and reuse operations in the County;
- there has been no corresponding allocation for the disposal of the special wastes created by incineration;
- no consideration has been given to the disbenefits of incineration in terms of pollution and health effects.

Policy 95 of the draft plan is vague, and the policy framework it seeks to implement - allowing the development of incinerators in the county - is vague, uncertain, and does not provide a clear indication to the public of the limitations and prohibitions surrounding the development of any incineration facility. By definition the objection to Policy 95 must also be an objection to all references to waste incineration in the plan.

It has not been demonstrated that incineration need be adopted as part of the overall waste strategy. At no point have the planning authority adequately justified the need for incineration in Lancashire. They have identified incineration as one of many waste management options, but have not justified this selection by comparison with the problems/opportunities provided by other management options. The arguments put forward in favour of incineration are fundamentally flawed.

There is a general analysis of the incineration debate in Appendix 2 - these objections have been made within the context of the current debate on incineration.

It has not been demonstrated that incineration is a 'sustainable' form of waste management. The current uncertainties regarding the future of waste planning, in particular the effects of the national statutory waste strategy, have not been considered in detail. But more crucially the integrated nature of any sustainable strategy has not been properly explored in the plan. The plan essentially permits every possible waste management option. This free-for-all is not conducive to the development of a properly organised range of facilities, fitting the needs of communities in Lancashire. This defeats the whole purpose of local plans providing clarity and certainty for future development. In practice, considering the guidance in PPG12 on environmental impacts, we have to consider waste management options in terms of their polluting potential as well as their practicality or land use impact. [see "*Recycling and landfill beat incineration in greenhouse league*" - Appendix 3]

The failure to consider the full background to the debate of sustainable waste management, and to transpose these issues into some form of local integrated system, is a major flaw in the plan. In terms of incineration, this further condemns Policies 95/96 because there is no objective evaluation of this

policy to determine if it is sustainable or not. Additionally, until the failure to make comparisons between options using appropriate indicators, it is not possible for the planning authority to state that the options put forward in the plan represent either BPEO or a 'sustainable' system of waste management [see "*Blow for incineration as recycling triumphs in EC cost-benefit study*" - Appendix 3].

It has not been proven that incineration can be carried out without prejudicing other waste recycling and reuse operations in the County. There is a definite conflict between the operation of incineration plants under the current system of waste contracts, and the operation of more sustainable waste minimisation and recycling systems. It is difficult to get an equitable mix - in our view it is either/or. The Policy in the plan which encourages the growth of incineration in the county is therefore in contradiction to the development of more sustainable systems of waste management, and waste minimisation. [see "*Emission deadline heralds new era in municipal incineration*" - Appendix 3]

There has been no corresponding allocation for the disposal of the special wastes created by incineration. Incinerators are very dependent on landfill. Though central and local government promotion of incineration have been justified by a supposed shortage of landfill, significant quantities of landfill, including special waste landfill, is still needed for the diverted fraction and ashes. It is therefore a fundamental error that Policy 95, and other policies in the plan, do not adequately consider the disposal of bottom ash, the 'special waste' fly ash, and diverted materials.

Finally, no consideration has been given to the disbenefits of incineration in terms of pollution and health effects. There has been no attempt to quantify the human health impacts of the strategy in terms of the effects of the 'collective' emissions from the whole incineration policy. This matter is relevant in any decision on the development of a large scale incineration capacity.

To resolve this objection we request that...

- Policies 95/96 be amended so that any proposals for the combustion of controlled waste will not be permitted unless it can be demonstrated that the other 'more sustainable' management options, at the top of the waste hierarchy, have been adopted first, and in terms of the resource and environmental impacts, the use of incineration represent the 'best practicable environmental option' for the waste concerned;
- A new policy be drawn up covering agricultural, clinical and forestry wastes as the impacts and economics of such projects are radically different to controlled waste combustion;
- Policies 95/96, and the new policy suggested above, must ensure that all proposals for waste combustion have adequate facilities for the reuse/disposal of the incinerator residue within the County of Lancashire.

## Issue: Implementation and monitoring

ARROW Ref.: 31

Inquiry Ref.: 5159/1/32

Plan Ref.: Whole chapter, p179/180

We are concerned that the monitoring and implementation sections of the plan fail to set performance indicators and targets as a means of quantifying the working of the plan, and the achievement of policy goals. The plan should set performance indicators, and more especially locally agreed '*sustainability indicators*'. At the moment the implementation/ monitoring structure has no proper system of measurement.

Now that government policy has set an overall objective of achieving sustainable development, it is important that any plan has a system of measuring progress towards this goal. For this reason development plans must set 'sustainability indicators'. There are a number of reports<sup>2</sup> on how to set and monitor sustainability indicators.

Guidance does already exist for the setting of indicators in development plans, and this should be clarified for the purposes of the UDP. '*Development Plans - a good practice guide*<sup>3</sup> sets out specific guidelines on how monitoring of plans should be carried out, and this specifically identifies (paragraph 5.12 and shaded box on page 105) that policies should include performance measures. In terms of monitoring, this cannot meaningfully take place unless performance indicators, targets and objectives are set.

To remedy this objection we request that the objectives and indicators set in the plan have a more detailed monitoring framework, and that a key part of the monitoring of the plan should be the creation and tracking of 'sustainability indicators'. We do not suggest what these should be since it is properly a matter to be completed when the final draft of the plan is prepared. It is also heavily dependent upon the resources of the county council to monitor performance, and what types of data they have/could collect in order to monitor performance.

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<sup>2</sup> For example, "Indicators of Sustainable Development for the United Kingdom", DETR, 1997

<sup>3</sup> "*Development Plans: A Good Practice Guide*", Department of the Environment/HMSO, 1992. ISBN 0-11-752689-4.

## **Appendix 1: DETR Press Release 12 May, 1998**

### **DEPARTMENT OF THE ENVIRONMENT, TRANSPORT AND THE REGIONS**

Press release 362/env - 12 May 1998

### **Richard Caborn Pledges A Better Deal For The Environment On Quarrying**

The government made clear today that it is determined to go further in addressing the environmental damage caused by quarrying. Planning Minister Richard Caborn today told the quarrying industry:

"I believe that government, planners, and the quarrying industry all share a goal in ensuring that the aggregate the nation needs is obtained at least cost to the environment."

