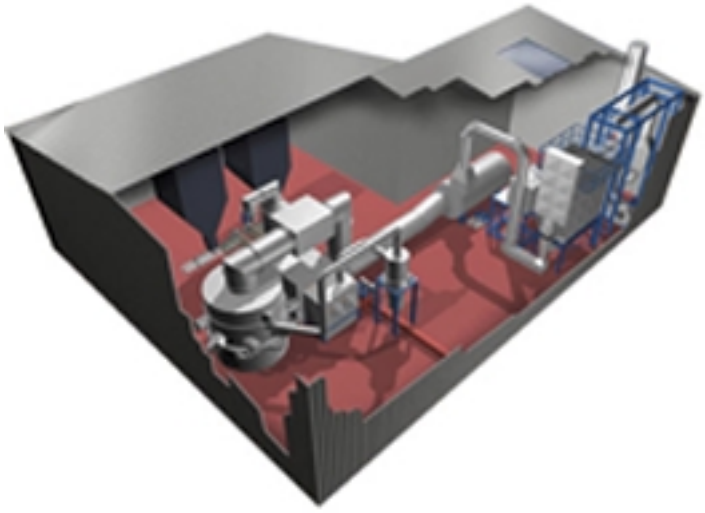
Fact Sheet

COMPACT POWER

Municipal Solid Waste
MSW



Integrated Solutions to Waste

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Municipal Solid Waste
MSW

Plant capacity	**30,000 tpa — 60,000tpa**
Gate fee for disposal	**£40/t - £50/t**
Energy recovery	**80%**
Clean emissions	

Sustainable solutions
for local communities
environmental and social benefits
and Best Value

Integrated Waste Management [IWM]
with
recycling, composting and energy recovery

Material Recycling Facility [MRF]
with
advanced thermal conversion
of
residual waste
by
pyrolysis, gasification and high temperature oxidation

Combined Heat and Power [CHP]
community heating for affordable warmth
CHP for job creation

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Strategic objectives:

Energy from waste can make an important contribution towards sustainable development as a source of renewable energy, reducing the use of fossil fuels and cutting emissions of greenhouse gases. [Government s Waste Strategy 2000 — published May 2000]

If we are to achieve a sustainable waste management system, then incineration with energy recovery will need to play a full and integrated part in local and regional solutions developed over the next few years. Waste to energy incineration must be considered in the context of an integrated approach to waste management which encourages waste reduction, re-use and recycling. Where incineration with energy recovery is the best practicable environmental option, the potential for incorporating CHP should always be considered in order to increase the efficiency of the process. [Waste Strategy 2000]

Advanced conversion technologies will be most appropriate where minimising environmental impact is a priority or where a local-scale waste management solution is required. [Advanced Thermal Conversion Technologies for Energy from Solid Waste. A joint Report of the International Energy Agency Bioenergy Programme and the IEA CADDET Renewable Energy Technologies Programme - published August 1998 — the CADDET Report].

Exploring the PFI as a means of financing waste to energy projects [ETSU Report - published August 2000]

Background

The reduction, reuse, recycling, of waste and the recovery of energy from waste are key features in achieving the UK s international and national waste management obligations.

According to the most recent government figures, in 1998/9 the UK produced 27.9 million tonnes per annum of municipal solid waste (MSW). 83% was landfilled (23 million tonnes), 9% was recycled and 8% was incinerated with energy recovery. [WS2000 — 2.16]

The Landfill Directive requires the UK to reduce the amount of biodegradable municipal waste going to landfill to 25% below 1995 arisings by 2006, 50% by 2009 and 65% by 2016 (with a possible 4 year grace period) [WS2000 — C.9 Note]. The Government and the National Assembly of Wales have established more ambitious targets: 40% by 2005, 45% by 2010 and 67% by 2015.

Over 40% of the local waste disposal authorities in the UK have total MSW arisings of less than 200,000 tpa. With waste strategies now favouring integrated waste management solutions and firm targets for waste reduction in the Government s Waste Strategy 2000, thermal solutions must be effective and economic at levels of 30,000 tpa — 60,000tpa. Increasingly local communities will seek integrated waste management solutions for total waste arisings of c.100,000 tpa. If optimum targets for recycling and composting are met, residual waste streams of 30,000 tpa — 60,000 tpa will remain for thermal processing.