In a keynote speech at a conference in Solihull organised by the Quarry Products Association and the Royal Town Planning Institute, Mr Caborn announced a series of measures including:

- further research to help the Chancellor decide whether or not there should be an aggregates tax;
- revised forecasts of future demand as part of a review of Minerals Planning Guidance on aggregates later this year;
- consideration of further measures to strengthen the recent increase in recycling;
- a strong emphasis of the government's determination to protect National Parks from further quarrying and an invitation to the industry to operate voluntary restraint in those areas; and
- a clear signal that Environmental Assessment should be the norm for all quarrying proposals and an announcement that the government plans legislation to apply this compulsorily to marine dredging.

"This Government recognises the importance of aggregates to the social and economic progress of the country. Too many people in this country still need the benefits of regeneration and new construction - and aggregates are the most basic of their raw materials.

"But there is an issue about the environmental effects of supplying aggregates. The evidence is clear - there are remaining impacts still perceived by the community in terms of noise, dust, heavy traffic movements, and damage to landscapes and valuable habitats."

### **Possible Aggregates Tax**

In explaining the Government's next steps on an aggregates tax, Mr Caborn announced further research to build on "The Environmental Costs and Benefits of the Supply of Aggregates" report published last month (see note to editors). He emphasised that any decision on taxation was a matter for the Chancellor, and confirmed that the Chancellor had agreed that further work was needed before that decision could be taken.

"We are now putting that work in hand, together with an independent cross-check of the research techniques and survey methods, looking at among other things at the best way to value more subjective elements such as landscape and habitats."

But the Minister also called on the quarrying industry to come up with any alternatives which they would wish government to consider.

"There may be various other measures which could be proposed as an alternative to the idea of a tax. While working towards developing an effective aggregates tax, should one be introduced, therefore, we remain open to suggestions which could be demonstrated to significantly mitigate the environmental impact of quarrying.

But Mr Caborn warned that any alternative proposal would come under close and authoritative scrutiny and would have to be:

- credible in tackling the impacts of aggregate extraction
- deliverable across the industry
- permanent in application and benefit
- proportionate to what a tax might yield, taking all factors into account

### **Levels of Demand and Recycling**

Mr Caborn said that forecasts and regional guidelines in current Mineral Planning Guidance (MPG6) had so far proved to be too high since being calculated several years ago..

"In my view the demand forecasts used in MPG6 were partly derived from the boom years of the late 1980s. Primary aggregate production in Britain was then touching 300 million tonnes a year. Now it is not far above 200 million tonnes."

Part of the reduction in required tonnage is due to impressive increases in the use of recycled and secondary material and the Minister praised the industry for the progress which has been made.

"The aggregates industry deserves credit for what it has done in recent years and is continuing to do to develop its recycling activities and blend it into the mainstream.

"Evidence from recent research suggests there has been a substantial increase in the amount of construction and demolition waste used as aggregate. Provisional estimates suggest this could now be around 25 million tonnes in England - double the 1990 estimates.

"But more can be done. I do not agree with those who argue we can meet all our needs from recycled material. But I do not think we are yet at, or even near, the limits of tonnage we can recycle. I shall therefore be considering further measures to strengthen the recent welcome increase in recycling activity.

### **National Parks**

Mr Caborn emphasised the powers which National Parks already have to defend themselves from inappropriate quarry proposals, and added that no-one should be in any doubt about the government's determination to protect National Parks. He told the quarrying industry:

"I invite the industry to consider whether its interests overall might not be better served by a policy of voluntary self-restraint over further proposals to extract aggregates in National Parks, bearing in mind the strong policies of planning protection which are already in place and which will remain in place."

## **Environmental Impact Assessment**

Mr Caborn stressed the importance of an Environmental Impact Assessment (EIA) for quarrying proposals, pointing out that planning authorities must always consider the need for an EIA for any quarrying proposal and reminding the industry that from March 1999 all proposals for new or extended quarrying operations over 25 hectares will be subject to a mandatory EIA. The Minister also announced that the requirement for EIA for marine aggregate dredging proposals will be made statutory, replacing the current informal arrangement.

## **NOTE TO EDITORS**

1. In his July 1997 Budget Statement, the Chancellor of the Exchequer said that he was considering bringing forward proposals for an environmental tax or levy on quarrying. To inform this processes, and a review of MPG6 due later this year, the Department of the Environment, Transport and the Regions commissioned research in September 1997 to provide information on the environmental costs and benefits associated with the extraction, processing and transport of aggregates. An executive summary of the final report, published on 30 April 1998, is available free of charge from DETR Free Literature, PO Box 236, Wetherby, LS23 7NB .

## Appendix 2: Incineration

This appendix outlines the general issues with regard to waste incineration. It sets the context in which we have made our objections.

### *Introduction*

In terms of Planning Policy Guidance no.12, and government guidance risk assessment<sup>4</sup>, Lancashire County Council should have produced some sort of reasoned argument to support their selection of waste management technologies in the strategy. Unless some form of systematic environmental appraisal is carried out there is no guarantee that the approach taken is the best. Fundamentally, it is a matter of applying the precautionary principle

In terms of our objection to the policies on incineration, the fundamental problem is the 'sterilisation' of resources in incinerators. There is also a significant pollution problem relating to incinerators and health impacts. We believe that it is possible to create a strategy that does not rely on either incineration or landfill. At the moment the draft plan is essentially presenting a 'business as usual' approach. Large capital intensive solutions to problems, with the resultant commitment to them over many years, but which essentially enable local authorities to shift its responsibility to others (either the landfill or the incinerator operator) by being able to dispose of collected waste in bulk loads.

### *The 'reclamation' issue*

Government policy has been to look upon the burning of waste with energy recovery as '*renewable*' or as a form of '*material recycling*'. However, there is a growing body of evidence that waste incineration is not only a more expensive option, but when considering its wider effects it is more environmentally damaging than, for example, waste recycling.

From a purely chemical point of view incineration does not recycle materials - it degrades them. It takes materials which have an energy value and releases this energy through combustion. Once released, these materials cannot be recreated without a much greater input of energy than that recovered from them. **The term 'energy recovery' must therefore be looked upon as being completely misleading.**

Often, waste incineration is called 'waste to energy'. This implies that waste incineration is an effective means of generating electricity - it is not. If we compare incineration to other forms of power generation, gas turbines cost around £1,500 per kilowatt of installed capacity. Waste incinerators, even with the subsidy of the Non-Fossil-Fuel-Obligation cost in excess of £2,500 to £3,000 per kilowatt of installed capacity.

Also, if we take a traditional fossil fuel such as coal, it contains more energy per unit volume than waste. If we take an absolute calorific value, then coal - calorific value 30 giga-joules per tonne (GJ/te) - has around three times the energy content of mixed solid waste - calorific value 10-12 GJ/te. Thus you have to burn three time more waste for the same energy release. However, taking the energy value of waste - that is, the energy taken to make the materials in the first place - as between 40 and 120 GJ/te by not recycling material you expend more energy in the long-term.

What we have to ask is what is the primary purpose of an incinerator - to generate power or to

<sup>4</sup> "A Guide to Risk Assessment and Risk Management for Environmental Protection", Department of the Environment, HMSO 1995.

dispose of waste?:

- If it is to produce power, there are other generation options with lesser environmental impacts, and an equal or smaller capital cost - e.g., wind, micro-hydro and wave/tidal devices;
- If it is to dispose of waste there are other options with lesser environmental impacts - e.g., anaerobic digestion, source separation of recyclable materials, or better still waste prevention/minimisation;
- Another way to look at the issue - £50,000,000 (the cost of an average incinerator) would buy around 10,000,000 low energy bulbs, and would save 2.16 billion kilo-Watt hours (kWh) of electricity - over twice the energy production of an average incinerator over 15 years.

If we consider an average local authority that collects waste, they typically have 360,000 tonnes of household waste to dispose of every year. The content of plastics in this waste will be around 11.4% (41,000 tonnes), of which 6.5% (23,500 tonnes) is feasibly recyclable. 23,500 tonnes of plastics, sourced from oil based polymers, would take around 100 GJ/te to manufacture, which equates to around 2,350,000 GJ (about 650 million kWh of energy).

Incinerating 23,500 tonnes of plastics, calorific value of 40 giga-joules per tonne, equates to 940,000 GJ (about 260 million kWh). Assuming a plant generating efficiency of 30%, the total energy output is only 282,000 GJ (about 78 million kWh). The overall "energy-efficiency" of plastics incineration is therefore:

$$( 282 / 2,359 ) \times 100\% = \mathbf{12\%}$$

If we were to recycle that plastic, energy inputs in recycling polymers is about 25-30 GJ/te (including transportation). This of course leaves 70 GJ/te of energy in the plastic material itself, equivalent to 1,645 GJ (457 million kWh). The overall efficiency of plastics reclamation is therefore:

$$( 1,645 / 2,359 ) \times 100\% = \mathbf{70\%}$$

By comparison, the same energy output as a small to medium sized incinerator, around 6 megawatts, could be provided from less than twenty modern wind turbines.

As shown above, it must be stressed that waste incineration can never be considered as a means of recycling resources, or as a form of energy generation. It can only ever be considered as a waste management option, above which there are many other options which are preferable.

### ***Contracts, and the conflict with recycling***

Incinerators are expensive plants - even small plants burning around 125,000 tonnes per year cost upwards of £40,000,000. The designed lifetime of the average plant is between fifteen and twenty years, and over this time it must be fed with a mixture of combustible materials as homogenous as possible, with a calorific value of between 7 and 10 GJ/te.

This leads to some practical problems. Firstly, the incinerator operator will want a contract with the organisation supplying the fuel for the duration of the plant's life. In practical terms this means that a local authority will have to sign a fifteen or twenty year contract to supply the plant with waste. There will also be conditions in the contract relating to the calorific value of the waste supplied, which will mean restrictions on the types of waste which can be supplied.

Also, in terms of planning, incinerators are 'bad neighbour' developments. Not only do they blight the area they are located in, but the presence of an incinerator makes it more difficult for local planning departments to resist other 'unwelcome' polluting industrial developments.

The fact that the calorific value must be maintained leads to a conflict between materials recycling and incineration. The materials in the domestic waste stream with the highest calorific value are plastic (30 GJ/te), textiles (15 GJ/te) and paper (12 GJ/te). This must be balanced by amounts of putrescible and non-combustible matter in order to balance out the calorific value to between 7 and 10 GJ/te - values outside of these limits cause problems with the operation of the incinerator plant. This means that the adoption of an incineration policy automatically precludes any large scale materials recycling schemes over the lifetime of the incinerator contract.

Another problem with the recycling side of things is that all materials have two economic values - one based on their value as recycled material, and one according to their potential to burn and produce electricity. From this perspective the burn value of glass and metal is negative - because they do not burn, and actually remove energy from the system as they heat up. Plastics and paper on the other hand have a great burn value. Balancing this, metal, glass, paper and plastics have a reclaim value.

To ensure the maximum operating profit, the balance between recycle vs. burn has to be operated very strictly. The major factors are...

- The value of the recycled product.
- The cost to sort/process the material.
- The value of generated electricity.
- The efficiency of generation.
- The operating/capital cost of the plant.

The greater the value of the electricity and the less the value of the recycled product, the greater the incentive to burn, or if the material has a negative value as fuel, the greater the incentive to send the material directly to landfill. Only where the value of the recycled material is great, and the material has a low or negative value as fuel, will the emphasis be on recycling (for example, aluminium metal).

In practice, if the plant is to make a return on the large capital cost of the incinerator, the plant will have to burn most or all of the paper, card and plastics - leaving only metals and glass as viable recycling options. Putrescibles/wood have value if composted, but the need to make a return on the large capital cost would mean that, even though compost has a small calorific value, it would be more worthwhile to burn these materials for the energy they contain.

The problem with incinerators, and how incinerators affect other waste management options, is the contract the operator will require the local authority to sign. Contracts last a long period - fifteen to twenty years. Over this period the authority will have to supply specified quantities of waste, with a specific composition. This means that at certain times of the year waste will still have to be sent directly to landfill - either because there is too much, or because it is the wrong composition (too much garden waste for example).

This has an unwelcome effect on recycling options. Composting and anaerobic digestion take putrescible material out of the waste stream - this will push the calorific value over the threshold, and the authority would be penalised. At the other extreme, recycling paper and plastics lowers the calorific value. Once again, this could cause contract problems. In this way the requirement to feed the incinerator dominates all other waste decisions - normally to the detriment of other options.

Perhaps the greatest problem with long contracts will be cost escalations. Over twenty years it is highly likely that emission standards or operating procedures will be tightened by regulatory authorities - the current round of incinerator closures is a good example of this.