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Current waste management strategies appear to assume that mass burn combustion is the only process available and that it is only practical and economic in volumes in excess of 200,000 tpa. For this reason many larger scale regional solutions are under discussion with an inevitable compromise on many environmental objectives such as the proximity principle, reducing transportation, optimising CHP applications and minimising visual impact. [For example, an incinerator of 250,000 tpa capacity requires a gross waste stream of over 400,000 tpa if recycling and composting targets are being met (which represents a population equivalent of about 1 million people). Such a plant would typically generate up to 12 MW of electricity and 48 MW of waste heat, but waste heat in such volumes would be difficult to use effectively for CHP applications.

However Compact Power has developed an advanced thermal conversion process which is economic for MSW at 30,000 tpa — 60,000tpa and opens the way for optimum local integrated waste management solutions.

In Waste Strategy 2000 Appendix C estimates are made of the numbers of new waste management facilities that could be required to meet the Landfill Directive targets [Table C8] assuming various waste management options. The conclusions are that the following number of facilities will be required over the next 20 years assuming a growth rate of 3% pa in MSW and average present value costs per tonne are indicated * for urban situations, excluding the costs of collection:

Capacity tpa	MRF s (recycling) 40,000	Composting stations 30,000	**Incinerators 250,000**	**Compact Power 30 — 60,000**	Incinerators 100,000
No. of facilities	223 — 316	116 — 196	**89 — 166**		
Costs / tonne	£23 *	£10 *	**£48 ***	**£40 - £50**	£60 [estimate]

Advanced thermal conversion technologies can be an attractive addition to the range of waste management options. They have several potential benefits relative to Mass Burn Combustion:

- lower environmental impacts;
- higher electrical conversion efficiencies;
- social benefits associated with local appropriateness of scale;
- greater compatibility with recycling and CHP.

Advanced conversion technologies will be most appropriate where these advantages are policy requirements, for example where minimising environmental impact is a priority or where a local-scale waste management solution is required. [CADDET Report Conclusions]

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CHP — Community heating

The Government has stated its commitment to CHP in its Waste Strategy 2000. Now Compact Power can offer local communities an economic and environmentally friendly alternative to incineration.

Where energy recovery forms part of an integrated waste strategy, the potential for incorporating CHP technology should always be considered in order to maximise the energy which is recovered.

If we are to achieve a sustainable waste management system, then incineration with energy recovery will need to play a full and integrated part in local and regional solutions developed over the next few years. Waste to energy incineration must be considered in the context of an integrated approach to waste management which encourages waste reduction, re-use and recycling. Where incineration with energy recovery is the best practicable environmental option, the potential for incorporating CHP should always be considered in order to increase the efficiency of the process. Energy from waste schemes will be given a boost by the exemption of renewable energy and of good quality CHP from the Climate Change Levy.

The government and the national assembly are working with industry to promote the wider uptake of CHP because of its environmental and economic benefits. Every 1,000 megawatts of CHP can reduce energy costs by £100 million and carbon emissions by around 1 million tonnes per annum. CHP will be a key element in achieving our aims under the legally binding Kyoto Protocol which requires the UK to reduce its greenhouse gas emissions by 12.5% by 2008 to 2010, and to move towards our domestic goal of reducing carbon dioxide emissions by 20% by 2010.

Combined heat and power schemes incorporating municipal sold waste incineration enable the energy efficiency of the process to be increased to as much as 75%, compared with the normal efficiency of about 25 to 35% from a conventional energy from waste plant.
[cf. Compact Power s 80% below]

Municipal waste incineration with energy recovery — combined with CHP plant and a community heating system — has the potential to provide an integrated, sustainable and cost effective means of managing waste locally, particularly in certain urban locations with a large heat demand nearby, and supplying affordable power and warmth for the community.

Compact Power has developed its technology with these objectives in mind.

Compact Power recovers 80% of the energy value of the waste fuel as usable heat and power and typical projects include:

- **community heating schemes offering affordable heat in inner-city areas;**
- **industrial schemes providing space heating and process steam to industrial users.**

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Plant is sized to make it as practical as possible to match heat output to local demand and the use of the steam cycle facilitates the delivery of heat through conventional means of distribution.