Where there are long contracts, any upgrading costs, and any subsequent increased running

costs, will be passed on to the customer through higher gate prices. This means that what might be an attractive financial option for the authority in the first year of the contract could become, in subsequent years, a financial millstone to local authorities.

### ***Ash disposal***

Incinerator ash comes in different forms:

- Ash from the grate (bottom ash) consists of non-combustible metals and ceramics which 'drop' straight through the system. In some places this material is reused, following separation of the metals, as an aggregate. But in general, contamination problems may prevent reuse;
- Boiler ash is fly ash that is cleaned from within the system. It contains varying concentrations of heavy metals, dioxins, and similar products of incomplete combustion (PICs). This materials would normally be landfilled, and depending upon its toxicity may be classed as 'special waste' - requiring special handling and disposal to an appropriately licensed site;
- Baghouse ash is a mixture of fly ash and the pollution control reagents - normally lime and activated carbon - used in the pollution control system. This is classed as special waste primarily because of the presence of the lime, but the concentration of contaminants cleaned from the flue gas will also make the ash particularly hazardous to health.

The amount of ash produced by the incinerator will vary - below is a simple mass balance for a 100,000 tonne per year incinerator:

<u>Inputs</u>		<u>Output</u>	
Waste	100,000 te	Non-combustible material	10,000 te
Gas scrubbing reagents	10,000 te	Ash	30,000 te
		Gases	70,000 te

If the incinerator plant cannot get rid of its ash - it cannot operate. There are problems with the disposal of the ash from incinerators. The bottom ash, while being described as 'inert' will leach pollutants such as heavy metals if it becomes wet. The 'fly ash', from the pollution control equipment, is toxic and has to be disposed of as 'special waste'. It is a fact that the rush for incineration is due in part to the shortage of landfill, and this of course spells problems for ash disposal. Only certain sites can accept incinerator ash, partly because of the problems involved in handling it, but also because of the extra design/engineering features which are required for the landfilling of special waste. This makes special waste space a premium commodity.

Currently one large incinerator - SELCHP in Lewisham, London - is having problems finding space for its ash. This is before any of the proposed larger incinerators planned for the south-east has even been built. At the end of 1994, according to a source within a Waste Regulation Authority, SELCHP were phoning around the country looking for special waste void space for their ash. Currently, ash is going to a site at Bishops Cleeve near Cheltenham - a road journey of 115 miles. This obviously offend the 'precautionary principle'. With any large incinerator, there is a significant quantity of ash to be disposed of. If special waste void space is in short supply, this will not only be expensive, but may involve significant transport costs too. **If the local authorities are proposing to build incinerators as part of their waste strategy, then they must also allocate space for 'special waste' landfill sites to take the ash.**

It is also a fallacy that sending waste to incinerators significantly reduces the need for landfill space. There are many figures put forward for how much landfill space is saved by building incinerator plants. Incinerators do not mean we get rid of landfill - in fact the adoption of

incineration creates wastes which themselves can be difficult to safely dispose of.

The Department of the Environment booklet on energy from waste<sup>5</sup> states that, "*energy from waste plants reduce the waste for disposal by 90%*" (70% by weight). This statement is extremely 'economical with the truth'. Studies of the waste streams associated with incineration, commissioned by the Government's renewable energy body ETSU<sup>6</sup>, show that the real figure for the **whole** waste stream is about 50% (by weight). The reason for the difference in figures is that the 'official' figure only includes waste burnt. In reality incinerators close for maintenance, and waste quantities vary over the year, so a significant quantity of waste still goes to landfill, 'diverted' from the incinerator.

### ***In conclusion...***

From the analysis of incinerator as a waste disposal option it is clear that the bulk incineration of waste is not a favoured technology above other waste management options. It is clear to see that incineration would not produce any benefits for a local authority – nor can it be considered a quick short-term fix for the immediate problem of a shortage of landfill because there would still be a significant demand for landfill, it requires the provision of more landfill for 'special waste', and the fifteen to twenty year contract would preclude other waste management options being adopted.

In terms of costs, though at present comparable to the costs of materials recycling, incineration brings with it many disamenities which can damage the local environment. Incineration/waste-to-energy is neither an effective means of materials recycling, nor is it an effective method of energy generation. For the above reasons there should be no reliance on incineration as an 'effective' waste management option in the PPG.

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<sup>5</sup> "*Energy from Waste: Getting more value from municipal waste*". DoE booklet 96 EP 137.

<sup>6</sup> Energy Technology Support Unit, Report B/R1/00341, M.R. Fox et. al (WS Atkins).

## Appendix 3: ENDS Articles

### 1. Blow for incineration as recycling triumphs in EC cost-benefit study

#### **ENDS Report: 267 April 1997 Waste Management No. 117**

A wide-ranging cost-benefit study of household waste management options conducted for the European Commission has come up with conclusions which will rattle many ingrained ideas. High rates of recycling would, it says, bring sizeable environmental benefits in all EC countries. And it also ranks landfill above both incineration and composting as the best option for managing the residual household waste stream.

Evaluating the costs and benefits of individual recycling or waste-to-energy projects is a difficult task. The environmental impacts to consider range from methane emissions from landfills to the energy used when transporting wastes to a recycling plant and the pollution that is avoided by using recycled materials. Increasingly, governments and researchers are turning to life-cycle analysis (LCA) to weigh up the relative merits of waste management systems. But because the answers that LCAs produce depend on the assumptions made, they must be treated with caution.

In the case of household waste, evidence suggesting that most recycling systems bring large environmental benefits is advanced in a new cost-benefit study prepared for the European Commission. But its conclusions on incineration with energy recovery and centralised composting fly in the face of EC policy. It concludes that landfill is the best option, environmentally and financially, for household wastes which are not recycled.

The report was prepared for the Commission's Environment Directorate, DGXI, by Coopers & Lybrand. They were asked to analyse the financial and environmental costs of various options for managing household waste in each Member State. They were also asked to "give a substantial input to the elaboration of a comprehensive strategy in the field of MSW management."

In collaboration with the Centre for Social and Economic Research on the Global Environment (CSERGE), Coopers used LCA techniques to quantify the environmental burdens which various waste management options caused or avoided. To weigh the significance of these environmental "externalities", CSERGE used monetary valuation techniques to place prices on environmental impacts. Coopers then calculated a figure for "total net economic costs" - the environmental costs added to the conventional economic costs.

DGXI commissioned the study as it was preparing changes to the EC's waste strategy, which was formally published earlier this year (ENDS Report 266, pp 44-45 e). By confirming the benefits of recycling, the study will help the Commission to justify its focus on "producer responsibility" - in which product suppliers are required to recover materials after use. The study will also provide ammunition for the debate on the recycling and recovery targets in the 1994 Directive on packaging waste which are due to be reassessed in 1999. Several northern Member States are pressing for an increase in the minimum 25% recycling rate.

#### **Recycling benefits for most materials**

The overwhelming conclusion of Coopers' study is that, apart from organic waste and plastic film, household waste recycling is environmentally beneficial. The conclusion applies equally to urban and rural areas, the study found, because distances travelled have only a "limited" impact on

environmental costs.

Waste management systems based on landfilling have estimated environmental costs as high as ECU20 per tonne in some EC countries, principally due to methane emissions and pollution from refuse vehicles. But recycling systems bring net environmental benefits on average, because of the energy consumption and pollution avoided by recycled products. Recycling of non-ferrous metals has a

net benefit of ECU979 per tonne, while ferrous metals and glass both come in above ECU200. Paper, textiles and rigid plastic have benefits of more than ECU50 per tonne.

However, the conclusion that landfill is preferable to both municipal composting and incineration - with or without energy recovery - was not what DGXI was anticipating. On the contrary, its new waste strategy proposes that landfilling of municipal waste should be the last resort after pre-treatments such as incineration and composting - a point echoed in the new draft Directive on landfill (ENDS Report 265, pp 40-41 e).

### **Challenging the hierarchy**

By questioning the merits of energy recovery, the Coopers study challenges some of the foundations on which the concept of a waste hierarchy - reduce, reuse, recover, dispose - is founded. By ranking landfill above energy recovery, it also challenges EC law. The 1991 framework Directive on waste requires Member States to "take appropriate measures to encourage firstly the prevention or reduction of waste...and secondly the recovery of waste...or the use of waste as a source of energy."

In the UK, the Department of the Environment made the hierarchy a central theme of its 1995 White Paper, Making Waste Work. The paper said that energy recovery and recycling sat on the same rung of the hierarchy, but the choice between them should depend on the best practicable environmental option in individual cases. The Government was clear, however, that "waste disposal comes at the bottom of the hierarchy, as the least attractive waste management option."

Coopers' report puts a new spin on the meaning of the waste hierarchy. It argues that the hierarchy should be determined on the basis of combined economic and environmental costs. Thus, the lower the combined costs the better the option.

The implications of this approach are considerable. A hierarchy based on cost- benefit analysis has the potential to be a very different animal from one based purely on environmental criteria. Introducing financial costs into the equation could in some circumstances stand the hierarchy on its head. Furthermore, the direct comparison of well-defined financial costs with less certain environmental impact valuations will also raise eyebrows.

Happily for DGXI, however, Coopers found that the same ranking of household waste options would have applied even if financial costs were not considered. The environmental benefits of the recycling systems considered place them above landfill; but the environmental externalities associated with both energy recovery and composting place them at the bottom (see table x).

### **Read with caution**

Coopers stresses that the conclusions should be treated with caution. "The limitations of our work mean that it is more difficult to be sure that the conclusions regarding landfill, incineration and composting would hold if a more comprehensive assessment were possible," the report warns.

Energy, transport and greenhouse gas emissions are the principal environmental factors considered in the analysis. The LCA and economic valuations focus on the impact of air pollution from waste facilities and vehicles, and the emissions associated with energy use. The impacts of the greenhouse gases carbon dioxide, carbon monoxide, methane and nitrous oxide were considered, as were those of sulphur and nitrogen oxides and PM10 particulates. The cost of road accidents was also brought into the equation.

\* Omitted costs: Several environmental costs and some benefits were excluded from the analysis. Most importantly, these include the disamenity impacts of waste management facilities - frequently the focus of opposition to landfills and incinerators - which can only be meaningfully assessed at the local level. Omitting them from the equation also means that other options get no credit for

averting disamenity. Landfill leachate and certain air pollutants, including dioxins emitted from landfill flares and incinerators, were also excluded from the assessment.

Another omission is any measure of the damage to nature and disamenity caused by mineral and peat extraction. Neither does the study include any scarcity value for non-renewable materials. According to Mark Ambler, an economist at Coopers who worked on the study, "the argument we make is that, given most of the materials we're interested in, the virgin resources such as metal ores and sand are not scarce."

Most of the impacts attributed to composting relate to air pollution from transport and collection. Composting would have fared better if a credit for conserving peat - often extracted from ecologically prized sites - had been given. In markets such as landscaping and agriculture, moreover, waste-based composts confer environmental benefit in restoring or improving land which is also not considered in the study, beyond the market price of the composts themselves.

\* Energy recovery: The assessment of energy recovered from incineration and landfill gas will also prove controversial. In their calculations, the consultants used the average air emissions from EC power generation to work out the environmental benefit of producing electricity. More favourable results would have been obtained for incineration if coal-fired power stations were assumed to be displaced (see table x), although these would generally still have been insufficient to push it above recycling.

Ironically, CSERGE made the opposite assumption in its 1993 study on the externalities of landfill and incineration for the UK Government. That study, which was used to justify the landfill tax, concluded that incineration had net environmental benefits over landfill of £5-8 per tonne (ENDS Report 226, pp 15- 16 e).

Coopers and CSERGE now argue that the choice of which energy source to use in the displacement analysis depends on the policy context. For example, at present a new incinerator in the UK would probably displace coal-fired capacity. If a new policy proposal is being debated, however, such as targets under the packaging waste Directive, average EC fuel use should be considered because the effect will be to create larger structural changes in the power generation market.

\* Data sources and key assumptions: The LCA used in the study was based on a computer model for waste management systems developed by Procter & Gamble's Peter White and colleagues. A life-cycle inventory was built up around this model, which also provided much of the relevant data. Assumptions - some more valid than others - were then made about key variables.

For the UK analysis, the household waste recycling rates assumed ranged from 5% in 1993 to 25% in 2001. The highest recycling rates modelled were in Denmark, ranging from 22% in 1993 to 45% in 2001. Substantial environmental benefits were identified for all recycling systems. Anaerobic digestion was not considered.