THE COMPACT POWER SOLUTION
[FOR FURTHER DETAIL SEE COMPACT POWER BROCHURE S OLUTIONS TO WASTE]

Compact Power has developed a new advanced thermal conversion technology for a wide range of wastes using the processes of pyrolysis, gasification and high temperature oxidation. The plant is designed as a closed system in which all waste materials are converted into simple gases and used to fuel conventional steam power cycle. Facilities can be designed for multiple waste streams, meeting the highest environmental standards optimising energy recovery.

This is an economic new energy recovery technology for the disposal of wastes. Processing costs range from £40 at 60,000 tpa to £50 at 30,000 tpa.

Units of plant are designed to process waste streams with widely differing calorific values. They have a nominal throughput capacity in the range of 6,000 to 30,000 tpa generating heat and electricity (350kWe — 8MWe). They are easily transportable and can be assembled in a modular manner so that where greater capacity is required two or more systems can be combined.

The Compact Power plant fits perfectly into an integrated approach to waste management. It allows for the initial recycling and composting of waste, with the remainder being used for heat and power generation. Compact Power believes in recovering value from waste by recovering recyclables and producing a soil conditioner prior to using the residual waste to generate power.

The ability of the technology to process difficult wastes permits the same plant to deal with smaller quantities of such wastes as part of a total waste management solution.

As part of an integrated waste management facility the substantial economic advantages of the Compact Power plant can make a local solution affordable.

Compact Power provides a synthesis of local options which can be offered in partnership with local authorities, waste producers and industry.

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Performance data:

CV (MJ/kg) +/- 10% LCV wet	Steam Flow (MW) @ 80% Thermal Efficiency	% Residual Ash	Electrical Output @ 20 % Thermal Efficiency						Population Equivalent (MSW @ 1 kg/head/day)		
			MT8			MT8 x 2			MT8		MT8 x 2
			Tonnes/Hr	Tonnes/Yr*	MWe	Tonnes/Hr	Tonnes/Yr*	MWe		
8.50	6.0	25-30	3.75	30,000	1.66	7.50	60,000	1.66	82,200	164,400
10.00	7.2	21-25	3.75	30,000	1.99	7.50	60,000	1.99	82,200	164,400
12.00	8.8	18-21	3.75	30,000	2.42	7.50	60,000	2.42	82,200	164,400
15.00	11.1	15-18	3.34	26,728	2.70	6.68	53,456	2.70	73,200	146,500

*Operating for 8000 hrs/yr

Emissions data:

mg/Nm^3 unless stated (Normalised to 11% O_2 at 273K and 101.3kPa)	* Current IPC limits >3T/h MSW	Typical modern mass burn incinerator	** Proposed EC limits for MSW incineration	Compact Power for MSW
Particulates	30	0.2	10	0.2
VOC s as carbon	20	<3	10	trace
Nox	-	393	200	<37
HCl	50	4	10	2
HF	2	<0.1	1	<0.1
SO_2	300	59	50	25
CO	100	19	50	trace
Cd + Tl	-	0.03	0.05	0.006
Mercury	-	0.01	0.05	0.006
Pb+Cr+Cu+Mn+Ni+As+Sb+Co+V+Sn	-	0.15	0.5	0.006
Dioxins TEQ (ng/Nm^3)	-	0.26	0.1	0.03

* Limits according to Directive 89/369EEC adopted for UK IPC Guidance, (7 day averages).
** Proposed limits in the Draft Directive on the incineration of Non-Hazardous Wastes, April 1997 (24 hr averages).

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The Commercial Opportunity

Compact Power is dedicated to working with local partners to ensure that projects are designed to meet the strategic aims of the community for sustainable development and to provide opportunity for local participation. Local partners are supported with all necessary experienced technical, professional and financial support so that projects can properly reflect local requirements while benefiting from the wider national and international scope of Compact Power s project developments.

In addition to the usual development skills Compact Power has a professional team headed by David Bulman focusing on the opportunities for developing projects under the PFI. David Bulman is the author of a DTI report on the PFI for integrated waste management and energy from waste projects. The team have a strong focus on working with local authorities to obtain PFI funding on the best available terms, and have strong associations with major financiers in the field of PFI finance.

For further details see:
Compact Power Brochures: Solutions to Waste
Fact sheets: Municipal Solid Waste [MSW]
[Packaging waste]
[ELV s]
[Biomass]
[Tyres]
[Abattoir waste]