Each household was assumed to comprise 2.5 persons generating the EC average for household waste of 348 kilograms per year. But waste composition was allowed to differ between Member States in accordance with national data. For bring schemes, an average consumer journey by car was assumed to be 1.8 kilometres in all cases. In all cases landfills were assumed to be ten kilometres from the point of collection, or 60 kilometres where a transfer station was used.

\* National variations: The study underlines that an LCA conducted locally or regionally would produce a different, and hopefully clearer, picture - an EC- level study can only paint an overview. Even so, some of the differences in environmental costs and benefits calculated for different Member States raise questions about the validity of the results. For example, a landfill-based system in the UK is calculated to have

externalities of ECU3.8 per tonne, whereas a French one comes out at ECU14.9 per tonne. Similarly, a "bring" recycling scheme in the UK has environmental benefits of ECU169.7 per tonne, compared with ECU282.5 per tonne in France. One of the biggest differences between the French and UK scenarios is a higher cost allocated for road accidents, which were priced by considering accident rates, distances travelled and the value of a "statistical life".

CSERGE's monetary valuations of environmental impacts are based on willingness- to-pay. In the case of sulphur dioxide emissions, for example, calculations are made to project the impact on human health, forestry, water, crops and buildings. A price is derived by considering clean-up costs in the case of fresh waters, the market value of lost timber production in the case of forests, and the value of lives and medical costs for human health effects.

Willingness-to-pay techniques are a convenient means of weighing the relative importance of the impacts identified by LCA. However, it is as well to acknowledge that many people have severe practical reservations, and sometimes fundamental philosophical objections, about using them to influence environmental policy-making.

### **UK work on waste LCAs**

The Coopers study marks a significant step forward in the application of LCA to waste management systems. It is being examined with great interest by officials and researchers in several countries where LCA waste management tools are being developed, including Britain, France and the USA.

The UK programme, now run by the Environment Agency, kicked off in 1994 (ENDS Report 244, pp 14-15 e) and is likely to extend until 1999 at a cost of £1.5 million. A life-cycle inventory, now almost complete, is the fruit of a vast data-gathering exercise covering everything down to the amount of rubber used to make the conveyor belt in a materials reclamation facility.

The Agency's next task is to produce an impact assessment tool for use by local authorities and developers of waste facilities. Ambitiously, it hopes to have a usable tool by the end of the year, probably based on developing off-the-shelf software such as that used in the Coopers study. The tool will also provide a measure of the financial costs of different waste management options.

### **Tool for local use**

The Agency wants LCA to inform policy nationally, regionally and locally. At the local level, an LCA would cover all waste arisings and transfers - commercial and industrial as well as household waste - within the appropriate geographical boundaries. Local planning authorities could use the tool in determining the need for waste management facilities in their waste local plans and when

assessing planning applications.

The tool could also be used by the regional waste planning fora proposed by the DoE last year (ENDS Report 260, pp 31-32 e). And waste disposal and collection authorities could use LCA when inviting tenders for waste management services, drawing up recycling plans, and preparing the recently proposed local municipal waste management strategies (ENDS Report 265, p 33 e).

The theory is that locally based studies will build up into a national picture, eventually helping to inform revisions of the national waste strategy. LCA studies at national level would also allow the Agency to predict the impact of policy proposals and progress towards targets such as reductions in methane emissions.

Simon Aumonier, until recently manager of the Agency's research programme, says that "the LCA programme is seeking to provide people with more information to help them make decisions. But we've got to be very wary of jumping to conclusions from individual studies." The assessment tool will have to be interpreted by people who are not LCA experts, including local councillors, so it must be developed with care.

The Agency is showing interest in applying economic valuations to the impacts identified by waste management LCAs, but the LCA community remains cautious over the technique. "We feel much happier as a company with the internalities approach," said Neil Kirkpatrick of Ecobalance, the consultancy where Mr Aumonier also now works. "The use of willingness-to-pay arguments is sometimes questionable."

CSERGE's Jane Powell, who led the LCA work in the Coopers study, says that economic valuation can give a more "holistic" picture, but acknowledges that monetary estimates were not available for all impacts. She has also worked with alternative assessment techniques, including multi-criteria evaluation in a study of waste management in Milton Keynes. This found that recycling brought environmental benefits under both assessment techniques. But the economic valuation approach placed incineration above landfill, while the multi-criteria evaluation favoured landfill.

Another approach which the Agency could consider is the new "best practicable environmental option" methodology which it has itself developed for assessing integrated pollution control applications (see pp 32-33 e). The Agency has steered away from the idea of producing a single numerical or monetary rating for a process's environmental impact. Instead, the methodology produces separate figures for a range of impacts: air quality, water quality, global warming, deposition to land and the potential hazard of waste. In Scotland, by contrast, HM Industrial Pollution Inspectorate toyed with the idea of putting price tags on the environmental impacts of IPC processes (ENDS Report 253, p 39 e).

For LCAs in waste management to succeed, there must be sufficient confidence in the methodology for a consensus to emerge. A way forward suggested by Jane Powell is to use local panels to weigh the relative importance of different impacts.

### **Financial realities**

Nevertheless, experience in the UK suggests that financial cost is the biggest single deterrent to local authority investments in recycling, not disagreement over environmental benefits. The Coopers report projects that in most Member States kerbside recycling could soon become competitive with landfill. However, this seems unlikely to apply in the UK, where, despite the landfill tax, prices for landfill and incineration remain far lower than in other northern European countries, and below the average EC figures calculated by Coopers.

The report discusses a range of economic instruments which could encourage recycling and waste reduction. Taxes on raw materials and energy would be the most efficient, it suggests, but could damage EC competitiveness. Disposal charges are attractive because of their potential to raise revenue, "at least some of which could be used to promote recycling and source reduction."

Friends of the Earth campaigner Mike Childs says that the Coopers study shows that recycling rates could be increased considerably - well beyond the levels modelled in the study - with net environmental benefit. The UK landfill tax should therefore, he argues, be increased "substantially" and turned into a "waste tax", applying equally to landfill and incineration. He points out that internalising the environmental costs of landfill through the tax does not account for the environmental benefits of recycling.

Some of these views are echoed by waste management businesses which are eyeing up recycling opportunities. "Pricing signals in the waste management market are too low to promote recycling," according to Miguel Pestana of Waste Management International. "It's only when the Government says 'thou shalt recycle' that anything happens."

The incineration industry, though unsettled by the report, can take some comfort from the fact that a locally conducted LCA may draw different conclusions from an EC-wide study. Ray Palin, Director of the Energy from Waste Association,

said: "It would be quite wrong to infer from the study that any one option is always best: costs and benefits of recycling are dependent on the materials in question and landfill in the UK is already scarce."

The argument between landfill and incineration looks set to continue. But the Coopers report suggests that locally conducted LCAs could give local authorities a more objective basis for justifying recycling investments. It remains to be seen whether future increases in the landfill tax - or any future waste tax - will be sufficient to tip the balance in cash-strapped local authorities in favour of recycling.

## 2. Recycling and landfill beat incineration in greenhouse league

### **ENDS Report: 270 July 1997**

The environmental benefits of waste-to-energy (WTE) incineration have been questioned by a study prepared for the US Environmental Protection Agency (EPA) .1 The study concludes that burning municipal waste in an "average" WTE plant causes slightly higher greenhouse gas emissions than disposal to landfill - while waste reduction at source and recycling emerge much more favourably than both on global warming grounds.

Greenhouse gas emissions are an increasingly important issue in waste policy. Concern about methane emissions from landfill has driven the European Commission's plans to reduce landfilling of biodegradable waste - a policy which in the UK means investing in incineration, composting and recycling.

The EPA study, still in draft, concludes that recycling municipal solid waste (MSW) will reduce greenhouse gas emissions. But it cautions that, if global warming is the overriding concern, then some wastes - plastics in particular - should be landfilled if they cannot be recycled. This is because burning fossil fuels in a power station produces less carbon dioxide per unit of electricity than burning plastic in WTE incinerators. In contrast, landfilling traps carbon in wastes such as plastics which do not biodegrade.

The report compares landfill with a range of alternatives - source reduction, recycling, composting and incineration - using a "streamlined" life cycle assessment (LCA) which does not consider non-greenhouse gas issues.

The report estimates that only 13.6% of the heat produced in an "average" WTE incinerator is converted into electrical energy. On top of the normal thermodynamic losses in power generation, incinerators have to drive off moisture in the waste and also lose energy in gas cleaning equipment.

The study did not consider WTE plants fitted with combined heat and power equipment - such as the Sheffield and Coventry incinerators in England - for which different results would be obtained, since more of the heat produced is captured as useful energy.

The study considered eight waste materials as well as mixed MSW and concluded that emissions are reduced significantly by both source reduction and recycling (see table x).

The reason why paper recycling scores so well is that the study took into account the amount of carbon "sequestered" in forests. It assumes that reducing paper consumption will lead to retention of larger tonnages of carbon in living trees.

The study allows for the loss of materials in recovery processes, assuming, for example, that only 66% of recovered office paper ends up as recycled product. But it does not say what sort of recycling systems - or recovery rates - were modelled. The energy consumed in transporting and sorting recovered materials can vary widely.

Where the table gives WTE a negative score, this is because incineration converts all the carbon into CO<sub>2</sub> - at lower energy efficiency than fossil fuel combustion - whereas landfilling leaves a large proportion locked into solid waste material. The study used results from EPA-funded research showing that lignin is relatively stable and non-decomposable under anaerobic conditions in landfills, while cellulose and protein decompose only partly.

The estimates are that 40% of the dry weight of newspaper, 26% of corrugated card and 31% of

food scraps - but only 4% of office paper - end up as sequestered carbon in landfill. The results were obtained from laboratory reactors designed to maximise methane generation, but it is not clear how

accurately these reflect real landfill conditions over decades.

The study also assumed that 85% of the methane produced in landfills with gas recovery facilities is collected - although no research is cited to back up this relatively high estimate.

Composting fared poorly in the LCA - slightly better than landfill for garden waste and slightly worse for food scraps, despite the avoided methane emissions. The reason is that, unlike other forms of recycling, composting does not reduce energy consumption in product manufacturing.

Overall, the results are similar to those of a recent cost-benefit study of MSW options prepared for the European Commission (ENDS Report 267, pp 23-26 e), which also found considerable benefits in recycling and placed landfill just above incineration and composting in the waste hierarchy. As with that report, however, the results of the EPA study must be taken in context. A locally-based LCA - considering site-specific and regional factors and broader environmental impacts - would produce different results.

According to Friends of the Earth campaigner Mike Childs, "the EPA report demonstrates that recycling is way out on top while landfill and incineration are battling for bottom place in the waste hierarchy."

1 Greenhouse gas emissions from municipal waste management, Draft working paper, from EPA web site: <http://www.epa.gov/epaoswer/non-hw/muncpl/ghg.htm>

### 3. Emission deadline heralds new era in municipal incineration

#### **ENDS Report: 262 November 1996**

New EC emission standards for municipal waste incinerators came into force on 1 December, forcing the closure of all but five of the UK's incinerators. But several new waste-to-energy plants already under construction will soon bring capacity back towards that of the early 1990s - and several more large-scale proposals are in the pipeline.

The late 1960s and early 1970s saw a boom in municipal waste incineration in the UK, with the construction of some 40 plants. In 1992, 28 incinerators were still in operation with a total capacity of 2.6 million tonnes - roughly 7% of municipal waste arisings (ENDS Report 211, pp 12-14 e).

Since 1989, the sector has been living under the shadow of an EC Directive which requires existing incinerators to meet new emission standards by 1 December 1996 (ENDS Report 174, pp 26-27). Many plants have closed down over the past two years rather than meet the costs of installing flue gas treatment systems, and a dozen or so limped on up to the deadline before closing.

	Status and date for commissioning	Capacity tonnes/year
<b>Operational</b>		
Coventry	Upgrade	300,000
Edmonton	Upgrade	550,000
Nottingham	Upgrade	150,000
SELCHP	New	420,000
Tyseley	New	350,000
Total		1,790,000
<b>Under construction</b>		
Cleveland	New, mid '97	220,000
Dudley	New, early '98	90,000
Sheffield	Upgrade, early '97	135,000
Stoke	New, late '97	200,000
Wolverhampton	New, early '98	105,000
Total		750,000

As ENDS predicted in 1992, the only plants to be upgraded are those producing electricity or supplying district heating schemes. Upgrading of the Nottingham plant was completed last year, while a £9 million retrofit of the Coventry incinerator was completed in November. The Edmonton waste-to-energy plant in North London will stay in operation at reduced throughput while upgrading work is carried out. And the Sheffield plant will shut down for several months to allow abatement plant to be installed. In the meantime, oil-fired boilers will supply the city's district heating scheme.

With only five plants left in operation, the nominal incineration capacity will fall to 1.8 million tonnes. Nearly half of this is accounted for by the SELCHP plant in south-east London and Birmingham's new £95 million incinerator in Tyseley, built by Generale des Eaux subsidiary Onyx UK.

However, capacity is set to bounce back in the next 18 months to 2.5 million tonnes when the Sheffield unit and four new waste-to-energy plants come on stream. Three new units in Dudley, Wolverhampton and Stoke, on the sites of old incinerators, are being built by French firm CNIM and will be operated by its UK subsidiary Martin Engineering Systems.

The fourth new plant, built on a greenfield site at Billingham by Northumbrian Water subsidiary Cleveland Waste Management (CWM), will replace Teesside's old Portrack incinerator. However, a row with the region's local authorities has reinforced environmentalists' fears that long-term waste disposal contracts and large-scale incinerators - important factors in making waste-to-

energy projects commercially attractive - may undermine efforts to minimise waste and boost recycling.

In mid-1995, CWM signed a 25-year contract with Cleveland County Council based on projected long-term waste arisings of 310,000 tonnes. The council - which was abolished in the recent local government review - signed up to deliver at least 180,000 tonnes for incineration and 80,000 tonnes for landfill. However, in the first year of the contract the region supplied only 248,000 tonnes - and the county and four borough councils which succeeded it incurred penalty charges of £147,000 because of the shortfall.

Les Milne, Assistant Director of Environmental Services at Stockton Borough Council, observed that the penalty clauses "mean that fundamentally we are into waste maximisation." Cleveland's 3% recycling rate is far short of the Government's target of 25% for 2000. According to Mr Milne, the councils "are already constrained by the contracts from doing even a modest amount of recycling," and the future of two materials reclamation facilities is in jeopardy.

CWM argues that reuse of bottom ash from the new incinerator in low-grade applications such as road building could count towards the 25% target. The councils are now seeking to renegotiate the contracts, and have even considered buying in waste from other regions.

Many other large-scale projects are on the stocks. Ray Palin of the Energy from Waste Association (EWA) says that "the industry is in a bullish mood". EWA believes that capacity will rise to around 4 million tonnes by 2000 and possibly to over 7 million tonnes by 2005 if all known projects come to fruition - an admittedly unlikely prospect given the sector's recent difficulties in winning planning permission.

Mr Palin says that demand for incineration is being driven by several Government policies, including the landfill tax, the packaging Directive, subsidy from the non-fossil fuel levy, and the target to "recover" 40% of municipal waste by 2005 (ENDS Report 251, pp 15-18 e). In November, Environment Minister Earl Ferrers launched a booklet on energy from waste which he hoped "will prove a useful contribution towards a proper consideration by local waste authorities of this significant waste management option."<sup>1</sup>

In October, PowerGen CHP and Biffa Waste Services applied for planning consent for an £80 million development at Kingsnorth power station on the north Kent coast. The scheme would be dominated by a waste-to-energy plant with an annual capacity of 400,000 tonnes and power output of 40MW. PowerGen has also applied for planning permission for a 1.5 million tonne incinerator in Belvedere, east London. An earlier version of the scheme, proposed by Cory Environmental, failed to win approval in 1994 (ENDS Report 231, p 14 e).

A planning application for another incinerator in Kent - a 200,000 tonne per year unit at Halling - is due to be submitted early next year by Kent Enviropower, a joint venture between Kvaerner and Rolls Royce.

Hampshire Waste Services, part of the Generale des Eaux group, intends to seek planning consent for three incinerators next year. Earlier plans for a single large plant at Portsmouth failed to win approval. The county's waste plan now allows for incinerators at Basingstoke (90,000 tonnes), Portsmouth (160,000 tonnes) and an unspecified site in the south-west of the area (105,000 tonnes). Southampton City Council has opted for an anaerobic digester in preference to a new incinerator (ENDS Report 240, pp 14-15 e).

Another application for an incinerator at Colnbrook, west of London, is expected in early 1997 from waste group Grundon. The project, scaled down to a capacity of 250,000 tonnes, was first announced in 1993 (ENDS Report 219, pp 12-13 e).

Greater Manchester Waste is also expected to apply for planning consent for a £12 million upgrade of its Bolton incinerator, which shut at the end of November. The plant's capacity would be increased from 80,000 to 128,000 tonnes. The council has also carried out a feasibility study for a further four incinerators in Greater Manchester, with a total capacity of up to 1.1 million tonnes.

Other areas where waste-to-energy plants are under consideration include Avonmouth, Devon, Dorset, Surrey, North Tyneside and Essex.

Meanwhile, Dundee City Council's controversial Baldovie incinerator ceased operation at the end of November. The plant has been dogged by repeated breaches of authorisation limits and reports of partially incinerated clinical waste being found on a nearby landfill (ENDS Report 250, pp 12-13 e).

Emission tests by the Scottish Environmental Protection Agency (SEPA) in September found particulate emissions of up to 3 290mg/m , well above the authorised limit of 200mg/m . The council shut one furnace for repairs and was required to recalibrate its continuous emission monitors, which had reported compliance with the limit.

Last spring, Dundee council promised that the plant would close by the end of June, when two new autoclaves would take over the disposal of clinical waste supplied from Glasgow and Lothian under lucrative long-term contracts (ENDS Report 254, pp 14-15 e). However, by the end of November only one of the units had passed performance tests which allow it to handle clinical waste - and Sal Pharma, supplier of the £750,000 autoclaves, had gone into receivership.

Dundee council has failed to deliver on several other commitments. Promised inquiries into the incinerator's high emissions and the operation of the landfill have failed to materialise. Under pressure from Tayside Health Council and local residents, the council's environmental and consumer protection committee recently backed a study into the health effects of the incinerator's emissions - though experience suggests that this may fall by the wayside.

The council's plans for a £40 million, 120,000 tonnes per year waste-to-energy plant on the Baldovie site are also in limbo. The plant would be built by Kvaerner and operated by Dundee Energy Recycling. The council has been promising for over a year that a financial agreement with unnamed private sector partners was "imminent". It blames the delay on difficulties with the Government's private finance initiative.

1 Energy from waste, from DoE, Publications Despatch Centre, Blackhorse Rd, London SE99 6TT.